

ANNEXURE Q_nM 1.2.1/1

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A. in Arabic	Pre-Islamic Arabic Literature	MAARB 101	2020-2021
M.A. in Arabic	Arabic Literature During Islamic Period	MAARB 102	2020-2021
M.A. in Arabic	Linguistics	MAARB 103	2020-2021
M.A. in Arabic	Arabic Text and Applied Grammar	MAARB 104	2020-2021
M.A. in Arabic	Translation: Theory and Practice	MAARB 105	2020-2021
M.A. in Arabic	Arabic Literature During Umayyad Period	MAARB 201	2020-2021
M.A. in Arabic	Rhetoric & Prosody	MAARB 202	2017-18
M.A. in Arabic	Use of Language-I	MAARB 203	2020-2021
M.A. in Arabic	Arabic Literature in India	MAARB 204	2020-2021
M.A. in Arabic	Specialized Translation	MAARB 205	2020-2021
M.A. in Arabic	Arabic Poetry During Abbasid Period	MAARB 301	2020-2021
M.A. in Arabic	Arabic Prose During Abbasid Period	MAARB 302	2020-2021
M.A. in Arabic	Principles of Literary Criticism	MAARB 303 A	2020-2021
M.A. in Arabic	Teaching Methodology	MAARB 303 B	2020-2021
M.A. in Arabic	Development of AutoBiography in Arabic literature	MAARB 303 C	2020-2021
M.A. in Arabic	Stylistics of Arabic Literature	MAARB 303 D	2020-2021
M.A. in Arabic	Literary Trends, Movements & Schools	MAARB 304 A	2020-2021
M.A. in Arabic	Communicative Arabic1	MAARB 304 B	2020-2021
M.A. in Arabic	Applied Criticism	MAARB 304 C	2020-2021
M.A. in Arabic	Development of Travel Literature in Arabic	MAARB 304 D	2020-2021
M.A. in Arabic	Essential Arabic	MAARB 305 A	2020-2021
M.A. in Arabic	Contemporary Arab World (Social, Economical & Political Conditions)	MAARB 305 B	2020-2021
M.A. in Arabic	Arab Culture and Civilization	MAARB 305 C	2020-2021
M.A. in Arabic	A brief history of Arabic Literature	MAARB 305 D	2020-2021
M.A. in Arabic	Community Engagement Course	MAARB 400	2020-2021
M.A. in Arabic	Modern Arabic Prose	MAARB 401	2017-2018

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A. in Arabic	Modern Arabic Poetry	MAARB 402	2017-2018
M.A. in Arabic	Arabic Novel & Short story	MAARB 403 A	2017-2018
M.A. in Arabic	Mahjar Literature	MAARB 403 B	2020-2021
M.A. in Arabic	Development of Arabic Journalism	MAARB 403 C	2020-2021
M.A. in Arabic	Arabic Play	MAARB 403 D	2020-2021
M.A. in Arabic	Use of Language-II	MAARB 404 A	2020-2021
M.A. in Arabic	Communicative Arabic-II	MAARB 404 B	2020-2021
M.A. in Arabic	Consecutive Interpretation	MAARB 404 C	2020-2021
M.A. in Arabic	Andalusian & Ottoman Literature	MAARB 404 D	2020-2021
M.A. in Arabic	Dissertation Writing & Research Methodology	MAARB 405	2020-2021
M.A. in Bengali	History of Bengali Literature (10-15th Century); Historical & Descriptive Linguistics	BENG-101	2014-2015
M.A. in Bengali	Old & Medieval Literature & Poetry of 19th Century	BENG-102	2020-2021
M.A. in Bengali	Tagore & his contemporary Poetry	BENG-103	2014-2015
M.A. in Bengali	Fiction& Autobiography	BENG-104	2020-2021
M.A. in Bengali	Literary Theory & Essays	BENG-105	2020-2021
M.A. in Bengali	History of Bengali Literature (16-18th Century) & Linguistics	BENG-201	2014-2015
M.A. in Bengali	Poetry of Medieval & Modern age	BENG-202	2014-2015
M.A. in Bengali	Tagore's Fiction & Modern Short-stories	BENG-203	2014-2015
M.A. in Bengali	Drama & Fiction	BENG-204	2020-2021
M.A. in Bengali	Aesthetics, Critical Theory& Essay-literature	BENG-205	2020-2021
M.A. in Bengali	History of Bengali Literature (19th Century) & Bengali Fiction & Drama	BENG-301	2014-2015
M.A. in Bengali	Drama	BENG-302	2014-2015
M.A. in Bengali	Old & Medieval Social History of Bengal & Literature	BENG-303 A	2014-2015
M.A. in Bengali	Literature & Culture of 19th Century Bengal	BENG-303 B	2020-2021
M.A. in Bengali	Theoretical concept on Fiction & Short-story; Bengali Fiction	BENG-303 C	2014-2015

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A. in Bengali	Theory of Drama & History of Bengali Theatre	BENG-303 D	2014-2015
M.A. in Bengali	Modern Linguistics	BENG-303 E	2014-2015
M.A. in Bengali	Medieval Bengali Literature	BENG-304 A	2014-2015
M.A. in Bengali	19th Century Bengali Drama & Poetry	BENG-304 B	2020-2021
M.A. in Bengali	Bengali Fiction	BENG-304 C	2014-2015
M.A. in Bengali	Bengali Drama	BENG-304 D	2014-2015
M.A. in Bengali	Sociolinguistics, Dialectology & Field Survey; Ancient Linguistic Schools, Historical & Comparative Linguistics	BENG-304 E	2020-2021
M.A. in Bengali	Interdisciplinary Elective/ SWAYAM	BENG-305	2020-2021
M.A. in Bengali	Community Engagement Course	BENG-400	2020-2021
M.A. in Bengali	History of Bengali Literature (20th Century), Essays of Tagore	BENG-401	2014-2015
M.A. in Bengali	Literary Movement, Translation Theory, Poetic Metre, Research Methodology	BENG-402	2020-2021
M.A. in Bengali	Vaishnab Padabali, Mongal Kavya, Sati Moina	BENG-403 A	2014-2015
M.A. in Bengali	Battala Literature, Social History of 19th Century Bengal, Writings of Bankimchandra	BENG-403 B	2020-2021
M.A. in Bengali	Bengali Fiction	BENG-403 C	2014-2015
M.A. in Bengali	Bengali Drama of 19th& 20th Century	BENG-403 D	2020-2021
M.A. in Bengali	Modern Linguistics& Linguistic Schools	BENG-403 E	2020-2021
M.A. in Bengali	Shibayan, Maharashtra Puran, Folk tradition of Medieval Literature, Criticism of Medieval Bengali Literature in 19th& 20th Century	BENG-404 A	2020-2021
M.A. in Bengali	19th Century Bengali Fiction, Women movement& Literature, Theatre	BENG-404 B	2020-2021
M.A. in Bengali	Modern Bengali Stories	BENG-404 C	2014-2015
M.A. in Bengali	Adapted Drama, One Act Play, Essays on Drama and Theatre	BENG-404 D	2020-2021
M.A. in Bengali	Semiotics, Language Planning, Lexicography	BENG-404 E	2020-2021
M.A. in Bengali	Project paper	BENG-405	2014-2015
MSc in Biotechnology	Biochemistry & Cell Biology	MSBT101	2020-2021

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Biotechnology	Developmental Biology & Molecular Biology	MSBT102	2020-2021
MSc in Biotechnology	Analytical Techniques & Biostatistics and Computer Application	MSBT103	2014-2015
MSc in Biotechnology	Biochemistry & Cell Biology (Practical)	MSBT104	2014-2015
MSc in Biotechnology	Molecular biology (Practical)	MSBT105	2014-2015
MSc in Biotechnology	Analytical Techniques & Biostatistics and Computer Application (Practical)	MSBT106	2014-2015
MSc in Biotechnology	Immunology & Genetics	MSBT201	2020-2021
MSc in Biotechnology	Microbiology & Industrial Applications & Genetic Engineering	MSBT202	2020-2021
MSc in Biotechnology	Bioinformatics	MSBT203	2020-2021
MSc in Biotechnology	IPR & Biosafety Bioentrepreneurship	MSBT204	2020-2021
MSc in Biotechnology	Immunology & Genetics (Practical)	MSBT205	2014-2015
MSc in Biotechnology	Microbiology & Industrial Applications & Genetic Engineering & Bioinformatics	MSBT206	2020-2021
MSc in Biotechnology	Bioprocess Engineering & Technology & Immunotechnology	MSBT301	2020-2021
MSc in Biotechnology	Molecular Virology	MSBT302	2020-2021
MSc in Biotechnology	Bioprocess Engineering & Technology Immunotechnology	MSBT303	2020-2021
MSc in Biotechnology	A general idea on Basic & Applied Biotechnology OR may be opted from SWAYAM	MSBT304	2020-2021
MSc in Biotechnology	Plant Biotechnology	MSBT305-1	2014-2015
MSc in Biotechnology	Animal Biotechnology	MSBT305-2	2014-2015
MSc in Biotechnology	Microbial Biotechnology	MSBT305-3	2020-2021
MSc in Biotechnology	Computer Skills for Biological Research	MSBT305-4	2020-2021
MSc in Biotechnology	Plant Biotechnology (P)	MSBT306-1	2014-2015
MSc in Biotechnology	Animal Biotechnology (P)	MSBT306-2	2014-2015
MSc in Biotechnology	Microbial Biotechnology (P)	MSBT306-3	2014-2015
MSc in Biotechnology	Computer Skills for Biological Research (P)	MSBT306-4	2020-2021
MSc in Biotechnology	Proteomics	MSBT401	2014-2015

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Biotechnology	Genomics	MSBT402	2014-2015
MSc in Biotechnology	Review of Literature on Project topic and Seminar presentation	MSBT403	2020-2021
MSc in Biotechnology	Advanced Plant Biotechnology	MSBT404-1	2020-2021
MSc in Biotechnology	Advanced Animal Biotechnology	MSBT404-2	2020-2021
MSc in Biotechnology	Advanced Microbial Biotechnology	MSBT404-3	2020-2021
MSc in Biotechnology	Advanced Bioinformatics	MSBT404-3	2020-2021
MSc in Biotechnology	Advanced Plant Biotechnology (P)	MSBT405-1	2020-2021
MSc in Biotechnology	Advanced Animal Biotechnology (P)	MSBT405-2	2020-2021
MSc in Biotechnology	Advanced Microbial Biotechnology (P)	MSBT405-3	2020-2021
MSc in Biotechnology	Advanced Bioinformatics (P)	MSBT405-3	2020-2021
MSc in Biotechnology	Project/ Term paper	MSBT406	2014-2015
MSc in Botany	Microbiology	MSBO101	2014-2015
MSc in Botany	Phycology	MSBO102	2014-2015
MSc in Botany	Unit I: Mycology Unit II: Plant Pathology	MSBO103	2014-2015
MSc in Botany	Unit I: Bryology Unit II: Pteridology	MSBO104	2014-2015
MSc in Botany	Unit I: Microbiology Unit II: Phycology	MSBO105	2014-2015
MSc in Botany	Unit I: Mycology & Plant Pathology Unit II: Bryology & Pteridology (P)	MSBO106	2014-2015
MSc in Botany	Plant Physiology	MSBO201	2014-2015
MSc in Botany	Plant Biochemistry	MSBO202	2014-2015
MSc in Botany	Unit I: Taxonomy of Angiosperm Unit II: Phytogeography	MSBO203	2014-2015
MSc in Botany	Gymnosperm, Paleobotany&Palynology	MSBO204	2014-2015
MSc in Botany	Unit I: Plant Physiology Unit II: Plant Biochemistry (P)	MSBO205	2014-2015
MSc in Botany	Unit I: Taxonomy of Angiosperm & Phytogeography Unit II: Gymnosperm, Paleobotany & Palynology (P)	MSBO206	2014-2015
MSc in Botany	Ecology & Plant Anatomy	MSBO301	2020-2021

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Botany	Pharmacognosy & Instrumentation	MSBO302	2014-2015
MSc in Botany	Unit I: Ecology & Plant Anatomy Unit II: Pharmacognosy & Instrumentation (P)	MSBO303	2020-2021
MSc in Botany	Plant System and Function / Plant Diversity and Evolution	MSBO304	2020-2021
MSc in Botany	Plant Physiology and Biochemistry	MSBO305-1	2014-2015
MSc in Botany	Applied and Molecular Mycology and Plant Pathology	MSBO305-2	2014-2015
MSc in Botany	Microbiology	MSBO305-3	2014-2015
MSc in Botany	Plant Genetics and Biotechnology	MSBO305-4	2020-2021
MSc in Botany	Taxonomy of Angiosperms and Biosystematics	MSBO305-5	2014-2015
MSc in Botany	Phycology	MSBO305-6	2014-2015
MSc in Botany	Plant Physiology and Biochemistry	MSBO306-1	2014-2015
MSc in Botany	Applied and Molecular Mycology and Plant Pathology	MSBO306-2	2014-2015
MSc in Botany	Microbiology	MSBO306-3	2014-2015
MSc in Botany	Plant Genetics and Biotechnology	MSBO306-4	2020-2021
MSc in Botany	Taxonomy of Angiosperms and Biosystematics	MSBO306-5	2014-2015
MSc in Botany	Phycology	MSBO306-6	2014-2015
MSc in Botany	Workshops on Awareness campaign on preservation of Biodiversity, agrobiodiversity, medicinal plants etc.	MSBO307	2020-2021
MSc in Botany	Genetics, Plant Breeding & Biostatistics	MSBO401	2020-2021
MSc in Botany	Cell Biology & Bioinformatics	MSBO402	2020-2021
MSc in Botany	Unit I: Genetics, Plant Breeding & Biostatistics Unit II: Cell Biology & Bioinformatics	MSBO403	2020-2021
MSc in Botany	Plant Physiology and Biochemistry	MSBO404-1	2014-2015
MSc in Botany	Applied and Molecular Mycology and Plant Pathology	MSBO404-2	2020-2021
MSc in Botany	Microbiology	MSBO404-3	2014-2015
MSc in Botany	Plant Genetics and Biotechnology	MSBO404-4	2020-2021

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Botany	Taxonomy of Angiosperms and Biosystematics	MSBO404-5	2014-2015
MSc in Botany	Phycology	MSBO404-6	2014-2015
MSc in Botany	Plant Physiology and Biochemistry	MSBO405-1	2014-2015
MSc in Botany	Applied and Molecular Mycology and Plant Pathology	MSBO405-2	2020-2021
MSc in Botany	Microbiology	MSBO405-3	2014-2015
MSc in Botany	Plant Genetics and Biotechnology	MSBO405-4	2020-2021
MSc in Botany	Taxonomy of Angiosperms and Biosystematics	MSBO405-5	2014-2015
MSc in Botany	Phycology	MSBO405-6	2014-2015
MSc in Botany	Project / Term paper	MSBO406	2014-2015
MSc in Chemistry	Inorganic Gen-I	MSCH101	2014-2015
MSc in Chemistry	Nuclear Analytical Gen-I	MSCH102	2014-2015
MSc in Chemistry	Organic Gen-I	MSCH103	2014-2015
MSc in Chemistry	Physical Gen-I	MSCH104	2014-2015
MSc in Chemistry	Inorganic Practical	MSCH105	2014-2015
MSc in Chemistry	Nuclear Analytical Practical	MSCH106	2014-2015
MSc in Chemistry	Inorganic Gen-II	MSCH201	2014-2015
MSc in Chemistry	Nuclear Analytical Gen-II	MSCH202	2014-2015
MSc in Chemistry	Organic Gen-II	MSCH203	2014-2015
MSc in Chemistry	Physical Gen-II	MSCH204	2014-2015
MSc in Chemistry	Organic Practical	MSCH205	2014-2015
MSc in Chemistry	Physical Practical	MSCH206	2014-2015
MSc in Chemistry	Inorganic Advanced General	MSCH301	2014-2015
MSc in Chemistry	Nuclear Analytical Advanced General	MSCH302	2014-2015
MSc in Chemistry	Organic Advanced General	MSCH303	2014-2015
MSc in Chemistry	Basics in Medicinal Chemistry	MSCH304-M	2020-2021

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Chemistry	Basics in Industrial Chemistry	MSCH304-I	2020-2021
MSc in Chemistry	Inorganic Major-I	MSCH305-I	2014-2015
MSc in Chemistry	Nuclear Analytical Major-I	MSCH305-N	2014-2015
MSc in Chemistry	Organic Major-I	MSCH305-O	2014-2015
MSc in Chemistry	Physical Major-I	MSCH305-P	2014-2015
MSc in Chemistry	Inorganic Major-I Practical	MSCH306-I	2014-2015
MSc in Chemistry	Nuclear Analytical Major-I Practical	MSCH306-N	2014-2015
MSc in Chemistry	Organic Major-I Practical	MSCH306-O	2014-2015
MSc in Chemistry	Physical Major-I Practical	MSCH306-P	2014-2015
MSc in Chemistry	Social Outreach (SO)	MSCH307	2020-2021
MSc in Chemistry	Physical Advanced General	MSCH401	2014-2015
MSc in Chemistry	Medicinal Chemistry	MSCH402	2020-2021
MSc in Chemistry	Inorganic Major-II	MSCH403-I	2014-2015
MSc in Chemistry	Nuclear Analytical Major-II	MSCH403-N	2014-2015
MSc in Chemistry	Organic Major-II	MSCH403-O	2014-2015
MSc in Chemistry	Physical Major-II	MSCH403-P	2014-2015
MSc in Chemistry	Inorganic Major-III	MSCH404-I	2014-2015
MSc in Chemistry	Nuclear Analytical Major-III	MSCH404-N	2014-2015
MSc in Chemistry	Organic Major-III	MSCH404-O	2014-2015
MSc in Chemistry	Physical Major-III	MSCH404-P	2014-2015
MSc in Chemistry	Inorganic Major-II Practical	MSCH405-I	2014-2015
MSc in Chemistry	Nuclear Analytical Major-II Practical	MSCH405-N	2014-2015
MSc in Chemistry	Organic Major-II Practical	MSCH405-O	2014-2015
MSc in Chemistry	Physical Major-II Practical	MSCH405-P	2014-2015
MSc in Chemistry	Project (INORGANIC)	MSCH406-I	2014-2015

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Chemistry	Project (NUCLEAR ANALYTICAL)	MSCH406-N	2014-2015
MSc in Chemistry	Project (ORGANIC)	MSCH406-O	2014-2015
MSc in Chemistry	Project (PHYSICAL)	MSCH406-P	2014-2015
MCom (Commerce)	Organizational Behaviour and Human Resource Management (OBHRM)	COM 101	2014-2015
MCom (Commerce)	Corporate Governance and Sustainability (CGS)	COM 102	2020-2021
MCom (Commerce)	Managerial Economics (ME)	COM 103	2014-2015
MCom (Commerce)	Statistics for Business Decisions (SBD)	COM 104	2014-2015
MCom (Commerce)	Accounting for Managerial Decisions (AMD)	COM 105	2014-2015
MCom (Commerce)	Financial Reporting and Financial Statement Analysis (FRFSA)	COM 201	2014-2015
MCom (Commerce)	Operations Research (OR)	COM 202	2014-2015
MCom (Commerce)	International Business (IB)	COM 203	2020-2021
MCom (Commerce)	Advanced Financial Management (AFM)	COM 204	2020-2021
MCom (Commerce)	Marketing Management and Strategic Management (MMSM)	COM 205	2014-2015
MCom (Commerce)	Direct and Indirect Taxes (DIT)	COM 301	2014-2015
MCom (Commerce)	Computer Applications in Business – I (CAB I)	COM 302	2014-2015
MCom (Commerce)	Strategic Financial Management (SFM)	COM 303A	2020-2021
MCom (Commerce)	Principles & Practices of Banking (PPB)	COM 303B	2014-2015
MCom (Commerce)	Advanced Auditing and Assurance (AAA)	COM 303C	2020-2021
MCom (Commerce)	Security Analysis and Portfolio Management (SAPM)	COM 304A	2014-2015
MCom (Commerce)	Principles & Practice of Insurance (PPI)	COM 304B	2014-2015
MCom (Commerce)	International Accounting (IA)	COM 304C	2014-2015
MCom (Commerce)	Basic Accounting and Finance (AF)	COM 305A	2020-2021
MCom (Commerce)	Personal Finance (PF)	COM 305B	2020-2021
MCom (Commerce)	Social Outreach (SO)	COM 400	2020-2021
MCom (Commerce)	Strategic Cost Management (SCM)	COM 401	2014-2015

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MCom (Commerce)	Computer Applications in Business – II (CAB II)	COM 402	2014-2015
MCom (Commerce)	Business Valuation (BV)	COM 403A	2020-2021
MCom (Commerce)	Management of Commercial Banks & Insurance (MCBI)	COM 403B	2014-2015
MCom (Commerce)	Corporate Reporting I (CR I)	COM 403C	2014-2015
MCom (Commerce)	Financial Institutions and Financial Derivatives (FIFD)	COM 404A	2020-2021
MCom (Commerce)	Management of Risk in Banking & Insurance (MRBI)	COM 404B	2014-2015
MCom (Commerce)	Corporate Reporting II (CR II)	COM 404C	2014-2015
MCom (Commerce)	Project Work	COM 405	2014-2015
MSc in Computer Science	Advanced Algorithm Design	MSCS- 101	2020-2021
MSc in Computer Science	Advanced Computer Architecture	MSCS -102	2020-2021
MSc in Computer Science	Advanced Software Engineering	MSCS -103	2020-2021
MSc in Computer Science	Numerical & Statistical Computing	MSCS -104	2014-2015
MSc in Computer Science	Lab I (Advanced Algorithm Design)	MSCS -105	2020-2021
MSc in Computer Science	Lab II (Advanced Software Engineering and Numerical & Statistical Computing)	MSCS -106	2014-2015
MSc in Computer Science	Advanced Operating Systems	MSCS- 201	2014-2015
MSc in Computer Science	Advanced Computer Networks	MSCS- 202	2014-2015
MSc in Computer Science	AI & Applications	MSCS- 203	2014-2015
MSc in Computer Science	Advanced DBMS	MSCS- 204	2014-2015
MSc in Computer Science	Lab III (Advanced Operating Systems and Advanced Computer Networks)	MSCS- 205	2014-2015
MSc in Computer Science	Lab IV (AI & Applications and Advanced DBMS)	MSCS- 206	2014-2015
MSc in Computer Science	Compiler Design	MSCS-301	2014-2015
MSc in Computer Science	Machine Learning	MSCS-302 A	2020-2021
MSc in Computer Science	Cryptography and Network Security	MSCS-302 B	2014-2015
MSc in Computer Science	Software Project Management	MSCS-302 C	2020-2021
MSc in Computer Science	Data Mining	MSCS-302 D	2020-2021

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Computer Science	Object Technology using JAVA	MSCS-302 E	2014-2015
MSc in Computer Science	Soft Computing	MSCS-302 F	2020-2021
MSc in Computer Science	Theory of Computing	MSCS-302 G	2014-2015
MSc in Computer Science	May be opted from SWAYAM	MSCS-302 H	2020-2021
MSc in Computer Science	Internet and E-Commerce	MSCS -304 A	2020-2021
MSc in Computer Science	Web Security	MSCS -304 B	2020-2021
MSc in Computer Science	Introduction to Artificial Intelligence	MSCS -304 C	2020-2021
MSc in Computer Science	Cryptography	MSCS -304 D	2020-2021
MSc in Computer Science	Introduction to Programming	MSCS -304 E	2020-2021
MSc in Computer Science	MSWM-304 - May be opted from SWAYAM	MSCS -304 F	2020-2021
MSc in Computer Science	Lab V (Compiler Design)	MSCS -305	2014-2015
MSc in Computer Science	Lab VI (Discipline-centric Elective : E1)	MSCS -306	2014-2015
MSc in Computer Science	Community Engagement Activities	MSCS -307	2020-2021
MSc in Computer Science	Discipline-centric Elective (E2): Operation Research and Optimization	MSCS-401 A	2020-2021
MSc in Computer Science	Discipline-centric Elective (E2): Model Checking	MSCS-401 B	2020-2021
MSc in Computer Science	Discipline-centric Elective (E2): Bioinformatics	MSCS-401 C	2020-2021
MSc in Computer Science	Discipline-centric Elective (E2): Internet of Things	MSCS-401 D	2020-2021
MSc in Computer Science	Discipline-centric Elective (E2): Data Science	MSCS-401 E	2020-2021
MSc in Computer Science	Discipline-centric Elective (E2): Deep Learning and NLP	MSCS-401 F	2014-2015
MSc in Computer Science	Discipline-centric Elective (E3): Mobile Computing	MSCS-402 A	2014-2015
MSc in Computer Science	Discipline-centric Elective (E3): Computer Graphics & Multimedia	MSCS-402 B	2014-2015
MSc in Computer Science	Discipline-centric Elective (E3): Real time system	MSCS-402 C	2020-2021
MSc in Computer Science	Discipline-centric Elective (E3): Image Processing	MSCS-402 D	2014-2015
MSc in Computer Science	Discipline-centric Elective (E3): Block Chain Technology	MSCS-402 E	2020-2021
MSc in Computer Science	Discipline-centric Elective (E3): Web Technology	MSCS-402 F	2020-2021

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Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Computer Science	Major Project	MSCS-403	2014-2015
MSc in Computer Science	Seminar and Grand Viva	MSCS-404	2014-2015
MSc in Computer Science	DE Lab VII(E2)	MSCS-405	2014-2015
MSc in Computer Science	DE Lab VIII(E3)	MSCS-406	2014-2015
M.A./ MSc in Economics	Microeconomics-I	ECN 101	2014-2015
M.A./ MSc in Economics	Macroeconomics-I	ECN 102	2014-2015
M.A./ MSc in Economics	Development Economics-I	ECN 103	2014-2015
M.A./ MSc in Economics	Mathematical Economics & Statistics	ECN 104	2020-2021
M.A./ MSc in Economics	Econometrics	ECN 105	2014-2015
M.A./ MSc in Economics	Microeconomics-II	ECN 201	2014-2015
M.A./ MSc in Economics	Macroeconomics-II	ECN 202	2014-2015
M.A./ MSc in Economics	Development Economics-II	ECN 203	2014-2015
M.A./ MSc in Economics	Basic Environmental Economics	ECN 204	2020-2021
M.A./ MSc in Economics	Basic Financial Economics	ECN 205	2014-2015
M.A./ MSc in Economics	Select Features of Indian Economy	ECN 301	2020-2021
M.A./ MSc in Economics	International Economics	ECN 302	2014-2015
M.A./ MSc in Economics	Advanced Econometrics	ECN 303A	2014-2015
M.A./ MSc in Economics	Agricultural Economics-I	ECN 303B	2014-2015
M.A./ MSc in Economics	Industrial Organisation	ECN 303C	2020-2021
M.A./ MSc in Economics	Spatial Econometrics	ECN 303D	2014-2015
M.A./ MSc in Economics	Applied Econometrics-I	ECN 304A	2020-2021
M.A./ MSc in Economics	Agricultural Economics-II	ECN 304B	2014-2015
M.A./ MSc in Economics	Behavioural Economics	ECN 304C	2020-2021
M.A./ MSc in Economics	Data Analysis for Social Sciences	ECN 304D	2020-2021
M.A./ MSc in Economics	Environment & Economy	ECN 305A	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A./ MSc in Economics	Demography	ECN 305B	2014-2015
M.A./ MSc in Economics	Basic Econometrics	ECN 305C	2014-2015
M.A./ MSc in Economics	Indian Economy	ECN 305D	2014-2015
M.A./ MSc in Economics	Banking, Insurance & Finance	ECN 305E	2020-2021
M.A./ MSc in Economics	Community Engagement	ECN 400	2020-2021
M.A./ MSc in Economics	Growth & Planning	ECN 401	2014-2015
M.A./ MSc in Economics	Public Economics	ECN 402	2014-2015
M.A./ MSc in Economics	Advanced Financial Economics -I	ECN 403A	2020-2021
M.A./ MSc in Economics	Resource Environment & Sustainable Development	ECN 403B	2020-2021
M.A./ MSc in Economics	Law & Economics	ECN 403C	2020-2021
M.A./ MSc in Economics	Rural Development	ECN 403D	2014-2015
M.A./ MSc in Economics	Applied Econometrics–II	ECN 404A	2020-2021
M.A./ MSc in Economics	Economics of Climate Change & Energy	ECN 404B	2020-2021
M.A./ MSc in Economics	Economics of Social Capital	ECN 404C	2020-2021
M.A./ MSc in Economics	Game Theory & Information	ECN 404D	2020-2021
M.A./ MSc in Economics	Computer Applications & Project	ECN 405	2014-2015
M.A. in Education	Philosophical Foundations of Education	EDN 101	2014-2015
M.A. in Education	Psychological Foundations of Education	EDN 102	2014-2015
M.A. in Education	Sociological Foundations of Education	EDN 103	2014-2015
M.A. in Education	Historical, Political and Economic Foundations of Education	EDN 104	2020-2021
M.A. in Education	Theoretical Foundations of Research	EDN 105	2014-2015
M.A. in Education	Assessment in Education	EDN 201	2020-2021
M.A. in Education	Pedagogy and Andragogy in Education	EDN 202	2020-2021
M.A. in Education	Inclusive Education	EDN 203	2020-2021
M.A. in Education	Teacher Education	EDN 204	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A. in Education	Applied Educational Research	EDN 205	2014-2015
M.A. in Education	Educational Technology	EDN 301	2014-2015
M.A. in Education	Dissertation – I	EDN 302	2014-2015
M.A. in Education	Education for Sustainable Development –I	EDN 303A	2020-2021
M.A. in Education	Comparative Education - I	EDN 303B	2014-2015
M.A. in Education	Value and Human Rights Education–I	EDN 303C	2014-2015
M.A. in Education	Guidance and Counseling in Education-I	EDN 303D	2014-2015
M.A. in Education	Yoga and Health Education -I	EDN 304A	2014-2015
M.A. in Education	Life-Skill Education-I	EDN304B	2020-2021
M.A. in Education	ICT in Education – I	EDN 304C	2020-2021
M.A. in Education	Lifelong Education–I	EDN 304D	2020-2021
M.A. in Education	Inter-disciplinary Elective / SWAYAM	EDN 305	2020-2021
M.A. in Education	Community Outreach Activity	EDN 401	2020-2021
M.A. in Education	Curriculum Studies	EDN 402	2014-2015
M.A. in Education	Management and Leadership in Education	EDN 403	2020-2021
M.A. in Education	Education for Sustainable Development –II	EDN 403A	2020-2021
M.A. in Education	Comparative Education - II	EDN 403B	2014-2015
M.A. in Education	Value and Human Rights Education–II	EDN 403C	2020-2021
M.A. in Education	Guidance and Counseling in Education-II	EDN 403D	2014-2015
M.A. in Education	Yoga and Health Education -II	EDN 404A	2014-2015
M.A. in Education	Life-skill Education-II	EDN 404B	2020-2021
M.A. in Education	ICT in Education – II	EDN 404C	2020-2021
M.A. in Education	Life- Long Education–II	EDN 404D	2020-2021
M.A. in Education	Dissertation -II	EDN 405	2020-2021
M.ED.	Educational Studies	MED 101	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.ED.	Historical ,Political and Economic Perspectives of Education	MED 102	2014-2015
M.ED.	Psychology of Learning and Development	MED 103	2014-2015
M.ED.	Pre- service and In- service Teacher Education	MED 104	2014-2015
M.ED.	Communication and Expository Writing	MED 105	2014-2015
M.ED.	Self Development through Yoga Education	MED 106	2014-2015
M.ED.	Philosophical Perspective of Education	MED 201	2014-2015
M.ED.	Sociological Perspectives of Education	MED 202	2014-2015
M.ED.	Introduction to Research Methodology	MED 203	2014-2015
M.ED.	Inclusive Education and gender Issues in Education	MED 204	2014-2015
M.ED.	Curriculum Studies	MED 205	2014-2015
M.ED.	Internship in Teacher Education Institutions	MED 206	2014-2015
M.ED.	Institutions, Systems and Structures	MED 301A	2014-2015
M.ED.	Stage Specific Status Issues and Concerns	MED 301B	2014-2015
M.ED.	Policy and Practice Relating to Curriculum, Pedagogy and Assessment	MED 301C	2014-2015
M.ED.	Advance Research Methods Including Statistical Techniques	MED 302	2014-2015
M.ED.	Internship	MED 303	2014-2015
M.ED.	ICT in Education	MED 304	2014-2015
M.ED.	ICT in Education	MED 305	2014-2015
M.ED.	Academic Writing	MED 306	2014-2015
M.ED.	Interdisciplinary elective/ SWAYAM		2020-2021
M.ED.	Community Outreach Activity	MED 400	2020-2021
M.ED.	Perspectives and Issues and Research in Teacher Education	MED 401	2014-2015
M.ED.	Educational Policy, Economics of Education and Educational Planning in the context of Elementary Education	MED 402A	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.ED.	Educational Policy, Economics of Education and Educational Planning in the context of Secondary Education	MED 402B	2014-2015
M.ED.	Educational Planning , Educational Administration and Management, Leadership in the Context of Elementary Education	MED 402C	2014-2015
M.ED.	Educational Planning , Educational Administration and Management, Leadership in the Context of SSecondary Education	MED 402D	2014-2015
M.ED.	Educational Technology and ICT in Elementary Education	MED 402E	2014-2015
M.ED.	Educational Technology and ICT in Secondary Education	MED 402F	2014-2015
M.ED.	Dissertation	MED 403	2014-2015
MSc in Electronics and Communication	Mathematical Methods and Numerical Analysis	MSEC 101	2021-2022
MSc in Electronics and Communication	Electromagnetic Theory and Transmission lines	MSEC 102	2021-2022
MSc in Electronics and Communication	Network Analysis	MSEC 103	2021-2022
MSc in Electronics and Communication	Physics of Semiconductor Devices	MSEC 104	2021-2022
MSc in Electronics and Communication	Practical (Electrical and Electronics)	MSEC 105	2021-2022
MSc in Electronics and Communication	Computational Lab (C/C++)	MSEC 106	2021-2022
MSc in Electronics and Communication	Analog and Digital Integrated Circuits	MSEC 201	2021-2022
MSc in Electronics and Communication	Analog communication Systems	MSEC 202	2021-2022
MSc in Electronics and Communication	Digital Signal Processing	MSEC 203	2021-2022
MSc in Electronics and Communication	Microprocessor and microcontroller	MSEC 204	2021-2022
MSc in Electronics and Communication	Practical (Electrical and Electronics)	MSEC 205	2021-2022
MSc in Electronics and Communication	Computational lab (using Python and Scilab)	MSEC 206	2021-2022
MSc in Electronics and Communication	Digital Communication Systems	MSEC301	2021-2022
MSc in Electronics and Communication	Microwave devices and circuits	MSEC302	2021-2022
MSc in Electronics and Communication	Advanced General Practical	MSEC303	2021-2022
MSc in Electronics and Communication	Electronic Science	MSEC304	2021-2022
MSc in Electronics and Communication	VLSI Technology	MSEC305-1	2021-2022

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Electronics and Communication	Medical Electronics	MSEC305-2	2021-2022
MSc in Electronics and Communication	Satellite and Mobile Communications	MSEC306-1	2021-2022
MSc in Electronics and Communication	Nano Electronics	MSEC306-2	2021-2022
MSc in Electronics and Communication	May be opted from SWAYAM	MSEC306-3	2021-2022
MSc in Electronics and Communication	Community Engagement	MSEC307	2021-2022
MSc in Electronics and Communication	Optical Fiber communication	MSEC401	2021-2022
MSc in Electronics and Communication	Power Electronics & Control Systems	MSEC402	2021-2022
MSc in Electronics and Communication	Advanced General Practical	MSEC403	2021-2022
MSc in Electronics and Communication	Photonics	MSEC404-1	2021-2022
MSc in Electronics and Communication	Digital Image Processing	MSEC404-2	2021-2022
MSc in Electronics and Communication	Radar, Remote Sensing and Navigational Systems	MSEC405-1	2021-2022
MSc in Electronics and Communication	Antenna Design	MSEC405-2	2021-2022
MSc in Electronics and Communication	Term Paper	MSEC406	2021-2022
M. Tech in E&CE (Microwaves)	Advanced Electromagnetic Engineering	MW 101	2004-2005
M. Tech in E&CE (Microwaves)	Microwave & mm Wave Circuits	MW 102	2004-2005
M. Tech in E&CE (Microwaves)	Microwave & mm Wave Vacuum and Solid State Devices	MW 103	2004-2005
M. Tech in E&CE (Microwaves)	Antenna and Radio Wave Propagation	MW 104	2004-2005
M. Tech in E&CE (Microwaves)	Digital Signal Processing	MW 105	2004-2005
M. Tech in E&CE (Microwaves)	Communication Theory	MW 106	2021-2022
M. Tech in E&CE (Microwaves)	Seminar-I	MW 107	2004-2005
M. Tech in E&CE (Microwaves)	Comprehensive Viva Voce on Practical's-I	MW 108	2004-2005
M. Tech in E&CE (Microwaves)	Computational Electromagnetics	MW 201	2004-2005
M. Tech in E&CE (Microwaves)	Microwave & mm Wave Measurements	MW 202	2004-2005
M. Tech in E&CE (Microwaves)	Microwave & mm Wave Communication	MW 203	2004-2005
M. Tech in E&CE (Microwaves)	Radar, Remote Sensing and Navigational Technique	MW 204	2021-2022

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M. Tech in E&CE (Microwaves)	Microwave & mm Wave Device, Circuit and System Modeling	MW 2051	2004-2005
M. Tech in E&CE (Microwaves)	Advanced Antenna Engineering	MW 2052	2021-2022
M. Tech in E&CE (Microwaves)	Gyrotron Technology	MW 2053	2021-2022
M. Tech in E&CE (Microwaves)	Light Wave Technology	MW 2061	2004-2005
M. Tech in E&CE (Microwaves)	Microwave Photonics	MW 2062	2021-2022
M. Tech in E&CE (Microwaves)	Seminar-II	MW 207	2004-2005
M. Tech in E&CE (Microwaves)	Comprehensive Viva Voce on Practical's-II	MW 208	2004-2005
M. Tech in E&CE (Microwaves)	Project I	MW 301	2004-2005
M. Tech in E&CE (Microwaves)	Term Paper/ Minor Elective from AICTE Approved Departments	MW 302	2021-2022
M. Tech in E&CE (Microwaves)	Research Methodology and IPR May be opted from SWAYAM	MW 303	2021-2022
M. Tech in E&CE (Microwaves)	Project II	MW 401	2004-2005
M. Tech in E&CE (Microwaves)	Grand Viva-Voce	MW 402	2004-2005
M.A. in English & Culture Studies	The Cultural History of English in India	MAENG 101	2020-2021
M.A. in English & Culture Studies	Literary Genres in Theory and Practice	MAENG 102	2020-2021
M.A. in English & Culture Studies	Classical Literature and Criticism	MAENG 103	2014-2015
M.A. in English & Culture Studies	Medieval and Renaissance English Literature	MAENG 104	2014-2015
M.A. in English & Culture Studies	Renaissance Drama	MAENG 105	2014-2015
M.A. in English & Culture Studies	Literature of the Age of Enlightenment -1 (Poetry and Drama)	MAENG 201	2014-2015
M.A. in English & Culture Studies	Literature of the Age of Enlightenment -2 (Prose)	MAENG 202	2014-2015
M.A. in English & Culture Studies	Romantic Literature	MAENG 203	2020-2021
M.A. in English & Culture Studies	Victorian Literature	MAENG 204	2020-2021
M.A. in English & Culture Studies	Literary Criticism: Renaissance to Modern	MAENG 205	2014-2015
M.A. in English & Culture Studies	Modern English Literature (till 1945)	MAENG 301	2014-2015
M.A. in English & Culture Studies	Literary and Cultural Theory	MAENG 302	2014-2015
M.A. in English & Culture Studies	Indian English Literature	MAENG 303A	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A. in English & Culture Studies	American Literature	MAENG 303B	2014-2015
M.A. in English & Culture Studies	Australian Literature	MAENG 303C	2014-2015
M.A. in English & Culture Studies	African English Literature	MAENG 303D	2014-2015
M.A. in English & Culture Studies	Translation Studies	MAENG 304A	2014-2015
M.A. in English & Culture Studies	Literature and Film	MAENG 304B	2014-2015
M.A. in English & Culture Studies	Folklore Studies	MAENG 304C	2014-2015
M.A. in English & Culture Studies	Ecology and Literature	MAENG 304D	2014-2015
M.A. in English & Culture Studies	Popular Literature and Culture -1	MAENG 305A	2020-2021
M.A. in English & Culture Studies	Popular Literature and Culture -2	MAENG 305B	2020-2021
M.A. in English & Culture Studies	Community Enagagement	MAENG 400	2014-2015
M.A. in English & Culture Studies	English Literature in Britain (1945-1970)	MAENG 401	2020-2021
M.A. in English & Culture Studies	English Literature in Britain (1971-2000)	MAENG 402	2020-2021
M.A. in English & Culture Studies	South Asian Diasporic and Transnational Literature	MAENG 403A	2020-2021
M.A. in English & Culture Studies	Gender and Literature	MAENG 403B	2014-2015
M.A. in English & Culture Studies	Partition Studies	MAENG 403C	2020-2021
M.A. in English & Culture Studies	Comics and Graphic Novels	MAENG 403D	2020-2021
M.A. in English & Culture Studies	William Shakespeare	MAENG 404A	2014-2015
M.A. in English & Culture Studies	Children's Literature	MAENG 404B	2020-2021
M.A. in English & Culture Studies	Trauma and Literature	MAENG 404C	2014-2015
M.A. in English & Culture Studies	Special Areas in Twenty-First Century English Literature	MAENG 404D	2014-2015
M.A. in English & Culture Studies	Project/ Term Papaer	MAENG 405	2014-2015
MSc in Environmental Science	Basic Ideas on Environment	MSES 101	2014-2015
MSc in Environmental Science	Physical Environment	MSES 102	2014-2015
MSc in Environmental Science	Environmental Biology	MSES 103	2014-2015
MSc in Environmental Science	Environmental Microbiology	MSES 104	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Environmental Science	Practical on Physical Environment	MSES 105	2014-2015
MSc in Environmental Science	Practical on Environmental Biology	MSES 106	2014-2015
MSc in Environmental Science	Life Processes & Ecotoxicology	MSES 201	2014-2015
MSc in Environmental Science	Environmental Geoscience	MSES 202	2014-2015
MSc in Environmental Science	Energy Resource & Environmental Statistics	MSES 203	2014-2015
MSc in Environmental Science	Environmental Pollution & Degradation	MSES 204	2014-2015
MSc in Environmental Science	Practical on Environmental Problems	MSES 205	2014-2015
MSc in Environmental Science	Practical on Ecotoxicological Measurements	MSES 206	2014-2015
MSc in Environmental Science	Biodiversity Conservation & Sustainable Development	MSES 301	2014-2015
MSc in Environmental Science	Emerging Environmental Problems, Health Hazards & Genetic Engineering	MSES 302	2014-2015
MSc in Environmental Science	Remote Sensing & GIS	MSES 303	2014-2015
MSc in Environmental Science	Environmental Perspectives/ may BE OPTED FROM SWAYAM	MSES 304	2020-2021
MSc in Environmental Science	Practical on RS & GIS, EIA & Diseases	MSES 305-1	2014-2015
MSc in Environmental Science	Ecological Modelling and GIS for Environmental Applications	MSES 305-2	2014-2015
MSc in Environmental Science	Ecotoxicology & Industrial Microbiology	MSES 305-3	2014-2015
MSc in Environmental Science	May be opted from SWYAM	MSES 306-1	2020-2021
MSc in Environmental Science	Forest Ecology and Oceanography	MSES 306-2	2020-2021
MSc in Environmental Science	Community Engagement Activities	MSES 307	2020-2021
MSc in Environmental Science	Environmental Impact Assessment & Environmental Laws	MSES 401	2014-2015
MSc in Environmental Science	Environmental Toxicology & Hazardous Wastes	MSES 402	2014-2015
MSc in Environmental Science	Environmental Biotechnology	MSES 403	2014-2015
MSc in Environmental Science	Environmental Issues, Economics & Environmental Management	MSES 404-1	2014-2015
MSc in Environmental Science	Environmental Engineering and Science	MSES 404-2	2014-2015
MSc in Environmental Science	Practical of Toxicological Testing	MSES 405-1	2014-2015
MSc in Environmental Science	Practical of Spatial Data Analysis and Ecological Modelling	MSES 405-2	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Environmental Science	Dissertation Work	MSES 406	2014-2015
M.A./ MSc in Geography	Geographical Thought	MSGG 101	2014-2015
M.A./ MSc in Geography	Geotectonics and Geomorphology	MSGG 102	2014-2015
M.A./ MSc in Geography	Soil and Biogeography	MSGG 103	2014-2015
M.A./ MSc in Geography	Resources and Economic Activities	MSGG 104	2014-2015
M.A./ MSc in Geography	Quantitative Techniques in Geography	MSGG 105	2014-2015
M.A./ MSc in Geography	Instrumental Survey and Map Projection	MSGG 106	2014-2015
M.A./ MSc in Geography	Recent Trend in Geography	MSGG 201	2014-2015
M.A./ MSc in Geography	Climatology & Hydrology	MSGG 202	2020-2021
M.A./ MSc in Geography	Region & Regional Planning	MSGG 203	2014-2015
M.A./ MSc in Geography	Population and Settlement Geography	MSGG 204	2014-2015
M.A./ MSc in Geography	Thematic Mapping	MSGG 205	2014-2015
M.A./ MSc in Geography	Remote Sensing and Geographical Information System	MSGG 206	2014-2015
M.A./ MSc in Geography	Social and Cultural Geography	MSGG 301	2014-2015
M.A./ MSc in Geography	Contemporary Geographical Issues in India	MSGG 302	2014-2015
M.A./ MSc in Geography	Statistical Techniques in Geographical Analysis	MSGG 303	2014-2015
M.A./ MSc in Geography	Geoinformatics	MSGG 304A	2014-2015
M.A./ MSc in Geography	Environment al Geography	MSGG 304B	2014-2015
M.A./ MSc in Geography	GEOMORPHOLOGY	MSGG 305A	2014-2015
M.A./ MSc in Geography	SOIL AND AGRICULTURAL GEOGRAPHY	MSGG 305B	2014-2015
M.A./ MSc in Geography	ENVIRONMENTAL GEOGRAPHY	MSGG 305C	2014-2015
M.A./ MSc in Geography	URBAN GEOGRAPHY	MSGG 305D	2014-2015
M.A./ MSc in Geography	REGIONAL PLANNING AND DEVELOPMENT	MSGG 305E	2014-2015
M.A./ MSc in Geography	NATURAL HAZARDS AND DISASTER MANAGEMENT	MSGG 305F	2014-2015
M.A./ MSc in Geography	Geography of Water Resources	MSGG 305G	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A./ MSc in Geography	Discipline centric Elective Practical: GEOMORPHOLOGY	MSGG 306A	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: SOIL AND AGRICULTURAL GEOGRAPHY	MSGG 306B	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: ENVIRONMENTAL GEOGRAPHY	MSGG 306C	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: URBAN GEOGRAPHY	MSGG 306D	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: REGIONAL PLANNING AND DEVELOPMENT	MSGG 306E	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: NATURAL HAZARDS AND DISASTER MANAGEMENT	MSGG 306F	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: Geography of Water Resources	MSGG 306G	2014-2015
M.A./ MSc in Geography	Community Engagement Activities	MSGG 307	2020-2021
M.A./ MSc in Geography	Geography of Development & Political Geography	MSGG 401	2014-2015
M.A./ MSc in Geography	Research Methodology	MSGG 402	2014-2015
M.A./ MSc in Geography	Review of Literature based on Discipline Centric Elective Course	MSGG 403	2020-2021
M.A./ MSc in Geography	Discipline centric Elective Theory: GEOMORPHOLOGY	MSGG 404A	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Theory: SOIL AND AGRICULTURAL GEOGRAPHY	MSGG 404B	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Theory: ENVIRONMENTAL GEOGRAPHY	MSGG 404C	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Theory: URBAN GEOGRAPHY	MSGG 404D	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Theory: REGIONAL PLANNING AND DEVELOPMENT	MSGG 404E	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Theory: NATURAL HAZARDS AND DISASTER MANAGEMENT	MSGG 404F	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Theory: Geography of Water Resources	MSGG 404G	2020-2021
M.A./ MSc in Geography	Discipline centric Elective Practical: GEOMORPHOLOGY	MSGG 405A	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: SOIL AND AGRICULTURAL GEOGRAPHY	MSGG 405B	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: ENVIRONMENTAL GEOGRAPHY	MSGG 405C	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: URBAN GEOGRAPHY	MSGG 405D	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A./ MSc in Geography	Discipline centric Elective Practical: REGIONAL PLANNING AND DEVELOPMENT	MSGG 405E	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: NATURAL HAZARDS AND DISASTER MANAGEMENT	MSGG 405F	2014-2015
M.A./ MSc in Geography	Discipline centric Elective Practical: Geography of Water Resources	MSGG 405G	2014-2015
M.A./ MSc in Geography	Dissertation	MSGG 406	2014-2015
MSc in Geospatial Science	GENERIC CONCEPTS IN GEOGRAPHY	MSGS-101	2020-2021
MSc in Geospatial Science	FUNDAMENTALS OF MAP MAKING AND DATA REPRESENTATION	MSGS-102	2020-2021
MSc in Geospatial Science	GEODESY AND MAP PROJECTION	MSGS-103	2014-2015
MSc in Geospatial Science	FUNDAMENTALS OF REMOTE SENSING, GIS AND GNSS	MSGS-104	2014-2015
MSc in Geospatial Science	PROBABILITY AND STATISTICS	MSGS-105	2014-2015
MSc in Geospatial Science	CARTOGRAPHY AND SURVEYING	MSGS-106	2014-2015
MSc in Geospatial Science	PRINCIPLES OF PHOTOGRAMMETRY	MSGS-201	2014-2015
MSc in Geospatial Science	DIGITAL IMAGE PROCESSING (DIP): THEORETICAL	MSGS-202	2014-2015
MSc in Geospatial Science	MICROWAVE, THERMAL AND HYPERSPECTRAL REMOTE SENSING	MSGS-203	2014-2015
MSc in Geospatial Science	DIGITAL IMAGE PROCESSING (DIP): PRACTICAL	MSGS-204	2014-2015
MSc in Geospatial Science	PRACTICALS IN GIS AND CHANGE DETECTION	MSGS-205	2020-2021
MSc in Geospatial Science	MULTIVARIATE STATISTICS IN GEOSPATIAL SCIENCE	MSGS-206	2014-2015
MSc in Geospatial Science	TECHNIQUES OF GEOSPATIAL ANALYSIS	MSGS-301	2014-2015
MSc in Geospatial Science	SPATIAL DECISION SUPPORT SYSTEMS AND MODELLING	MSGS - 302	2014-2015
MSc in Geospatial Science	ELEMENTARY MATHEMATICS AND PROGRAMMING FUNDAMENTALS	MSGS-303	2020-2021
MSc in Geospatial Science	GEOSPATIAL SCIENCE AND APPLICATIONS	MSGS - 304	2020-2021
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (THEORETICAL)	MSGS – 305A	2020-2021
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT (THEORETICAL)	MSGS – 305B	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (PRACTICAL)	MSGS – 306A	2014-2015
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT (PRACTICAL)	MSGS – 306B	2014-2015
MSc in Geospatial Science	COMMUNITY ENGAGEMENT ACTIVITY	MSGS 307	2020-2021
MSc in Geospatial Science	WEB GIS	MSGS-401	2014-2015
MSc in Geospatial Science	DATABASE MANAGEMENT (DBMS)	MSGS-402	2014-2015
MSc in Geospatial Science	Review of Literature based on Discipline Centric Elective Course	MSGS 403	2020-2021
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (THEORETICAL)	MSGS – 404A	2020-2021
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT (THEORETICAL)	MSGS – 404B	2014-2015
MSc in Geospatial Science	GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (PRACTICAL)	MSGS – 405A	2014-2015
MSc in Geospatial Science	GEOSPATIAL SCIENCE in URBAN PLANNING AND RESOURCE MANAGEMENT (PRACTICAL)	MSGS – 405B	2014-2015
MSc in Geospatial Science	DISSERTATION/ TERM PAPER	MSGS -406	2014-2015
MA in Hindi	Hindi Sahitya ka itihās : Aadikaal aur madhyakaal	HIN-101	2014-2015
MA in Hindi	Hindi Sahitya ka itihaas : Aadhunikaal	HIN-102	2014-2015
MA in Hindi	Bhasha vigyan aur Hindi bhasha ka vikās	HIN-103	2014-2015
MA in Hindi	Hindi gadya ki vividh vidhayen	HIN-104	2014-2015
MA in Hindi	Hindi patrakarita	HIN-105	2014-2015
MA in Hindi	Bhartiya aur pashchatya kavya siddhanta	HIN-201	2014-2015
MA in Hindi	Hindi aalochana	HIN-202	2014-2015
MA in Hindi	Anuvaad vigyaan	HIN-203	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Hindi	Natak aur Rangmanch	HIN-204	2020-2021
MA in Hindi	Madhyakalin kavya	HIN-205	2014-2015
MA in Hindi	Aadhunik kavya- I	HIN301	2014-2015
MA in Hindi	Aadhunik kavya – II	HIN302	2014-2015
MA in Hindi	Jay Shankar Prasad	HIN303 A	2014-2015
MA in Hindi	Sumitra Nandan Pant	HIN303 B	2020-2021
MA in Hindi	Mahadevi Verma	HIN303 C	2020-2021
MA in Hindi	Suryakant tripathi Nirala	HIN303 D	2014-2015
MA in Hindi	Bhartendu Harischandra	HIN304 A	2020-2021
MA in Hindi	Premchand	HIN304 B	2014-2015
MA in Hindi	Rahul Sankrityayan	HIN304 C	2014-2015
MA in Hindi	Fanishwar Nath Renu	HIN304 C	2014-2015
MA in Hindi	Hindi Sahitya A	HIN305 A	2014-2015
MA in Hindi	Hindi Sahitya B	HIN305 B	2014-2015
MA in Hindi	Hindi Sahitya C	HIN305 C	2014-2015
MA in Hindi	Hindi Sahitya D	HIN305 C	2014-2015
MA in Hindi	Community Engagement Course/ Educational/ Litrary Tour	HIN 400	2020-2021
MA in Hindi	Hindi upanyas: Pristhabhumi aur path	HIN 401	2014-2015
MA in Hindi	Hindi kahaani: Pristhabhumi aur path	HIN 402	2014-2015
MA in Hindi	Samkaaleen Mahila Kahanikaar	HIN 403A	2020-2021
MA in Hindi	Samkaaleen kavita	HIN 403B	2020-2021
MA in Hindi	Adivasi Vimarsh	HIN 403C	2020-2021
MA in Hindi	Samkaaleen Upanyaas	HIN 403D	2020-2021
MA in Hindi	AJNEYA	HIN 404A	2020-2021
MA in Hindi	Jainendra	HIN 404B	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Hindi	Yashpal	HIN 404C	2020-2021
MA in Hindi	Shivprasad Singh	HIN 404D	2020-2021
MA in Hindi	Project Work Dessertation	HIN 405	2014-2015
MA in History	Interrogating Indian Historiography	HIST 101	2014-2015
MA in History	Nineteenth Century Bengal: Life and Culture	HIST 102	2014-2015
MA in History	Institutional Politics in India: Pre-Gandhian Phase	HIST 103	2020-2021
MA in History	Burma, IndoChina and Thailand: Society, Economy and Politics	HIST 104	2014-2015
MA in History	History of Ideas: 19th& 20th Century India	HIST 105	2014-2015
MA in History	Historiography and Methodology: Western Tradition	HIST 201	2014-2015
MA in History	Twentieth Century Bengal: Life and Culture	HIST 202	2014-2015
MA in History	Institutional Politics in India: Gandhian Phase	HIST 203	2020-2021
MA in History	Indonesia and Malay: Society, Economy and Politics	HIST 204	2014-2015
MA in History	Western Political Ideas: Machiavelli to Marx	HIST 205	2014-2015
MA in History	The Rahr in the Nineteenth Century	HIST 301	2014-2015
MA in History	Economy in Transition: Precolonial India	HIST 302	2014-2015
MA in History	Science & Society in Pre-colonial India	HIST 303A	2014-2015
MA in History	State and Society in Colonial India	HIST 303B	2014-2015
MA in History	History of the USA (1776-1900)	HIST 303C	2014-2015
MA in History	State and Society in Ancient India	HIST 304A	2014-2015
MA in History	Science & Society in Colonial & Post -Colonial India	HIST 304B	2014-2015
MA in History	History of the USA (1900-1945)	HIST 304C	2014-2015
MA in History	History of Women: Emerging Perspectives	HIST 305A	2014-2015
MA in History	Emergence of Industrial Societies in Europe	HIST 305B	2014-2015
MA in History	A Cultural History of Europe: Renaissance and Reformation	HIST 305C	2014-2015
MA in History	Indian Foreign Policy: 1952-2014	HIST 305D	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in History	Community Engagement	HIST 400	2020-2021
MA in History	The Rahr in the Twentieth Century: 1900-1947	HIST 401	2014-2015
MA in History	Economy in Transition: Colonial India	HIST 402	2014-2015
MA in History	State & Society in Medieval India	HIST 403A	2014-2015
MA in History	India Since Independence: 1947-2007	HIST 403B	2014-2015
MA in History	History of the USA: 1945-1991	HIST 403C	2014-2015
MA in History	Indian Women Through the Ages	HIST 404A	2014-2015
MA in History	Bi-Polarism to Unipolarism: International Relations (1945-1991)	HIST 404B	2014-2015
MA in History	Europe in the Age of Enlightenment	HIST 404C	2014-2015
MA in History	Project Paper	HIST 405	2014-2015
MLibISc (Library and Information Science)	Library and Society	MLIS101	2014-2015
MLibISc (Library and Information Science)	Knowledge Organization	MLIS102	2014-2015
MLibISc (Library and Information Science)	Resource Description	MLIS103	2014-2015
MLibISc (Library and Information Science)	Library Information Technology	MLIS104	2014-2015
MLibISc (Library and Information Science)	Information Sources and Services	MLIS105	2014-2015
MLibISc (Library and Information Science)	Library System Management	MLIS201	2014-2015
MLibISc (Library and Information Science)	Document Classification	MLIS202	2014-2015
MLibISc (Library and Information Science)	Document Cataloguing	MLIS203	2014-2015
MLibISc (Library and Information Science)	Content Designation and Metadata Encoding	MLIS204	2014-2015
MLibISc (Library and Information Science)	Information Systems and Users	MLIS205	2014-2015
MLibISc (Library and Information Science)	Information Communication and Management	MLIS301	2014-2015
MLibISc (Library and Information Science)	Information Retrieval	MLIS302	2014-2015
MLibISc (Library and Information Science)	Automated Library System	MLIS303A	2014-2015
MLibISc (Library and Information Science)	Digital Resource Management	MLIS303B	2014-2015
MLibISc (Library and Information Science)	Technical Writing	MLIS303C	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MLibISc (Library and Information Science)	Digital Preservation	MLIS303D	2020-2021
MLibISc (Library and Information Science)	Neoteric Library Technology	MLIS304A	2020-2021
MLibISc (Library and Information Science)	Content Management and Web Products	MLIS304B	2020-2021
MLibISc (Library and Information Science)	Library Networking	MLIS304C	2020-2021
MLibISc (Library and Information Science)	Learning Content Management System	MLIS304D	2020-2021
MLibISc (Library and Information Science)	Current Trends in LIS	MLIS305A	2020-2021
MLibISc (Library and Information Science)	Medical Information Systems and Services	MLIS305B	2020-2021
MLibISc (Library and Information Science)	Agricultural Information Systems and Services	MLIS305C	2020-2021
MLibISc (Library and Information Science)	LIS Education	MLIS305D	2020-2021
MLibISc (Library and Information Science)	MAY BE OPTED FROM SWAYAM	MLIS305E	2020-2021
MLibISc (Library and Information Science)	Library Community Development Programme (30 hours of involvement with at least 50 per cent field work)	MLIS400	2014-2015
MLibISc (Library and Information Science)	Digital Library System	MLIS401	2014-2015
MLibISc (Library and Information Science)	Research Methodology	MLIS402	2014-2015
MLibISc (Library and Information Science)	Community Information System	MLIS403A	2014-2015
MLibISc (Library and Information Science)	Academic Library System	MLIS403B	2014-2015
MLibISc (Library and Information Science)	Informetrics	MLIS403C	2014-2015
MLibISc (Library and Information Science)	Web Scale Library Discovery Services	MLIS403D	2020-2021
MLibISc (Library and Information Science)	Semantic Digital Repository	MLIS404A	2020-2021
MLibISc (Library and Information Science)	Open Access System	MLIS404B	2020-2021
MLibISc (Library and Information Science)	Library and Information Profession and Related Agencies	MLIS404C	2020-2021
MLibISc (Library and Information Science)	Library Functions and Operations	MLIS404D	2014-2015
MLibISc (Library and Information Science)	Guided Research Project	MLIS405	2014-2015
LLM (Law)	Jurisprudence	LMCT 101	2014-2015
LLM (Law)	Indian Constitutional Law: New Challenges	LMCT 102	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
LLM (Law)	Law and Social Transformation	LMCT 103	2014-2015
LLM (Law)	Principles of Corporate Law	LMCT 104	2014-2015
LLM (Law)	Judicial Process	LMCT 201	2014-2015
LLM (Law)	Human Rights and Contemporary Challenges	LMCT 202	2014-2015
LLM (Law)	Competition and Consumer Law	LMMJ (A) 203	2014-2015
LLM (Law)	Capital Market and foreign investment	LMMJ (A)204	2014-2015
LLM (Law)	Environment And Legal Order	LMCT 301	2014-2015
LLM (Law)	Constitutionalism, Administration and Access to Information	LMCT 302	2014-2015
LLM (Law)	Basics of Law	LMCT 303	2020-2021
LLM (Law)	Economic enterprise and Legal Regulation	LMMJ (A) 304	2020-2021
LLM (Law)	Law and Credit	LMMJ (A) 305	2020-2021
LLM (Law)	Research Methodology	LMCT 401	2014-2015
LLM (Law)	Community Engagement Course/ Educational/ Litrary Tour	LMCT 402	2020-2021
LLM (Law)	Dissertation and Presentation	LMCT 403	2020-2021
LLM (Law)	Research Methodology II (Practical)	LMCT 404	2020-2021
M.A. IN Mass Communication	Introduction to Communication	MC101	2014-2015
M.A. IN Mass Communication	Development of Media and Media Law	MC102	2014-2015
M.A. IN Mass Communication	Advertising and Marketing Communication	MC103	2014-2015
M.A. IN Mass Communication	Public Relations & Corporate Communication	MC104	2014-2015
M.A. IN Mass Communication	Computer Application in Media	MC105	2014-2015
M.A. IN Mass Communication	International Communication and Globalization	MC201	2014-2015
M.A. IN Mass Communication	Reporting and Writing	MC202	2014-2015
M.A. IN Mass Communication	Editing and Designing	MC203	2014-2015
M.A. IN Mass Communication	Media Management and Economics	MC204	2014-2015
M.A. IN Mass Communication	Online Media	MC205	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A. IN Mass Communication	Communication Research	MC301	2014-2015
M.A. IN Mass Communication	Development Communication	MC302	2014-2015
M.A. IN Mass Communication	Health Communication	MC303A	2014-2015
M.A. IN Mass Communication	NGO and Advocacy Communication	MC303B	2020-2021
M.A. IN Mass Communication	Women and Media	MC304A	2014-2015
M.A. IN Mass Communication	Photo Journalism	MC304B	2020-2021
M.A. IN Mass Communication	Media Culture and Society/ May be opted from SWAYAM	MC305	2020-2021
M.A. IN Mass Communication	Social Outreach Programme	MC400	2020-2021
M.A. IN Mass Communication	Radio	MC401	2014-2015
M.A. IN Mass Communication	Television	MC402	2014-2015
M.A. IN Mass Communication	Film Studies: Indian Cinema	MC403A	2014-2015
M.A. IN Mass Communication	Film Studies: World Cinema	MC403B	2014-2015
M.A. IN Mass Communication	Radio Production	MC404A	2020-2021
M.A. IN Mass Communication	Television Production	MC404B	2020-2021
M.A. IN Mass Communication	Film Production	MC404A	2020-2021
M.A. IN Mass Communication	Documentary Production	MC404B	2020-2021
M.A. IN Mass Communication	Dissertation	MC405	2014-2015
M.A/ MSc in Mathematics	Real Analysis	MSMG101	2014-2015
M.A/ MSc in Mathematics	Complex Analysis	MSMG102	2014-2015
M.A/ MSc in Mathematics	Foundation of Topology	MSMG103	2014-2015
M.A/ MSc in Mathematics	Integral Transforms and Integral Equations	MSMG104	2014-2015
M.A/ MSc in Mathematics	Classical Mechanics	MSMG105	2014-2015
M.A/ MSc in Mathematics	Numerical Analysis	MSMG106	2014-2015
M.A/ MSc in Mathematics	Algebra	MSMG201	2014-2015
M.A/ MSc in Mathematics	Elements of Functional Analysis and Multivariate Calculus	MSMG202	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A/ MSc in Mathematics	Geometry of Curves and Surfaces	MSMG203	2020-2021
M.A/ MSc in Mathematics	Differential Equations	MSMG204	2014-2015
M.A/ MSc in Mathematics	Operations Research	MSMG205	2014-2015
M.A/ MSc in Mathematics	Computer-aided Numerical practical	MSMG206	2014-2015
M.A/ MSc in Mathematics	Methods of Applied Mathematics	MSMA301	2020-2021
M.A/ MSc in Mathematics	Continuum Mechanics	MSMA302	2014-2015
M.A/ MSc in Mathematics	Theory of Electromagnetic fields and Special Theory of Relativity	MSMA303	2020-2021
M.A/ MSc in Mathematics	Introduction to Operations Research/ to be opted from SWAYAM	MSMA304	2020-2021
M.A/ MSc in Mathematics	Boundary Layer Theory and Magneto-hydrodynamics-I	MSMA305-1	2014-2015
M.A/ MSc in Mathematics	Turbulent Flows-I	MSMA305-2	2014-2015
M.A/ MSc in Mathematics	Space Sciences-I	MSMA305-3	2014-2015
M.A/ MSc in Mathematics	Course opted from SWAYAM	MSMA305-4	2020-2021
M.A/ MSc in Mathematics	Advanced Optimization-I	MSMA306-1	2014-2015
M.A/ MSc in Mathematics	Advanced Operations Research-I	MSMA306-2	2014-2015
M.A/ MSc in Mathematics	Quantum Mechanics-I	MSMA306-3	2014-2015
M.A/ MSc in Mathematics	Fuzzy Mathematics and Applications-I	MSMA306-4	2020-2021
M.A/ MSc in Mathematics	Course opted from SWAYAM	MSMA306-5	2020-2021
M.A/ MSc in Mathematics	Community Engagement Activities	MSMA307	2020-2021
M.A/ MSc in Mathematics	Abstract Algebra	MSMP301	2014-2015
M.A/ MSc in Mathematics	Analysis I	MSMP302	2014-2015
M.A/ MSc in Mathematics	Geometry of Manifolds	MSMP303	2014-2015
M.A/ MSc in Mathematics	Introduction to Graph Theory/ may be opted from SWAYAM	MSMP304	2020-2021
M.A/ MSc in Mathematics	Advanced Functional Analysis-I	MSMP305-1	2014-2015
M.A/ MSc in Mathematics	Advanced Differential Geometry – I	MSMP305-2	2014-2015
M.A/ MSc in Mathematics	Advanced Complex Analysis-I	MSMP305-3	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A/ MSc in Mathematics	Measure and Integration-I	MSMP305-4	2014-2015
M.A/ MSc in Mathematics	Course opted from SWAYAM	MSMP305-5	2020-2021
M.A/ MSc in Mathematics	Euclidean and non – Euclidean Geometries-I	MSMP306-1	2014-2015
M.A/ MSc in Mathematics	Commutative Algebra-I	MSMP306-2	2014-2015
M.A/ MSc in Mathematics	Advanced Operator Theory –I	MSMP306-3	2014-2015
M.A/ MSc in Mathematics	Ergodic Theory-I	MSMP306-4	2014-2015
M.A/ MSc in Mathematics	Algebraic Topology-I	MSMP306-5	2014-2015
M.A/ MSc in Mathematics	Course opted from SWAYAM	MSMP306-6	2020-2021
M.A/ MSc in Mathematics	Community Engagement Activities	MSMP307	2020-2021
M.A/ MSc in Mathematics	Dynamical Systems, Chaos and Fractals	MSMA401	2014-2015
M.A/ MSc in Mathematics	Fluid Mechanics	MSMA402	2014-2015
M.A/ MSc in Mathematics	Introduction to Quantum Mechanics and Wavelet Analysis	MSMA403	2014-2015
M.A/ MSc in Mathematics	Boundary Layer Theory and Magneto-hydrodynamics-II	MSMA404-1	2014-2015
M.A/ MSc in Mathematics	Turbulent Flows-II	MSMA404-2	2014-2015
M.A/ MSc in Mathematics	Space Sciences-II	MSMA404-3	2014-2015
M.A/ MSc in Mathematics	Advanced Optimization-II	MSMA405-1	2014-2015
M.A/ MSc in Mathematics	Advanced Operations Research-II	MSMA405-2	2014-2015
M.A/ MSc in Mathematics	Quantum Mechanics-II	MSMA405-3	2014-2015
M.A/ MSc in Mathematics	Fuzzy Mathematics and Applications-II	MSMA405-4	2014-2015
M.A/ MSc in Mathematics	PROJECT	MSMA406	2014-2015
M.A/ MSc in Mathematics	Graph Theory, Set Theory and Logic	MSMP401	2014-2015
M.A/ MSc in Mathematics	Analysis II	MSMP402	2014-2015
M.A/ MSc in Mathematics	Topology	MSMP403	2014-2015
M.A/ MSc in Mathematics	Advanced Functional Analysis-II	MSMP404-1	2014-2015
M.A/ MSc in Mathematics	Advanced Differential Geometry – II	MSMP404-2	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
M.A/ MSc in Mathematics	Advanced Complex Analysis-II	MSMP404-3	2014-2015
M.A/ MSc in Mathematics	Measure and Integration-II	MSMP404-4	2014-2015
M.A/ MSc in Mathematics	Euclidean and non – Euclidean Geometries-II	MSMP405-1	2014-2015
M.A/ MSc in Mathematics	Commutative Algebra-II	MSMP405-2	2014-2015
M.A/ MSc in Mathematics	Advanced Operator Theory –II	MSMP405-3	2014-2015
M.A/ MSc in Mathematics	Ergodic Theory-II	MSMP405-4	2014-2015
M.A/ MSc in Mathematics	Algebraic Topology-II	MSMP405-5	2014-2015
M.A/ MSc in Mathematics	Project	MSMP406	2014-2015
MBA (Business Administration)	Management Process & Organisation Theory (MPOT)	MBA-1101	2014-2015
MBA (Business Administration)	Managerial Economics (ME)	MBA-1102	2014-2015
MBA (Business Administration)	Research Methodology (RM)	MBA-2101	2014-2015
MBA (Business Administration)	Business Environment and Legislation (BEL)	MBA-2102	2014-2015
MBA (Business Administration)	Managerial Communication and Skill Development (MCSD)	MBA-2103	2014-2015
MBA (Business Administration)	Indian Ethos and Business Ethics (IEBE)	MBAE-1108	2020-2021
MBA (Business Administration)	Management Principles and Practices (MPP)	MBAE-3108	2014-2015
MBA (Business Administration)	Organizational Behavior (OB)	MBA-1203	2014-2015
MBA (Business Administration)	Corporate Success Behavior (CSB)	MBAE-1210	2014-2015
MBA (Business Administration)	Organizational Change and Development (OCD)	MBAE-2206	2014-2015
MBA (Business Administration)	Leadership (LDP)	MBAE-2207	2020-2021
MBA (Business Administration)	Team Dynamics at Work (TDW)	MBAE-3206	2014-2015
MBA (Business Administration)	Group and Team Effectiveness (GTE)	MBAE-3209	2014-2015
MBA (Business Administration)	Introductory Strategic Management (ISM)	MBA-3301	2014-2015
MBA (Business Administration)	Entrepreneurship Development (ED)	MBA-4301	2014-2015
MBA (Business Administration)	International Business (IB)	MBA-4302	2014-2015
MBA (Business Administration)	Corporate Governance (CG)	MBAE-1311	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Business Administration)	Corporate Social Responsibility and Sustainability (CSRS)	MBAE-2308	2014-2015
MBA (Business Administration)	Knowledge Management and Business Excellence (KMBE)	MBAE-3307	2014-2015
MBA (Business Administration)	Fundamentals of Marketing Management (FMM)	MBA-1405	2014-2015
MBA (Business Administration)	Consumer Behavior (CB)	MBAE-2409	2014-2015
MBA (Business Administration)	Sales & Distribution Management (SDM)	MBAE-2410	2014-2015
MBA (Business Administration)	Rural Marketing Management (RMM)	MBAE-2411	2014-2015
MBA (Business Administration)	Industrial Marketing (IM)	MBAE-2412	2014-2015
MBA (Business Administration)	Public Relations and Marketing (PRM)	MBAE-2413	2014-2015
MBA (Business Administration)	Integrated Marketing Communication (IMC)	MBAE-3410	2020-2021
MBA (Business Administration)	Voluntary Sector Marketing (VSM)	MBAE-3411	2014-2015
MBA (Business Administration)	Service Marketing (SVM)	MBAE-3412	2014-2015
MBA (Business Administration)	Strategic Marketing Management (SMM)	MBAE-3413	2014-2015
MBA (Business Administration)	Global Marketing Management (GMM)	MBAE-3414	2014-2015
MBA (Business Administration)	Retail Marketing (RTM)	MBAE-4409	2014-2015
MBA (Business Administration)	Brand Management (BM)	MBAE-4410	2014-2015
MBA (Business Administration)	Tourism Marketing (TM)	MBAE-4411	2014-2015
MBA (Business Administration)	Advertising and Sales Promotion Management (ASPM)	MBAE-4412	2014-2015
MBA (Business Administration)	Small Business Marketing (SBM)	MBAE-4413	2014-2015
MBA (Business Administration)	Accounting for Managers (AFM)	MBA-1504	2014-2015
MBA (Business Administration)	Corporate Finance (CF)	MBA-3502	2014-2015
MBA (Business Administration)	Corporate Financial Reporting and Analysis (CFRA)	MBAE-2509	2014-2015
MBA (Business Administration)	Security Analysis and Portfolio Management (SAPM)	MBAE-2510	2014-2015
MBA (Business Administration)	Project Finance and Management (PFM)	MBAE-2511	2014-2015
MBA (Business Administration)	Strategic Cost Management (SCM)	MBAE-2512	2014-2015
MBA (Business Administration)	Working Capital Management (WCM)	MBAE-2513	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Business Administration)	Corporate Taxation (CT)	MBAE-3510	2014-2015
MBA (Business Administration)	Behavioural Finance (BF)	MBAE-3511	2014-2015
MBA (Business Administration)	Financial Econometrics (FE)	MBAE-3512	2014-2015
MBA (Business Administration)	Financial Derivatives (FD)	MBAE-3513	2014-2015
MBA (Business Administration)	Financial Markets (FM)	MBAE-3514	2014-2015
MBA (Business Administration)	Management of Financial Services (MFS)	MBAE-4509	2014-2015
MBA (Business Administration)	Management Accounting for Business Decisions (MABD)	MBAE-4510	2014-2015
MBA (Business Administration)	Merger, Acquisition and Corporate Restructuring (MACR)	MBAE-4511	2014-2015
MBA (Business Administration)	Entrepreneurial Finance and Valuation (EFV)	MBAE-4512	2014-2015
MBA (Business Administration)	Multinational Finance (MF)	MBAE-4513	2014-2015
MBA (Business Administration)	Fundamentals of Human Resource Management (FHRM)	MBA-1606	2014-2015
MBA (Business Administration)	Human Resource Planning and Development (HRPD)	MBAE-2609	2014-2015
MBA (Business Administration)	Compensation and Benefits Management (CBM)	MBAE-2610	2014-2015
MBA (Business Administration)	Training & Development (T&D)	MBAE-2611	2014-2015
MBA (Business Administration)	Counselling Skills for Managers (CSM)	MBAE-2612	2014-2015
MBA (Business Administration)	Understanding Self: Indian Perspective (USIP)	MBAE-2613	2020-2021
MBA (Business Administration)	Performance Management (PM)	MBAE-3610	2014-2015
MBA (Business Administration)	Labour Legislation (LL)	MBAE-3611	2014-2015
MBA (Business Administration)	Employment Relations (ER)	MBAE-3612	2014-2015
MBA (Business Administration)	HRD: Strategies and Systems (HRDSS)	MBAE-3613	2014-2015
MBA (Business Administration)	Human Resource Information System (HRIS)	MBAE-3614	2014-2015
MBA (Business Administration)	Strategic Human Resource Management (SHRM)	MBAE-4609	2014-2015
MBA (Business Administration)	Human Capital Management (HCM)	MBAE-4610	2014-2015
MBA (Business Administration)	Contemporary Interventions in Human Resource Management	MBAE-4611	2014-2015
MBA (Business Administration)	International Human Resource Management (IHRM)	MBAE-4612	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Business Administration)	Employer Branding (EB)	MBAE-4613	2014-2015
MBA (Business Administration)	Fundamentals of Production and Operations Management	MBA-1707	2014-2015
MBA (Business Administration)	Fundamentals of Computer Applications and Management Information System (FCAMIS)	MBA-2704	2014-2015
MBA (Business Administration)	Quantitative Techniques in Management (QTM)	MBA-2705	2014-2015
MBA (Business Administration)	Operations Research (OR)	MBA-3703	2014-2015
MBA (Business Administration)	Business Analytics (BA)	MBA-3704	2014-2015
MBA (Business Administration)	Logistics and Supply Chain Management (LSCM)	MBAE-2709	2014-2015
MBA (Business Administration)	Purchasing and Materials Management (PMM)	MBAE-2710	2014-2015
MBA (Business Administration)	Production Planning and Control (PPC)	MBAE-2711	2014-2015
MBA (Business Administration)	Business Process Reengineering (BPR)	MBAE-2712	2014-2015
MBA (Business Administration)	Managing E-Business (MEB)	MBAE-2713	2014-2015
MBA (Business Administration)	Decision Support system (DSS)	MBAE-3710	2014-2015
MBA (Business Administration)	Internet of Things (IoT)	MBAE-3711	2020-2021
MBA (Business Administration)	Systems Analysis and Design (SAD)	MBAE-3712	2014-2015
MBA (Business Administration)	Project Management (PROM)	MBAE-3713	2014-2015
MBA (Business Administration)	World Class Manufacturing (WCMFG)	MBAE-3714	2014-2015
MBA (Business Administration)	Advanced Operations Research (AOR)	MBAE-4709	2014-2015
MBA (Business Administration)	Total Quality Management (TQM)	MBAE-4710	2014-2015
MBA (Business Administration)	Database Management System (DBMS)	MBAE-4711	2014-2015
MBA (Business Administration)	Decision Models and Optimization (DMO)	MBAE-4712	2014-2015
MBA (Business Administration)	Smart Manufacturing (SMFG)	MBAE-4713	2014-2015
MBA (Business Administration)	Tourism and Hospitality Management (THM)	MBAE-4804	2014-2015
MBA (Business Administration)	Health Care Management (HCM)	MBAE-4805	2020-2021
MBA (Business Administration)	Agri Business Management (ABM)	MBAE-4806	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Business Administration)	Innovation Management (IM)	MBAE-4807	2020-2021
MBA (Business Administration)	Management of Rural Business (MRB)	MBAE-4808	2020-2021
MBA (Human Resource)	Management Process and Organisation Theory (MPOT)	MBAHR1101	2014-2015
MBA (Human Resource)	Managerial Economics (ME)	MBAHR1102	2014-2015
MBA (Human Resource)	Organisational Behaviour (OB)	MBAHR1303	2014-2015
MBA (Human Resource)	Fundamentals of Marketing Management (FMM)	MBAHR1504	2014-2015
MBA (Human Resource)	Basic Accounting and Finance (BAF)	MBAHR1605	2014-2015
MBA (Human Resource)	Fundamentals of Human Resource Management (FHRM)	MBAHR1206	2014-2015
MBA (Human Resource)	Fundamentals of Production and Operations Management (FPOM)	MBAHR1707	2014-2015
MBA (Human Resource)	Corporate Governance (CG)	MBAHRE1408	2014-2015
MBA (Human Resource)	Indian Ethos and Business Ethics (IEBE)	MBAHRE1109	2020-2021
MBA (Human Resource)	Indian Economy and Policy (IE&P)	MBAHRE1110	2020-2021
MBA (Human Resource)	Development Economics (DE)	MBAHRE1111	2014-2015
MBA (Human Resource)	Business Laws (BL)	MBAHRE1112	2014-2015
MBA (Human Resource)	Research Methodology (RM)	MBAHR2101	2014-2015
MBA (Human Resource)	Human Resource Planning and Development (HRPD)	MBAHR2202	2014-2015
MBA (Human Resource)	Managerial Communication and Skill Development (MCSD)	MBAHR2103	2014-2015
MBA (Human Resource)	Compensation and Benefits Management (CBM)	MBAHR 2204	2020-2021
MBA (Human Resource)	Corporate Social Responsibility and Sustainability (CSRS)	MBAHRE2407	2014-2015
MBA (Human Resource)	Managerial Counselling and Negotiation Skills (MCNS)	MBAHRE2208	2014-2015
MBA (Human Resource)	Trade Unionism and Collective Bargaining (TUCB)	MBAHRE2209	2014-2015
MBA (Human Resource)	Understanding Self: Indian Perspective (USIP)	MBAHRE2210	2020-2021
MBA (Human Resource)	Training and Development (T&D)	MBAHR2205	2014-2015
MBA (Human Resource)	Summer Internship Project (SIP)	MBAHR2206	2014-2015
MBA (Human Resource)	Organisational Change and Development (OCD)	MBAHRE2311	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Human Resource)	Quantitative Techniques for Human Resource Management (QTHRM)	MBAHRE2712	2014-2015
MBA (Human Resource)	Business Environment (BE)	MBAHRE2113	2014-2015
MBA (Human Resource)	Corporate Finance (CF)	MBAHRE2614	2014-2015
MBA (Human Resource)	Financial Statement Analysis (FSA)	MBAHRE2615	2014-2015
MBA (Human Resource)	Corporate Reporting (CR)	MBAHRE2616	2014-2015
MBA (Human Resource)	Introductory Strategic Management (ISM)	MBAHR3401	2014-2015
MBA (Human Resource)	Performance Management and Competency Mapping (PMCM)	MBAHR3202	2014-2015
MBA (Human Resource)	Fundamentals of Industrial Relations (FIR)	MBAHR3203	2014-2015
MBA (Human Resource)	Labour Laws-I (LL-I)	MBAHR3204	2014-2015
MBA (Human Resource)	Economics of Human Resources (EHR)	MBAHRE3205	2014-2015
MBA (Human Resource)	Human Resource Management in Service Sector (HRMSS)	MBAHRE3206	2014-2015
MBA (Human Resource)	Stress Management and Employee Well-being (SMEW)	MBAHRE3207	2014-2015
MBA (Human Resource)	Employee Empowerment and Engagement (EEE)	MBAHRE3208	2014-2015
MBA (Human Resource)	Team Dynamics at Work (TDW)	MBAHRE3309	2020-2021
MBA (Human Resource)	Leadership (LSP)	MBAHRE3310	2020-2021
MBA (Human Resource)	Ergonomics (ERG)	MBAHRE3311	2014-2015
MBA (Human Resource)	Management Information System (MIS)	MBAHRE3712	2014-2015
MBA (Human Resource)	Corporate Creativity and Strategic Innovation (CCSI)	MBAHRE3413	2014-2015
MBA (Human Resource)	Infrastructure Management (IM)	MBAHRE3814	2020-2021
MBA (Human Resource)	Health Care Management (HCM)	MBAHRE3815	2020-2021
MBA (Human Resource)	Social Enterprise Management (SEM)	MBAHRE3816	2020-2021
MBA (Human Resource)	Financial Institutions and Markets (FIM)	MBAHRE3617	2014-2015
MBA (Human Resource)	Business Valuation (BV)	MBAHRE3618	2014-2015
MBA (Human Resource)	Industrial Organisation and Competitive Strategies (IOCS) (Generic Elective/ Interdepartmental Elective)	MBAHRME3419	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Human Resource)	Human Resource Development (HRD) (Generic Elective/Interdepartmental Elective)	MBAHRME3220	2014-2015
MBA (Human Resource)	Labour Laws-II (LL—II)	MBAHR4201	2014-2015
MBA (Human Resource)	Strategic Human Resource Management (SHRM)	MBAHR4202	2014-2015
MBA (Human Resource)	Dissertation and Field Work (D&FW)	MBAHR4203	2020-2021
MBA (Human Resource)	Community Engagement (CE)	MBAHR4204	2020-2021
MBA (Human Resource)	International Human Resource Management (IHRM)	MBAHRE4205	2014-2015
MBA (Human Resource)	Human Capital Management and HR Audit (HCMA)	MBAHRE4206	2014-2015
MBA (Human Resource)	Contemporary Employment Relations (CER)	MBAHRE4207	2014-2015
MBA (Human Resource)	Human Resource Information System (HRIS)	MBAHRE4208	2014-2015
MBA (Human Resource)	Entrepreneurship Development (ED)	MBAHRE4409	2014-2015
MBA (Tourism Management)	Management Process & Organizational Behaviour	MBT- 101	2014-2015
MBA (Tourism Management)	Tourism Economics	MBT- 102	2014-2015
MBA (Tourism Management)	Tourism Concept & Impacts	MBT- 103	2014-2015
MBA (Tourism Management)	Indian History Art, Culture & Architecture	MBT- 104	2014-2015
MBA (Tourism Management)	Geography and International Tourism	MBT- 105	2014-2015
MBA (Tourism Management)	Transport in Travel & Tourism	MBT- 106	2014-2015
MBA (Tourism Management)	Communication Skill Development	MBT- 107	2014-2015
MBA (Tourism Management)	Tourism Resources of West Bengal	MBT- 108	2014-2015
MBA (Tourism Management)	Tourism Products of India	MBT- 201	2014-2015
MBA (Tourism Management)	Travel Agency & Tour Operations Management	MBT- 202	2014-2015
MBA (Tourism Management)	Tourism Marketing	MBT- 203	2014-2015
MBA (Tourism Management)	Information Technology & Tourism	MBT- 204	2014-2015
MBA (Tourism Management)	Managerial Communication Skill Development	MBT- 205	2014-2015
MBA (Tourism Management)	Hotel Management	MBT- 206	2014-2015
MBA (Tourism Management)	PRACTICAL TOURISM	MBT- 207	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MBA (Tourism Management)	Air Fares & Ticketing	MBT- 301	2014-2015
MBA (Tourism Management)	Sustainable & Eco Tourism	MBT- 302	2014-2015
MBA (Tourism Management)	Computerized Reservation System	MBT- 303	2014-2015
MBA (Tourism Management)	Tour Guiding and Visitor Interpretation	MBT- 304	2014-2015
MBA (Tourism Management)	INTRODUCTION TO TOUR PACKAGE OPERATION	MBT3101	2014-2015
MBA (Tourism Management)	PLANNING FOR TOUR PACKAGING	MBT3102	2014-2015
MBA (Tourism Management)	UNDERSTANDING EVENT	MBT3201	2014-2015
MBA (Tourism Management)	MANAGING EVENT	MBT3202	2014-2015
MBA (Tourism Management)	FRONT OFFICE & HOUSE KEEPING MAN AGEMENT	MBT3301	2014-2015
MBA (Tourism Management)	HOTEL OPERATION	MBT3301	2014-2015
MBA (Tourism Management)	Adventure Tourism	MBT3501	2014-2015
MBA (Tourism Management)	Tourism Entrepreneurship	MBT3502	2014-2015
MBA (Tourism Management)	Research Methodology	MBT- 401	2014-2015
MBA (Tourism Management)	Tourism Policy, Planning & Development	MBT- 402	2014-2015
MBA (Tourism Management)	Project report & Grand Viva including Social Outreach Program	MBT- 403	2014-2015
MBA (Tourism Management)	MANAGING TOUR PACKAGE OPERATION	MBT- 4101	2014-2015
MBA (Tourism Management)	DESTINATION MARKETING	MBT4201	2014-2015
MBA (Tourism Management)	RESORT PLANNING & EVELOPMENT	MBT- 4301	2014-2015
MSc in Microbiology	Prokaryotic Microorganisms	MSMI101	2020-2021
MSc in Microbiology	Acellular and eukaryotic microorganisms	MSMI102	2014-2015
MSc in Microbiology	Biochemistry	MSMI103	2014-2015
MSc in Microbiology	Microbial Metabolism	MSMI104	2014-2015
MSc in Microbiology	General Microbiology	MSMI105	2014-2015
MSc in Microbiology	Biochemistry & Microbial Metabolism	MSMI106	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Microbiology	Molecular Biology	MSMI201	2014-2015
MSc in Microbiology	Cell Biology & Microbial Genetics	MSMI202	2014-2015
MSc in Microbiology	Statistics and Bioinformatics	MSMI203	2020-2021
MSc in Microbiology	Principles & Microbial techniques	MSMI204	2020-2021
MSc in Microbiology	Molecular Biology & Microbial Genetics	MSMI205	2014-2015
MSc in Microbiology	Statistics and Bioinformatics	MSMI206	2014-2015
MSc in Microbiology	Microbiology and Recombinant DNA Technology	MSMI 301	2014-2015
MSc in Microbiology	Agriculture Microbiology and Environmental Microbiology	MSMI 302	2014-2015
MSc in Microbiology	Industrial Microbiology & Recombinant DNA Technology	MSMI 303	2014-2015
MSc in Microbiology	Introduction to General & Applied Microbiology	MSMI 304	2020-2021
MSc in Microbiology	Agriculture & Environmental Microbiology	MSMI305-I	2014-2015
MSc in Microbiology	Advance Microbial Genetics	MSMI-305-II	2014-2015
MSc in Microbiology	Food Microbiology and IPR, Biosafety and Bioethics	MSMI-306-I	2020-2021
MSc in Microbiology	SWAYAM Course	MSMI-306-II	2020-2021
MSc in Microbiology	Social Outreach and Educational Tour	MSMI-307	2014-2015
MSc in Microbiology	Immunology	MSMI-401	2014-2015
MSc in Microbiology	Medical Microbiology	MSMI-402	2014-2015
MSc in Microbiology	Immunology & Medical Microbiology (Practical)	MSMI-403	2014-2015
MSc in Microbiology	Food Microbiology, IPR and Biosafety (Practical)	MSMI404-I	2014-2015
MSc in Microbiology	Advance Agriculture Microbiology	MSMI404-II	2014-2015
MSc in Microbiology	Review	MSMI-405-I	2020-2021
MSc in Microbiology	Advance Food Microbiology	MSMI-405-II	2014-2015
MSc in Microbiology	PROJECT	MSMI-406	2014-2015
MSc in Molecular Biology & Human Genetics	Transmission Genetics & Basic Human Genetics	MSMHG101	2021-2022
MSc in Molecular Biology & Human Genetics	Biochemistry & Cell Biology	MSMHG102	2021-2022

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Molecular Bilogy & Human Genetics	Computational Biology, Biostatistics & Evolutionary Genetics	MSMHG103	2021-2022
MSc in Molecular Bilogy & Human Genetics	Molecular Biology & Biotechniques	MSMHG104	2021-2022
MSc in Molecular Bilogy & Human Genetics	Lab work based on courses MSMHG101 & MSMHG102	MSMHG105	2021-2022
MSc in Molecular Bilogy & Human Genetics	Lab work based on courses MSMHG103 & MSMHG104	MSMHG106	2021-2022
MSc in Molecular Bilogy & Human Genetics	Reproductive Biology & Developmental Genetics	MSMHG201	2021-2022
MSc in Molecular Bilogy & Human Genetics	Immunology & Immunogenetics	MSMHG202	2021-2022
MSc in Molecular Bilogy & Human Genetics	Molecular Human Genetics & Human Genome	MSMHG203	2021-2022
MSc in Molecular Bilogy & Human Genetics	Genetic Engineering Model Genetic Systems	MSMHG204	2021-2022
MSc in Molecular Bilogy & Human Genetics	Lab work based on courses MSMHG201 & MSMHG202	MSMHG205	2021-2022
MSc in Molecular Bilogy & Human Genetics	Lab work based on courses MSMHG203 & MSMHG204	MSMHG206	2021-2022
MSc in Molecular Bilogy & Human Genetics	Bioinformatics & Omics	MSMHG301	2021-2022
MSc in Molecular Bilogy & Human Genetics	Clinical Genetics & Genetic Counselling	MSMHG302	2021-2022
MSc in Molecular Bilogy & Human Genetics	Lab work based on courses MSMHG301 & MSMHG302	MSMHG303	2021-2022
MSc in Molecular Bilogy & Human Genetics	Basic Principle of Genetics	MSMHG304	2021-2022
MSc in Molecular Bilogy & Human Genetics	CANCER BIOLOGY	MSMHG 305-DE1	2021-2022
MSc in Molecular Bilogy & Human Genetics	INFECTION BIOLOGY	MSMHG 305-DE2	2021-2022
MSc in Molecular Bilogy & Human Genetics	MOLECULAR DIAGNOSTICS	MSMHG 305-DE3	2021-2022
MSc in Molecular Bilogy & Human Genetics	NANOBIOTECHNOLOGY	MSMHG 305-DE4	2021-2022
MSc in Molecular Bilogy & Human Genetics	STEM CELL AND REGENERATIVE MEDICINE	MSMHG 305-DE5	2021-2022
MSc in Molecular Bilogy & Human Genetics	One course from SWAYAM	MSMHG 305-DE6	2021-2022
MSc in Molecular Bilogy & Human Genetics	Lab work based on courses MSMHG305	MSMHG306	2021-2022
MSc in Molecular Bilogy & Human Genetics	Community Engagement (CE)	MSMHG- 307	2021-2022
MSc in Molecular Bilogy & Human Genetics	Neurogenetics and Pharmacogenetics	MSMHG-401	2021-2022
MSc in Molecular Bilogy & Human Genetics	Intellectual Property Rights and Biosafety	MSMHG-402	2021-2022
MSc in Molecular Bilogy & Human Genetics	Project Proposal Preparation	MSMHG403	2021-2022

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Molecular Biology & Human Genetics	Journal Club/ Communication Skills and Seminar Presentation	MSMHG404	2021-2022
MSc in Molecular Biology & Human Genetics	Research Lab / Biotech Industry visit and internship	MSMHG405	2021-2022
MSc in Molecular Biology & Human Genetics	Dissertation	MSMHG406	2021-2022
MSc in Nutrition and Public Health	Concept of Food, Nutrition and Public Health	MSNP101	2021-2022
MSc in Nutrition and Public Health	Nutritional Biochemistry and Physiology	MSNP102	2021-2022
MSc in Nutrition and Public Health	Nutrition and Human Development	MSNP103	2021-2022
MSc in Nutrition and Public Health	Epidemiology and Microbiology	MSNP104	2021-2022
MSc in Nutrition and Public Health	Nutritional Physiology and Biochemistry	MSNP105	2021-2022
MSc in Nutrition and Public Health	Microbiology	MSNP106	2021-2022
MSc in Nutrition and Public Health	Pathophysiology and Dietetics	MSNP 201	2021-2022
MSc in Nutrition and Public Health	Nutritional Assessment and Community Nutrition Management	MSNP 202	2021-2022
MSc in Nutrition and Public Health	Parasitology and Medical Entomology	MSNP 203	2021-2022
MSc in Nutrition and Public Health	Public Health and Environment	MSNP 204	2021-2022
MSc in Nutrition and Public Health	Anthropometry and Diet Therapy	MSNP 205	2021-2022
MSc in Nutrition and Public Health	Eco-toxicology, Parasitology and Medical Entomology	MSNP 206	2021-2022
MSc in Nutrition and Public Health	FOOD SANITATION AND FOOD HYGIENE	MSNP-301	2021-2022
MSc in Nutrition and Public Health	FOOD-COMMODITIES AND FOOD-TECHNOLOGY	MSNP-302	2021-2022
MSc in Nutrition and Public Health	FOOD PREPARATION AND FOOD TECHNOLOGY	MSNP- 303	2021-2022
MSc in Nutrition and Public Health	Communicable diseases and their management, Food technology and Food preservation	MSNP 304	2021-2022
MSc in Nutrition and Public Health	EPIDEMIOLOGY AND COMMUNITY HEALTH	MSNP 305	2021-2022
MSc in Nutrition and Public Health	EPIDEMIOLOGY AND COMMUNITY HEALTH (PRACTICAL)	MSNP 306	2021-2022
MSc in Nutrition and Public Health	FOOD TOXICOLOGY, FOOD-PRESERVATION AND IMMUNOLOGY	MSNP 401	2021-2022
MSc in Nutrition and Public Health	BIostatistics, Bioinformatics and Nutrigenomics	MSNP 402	2021-2022

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Nutrition and Public Health	FOOD TOXICOLOGY, IMMUNOLOGY AND BIOINFORMATICS (PRACTICAL)	MSNP- 403	2021-2022
MSc in Nutrition and Public Health	EPIDEMIOLOGY AND COMMUNITY HEALTH-I	MSNP 404	2021-2022
MSc in Nutrition and Public Health	EPIDEMIOLOGY AND COMMUNITY HEALTH-II	MSNP 405	2021-2022
MSc in Nutrition and Public Health	DISCIPLINE-CENTRIC ELECTIVE COURSE [PRACTICAL]	MSNP 406	2021-2022
MSc in Nutrition and Public Health	DISSERTATION	MSNP 407	2021-2022
MA in Political Science	Indian Political Thought	MAPOL101	2014-2015
MA in Political Science	Liberal and Post Liberal Political Theory	MAPOL102	2014-2015
MA in Political Science	Comparative Politics: Principles and Approaches	MAPOL103	2014-2015
MA in Political Science	Politics in South Asia	MAPOL104	2014-2015
MA in Political Science	Indian Politics: Institutions and Processes	MAPOL105	2014-2015
MA in Political Science	Modern Western Political Thought	MAPOL201	2014-2015
MA in Political Science	Marxist Political Theory	MAPOL202	2014-2015
MA in Political Science	Theories of Public Administration	MAPOL203	2014-2015
MA in Political Science	Research Methodology	MAPOL204	2014-2015
MA in Political Science	Post Cold War International Relations	MAPOL205	2014-2015
MA in Political Science	Public Policy	MAPOL301	2014-2015
MA in Political Science	Political Sociology: Conceptual issues	MAPOL302	2014-2015
MA in Political Science	Comparative and Development Administration	MAPOL303A	2020-2021
MA in Political Science	Ethnic Politics and Nationhood in India	MAPOL303B	2020-2021
MA in Political Science	India and Her Neighbours	MAPOL303C	2014-2015
MA in Political Science	Issues of Citizencentric Administration in India	MAPOL304A	2014-2015
MA in Political Science	Understanding Indian Politics	MAPOL304B	2020-2021
MA in Political Science	India and the World	MAPOL304C	2020-2021
MA in Political Science	Issues in Contemporary Political Theory	MAPOL305A	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Political Science	Public Policy in India	MAPOL305B	2014-2015
MA in Political Science	Politics of Human Rights	MAPOL305C	2014-2015
MA in Political Science	Community Engagement	MAPOL400	2020-2021
MA in Political Science	State Formation and Political Regime	MAPOL401	2020-2021
MA in Political Science	Theories of International Relations	MAPOL402	2014-2015
MA in Political Science	Social Welfare Administration	MAPOL403A	2020-2021
MA in Political Science	India's Political Economy	MAPOL403B	2014-2015
MA in Political Science	Peace and Conflict Studies	MAPOL403C	2020-2021
MA in Political Science	Local Governance in India with Special Reference to West Bengal	MAPOL404A	2014-2015
MA in Political Science	Social and Political Movements in India	MAPOL40B	2014-2015
MA in Political Science	International Law	MAPOL404C	2014-2015
MA in Political Science	Project	MAPOL405	2014-2015
MA in Philosophy	INDIAN CLASSIC	MAPHIL 101	2014-2015
MA in Philosophy	INDIAN EPISTEMOLOGY	MAPHIL 102	2014-2015
MA in Philosophy	WESTERN CLASSIC	MAPHIL 103	2014-2015
MA in Philosophy	WESTERN ETHICS	MAPHIL 104	2014-2015
MA in Philosophy	SOCIO-POLITICAL PHILOSOPHY: INDIAN	MAPHIL 105	2021-2022
MA in Philosophy	INDIAN ETHICS	MAPHIL 201	2014-2015
MA in Philosophy	INDIAN METAPHYSICS	MAPHIL 202	2014-2015
MA in Philosophy	WESTERN EPISTEMOLOGY	MAPHIL 203	2014-2015
MA in Philosophy	WESTERN LOGIC	MAPHIL 204	2014-2015
MA in Philosophy	SOCIO-POLITICAL PHILOSOPHY: WESTERN	MAPHIL 205	2021-2022
MA in Philosophy	INDIAN PHILOSOPHY OF LANGUAGE	MAPHIL 301	2014-2015
MA in Philosophy	WESTERN METAPHYSICS	MAPHIL 302	2014-2015
MA in Philosophy	NYAYA-VAIŚEṢIKA	MAPHIL 303 A	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Philosophy	VEDANTA	MAPHIL 303 B	2014-2015
MA in Philosophy	APPLIED ETHICS	MAPHIL 303 C	2014-2015
MA in Philosophy	WESTERN LOGIC	MAPHIL 303 D	2014-2015
MA in Philosophy	SĀMKHYA-YOGA	MAPHIL 303 E	2014-2015
MA in Philosophy	NYAYA-VAIŚEṢIKA	MAPHIL 304 A	2014-2015
MA in Philosophy	VEDANTA	MAPHIL 304 B	2014-2015
MA in Philosophy	APPLIED ETHICS	MAPHIL 304 C	2014-2015
MA in Philosophy	WESTERN LOGIC	MAPHIL 304 D	2014-2015
MA in Philosophy	SĀMKHYA-YOGA	MAPHIL 304 E	2014-2015
MA in Philosophy	PHILOSOPHY FOR REAL LIFE ISSUES or may be opted from SWAYAM	MAPHIL 305	2021-2022
MA in Philosophy	PHILOSOPHICAL COUNSELLING (COMMUNITY ENGAGEMENT)	MAPHIL400	2021-2022
MA in Philosophy	CONTINENTAL PHILOSOPHY	MAPHIL401	2014-2015
MA in Philosophy	WESTERN PHILOSOPHY OF LANGUAGE	MAPHIL402	2014-2015
MA in Philosophy	NYAYA-VAIŚEṢIKA	MAPHIL403 A	2014-2015
MA in Philosophy	VEDANTA	MAPHIL403 B	2014-2015
MA in Philosophy	APPLIED ETHICS	MAPHIL403 C	2014-2015
MA in Philosophy	WESTERN LOGIC	MAPHIL403 D	2014-2015
MA in Philosophy	SĀMKHYA-YOGA	MAPHIL403 E	2014-2015
MA in Philosophy	NYAYA-VAIŚEṢIKA	MAPHIL404 A	2014-2015
MA in Philosophy	VEDANTA	MAPHIL404 B	2014-2015
MA in Philosophy	APPLIED ETHICS	MAPHIL404 C	2014-2015
MA in Philosophy	WESTERN LOGIC	MAPHIL404 D	2014-2015
MA in Philosophy	SĀMKHYA-YOGA	MAPHIL404 E	2014-2015
MA in Philosophy	PROJECT WRITING	MAPHIL405	2014-2015
MPed (Physical Education)	Yoga Education	MPCC-101	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MPEd (Physical Education)	Physiology of Exercise	MPCC-102	2014-2015
MPEd (Physical Education)	Test, Measurement And Evaluation in Physical Education	MPCC-103	2014-2015
MPEd (Physical Education)	Athletic Care and Rehabilitation	MPEC-101	2014-2015
MPEd (Physical Education)	Sports Technology	MPEC-102	2014-2015
MPEd (Physical Education)	Track & Field: Running Events; Gymnastics	MPPC-101	2014-2015
MPEd (Physical Education)	Self Defense Specialization Karate, Judo, Boxing, Fencing, wrestling, wushu.(any two)	MPPC-102	2014-2015
MPEd (Physical Education)	Yoga (compulsory) *Aerobics/Self Defense Techniques-Martial Arts, Taekwondo/Shooting/Archer y(any one activity)	MPPC-103	2014-2015
MPEd (Physical Education)	Camping; Mass Demonstration Activities	MPPC-104	2014-2015
MPEd (Physical Education)	Research Process in Physical Education & Sports Science	MPCC-201	2014-2015
MPEd (Physical Education)	Applied Statistics in Physical Education & Sports	MPCC-202	2014-2015
MPEd (Physical Education)	Sports Biomechanics and Kinesiology	MPCC-203	2014-2015
MPEd (Physical Education)	Sports Management and Curriculum Design in Physical Education	MPEC- 201	2014-2015
MPEd (Physical Education)	Education Technology in Physical Education	MPEC- 202	2014-2015
MPEd (Physical Education)	Track & Field : Jumping Events + Hurdles; Gymnastics	MPPC-201	2014-2015
MPEd (Physical Education)	1st Games Specialization Practical Skill Kabaddi, KhoKho, Badminton, Table Tennis, Volleyball, Basketball, Football, Cricket, Handball, Hockey, Netball, (Any one)	MPPC-202	2014-2015
MPEd (Physical Education)	Teaching Lesson of Indigenous Activities And Sports	MPPC-203	2014-2015
MPEd (Physical Education)	Class Room Teaching Lesson on Theory of Different Sports & Games	MPPC-204	2014-2015
MPEd (Physical Education)	Scientific Principles of Sports Training	MPCC 301	2014-2015
MPEd (Physical Education)	Sports Psychology	MPCC 302	2014-2015
MPEd (Physical Education)	Health Education and Sports Nutrition, Physical Fitness and Wellness	MPCC 303	2014-2015
MPEd (Physical Education)	Olympic Studies	MPEC-301	2014-2015
MPEd (Physical Education)	Sports Engineering	MPEC-302	2014-2015
MPEd (Physical Education)	Track & Field (Throwing Events + Introduction of Heptathlon Events); Swimming	MPPC-301	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MPed (Physical Education)	A) Sports Psychology; B) Physiology; C) Biomechanics & Kinesiology	MPPC-302	2014-2015
MPed (Physical Education)	Coaching Lesson of Track & Field/ Gymnastics/ Swimming	MPPC-303	2014-2015
MPed (Physical Education)	Coaching Lesson of 1st game specialization i.e Kabaddi, Kho-Kho, Badminton, Volleyball, Basketball, Football, Cricket, Handball	MPPC-304	2014-2015
MPed (Physical Education)	Trends and Practices in Physical Education OR may be opted from SWAYAM	MPMEC-305	2014-2015
MPed (Physical Education)	Community Engagement Course	MPCEC-400	2021-2022
MPed (Physical Education)	Information and Communication Technology (ICT) in Physical Education	MPCC-401	2014-2015
MPed (Physical Education)	Sports Medicine	MPCC-402	2014-2015
MPed (Physical Education)	Dissertation	MPCC-403	2014-2015
MPed (Physical Education)	Value and Environmental Education	MPEC-401	2014-2015
MPed (Physical Education)	Sports Journalism and Mass Media	MPEC-402	2014-2015
MPed (Physical Education)	Track & Field : Introduction of Decathlon events; Swimming (Practical skill)	MPPC-401	2014-2015
MPed (Physical Education)	2nd Games Specialization Practical Skill- Kabaddi, Kho-Kho, Badminton, Volleyball, Basketball, Football, Cricket, Handball (any one from major games)	MPPC-402	2014-2015
MPed (Physical Education)	Officiating Lesson of Track & Field/ Gymnastics/ Swimming	MPPC-403	2014-2015
MPed (Physical Education)	Officiating Lessons of 1st game specialization- i.e Kabaddi, Kho-Kho, Badminton, Volleyball, Basketball, Football, Cricket, Handball	MPPC-404	2014-2015
MSc in Physics	Mathematical Methods	MSPH101	2014-2015
MSc in Physics	Classical Mechanics, General Relativity & Astrophysics	MSPH102	2014-2015
MSc in Physics	Quantum Mechanics	MSPH103	2014-2015
MSc in Physics	Classical Electrodynamics	MSPH104	2014-2015
MSc in Physics	Practical-I	MSPH105	2014-2015
MSc in Physics	Practical-II	MSPH106	2014-2015
MSc in Physics	Atomic Spectroscopy & Laser physics	MSPH201	2014-2015
MSc in Physics	Solid State Physics	MSPH202	2014-2015
MSc in Physics	Nuclear & Particle Physics	MSPH203	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Physics	Electronics	MSPH204	2014-2015
MSc in Physics	Practical-I	MSPH205	2014-2015
MSc in Physics	Practical-II	MSPH206	2014-2015
MSc in Physics	Statistical Mechanics	MSPH301	2014-2015
MSc in Physics	Group Theory & Nonlinear dynamics	MSPH302	2020-2021
MSc in Physics	Advanced General Practical	MSPH303	2020-2021
MSc in Physics	Condensed Matter & Nano Physics	MSPH304	2014-2015
MSc in Physics	May be opted from SWAYAM	MSWM304	2020-2021
MSc in Physics	Advanced Electronics-I	MSPH305-1	2014-2015
MSc in Physics	Laser Physics-I	MSPH305-2	2014-2015
MSc in Physics	Materials Science-I	MSPH305-3	2014-2015
MSc in Physics	Condensed Matter Physics-I	MSPH305-4	2014-2015
MSc in Physics	Nuclear & Particle Physics-I	MSPH305-5	2014-2015
MSc in Physics	Astrophysics & Cosmology-I	MSPH305-6	2020-2021
MSc in Physics	Applied Electronics	MSPH306-1	2014-2015
MSc in Physics	Advanced Solid State Physics	MSPH306-2	2014-2015
MSc in Physics	Materials Physics	MSPH306-3	2014-2015
MSc in Physics	Selected Topics in Nuclear & Particle Physics	MSPH306-4	2014-2015
MSc in Physics	Lasers and Laser Spectroscopy	MSPH306-5	2014-2015
MSc in Physics	Special Topics in General Relativity and Astrophysics	MSPH306-6	2014-2015
MSc in Physics	Relativistic Quantum Mechanics& Quantum Field Theory	MSPH306-7	2014-2015
MSc in Physics	May be opted from SWAYAM	MSPH306-8	2020-2021
MSc in Physics	Community Engagement Activities (CE)	MSPH307	2020-2021
MSc in Physics	Molecular Spectroscopy	MSPH401	2014-2015
MSc in Physics	Advanced Quantum Mechanics &Computational Physics	MSPH402	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Physics	Advanced General Practical	MSPH403	2020-2021
MSc in Physics	Advanced Electronics-II	MSPH404-1	2014-2015
MSc in Physics	Laser Physics-II	MSPH404-2	2014-2015
MSc in Physics	Materials Science-II	MSPH404-3	2014-2015
MSc in Physics	Condensed Matter Physics-II	MSPH404-4	2014-2015
MSc in Physics	Nuclear & Particle Physics-II	MSPH404-5	2014-2015
MSc in Physics	Astrophysics & Cosmology-II	MSPH404-6	2020-2021
MSc in Physics	Advanced Electronics-III	MSPH405-1	2014-2015
MSc in Physics	Laser Physics-III	MSPH405-2	2014-2015
MSc in Physics	Materials Science-III	MSPH405-3	2014-2015
MSc in Physics	Condensed Matter Physics-III	MSPH405-4	2014-2015
MSc in Physics	Nuclear & Particle Physics-III	MSPH405-5	2014-2015
MSc in Physics	Astrophysics& Cosmology-III	MSPH405-6	2020-2021
MSc in Physics	Term paper/ Project	MSPH406	2014-2015
MSc in Physiology	Cell biology, molecular biology, cytogenetics and immunology	MSPY101	2020-2021
MSc in Physiology	Enzyme, Bioenergetics, Metabolism and Microbiology	MSPY102	2020-2021
MSc in Physiology	Homeostasis of Internal Environment in Human, Stress Physiology, Alimentation and Excretion	MSPY103	2020-2021
MSc in Physiology	Biophysics, Nutrition and Histochemistry	MSPY104	2020-2021
MSc in Physiology	Clinical Enzymology and Cytogenetics	MSPY105	2020-2021
MSc in Physiology	Histology and Histochemistry	MSPY106	2020-2021
MSc in Physiology	Cell Membrane Dynamics	MSPY201	2020-2021
MSc in Physiology	Central Nervous System and Sensory Physiology	MSPY202	2020-2021
MSc in Physiology	Sports and Exercise Physiology	MSPY203	2020-2021
MSc in Physiology	Ergonomics and Chronobiology	MSPY204	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Physiology	Amphibian Experimental Physiology and Educational Field Tour Report	MSPY205	2020-2021
MSc in Physiology	Mammalian Physiology Experiments and Human Physiology Experiments	MSPY206	2020-2021
MSc in Physiology	Endocrinology and Bioinstrumentation	MSPY301	2020-2021
MSc in Physiology	Biostatics and Computer Application	MSPY302	2020-2021
MSc in Physiology	Biostatistics and Computer Application	MSPY303	2020-2021
MSc in Physiology	Environmental Physiology and Occupational Health	MSPY304	2020-2021
MSc in Physiology	Nutrition and Dietetics	MSPY305-DE1	2020-2021
MSc in Physiology	Endocrinology and Reproduction	MSPY305-DE2	2020-2021
MSc in Physiology	Ergonomics and Occupational Health	MSPY305-DE3	2020-2021
MSc in Physiology	Environmental Physiology	MSPY305-DE4	2020-2021
MSc in Physiology	Sports and Exercise Physiology	MSPY305-DE5	2020-2021
MSc in Physiology	Nutrition and Dietetics	MSPY306-DE1	2020-2021
MSc in Physiology	Endocrinology and Reproduction	MSPY306-DE2	2020-2021
MSc in Physiology	Ergonomics and Occupational Health	MSPY306-DE3	2020-2021
MSc in Physiology	Environmental Physiology	MSPY306-DE4	2020-2021
MSc in Physiology	Sports and Exercise Physiology	MSPY306-DE5	2020-2021
MSc in Physiology	Community Health Assessment	MSPY307	2020-2021
MSc in Physiology	Developmental Biology and Population Science	MSPY401	2020-2021
MSc in Physiology	Reproductive Biology, Environmental Physiology and Evolution	MSPY402	2020-2021
MSc in Physiology	Toxicology, Xenobiotics and Human Health; Evolutionary Biology	MSPY403	2020-2021
MSc in Physiology	Nutrition and Dietetics	MSPY404-DE1	2020-2021
MSc in Physiology	Endocrinology and Reproduction	MSPY404-DE2	2020-2021
MSc in Physiology	Ergonomics and Occupational Health	MSPY404-DE3	2020-2021
MSc in Physiology	Environmental Physiology	MSPY404-DE4	2020-2021
MSc in Physiology	Biomechanics, Kinesiology in Sports and Exercise	MSPY404-DE5	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Physiology	Nutrition and Dietetics	MSPY405-DE1	2020-2021
MSc in Physiology	Endocrinology and Reproduction	MSPY405-DE2	2020-2021
MSc in Physiology	Ergonomics and Occupational Health	MSPY405-DE3	2020-2021
MSc in Physiology	Environmental Physiology	MSPY405-DE4	2020-2021
MSc in Physiology	Biomechanics, Kinesiology in Sports and Exercise	MSPY405-DE5	2020-2021
MSc in Physiology	Dissertation	MSPY406	2020-2021
MSc in Psychology	Human Cognition: Theory & Research	MSPS101	2020-2021
MSc in Psychology	Theory Construction & Research	MSPS102	2020-2021
MSc in Psychology	Psychometry and statistics: Part I	MSPS103	2020-2021
MSc in Psychology	Qualitative Research Methodology	MSPS104	2020-2021
MSc in Psychology	Practical Based on MSPS 101 & 102	MSPS105	2020-2021
MSc in Psychology	Practical Based on MSPS 103 & 104	MSPS106	2020-2021
MSc in Psychology	Biology and Behaviour	MSPS201	2020-2021
MSc in Psychology	Personality Theories	MSPS202	2020-2021
MSc in Psychology	Theories and Challenges of Developmental Psychology	MSPS203	2020-2021
MSc in Psychology	Psychometry and statistics: Part II	MSPS204	2020-2021
MSc in Psychology	Practical Based on MSPS 201, 202, 203	MSPS205	2020-2021
MSc in Psychology	Practical Based on MSPS 201 to 204	MSPS206	2020-2021
MSc in Psychology	Positive Psychology	MSPS301	2020-2021
MSc in Psychology	Social Psychology	MSPS302	2020-2021
MSc in Psychology	Clinical Psychology	MSPS303	2020-2021
MSc in Psychology	Elementary Qualitative Research Methodology	MSPS304-1	2020-2021
MSc in Psychology	Elementary Human Cognition	MSPS304-2	2020-2021
MSc in Psychology	Basic Psychometry and Statistics	MSPS304-3	2020-2021
MSc in Psychology	Course opted from SWAYAM	MSPS304-4	2020-2021

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Psychology	Advanced Clinical Psychology	MSPS305-1	2020-2021
MSc in Psychology	Industrial/ Organizational Psychology	MSPS305-2	2020-2021
MSc in Psychology	Advanced Qualitative Research Methodology	MSPS305-3	2020-2021
MSc in Psychology	Course opted from SWAYAM	MSPS305-4	2020-2021
MSc in Psychology	Practical	MSPS306	2020-2021
MSc in Psychology	Community Engagement Activities	MSPS307	2020-2021
MSc in Psychology	Health Psychology and Stress Management	MSPS 401	2020-2021
MSc in Psychology	Late Adulthood Psychology	MSPS 402	2020-2021
MSc in Psychology	Psychotherapy	MSPS 403-1	2020-2021
MSc in Psychology	Organizational and Human Resource Development	MSPS 403-2	2020-2021
MSc in Psychology	Course opted from SWAYAM	MSPS 403-3	2020-2021
MSc in Psychology	Vocational guidance and Counselling	MSPS 404-1	2020-2021
MSc in Psychology	Industrial Relations	MSPS 404-2	2020-2021
MSc in Psychology	Course opted from SWAYAM	MSPS 404-3	2020-2021
MSc in Psychology	Internship	MSPS 405	2020-2021
MSc in Psychology	Project/Term Paper	MSPS 406	2020-2021
MA in Santali	Indian Tribal Society & Culture: Special reference to the Santal	SANT-101	2020-2021
MA in Santali	History of Santali Language and Its affiliation	SANT-102	2014-15
MA in Santali	History of Santali Literature till 1890	SANT-103	2020-2021
MA in Santali	Literary Theory	SANT-104	2014-15
MA in Santali	Study of Santali Language in India and Abroad	SANT-105	2014-15
MA in Santali	History of Santali Literature (1890- 1947)	SANT-201	2020-2021
MA in Santali	Santali Folk Literature (Folk songs, Rhymes, Myth, Folk Tales, Riddles, Proverbs, Idioms)	SANT-202	2014-15
MA in Santali	History of Indian Literature (Sanskrit & Bengali Literature)	SANT-203	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Santali	Santali Fiction (Novel & Short Story)	SANT-204	2014-15
MA in Santali	Santali Linguistics: Historical & Descriptive	SANT-205	2014-15
MA in Santali	History of Santali Literature (1947 and after)	SANT-301	2014-15
MA in Santali	Santali Poetry & Drama	SANT-302	2014-15
MA in Santali	Santali Folk Culture & Folk Literature	SANT-303A	2014-15
MA in Santali	Santali Poetry	SANT-303B	2014-15
MA in Santali	Santali Fiction Literature (Novel & Short Story)	SANT-303C	2020-2021
MA in Santali	Santali Drama Literature	SANT-303D	2014-15
MA in Santali	Santali Folk Culture & Folk Literature	SANT-304A	2020-2021
MA in Santali	Santali Poetry	SANT-304B	2020-2021
MA in Santali	Santali Fiction Literature (Novel & Short Story)	SANT-304C	2020-2021
MA in Santali	Santali Drama Literature	SANT-304D	2014-15
MA in Santali	History of Santali Literature	SANT-305A	2014-15
MA in Santali	Santali Folk Literature	SANT-305B	2014-15
MA in Santali	Santali Poetry & Essay	SANT-305C	2014-15
MA in Santali	Santali periodicals	SANT-305D	2014-15
MA in Santali	Community Engagement Course	SANT-400	2020-2021
MA in Santali	Literature Criticism (Indian & Western)	SANT-401	2014-15
MA in Santali	History of Santali Periodicals	SANT-402	2020-2021
MA in Santali	Santali Folk Culture & Folk Literature	SANT-403A	2014-15
MA in Santali	Santali Poetry	SANT-403B	2014-15
MA in Santali	Santali Fiction Literature (Novel & Short Story)	SANT-403C	2014-15
MA in Santali	Santali Drama Literature	SANT-403D	2014-15
MA in Santali	Santali Folk Culture & Folk Literature	SANT-404A	2014-15
MA in Santali	Santali Poetry	SANT-404B	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Santali	Santali Fiction Literature (Novel & Short Story)	SANT-404C	2014-15
MA in Santali	Santali Drama Literature	SANT-404D	2014-15
MA in Santali	Project & Dissertation	SANT-405	2014-15
MA in Sanskrit	VEDIC HYMNS AND HISTORY OF VEDIC LITERATURE	MASANS101	2014-2015
MA in Sanskrit	MEGHADUTA AND HARSACARITA	MASANS102	2014-2015
MA in Sanskrit	BHASAPARICCHEDA (PART-I) AND SANSKRIT PHILOLOGY	MASANS103	2014-2015
MA in Sanskrit	ARTHASASTRA AND ASOKAN EDICTS	MASANS104	2014-2015
MA in Sanskrit	KENOPANISAD AND KRSIPARASARA	MASANS105	2020-2021
MA in Sanskrit	RK SAMHITA, AND RGVEDABHASYOPAKRAMANIK	MASANS201	2020-2021
MA in Sanskrit	MRCCHAKATIKA (PART-I) AND SAHITYADARPANA	MASANS202	2020-2021
MA in Sanskrit	SIDDHANTAKAUMUDI AND HISTORY OF CLASSICAL SANSKRIT LITERATURE	MASANS203	2014-2015
MA in Sanskrit	BHASAPARICCHEDA (PART-II) AND CARAKASAMHITA	MASANS204	2014-2015
MA in Sanskrit	NIRUKTA AND YAJNAVALKYA SAMHITA	MASANS205	2020-2021
MA in Sanskrit	SIDDHANTAKAUMUDI AND INSCRIPTIONS	MASANS301	2014-2015
MA in Sanskrit	RESEARCH METHODOLOGY & MANUSCRIPTOLOGY AND MRCCHAKATIKA (PART-II)	MASANS302	2014-2015
MA in Sanskrit	KAVYA-I	MASANS303A	2014-2015
MA in Sanskrit	DARSANA-I	MASANS303B	2014-2015
MA in Sanskrit	VEDA-I	MASANS303C	2014-2015
MA in Sanskrit	EPIGRAPHY-I	MASANS303D	2014-2015
MA in Sanskrit	VYAKARANA-I	MASANS303E	2014-2015
MA in Sanskrit	KAVYA-II	MASANS304A	2014-2015
MA in Sanskrit	DARSANA-II	MASANS304B	2014-2015
MA in Sanskrit	VEDA-II	MASANS304C	2014-2015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Sanskrit	EPIGRAPHY-II	MASANS304D	2014-2015
MA in Sanskrit	VYAKARANA-II	MASANS304E	2014-2015
MA in Sanskrit	Community Engagement Course	MASANS400	2020-2021
MA in Sanskrit	MAHABHASYA, AND SAMKHYAKARIKA	MASANS401	2020-2021
MA in Sanskrit	PRAKRTAPRAKASA AND ATHA KIM	MASANS402	2020-2021
MA in Sanskrit	KAVYA-III	MASANS403A	2014-2015
MA in Sanskrit	DARSANA-III	MASANS403B	2014-2015
MA in Sanskrit	VEDA-III	MASANS403C	2014-2015
MA in Sanskrit	EPIGRAPHY-III	MASANS403D	2014-2015
MA in Sanskrit	VYAKARANA-III	MASANS403E	2014-2015
MA in Sanskrit	KAVYA-IV	MASANS404A	2014-2015
MA in Sanskrit	DARSANA-IV	MASANS404B	2014-2015
MA in Sanskrit	VEDA-IV	MASANS404C	2014-2015
MA in Sanskrit	EPIGRAPHY-IV	MASANS404D	2014-2015
MA in Sanskrit	VYAKARANA-IV	MASANS404E	2014-2015
MA in Sanskrit	PROJECT	MASANS405	2014-2015
MA in Sociology	Sociological Thought I	SOC101	20014-15
MA in Sociology	Society and Culture in India	SOC102	20014-15
MA in Sociology	Gender and Sexuality	SOC103	2014-2015
MA in Sociology	Sociology of Development	SOC104	20014-15
MA in Sociology	Social Research: Philosophy, Design & Ethics	SOC105	2020-2021
MA in Sociology	Sociological Thought II	SOC201	2014-15
MA in Sociology	Functionalist, Structuralist and Interpretative Sociology/Anthropology	SOC202	2020-2021
MA in Sociology	Social Movements	SOC203	2020-2021
MA in Sociology	Sociology of Work and Occupation	SOC204	2014-12015

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MA in Sociology	Qualitative and Quantitative Research: Data Management	SOC205	2020-2021
MA in Sociology	Critical Theory and Neo-Marxism	SOC301	2020-2021
MA in Sociology	Sociology and Social Anthropology in India	SOC302	2014-15
MA in Sociology	Environmental Sociology	SOC303A	2020-2021
MA in Sociology	Political Sociology	SOC303B	2014-15
MA in Sociology	Cultural Studies and Everyday Life	SOC304A	2014-15
MA in Sociology	Sociology of Medicine and Health	SOC304B	2014-15
MA in Sociology	Sociology of Culture	SOC305A	2014-15
MA in Sociology	Sociology of Social Exclusion	SOC305B	2020-2021
MA in Sociology	Community Engagement Course	SOC400	2020-2021
MA in Sociology	Postmodern, Postcolonial and Structuration Theories	SOC401	2020-2021
MA in Sociology	Sociology of Globalisation, Modernity and Post-modernity	SOC402	2014-15
MA in Sociology	Rural and Urban Sociology	SOC403A	2014-15
MA in Sociology	Science, Technology And Society	SOC403B	2020-2021
MA in Sociology	Social Work and NGO Management	SOC404A	2020-2021
MA in Sociology	Society, Culture and Counselling	SOC404B	2014-15
MA in Sociology	Project Work DISSERTATION	SOC405	2014-15
MSc in Statistics	Mathematical Analysis	MSST101	2014-15
MSc in Statistics	Probability Theory	MSST102	2014-15
MSc in Statistics	Statistical Methods & Measure Theory	MSST103	2014-15
MSc in Statistics	Optimization Techniques & Statistical Quality Management	MSST104	2014-15
MSc in Statistics	R Programming	MSST105	2014-15
MSc in Statistics	Practicals	MSST106	2014-15
MSc in Statistics	Sampling Distributions & Inference - I	MSST201	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Statistics	Multivariate Techniques	MSST202	2014-15
MSc in Statistics	Linear Model & Design of Experiments-I	MSST203	2014-15
MSc in Statistics	Operations Research & Reliability Theory	MSST204	2014-15
MSc in Statistics	Practical Based on MSST 201-204	MSST205	2014-15
MSc in Statistics	Python Programming	MSST206	2020-2021
MSc in Statistics	Inference-II	MSST301	2014-15
MSc in Statistics	Regression Analysis & Design of Experiments-II	MSST302	2014-15
MSc in Statistics	Practical Based on MSST301 & 302	MSST303	2014-15
MSc in Statistics	Elementary Statistics	MSST304-1	2014-15
MSc in Statistics	Elementary Stochastic Process	MSST304-2	2014-15
MSc in Statistics	Numerical Methods and Matrix Algebra	MSST304-3	2014-15
MSc in Statistics	Advanced Statistical Methods	MSST305-1	2014-15
MSc in Statistics	Advanced Probability Theory	MSST305-2	2014-15
MSc in Statistics	Practical based on MSST305-1	MSST306-1	2014-15
MSc in Statistics	Practical based on MSST305-2	MSST306-2	2014-15
MSc in Statistics	Community Engagement	MSST307	2020-2021
MSc in Statistics	Stochastic Process & Time Series Analysis	MSST401	2014-15
MSc in Statistics	Demography & Sample Survey	MSST402	2014-15
MSc in Statistics	Industrial Statistics (Special-I)	MSST403-1	2014-15
MSc in Statistics	Biostatistics (Special-I)	MSST403-2	2014-15
MSc in Statistics	Advanced Mathematical Statistics (Special-I)	MSST403-3	2014-15
MSc in Statistics	Industrial Statistics (Special-II)	MSST404-1	2014-15
MSc in Statistics	Biostatistics (Special-II)	MSST404-2	2014-15
MSc in Statistics	Advanced Mathematical Statistics (Special-II)	MSST404-3	2014-15
MSc in Statistics	Practical Based on MSST401, 402 and opted DEs	MSST405	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Statistics	Project /Term paper	MSST406	2014-15
MA in Women Studies	Fundamentals of Women's Studies	WS 101	2014-15
MA in Women Studies	Strands of Feminist Theory	WS 102	2014-15
MA in Women Studies	Family, Community and State	WS 103	2014-15
MA in Women Studies	Women and Social Issues	WS 104	2014-15
MA in Women Studies	Women and the Economic Domain	WS 105	2014-15
MA in Women Studies	Socio-Political Movements and Women	WS 201	2014-15
MA in Women Studies	Women's Participation in Politics	WS 202	2014-15
MA in Women Studies	Women's Education	WS 203	2014-15
MA in Women Studies	Women: Health, Environment, Science and Technology	WS 204	2014-15
MA in Women Studies	Feminist Philosophy	WS 205	2014-15
MA in Women Studies	Women and Law in India	WS 301	2014-15
MA in Women Studies	Women in Literary and Communicative Media	WS 302	2014-15
MA in Women Studies	Gender, Violence and Resistance	WS 303A	2014-15
MA in Women Studies	Gender and Governance	WS 303B	2014-15
MA in Women Studies	Intersectional Feminism	WS304A	2014-15
MA in Women Studies	Discourses on Marginalized and Dalit Women	WS304B	2014-15
MA in Women Studies	Basics of Women's Studies and Feminist Thought	WS305A	2014-15
MA in Women Studies	Research Methodology	WS 401	2014-15
MA in Women Studies	Religion and Women	WS 402	2014-15
MA in Women Studies	Politics of Body	WS 403A	2014-15
MA in Women Studies	Gender Roles and Psychology	WS 403B	2014-15
MA in Women Studies	Women and Ecology	WS 404A	2014-15
MA in Women Studies	Gender and Poverty	WS 404B	2014-15
MA in Women Studies	Project Writing	WS 405	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Zoology	Ecology, Ethology and Conservation Biology	MSZO 101	2014-15
MSc in Zoology	Basic and Applied Entomology	MSZO 102	2014-15
MSc in Zoology	Parasitology and Vector Biology	MSZO 103	2014-15
MSc in Zoology	Fish Biology and Fisheries	MSZO 104	2014-15
MSc in Zoology	Ecology and Conservation Biology (Practical)	MSZO 105 (Unit-I)	2014-15
MSc in Zoology	Entomology (Practical)	MSZO 105 (Unit-II)	2014-15
MSc in Zoology	Parasitology and Vector Biology (Practical)	MSZO 106 (Unit-I)	2014-15
MSc in Zoology	Fish Biology and Fisheries (Practical)	MSZO 106 (Unit-II)	2014-15
MSc in Zoology	Biosystematics and Evolutionary Biology	MSZO 201	2020-2021
MSc in Zoology	Microbiology and Immunology	MSZO 202	2014-15
MSc in Zoology	Genetics and Cell Biology	MSZO 203	2020-2021
MSc in Zoology	Physiology and Endocrinology	MSZO 204	2020-2021
MSc in Zoology	Biosystematics (Practical)	MSZO 205A	2014-15
MSc in Zoology	Genetics and Cell Biology (Practical)	MSZO 205B	2014-15
MSc in Zoology	Physiology and Endocrinology (Practical)	MSZO 206A	2014-15
MSc in Zoology	Microbiology and Immunology (Practical)	MSZO 206B	2014-15
MSc in Zoology	Biochemistry and Toxicology	MSZO 301	2014-15
MSc in Zoology	HistologyHistochemistry and Comparative Anatomy	MSZO 302	2014-15
MSc in Zoology	Biochemistry and Toxicology (Practical)	MSZO 303 (Unit-I)	2014-15
MSc in Zoology	Histology, Histochemistry and Comparative Anatomy (Practical)	MSZO 303 (Unit-II)	2014-15
MSc in Zoology	Applied Zoology	MSZO 304Z	2020-2021
MSc in Zoology	AQUACULTURE AND FISHERIES	MSZO 305-DE1	2014-15
MSc in Zoology	ECOLOGY AND ENVIRONMENTAL BIOLOGY	MSZO 305-DE2	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Zoology	ENTOMOLOGY	MSZO 305-DE3	2014-15
MSc in Zoology	MOLECULAR BIOLOGY AND GENETICS	MSZO 305-DE4	2014-15
MSc in Zoology	PARASITOLOGY AND MICROBIOLOGY	MSZO 305-DE5	2014-15
MSc in Zoology	AQUACULTURE AND FISHERIES (Practical)	MSZO 306-DE1	2014-15
MSc in Zoology	ECOLOGY AND ENVIRONMENTAL BIOLOGY (Practical)	MSZO 306-DE2	2014-15
MSc in Zoology	ENTOMOLOGY (Practical)	MSZO 306-DE3	2014-15
MSc in Zoology	MOLECULAR BIOLOGY AND GENETICS (Practical)	MSZO 306-DE4	2014-15
MSc in Zoology	PARASITOLOGY AND MICROBIOLOGY (Practical)	MSZO 306-DE5	2014-15
MSc in Zoology	Developmental Biology and Stem cell Biology	MSZO 401	2020-2021
MSc in Zoology	Biostatistics and Computational Biology	MSZO 402	2014-15
MSc in Zoology	Developmental and Computational Biology Practical	MZGP 403	2014-15
MSc in Zoology	AQUACULTURE AND FISHERIES	MSZO 404 (DE-1)	2014-15
MSc in Zoology	ECOLOGY AND ENVIRONMENTAL BIOLOGY	MSZO 404 (DE-2)	2014-15
MSc in Zoology	ENTOMOLOGY	MSZO 404 (DE-3)	2014-15
MSc in Zoology	MOLECULAR BIOLOGY AND GENETICS	MSZO 404 (DE-4)	2014-15
MSc in Zoology	PARASITOLOGY and MICROBIOLOGY	MSZO 404 (DE-5)	2014-15
MSc in Zoology	AQUACULTURE AND FISHERIES	MSZO 405 (DE-1)	2014-15
MSc in Zoology	ECOLOGY AND ENVIRONMENTAL BIOLOGY	MSZO 405 (DE-2)	2014-15
MSc in Zoology	ENTOMOLOGY	MSZO 405 (DE-3)	2014-15
MSc in Zoology	MOLECULAR BIOLOGY AND GENETICS	MSZO 405 (DE-4)	2014-15
MSc in Zoology	PARASITOLOGY and MICROBIOLOGY	MSZO 405 (DE-5)	2014-15
MSc in Zoology	AQUACULTURE AND FISHERIES (Practical)	MSZO 406 (DE-1)	2014-15
MSc in Zoology	ECOLOGY AND ENVIRONMENTAL BIOLOGY (Practical)	MSZO 406 (DE-2)	2014-15
MSc in Zoology	ENTOMOLOGY (Practical)	MSZO 406 (DE-3)	2014-15
MSc in Zoology	MOLECULAR BIOLOGY AND GENETICS (Practical)	MSZO 406 (DE-4)	2014-15

1.2.1: Percentage of new courses introduced out of the total number of courses across all programmes offered during the last five years (The highlighted courses are introduced during the assessment period)

Name of the programme	Name of the Course	Course Code	Year of introduction (during the last five years)
MSc in Zoology	PARASITOLOGY and MICROBIOLOGY (Practical)	MSZO 406 (DE-5)	2014-15
MSc in Zoology	TERM PAPER / PROJECT WORK	MSZO 407	2014-15

THE UNIVERSITY OF BURDWAN
M.A. in Arabic Syllabus (CBCS)
With effect from academic year 2018-2019

Semester	Course Code	Course Title	Credit	Marks
Semester I	MAARB 101	Classical Arabic Prose	5	40+10
	MAARB 102	Classical Arabic Poetry	5	40+10
	MAARB 103	Translation	5	40+10
	MAARB 104	Modern Arab World and Interpretation	5	40+10

Semester	Course Code	Course Title	Credit	Marks
Semester II	MAARB 201	Rhetoric & Prosody	5	40+10
	MAARB 202	Modern Arabic Prose	5	40+10
	MAARB 203	Linguistics	5	40+10
	MAARB 204	Translation & Composition	5	40+10

Semester	Course Code	Course Title	Credit	Marks
Semester III	MAARB 301	Principles of Literary Criticism	5	40+10
	MAARB 302	Modern Arabic Poetry	5	40+10
	MAARB 303	Contemporary Arabic Novel, Short Story & Drama	5	40+10
	MAARB 304	Specialized Translation	5	40+10
	MAARB 305	Minor Elective (Essential Arabic)	5	40+10

Semester	Course Code	Course Title	Credit	Marks
Semester IV	MAARB 401	Poetry of Romanticism and Modernity	5	40+10
	MAARB 402	Specialized Translation	5	40+10
	MAARB 403	Special Study (Development of Arabic in India)	5	40+10
	MAARB 404	Dissertation Writing & Social Outreach Program	4+1	40+10

- Medium of Instruction will be in ARABIC
- Courses prescribed at Semester III and Semester IV will be applicable for the students admitted during the academic session 2017 -2018 also.

قسم اللغة العربية وآدابها
جامعة بردوان، بنغال الغربية - الهند

DEPARTMENT OF ARABIC
THE UNIVERSITY OF BURDWAN



SYLLABUS FOR MA IN ARABIC (CBCS)

With effect from academic year 2020 - 2021

THE UNIVERSITY OF BURDWAN
Syllabus of M.A in Arabic under the Faculty of Arts (Under CBCS System) 2020
With effect from academic year 2020-2021

SEMESTER-I

Semester	Course Code	Course Title	Course Type	Course Status	Credit Value of the Course	Marks Distribution (End Sem + Int. Asst.)
Semester-I	MAARB 101*	Pre-Islamic Arabic Literature	Theory	Core Course	5	40+10=50
	MAARB 102*	Arabic Literature During Islamic Period	Theory	Core Course	5	40+10=50
	MAARB 103*	Linguistics	Theory	Core Course	5	40+10=50
	MAARB 104*	Arabic Text and Applied Grammar	Theory	Core Course	5	40+10=50
	MAARB 105*	Translation: Theory and Practice*	Theory	Core Course	5	40+10=50
	Semester-I Total:				25	250

SEMESTER-II

Semester	Course Code	Course Title	Course Type	Course Status	Credit Value of the Course	Marks Distribution (End Sem + Int. Asst.)
Semester-II	MAARB 201*	Arabic Literature During Umayyad Period	Theory	Core Course	5	40+10=50
	MAARB 202*	Rhetoric & Prosody	Theory	Core Course	5	40+10=50
	MAARB 203*	Use of Language-I*	Theory	Core Course	5	40+10=50
	MAARB 204*	Arabic Literature in India	Theory	Core Course	5	40+10=50
	MAARB 205*	Specialized Translation*	Theory	Core Course	5	40+10=50
	Semester-II Total:				25	250

SEMESTER-III

Semester	Course Code	Course Title	Course Type	Course Status	Credit Value of the Course	Marks Distribution (End Sem + Int. Asst.)
Semester-III	MAARB 301*	Arabic Poetry During Abbasid Period	Theory	Core Course	5	40+10=50
	MAARB 302*	Arabic Prose During Abbasid Period	Theory	Core Course	5	40+10=50
	MAARB 303 A/B/C/D#	One of the Major Elective Course to be chosen from the following: a) Principles of Literary Criticism b) Teaching Methodology c) Development of Auto-Biography in Arabic literature d) Stylistics of Arabic Literature	Theory	Major Elective	5	40+10=50
	MAARB 304 A/B/C/D#	One of the Major Elective Course to be chosen from the following: a) Literary Trends, Movements & Schools	Theory	Major Elective	5	40+10=50

		b) Communicative Arabic-1 c) Applied Criticism d) Development of Travel Literature in Arabic				
	MAARB 305 A/B/C/D^	One of the Minor Elective Course to be chosen from the following: a) Essential Arabic b) Contemporary Arab World (Social, Economical & Political Conditions) c) Arab Culture and Civilization d) A brief history of Arabic Literature	Theory	Interdisciplinary Elective	4	40+10=50
	Semester-III Total:				24	250

SEMESTER-IV

Semester	Course Code	Course Title	Course Type	Course Status	Credit Value of the Course	Marks Distribution (End Sem + Int. Asst.)
Semester-IV	MAARB 400**	Community Engagement Course	PR	Community Engagement Course	2	10+10=20
	MAARB 401*	Modern Arabic Prose	Theory	Core Course	5	40+10=50
	MAARB 402*	Modern Arabic Poetry	Theory	Core Course	5	40+10=50
	MAARB 403 A/B/C/D#	One of the Major Elective Course to be chosen from the following: a) Arabic Novel & Short story b) Mahjar Literature c) Development of Arabic Journalism d) Arabic Play	Theory	Major Elective	5	40+10=50
	MAARB 404 A/B/C/D#	One of the Major Elective Course to be chosen from the following: a) Use of Language-II b) Communicative Arabic-II c) Consecutive Interpretation d) Andalusian & Ottoman Literature	Theory	Major Elective	5	40+10=50
	MAARB 405*	Dissertation Writing & Research Methodology	PR/Project & Theory	Core Course	5	30+10+10=50
	Semester-IV Total:				27	270
Program Total					101	1020

- Medium of instruction will be in Arabic
- *Courses focus on employability & skill development



বর্ধমান বিশ্ববিদ্যালয়

স্নাতকোত্তর বাংলা পাঠক্রম

২০২০-২০২১ শিক্ষাবর্ষ থেকে প্রযোজ্য

মোট নম্বর : ১০২৫

মোট সেমিস্টার : ০৪

এম.এ. প্রোগ্রামের এই পাঠ্যসূচি শিক্ষার্থীদের বাংলা ভাষা ও সাহিত্য সম্পর্কে পদ্ধতিসম্মতভাবে প্রশিক্ষিত করার উদ্দেশ্যে পরিকল্পিত। সেই সঙ্গে শিক্ষার্থীদের আন্তর্বিভাগীয় ক্ষেত্রে সামর্থ্য অর্জনের উপযুক্ত করাও এই পাঠ্যসূচির উদ্দেশ্য। পাঠ্যসূচির কোর্সগুলি থেকে যাতে বাংলা ভাষার ভাষাবিজ্ঞানগত ধারণা শিক্ষার্থীদের তৈরি হয়, সাহিত্যের ইতিহাসের পাঠ নেওয়ার মধ্য দিয়ে সাহিত্যকে আর্থ-সামাজিক-রাজনৈতিক পরিপ্রেক্ষিতে বুঝে নিতে পারে, বিভিন্ন সাহিত্যকর্ম বা টেক্সট-এর পাঠের দ্বারা শিল্প-সংরূপ হিসাবে সাহিত্যের স্বাভাব্য এবং সেই সঙ্গে এর দ্বারা সাহিত্যের সামাজিক পর্যবেক্ষণ চিনে নিতে সমর্থ হয় সেদিকে গুরুত্ব দেওয়া হয়েছে। শিক্ষার্থীদের যাতে গবেষণা করার আগ্রহ ও দক্ষতা জন্মায়, সংস্কৃতি বিদ্যাচর্চার বিকাশ ঘটে এবং এই পাঠ্যসূচির পাঠ নেওয়ার মাধ্যমে যাতে সমসাময়িক জগতে শিক্ষার্থীর নিজের অস্তিত্ব অর্থবহ বলে প্রতিপন্ন হয় সেদিকেও বিশেষ নজর দেওয়া হয়েছে।

(This syllabus of M.A. program is designed to systematically train the students in Bengali language and literature. Along with this, the curriculum aims to equip the students to acquire skills in interdisciplinary fields. Emphasis has been placed on the curriculum courses to enable students to develop a linguistic understanding of Bengali language, to understand literature from socio-economic and political perspective through the study of history of literature, to recognize the uniqueness of literature as an art-form through the reading of various texts and also to recognize the sociological observation of literature. Special attention has been paid to develop students' interest and skills in research, cultural studies and making their own existence meaningful in the contemporary world through the study of this curriculum.)

সমগ্র পাঠ্যক্রমটি ২১টি কোর্সে বিভক্ত। এর মধ্যে ২০টি হল থিওরির কোর্স এবং ১টি (MA/BENG-400) কোর্স প্রাকটিক্যাল (Community Engagement Course), যেটির নম্বর ২৫।

২০টি থিওরি কোর্স-এর প্রতিটির নম্বর ৫০। এই ২০টি থিওরি কোর্সের মধ্যে ১৫টি হবে কোর কোর্স, ৪টি হবে বিষয়ান্তর্গত ঐচ্ছিক কোর্স (Major Elective) এবং ১টি (MA/BENG-305) হবে বিষয়-বহির্ভূত ঐচ্ছিক (Interdisciplinary Elective)। কোনো শিক্ষার্থী সিলেবাসে থাকা চারটি বিষয়ান্তর্গত ঐচ্ছিক (Major Elective)-এর মধ্যে যে-কোনো একটি গ্রহণ করে ওই ঐচ্ছিকের চারটি কোর্স সমাপ্ত করতে বাধ্য থাকবে। প্রতিটি কোর্স দুটি এককে বিভক্ত হবে। প্রতিটি একক থেকে পরীক্ষার্থীকে ১০ নম্বরের দুটি প্রশ্নের উত্তর লিখতে হবে। প্রশ্নপত্রে প্রতিটি এককে প্রশ্নের সংখ্যা থাকবে ৪টি। অর্থাৎ প্রতিটি কোর্সের জন্য একক-প্রতি ২টি করে মোট ৪টি প্রশ্নের উত্তর লেখা বাধ্যতামূলক। প্রতিটি কোর্সে অভ্যন্তরীণ মূল্যায়নের জন্য ১০ নম্বর ধার্য হবে।

MA/BENG-305 কোর্সটি হল আন্তর্বিভাগীয় ঐচ্ছিক (Interdisciplinary Elective)। কোনো শিক্ষার্থী ইচ্ছা করলে বিভাগীয় সমিতির অনুমোদন-ক্রমে SWAYAM Platform থেকে ওই ঐচ্ছিক কোর্স গ্রহণ করতে পারবে।

Course Structure

Semester	Course-Code	Course Type	Course Status	Marks Distribution (End Sem + Int.Ass 40+10=50)	Credit Value
I	MA/BENG-101	Theory	Core Course	40+10=50	5
	MA/BENG-102	Theory	Core Course	40+10=50	5
	MA/BENG-103	Theory	Core Course	40+10=50	5
	MA/BENG-104	Theory	Core Course	40+10=50	5
	MA/BENG-105	Theory	Core Course	40+10=50	5
	Sem I Total			250	25
II	MA/BENG-201	Theory	Core Course	40+10=50	5
	MA/BENG-202	Theory	Core Course	40+10=50	5
	MA/BENG-203	Theory	Core Course	40+10=50	5
	MA/BENG-204	Theory	Core Course	40+10=50	5
	MA/BENG-205	Theory	Core Course	40+10=50	5
	Sem II Total			250	25
III	MA/BENG-301	Theory	Core Course	40+10=50	5
	MA/BENG-302	Theory	Core Course	40+10=50	5
	MA/BENG-303 (A/B/C/D/E)	Theory	Major Elective	40+10=50	5
	MA/BENG-304 (A/B/C/D/E)	Theory	Major Elective	40+10=50	5
	MA/BENG-305	Theory	Interdisciplinary Elective	40+10=50	4
		However, students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer.			
	Sem III Total			250	24
IV	MA/BENG-400	Practical	Community Engagement Course	20+05=25	2
	MA/BENG-401	Theory	Core Course	40+10=50	5
	MA/BENG-402	Theory	Core Course	40+10=50	5
	MA/BENG-403 (A/B/C/D/E)	Theory	Major Elective	40+10=50	5
	MA/BENG-404 (A/B/C/D/E)	Theory	Major Elective	40+10=50	5
	MA/BENG-405	Project paper (প্রকল্প পত্র)	Core Course	40+10=50	5
	Sem IV Total			270	27
Grand Total				1025	101

বর্ধমান বিশ্ববিদ্যালয়

স্নাতকোত্তর পাঠ্যক্রম (বাংলা)

(২০১৪-২০১৬ শিক্ষাবর্ষ থেকে প্রযোজ্য হবে)

মোট নম্বর : ৮০০

মোট সেমিস্টার : ০৪

(সমগ্র পাঠ্যক্রমটি ১৬টি কোর্সে বিভক্ত। প্রতিটি কোর্সের মোট নম্বর : ৫০। প্রতিটি কোর্সের জন্য মোট ৮০টি ক্লাস নেয়া হবে। ওই ৮০টি ক্লাসের মধ্যে ৫০/৬০টি ক্লাস হবে থিয়োরিটিক্যাল এবং বাকি ৩০/২০টি ক্লাস হবে টিউটোরিয়াল। প্রতিটি কোর্স দুটি এককে বিভক্ত হবে। প্রতিটি একক থেকে পরীক্ষার্থীকে ১০ নম্বরের দুটি প্রশ্নের উত্তর লিখতে হবে। প্রশ্নপত্রে প্রতিটি এককে প্রশ্নের সংখ্যা থাকবে ৪টি। অর্থাৎ প্রতিটি কোর্সের জন্য একক-প্রতি ২টি করে মোট ৪টি প্রশ্নের উত্তর লেখা বাধ্যতামূলক। প্রতিটি কোর্সে টিউটোরিয়ালের জন্য ১০ নম্বর ধার্য হবে।

সমগ্র পাঠ্যক্রমের ১৬টি কোর্সের মধ্যে ১২টি কোর্স হবে কোর কোর্স। কোর কোর্স স্নাতকোত্তর (বাংলা) স্তরের সকল ছাত্রকে পড়তে হবে। বাকি ৪টি কোর্সের মধ্যে ৩টি হবে বিষয়ান্তর্গত ঐচ্ছিক। কোনো শিক্ষার্থী একটি বিষয়ান্তর্গত ঐচ্ছিক গ্রহণ করে ওই ঐচ্ছিকে তিনটি কোর্স সমাপ্ত করতে বাধ্য থাকবে। বাকি ১টি বিষয়ান্তর্গত বা বিষয়-বহির্ভূত ঐচ্ছিক। বিষয়-বহির্ভূত ঐচ্ছিক কোর্স গ্রহণ করা বাধ্যতামূলক নয়। বিষয়-বহির্ভূত ঐচ্ছিক কোর্স বিভাগীয় সমিতির অনুমোদন-ক্রমে কোনো শিক্ষার্থী গ্রহণ করতে পারবে। বিষয়ান্তর্গত ঐচ্ছিক কোর্স গ্রহণ করেও স্নাতকোত্তর পরীক্ষা শেষ করতে শিক্ষার্থীর কোনো বাধা থাকবে না।)

প্রথম সেমিস্টার :

কোর কোর্স : ১০১/১ (মান : ২০+৫ = ২৫)

সাহিত্যের ইতিহাস (১০-১৫ শতক)

(পঠনীয় গ্রন্থ : বাঙ্গালা সাহিত্যের ইতিহাস— সুকুমার সেন, বাংলা সাহিত্যের ইতিবৃত্ত— অসিতকুমার বন্দ্যোপাধ্যায়, বাংলা সাহিত্যের রূপরেখা— গোপাল হালদার, বাংলা সাহিত্যের ইতিকথা— ভূদেব চৌধুরী)

কোর কোর্স : ১০১/২ (মান : ২০+৫ = ২৫)

ঐতিহাসিক ও বর্ণনামূলক ভাষাবিজ্ঞান

(পঠনীয় বিষয় : ভারতীয় আর্থভাষার ইতিহাস ও তুলনামূলক আলোচনা, ধ্বনিতত্ত্ব, রূপতত্ত্ব, IPA)

(পঠনীয় গ্রন্থ : ODBL— Sunitikumar Chatterjee, ভাষার ইতিবৃত্ত— সুকুমার সেন, ভাষাতত্ত্ব— অতীন্দ্র মজুমদার, আধুনিক ভাষাবিজ্ঞান ও বাংলা ভাষা— রামেশ্বর শ', তুলনামূলক ও ঐতিহাসিক ভাষাবিজ্ঞান— ছমায়ুন আজাদ)

কোর কোর্স : ১০২/১ (মান : ২০+৫ = ২৫)

কাব্য-কবিতা

(ক) মেঘনাদবধ কাব্য— মাইকেল মধুসূদন দত্ত

(খ) জীবনানন্দ দাশের কবিতা (বাংলার মুখ আমি দেখিয়াছি, বনলতা সেন, কুড়ি বছর পরে, হাওয়ার রাত, শিকার, অন্ধকার, সুচেতনা, বোধ, আট বছর আগের একদিন, অদ্ভুত আঁধার এক)

কোর কোর্স : ১০২/২ (মান : ২০+৫ = ২৫)

রবীন্দ্রনাথের কবিতা

(ক) চিত্রা / খেয়া,

(খ) পুনশ্চ / শেষ সপ্তক

কোর কোর্স : ১০৩/১ (মান : ২০+৫ = ২৫)

নাটক

(ক) সধবার একাদশী— দীনবন্ধু মিত্র / অলীকবাবু— জ্যোতিরিন্দ্রনাথ ঠাকুর

(খ) জনা / বলিদান— গিরিশচন্দ্র ঘোষ

কোর কোর্স : ১০৩/২ (মান : ২০+৫ = ২৫)

(ক) উপন্যাস ও ছোটগল্পের গঠন-সম্পর্কিত ধারণা ও শৈলীবিজ্ঞানের প্রাথমিক ধারণা

(পঠনীয় গ্রন্থ : উপন্যাসের কথা— দেবীপদ ভট্টাচার্য, উপন্যাস নিয়ে— দেবেশ রায়, উপন্যাসের নতুন ধরণের
খোঁজে— দেবেশ রায়, উপন্যাসের সাহিত্যতত্ত্ব— অঞ্জন সেন ও উদয়নারায়ণ সিংহ, সাহিত্যে ছোটগল্প— নারায়ণ
গঙ্গোপাধ্যায়, কথাসূত্র— পবিত্র সরকার, *The Short Story*— Ian Reid, *The Structure of the Novel*—
Edwin Muir)

(খ) আদি বাংলা গদ্য-পাঠ

নববাবুবিলাস— ভবানীচরণ বন্দ্যোপাধ্যায় (বঙ্গীয় সাহিত্য পরিষদ-প্রকাশিত) /

আলালের ঘরের দুলাল— প্যারীচাঁদ মিত্র (বঙ্গীয় সাহিত্য পরিষদ-প্রকাশিত) /

হুতোম পেঁচার নকশা— কালীপ্রসন্ন সিংহ (বঙ্গীয় সাহিত্য পরিষদ-প্রকাশিত)

কোর কোর্স : ১০৪/১ (মান : ২০+৫ = ২৫)

উপন্যাস

(ক) বিষবৃক্ষ / কৃষ্ণকান্তের উইল— বঙ্কিমচন্দ্র চট্টোপাধ্যায়;

(খ) পল্লীসমাজ— শরৎচন্দ্র চট্টোপাধ্যায় / ধাত্রীদেবতা— তারাপ্রসন্ন বন্দ্যোপাধ্যায়

কোর কোর্স : ১০৪/২ (মান : ২০+৫ = ২৫)

প্রবন্ধ

(ক) বিবিধ প্রবন্ধ— বঙ্কিমচন্দ্র চট্টোপাধ্যায় (পাঠ্য প্রবন্ধ : গীতিকাব্য; বিদ্যাপতি ও জয়দেব; অনুকরণ; শকুন্তলা,
মিরন্দা ও দেসদিমোনা; বঙ্গদর্শনের পত্র-সূচনা; বঙ্গদেশের কৃষক; বাঙ্গালার ইতিহাস; বাঙ্গালার নব্য লেখকদিগের
প্রতি নিবেদন; বাঙ্গালা ভাষা)

(খ) প্রবন্ধ সংগ্রহ : প্রমথ চৌধুরী (পাঠ্য প্রবন্ধ : বইপড়া, রামমোহন রায়, ভারতচন্দ্র, সাধুভাষা বনাম চলিত ভাষা,
বঙ্গতত্ত্বতা বস্তু কি, ভারতবর্ষের ঐক্য, নূতন ও পুরাতন, পূর্ব ও পশ্চিম) /

প্রবন্ধ সংকলন— বুদ্ধদেব বসু (পাঠ্য প্রবন্ধ : রবীন্দ্রনাথ : বিশ্বকবি ও বাঙালি, রবীন্দ্রনাথের প্রবন্ধ ও গদ্যশিল্প,
কথাসাহিত্যে রবীন্দ্রনাথ, রবীন্দ্রনাথ ও উত্তরসাধক, জীবনানন্দ দাশ-এর স্মরণে, বাংলা শিশুসাহিত্য, পুরানা পন্টন,
রবীন্দ্রনাথের শেষজীবন)

দ্বিতীয় সেমিস্টার :

কোর কোর্স : ২০১/১ (মান : ২০+৫ = ২৫)

সাহিত্যের ইতিহাস (১৬-১৮ শতক)

(পঠনীয় গ্রন্থ : বাঙ্গালা সাহিত্যের ইতিহাস— সুকুমার সেন, বাংলা সাহিত্যের ইতিবৃত্ত— অসিতকুমার বন্দ্যোপাধ্যায়,
বাংলা সাহিত্যের রূপরেখা— গোপাল হালদার, বাংলা সাহিত্যের ইতিকথা— ভূদেব চৌধুরী)

কোর কোর্স : ২০১/২ (মান : ২০+৫ = ২৫)

সংবর্তনী ও সঞ্জননী ভাষাবিজ্ঞান ও বাংলা বাক্যের গঠন, সমাজ-ভাষাবিজ্ঞানের প্রাথমিক ধারণা

(পঠনীয় গ্রন্থ : আধুনিক ভাষাবিজ্ঞান ও বাংলা ভাষা— রামেশ্বর শ', আধুনিক ভাষাবিজ্ঞান— আবুল কালাম মনজুর
মোরশেদ, ভাষার কথা : ভাষাবিজ্ঞান— দানীউল হক, বাংলা পদগুচ্ছ সংগঠন : সংবর্তনী-সঞ্জননী ভাষাবিজ্ঞান—
উদয়কুমার চক্রবর্তী, বাক্যতত্ত্ব— হুমায়ুন আজাদ)

কোর কোর্স : ২০২/১ (মান : ২০+৫ = ২৫)

প্রাচীন ও মধ্যযুগের কাব্য-কবিতা

(ক) চর্যাগীতি— বঙ্গীয় সাহিত্য পরিষদ-প্রকাশিত (পাঠ্য পদ-সংখ্যা : ১, ২, ৫, ৬, ৮, ১০, ২৬, ২৮, ৩৩, ৪০)

(খ) শ্রীকৃষ্ণকীর্তন— বঙ্গীয় সাহিত্য পরিষদ-প্রকাশিত (পাঠ্য অংশ : জন্মখণ্ড, তাম্বুলখণ্ড, দানখণ্ড, বংশীখণ্ড,
রাধাবিরহ)

কোর কোর্স : ২০২/২ (মান : ২০+৫ = ২৫)

কবিতা

(ক) সঙ্গীতা— কাজী নজরুল ইসলাম (পাঠ্য কবিতা : বিদ্রোহী, আজ সৃষ্টি সুখের উল্লাসে, সর্বহারার, সব্যসাচী, হিন্দু

মুসলিম যুদ্ধ, রাখীবন্ধন, পূজারিণী, পথহারা, অবেলার ডাক, বাতায়ন পাশে গুবাক তরুর সারি)

(খ) মোহিতলাল মজুমদারের শ্রেষ্ঠ কবিতা— (পাঠ্য কবিতা : অঘোরপট্টী, পাছু, মানসলক্ষ্মী, কালাপাহাড়, স্মরণরল, নারীসত্তা, দুঃখের কবি, রবীন্দ্রজয়ন্তী)

কোর কোর্স : ২০৩/১ (মান : ২০+৫ = ২৫)

রবীন্দ্রনাথের কথাসাহিত্য

(ক) গোরা

(খ) গল্পগুচ্ছ (পাঠ্য গল্প : হালদারগোষ্ঠী, হৈমন্তী, বোষ্টমী, অপরিচিতা, তপস্বিনী, পয়লা নম্বর, পাত্র ও পাত্রী, নামঞ্জুর গল্প, সংস্কার, চোরাই ধন)

কোর কোর্স : ২০৩/২ (মান : ২০+৫ = ২৫)

উপন্যাস

(ক) পথের পাঁচালী— বিভূতিভূষণ বন্দ্যোপাধ্যায়,

(খ) পুতুল নাচের ইতিকথা— মানিক বন্দ্যোপাধ্যায়

কোর কোর্স : ২০৪/১ (মান : ২০+৫ = ২৫)

আধুনিক কবিতা

(পাঠ্য কবিতা : দুখবাদী— যতীন্দ্রনাথ সেনগুপ্ত, উটপাখি— সুধীন্দ্রনাথ দত্ত, দিনযাপন— অমিয় চক্রবর্তী, কাঠের সিঁড়ি— প্রেমেন্দ্র মিত্র, জানালা— অজিত দত্ত, কঙ্কাবতী— বুদ্ধদেব বসু, আমি বাংলার লোক— বিষ্ণু দে, মধুবংশীর গলি— জ্যোতিরিন্দ্র মিত্র, কাস্তে— দিনেশ দাশ, মেঘদূত— সমর সেন, বুড়ি ছুঁয়ে— সুভাষ মুখোপাধ্যায়, মুখোশ— বীরেন্দ্র চট্টোপাধ্যায়, কমলে কামিনী— নীরেন্দ্রনাথ চক্রবর্তী, সঙ্গিনী— শঙ্খ ঘোষ, বসুধারা কল্যাণের ব্রতে— অলোকরঞ্জন দাশগুপ্ত, হেমন্তের অরণ্যে আমি পোস্টম্যান— শক্তি চট্টোপাধ্যায়, ছায়ার জন্য— সুনীল গঙ্গোপাধ্যায়, মুকুরে প্রতিফলিত— বিনয় মজুমদার, কবিতা কীভাবে হয়— বিজয়া মুখোপাধ্যায়, কোনো এক কুপমণ্ডকের উক্তি— কবিতা সিংহ)

কোর কোর্স : ২০৪/২ (মান : ২০+৫ = ২৫)

(ক) প্রাচীন ভারতীয় সাহিত্যতত্ত্ব (অলঙ্কার, বঙ্গোক্তি, ধ্বনি, রস, উচিত্য)

(খ) আরিস্ততলের কাব্যতত্ত্ব (শিশিরকুমার দাশ-অনূদিত)

তৃতীয় সেমিস্টার :

কোর কোর্স : ৩০১/১ (মান : ২০+৫ = ২৫)

সাহিত্যের ইতিহাস (১৯ শতক)

(পঠনীয় গ্রন্থ : বাঙ্গালা সাহিত্যের ইতিহাস— সুকুমার সেন, বাংলা সাহিত্যের ইতিবৃত্ত— অসিতকুমার বন্দ্যোপাধ্যায়, বাংলা সাহিত্যের রূপরেখা— গোপাল হালদার, উনিশ শতক— অলোক রায়, বাংলা সাহিত্যের ইতিকথা— ভূদেব চৌধুরী)

কোর কোর্স : ৩০১/২ (মান : ২০+৫ = ২৫)

কথাসাহিত্য

(ক) হাজার চুরাশির মা / অরণ্যের অধিকার— মহাশ্বেতা দেবী

(খ) নির্বাচিত গল্প (পাঠ্য গল্প : শঙ্কিতা অভয়া— জগদীশ গুপ্ত, বুধনী— বনফুল, পরশুরামের কুঠার—

সুবোধ ঘোষ, সমুদ্র— জ্যোতিরিন্দ্র নন্দী, সাগিনা মাহাতো— গৌরকিশোর ঘোষ, ভারতবর্ষ— রমাপদ চৌধুরী,

হেড মাস্টার— নরেন্দ্রনাথ মিত্র, শবাগার— মতি নন্দী, গরম ভাত অথবা নিছক ভূতের গল্প— সুনীল গঙ্গোপাধ্যায়,

আত্মজা ও একটি করবী গাছ— হাসান আজিজুল হক)

কোর কোর্স : ৩০২/১ (মান : ২০+৫ = ২৫)

রবীন্দ্রনাথের নাটক

(ক) বিসর্জন / মালিনী

(খ) রক্তকরবী

কোর্স : ৩০২/২ (মান : ২০+৫ = ২৫)

রবীন্দ্র-পরবর্তী নাটক

(ক) চাঁদ বগিকের পালা— শম্ভু মিত্র

(খ) টিনের তলোয়ার— উৎপল দত্ত

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : মধ্যযুগের বাংলা সাহিত্য

কোর্স : ৩০৩/১ (মান : ২০+৫ = ২৫)

মধ্যযুগের সামাজিক-রাজনৈতিক-সাংস্কৃতিক ইতিহাস ও বাংলা পুথি সংগ্রহ-সংরক্ষণ-সম্পাদনা

কোর্স : ৩০৩/২ (মান : ২০+৫ = ২৫)

(ক) বিদ্যাপতির পদাবলী— বিমানবিহারী মজুমদার-সম্পাদিত (পাঠ্য পদ-সংখ্যা : ৩১, ৬১০, ৬১২, ৬১৪, ৬৩৬, ৬৩৮, ৭০৮, ৭২০, ৭২৬, ৭২৭, ৭৩২, ৭৩৫, ৭৬০, ৭৬২)

(খ) চণ্ডীদাসের পদাবলী— বিমানবিহারী মজুমদার-সম্পাদিত (পাঠ্য পদ-সংখ্যা : ৬, ৮, ২০, ২৯, ৪৫, ৪৯, ৫১, ৫৯, ৬৫, ৮৩, ১২৪, ১২৬, ১২৮, ১৪২, ১৭৮)

কোর্স : ৩০৪/১ (মান : ২০+৫ = ২৫)

(ক) মনসাবিজয় — সুকুমার সেন-সম্পাদিত

(খ) রামায়ণ— সুখময় মুখোপাধ্যায়-সম্পাদিত

কোর্স : ৩০৪/২ (মান : ২০+৫ = ২৫)

(ক) চণ্ডীমঙ্গল— মুকুন্দ চক্রবর্তী (সুকুমার সেন-সম্পাদিত)

(খ) ময়মনসিংহ গীতিকা (দীনেশচন্দ্র সেন-সম্পাদিত; পাঠ্য গীতিকা : মছয়া, মলুয়া, চন্দ্রাবতী, দেওয়ানা মদিনা)

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : কথাসাহিত্য

কোর্স : ৩০৩/১ (মান : ২০+৫ = ২৫)

(ক) সাহিত্যতত্ত্ব : উপন্যাস-ছোটগল্প

(পঠনীয় গ্রন্থ : উপন্যাসের কথা— দেবীপদ ভট্টাচার্য, উপন্যাস নিয়ে— দেবেশ রায়, উপন্যাসের নতুন ধরনের খোঁজে— দেবেশ রায়, উপন্যাসের সাহিত্যতত্ত্ব— অঞ্জন সেন ও উদয়নারায়ণ সিংহ, সাহিত্যে ছোটগল্প— নারায়ণ গঙ্গোপাধ্যায়, কথাসূত্র— পবিত্র সরকার, *The Short Story*— Ian Reid, *The Structure of the Novel*— Edwin Muir)

(খ) উপন্যাস

কাহাকে— স্বর্ণকুমারী দেবী / কল্লাবতী— ত্রৈলোক্যনাথ মুখোপাধ্যায়

কোর্স : ৩০৩/২ (মান : ২০+৫ = ২৫)

(ক) পরশুরামের শ্রেষ্ঠগল্প : (পাঠ্য গল্প : শ্রীশ্রীসিন্ধুধরী লিমিটেড, চিকিৎসা সংকট, ভূশুণ্ডীর মাঠ, পরশপাথর, বিরিঞ্চিবাবা, দক্ষিণরায়, উলটপুরাণ) /

প্রেমেন্দ্র মিত্রের শ্রেষ্ঠগল্প : (পাঠ্য গল্প : হয়তো, তেলেনাপোতা আবিষ্কার, স্টোভ, সংসার সীমান্তে, কুয়াশায়, পুন্ডাম, শুধু কেরানী)

(খ) নির্বাচিত গল্প :

সুধাময়— বিমল কর, দুপুর— দেবেশ রায়, সাক্ষী ডুমুর গাছ— শ্যামল গঙ্গোপাধ্যায়, নরকের প্রহরী— দীপেন্দ্রনাথ বন্দ্যোপাধ্যায়, বিজনের রক্তমাংস— সন্দীপন চট্টোপাধ্যায়, আইন শৃঙ্খলা— অভিজিৎ সেন, রাবণ— ভগীরথ মিশ্র, মেহগনি— সাধন চট্টোপাধ্যায়, সর্বোচ্চ ছোলা ময়দা আটা— স্বপ্নময় চক্রবর্তী, সেমিনারজীবী— বিষ্ণুর রায়

কোর্স : ৩০৪/১ (মান : ২০+৫ = ২৫)

(ক) প্রথম প্রতিশ্রুতি / সুবর্ণলতা— আশাপূর্ণা দেবী

(খ) কিনু গোয়ালার গলি / শেষ নমস্কার, শ্রীচরণেশ্বর মাকে— সন্তোষকুমার ঘোষ

- কোর্স : ৩০৪/২ (মান : ২০+৫ = ২৫)
 (ক) বি. টি. রোডের ধারে / টানাপোড়েন— সমরেশ বসু
 (খ) কেরীসাহেবের মুসী— প্রমথনাথ বিশী / তুঙ্গভদ্রার তীরে— শরদিন্দু বন্দ্যোপাধ্যায়

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : রবীন্দ্রসাহিত্য

- কোর্স : ৩০৩/১ (মান : ২০+৫ = ২৫)
 (ক) বলাকা / নবজাতক
 (খ) প্রান্তিক / জন্মদিনে
 কোর্স : ৩০৩/২ (মান : ২০+৫ = ২৫)
 (ক) রাজা / ডাকঘর
 (খ) তাসের দেশ / চঙালিকা
 কোর্স : ৩০৪/১ (মান : ২০+৫ = ২৫)
 (ক) লিপিকা / তিনসঙ্গী
 (খ) ঘরে-বাইরে / যোগাযোগ
 কোর্স : ৩০৪/২ (মান : ২০+৫ = ২৫)
 (ক) প্রাচীন সাহিত্য / আধুনিক সাহিত্য
 (খ) ছিন্নপত্র / পশ্চিমবাত্রীর ডায়ারি

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : নাটক

- কোর্স : ৩০৩/১ (মান : ২০+৫ = ২৫)
 নাট্যতত্ত্ব ও থিয়েটার (প্রসেনিয়াম থিয়েটার, থার্ড থিয়েটার, ফোর্থ থিয়েটার, স্ট্রিট থিয়েটার)
 কোর্স : ৩০৩/২ (মান : ২০+৫ = ২৫)
 বাংলা নাট্যমঞ্চের ইতিহাস
 কোর্স : ৩০৪/১ (মান : ২০+৫ = ২৫)
 (ক) চন্দ্রগুপ্ত— দ্বিজেন্দ্রলাল রায়
 (খ) নরনারায়ণ— ক্ষীরোদপ্রসাদ বিদ্যাবিনোদ
 কোর্স : ৩০৪/২ (মান : ২০+৫ = ২৫)
 (ক) নবান্ন— বিজন ভট্টাচার্য
 (খ) নটী বিনোদিনী— চিত্তরঞ্জন ঘোষ / একাঙ্ক সঞ্চয়ন (সাধনকুমার ভট্টাচার্য ও অজিতকুমার ঘোষ-সম্পাদিত)

চতুর্থ সেমিস্টার :

- কোর কোর্স : ৪০১/১ (মান : ২০+৫ = ২৫)
 বাংলা সাহিত্যের ইতিহাস (২০ শতক)
 (পঠনীয় গ্রন্থ : বাঙ্গালা সাহিত্যের ইতিহাস— সুকুমার সেন, বাংলা সাহিত্যের ইতিবৃত্ত— অসিতকুমার বন্দ্যোপাধ্যায়, বাংলা সাহিত্যের রূপরেখা— গোপাল হালদার, বাংলা সাহিত্যের ইতিকথা— ভূদেব চৌধুরী)
 কোর্স : ৪০১/২ (মান : ২০+৫ = ২৫)
 মধ্যযুগের বাংলা সাহিত্য
 (ক) চৈতন্যভাগবত— বৃন্দাবন দাস (সুকুমার সেন-সম্পাদিত)
 (খ) পদ্মাবতী— সৈয়দ আলাওল
 কোর্স : ৪০২/১ (মান : ২০+৫ = ২৫)
 রবীন্দ্রনাথের প্রবন্ধ
 (ক) সাহিত্য (পাঠ্য প্রবন্ধ : সাহিত্যের তাৎপর্য, সাহিত্যের সামগ্রী, সাহিত্যের বিচারক, সৌন্দর্যবোধ, বিশ্বসাহিত্য, সাহিত্যসৃষ্টি, ঐতিহাসিক উপন্যাস, কাব্য : স্পষ্ট এবং অস্পষ্ট) /

সাহিত্যের পথে (পাঠ্য প্রবন্ধ : ভূমিকা, বাস্তব, তথ্য ও সত্য, সাহিত্যধর্ম, সাহিত্যে নবত্ব, সাহিত্যবিচার, আধুনিক কাব্য, সাহিত্যতত্ত্ব)

(খ) কালান্তর (পাঠ্য প্রবন্ধ : কালান্তর, লোকহিত, ছোটো ও বড়ো, সত্যের আহ্বান, হিন্দু মুসলমান, নারী, রবীন্দ্রনাথের রাষ্ট্রনৈতিক মত, সভ্যতার সংকট)

কোর্স : ৪০২/২ (মান : ২০+৫ = ২৫)

প্রতিবেশী সাহিত্য

(ক) উপন্যাস : গোদান— মুঙ্গী প্রেমচন্দ / ময়লা আঁচল— ফণীশ্বরনাথ রেণু

(খ) গল্প : (অসমীয়া) সৃষ্টি— বীরেন্দ্রকুমার ভট্টাচার্য / জলকুঁয়ারী— লক্ষ্মীনাথ বেজবরুয়া

(হিন্দি) সদগতি— মুঙ্গী প্রেমচন্দ / পঞ্চলাইট— ফণীশ্বরনাথ রেণু

(ওড়িয়া) পুনশ্চ— কালিন্দীচরণ পানিগ্রাহী / বিহঙ্গ— মনোজ দাস

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : মধ্যযুগের বাংলা সাহিত্য

কোর্স : ৪০৩/১ (মান : ২০+৫ = ২৫)

(ক) জ্ঞানদাসের পদাবলী— হরেকৃষ্ণ মুখোপাধ্যায়-সম্পাদিত (পাঠ্য পদ-সমূহ : কাঞ্চন বরণ গৌর তনু মোহন; শ্রীদাম বলে ওগো রাণি; মনের মরম কথা; সজনি কি পেখলু নীপমূলে ধন্দ; আলো মুঞি কেন গেলু কালিন্দীর জলে; দুই দোহাঁ দরশনে উলসিত ভেল; শ্যাম-অভিসারে চলু বিনোদিনী রাধা; নিতি নিতি যাও রাই মথুরা নগরে; যব কানু আওল মন্দির-মাঝে; শিশুকাল হৈতে বন্ধুর সহিতে; রূপ লাগি আঁখি বুঝে গুণে মন ভোর; আজু পরভাতে দেখিলুঁ কার মুখ)

(খ) লোর-চন্দ্রাণী— দৌলত কাজী (দেবনাথ বন্দ্যোপাধ্যায়-সম্পাদিত)

কোর্স : ৪০৩/২ (মান : ২০+৫ = ২৫)

(ক) ধর্মমঙ্গল— মানিকরাম (বিজিতকুমার দত্ত ও সুনন্দা দত্ত-সম্পাদিত)

(খ) মধ্যযুগের বাংলা সাহিত্যচর্চার ধারা (উনিশ শতক)

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : কথাসাহিত্য

কোর্স : ৪০৩/১ (মান : ২০+৫ = ২৫)

(ক) একদা— গোপাল হালদার / অন্তঃশীলা— ধূজটিপ্রসাদ মুখোপাধ্যায়

(খ) জাগরী / টোড়াইচরিত মানস— সতীনাথ ভাদুড়ী

কোর্স : ৪০৩/২ (মান : ২০+৫ = ২৫)

(ক) গড় শ্রীখণ্ড / রাজনগর— অমিয়াভূষণ মজুমদার

(খ) অসময় / পূর্ণ-অপূর্ণ— বিমল কর

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : রবীন্দ্রসাহিত্য

কোর্স : ৪০৩/১ (মান : ২০+৫ = ২৫)

রবীন্দ্র-রচনার অনুবাদ:

(ক) Song Offerings

(খ) The Post Office

কোর্স : ৪০৩/২ (মান : ২০+৫ = ২৫)

(ক) রবীন্দ্রসাহিত্য সমালোচনার ইতিহাস (১৯৪১-পূর্ববর্তী)

(খ) রবীন্দ্রসাহিত্য সমালোচনার ইতিহাস (১৯৪১-পরবর্তী)

বিষয়ান্তর্গত ঐচ্ছিক কোর্স : নাটক

কোর্স : ৪০৩/১ (মান : ২০+৫ = ২৫)

(ক) এবং ইন্দ্রজিৎ— বাদল সরকার

- (খ) সোক্রাটেস— মোহিত চট্টোপাধ্যায়
কোর্স : ৪০৩/২ (মান : ২০+৫ = ২৫)
(ক) সাজানো বাগান / কিনু কাহারের থেটার— মনোজ মিত্র ;
(খ) তিন পরসার পালা— অজিতেশ বন্দ্যোপাধ্যায় / ফুটবল— রুদ্র প্রসাদ সেনগুপ্ত

বিষয়ানুগত / বিষয়-বহির্ভূত ঐচ্ছিক কোর্স

কোর্স : ৪০৪

- মধ্যযুগের বাংলাসাহিত্য-ভিত্তিক প্রকল্প-পত্র রচনা (মান : ৫০ / লিখিত : ৪০, মৌখিক : ১০)
বাংলা কথাসাহিত্য-ভিত্তিক প্রকল্প-পত্র রচনা (মান : ৫০ / লিখিত : ৪০, মৌখিক : ১০)
রবীন্দ্রসাহিত্য-ভিত্তিক প্রকল্প-পত্র রচনা (মান : ৫০ / লিখিত : ৪০, মৌখিক : ১০)
বাংলা নাটক ও নাট্যমঞ্চ-ভিত্তিক প্রকল্প-পত্র রচনা (মান : ৫০ / লিখিত : ৪০, মৌখিক : ১০)
হিন্দি-সাহিত্য-ভিত্তিক প্রকল্প-পত্র রচনা (মান : ৫০ / লিখিত : ৪০, মৌখিক : ১০)
ইংরেজি-সাহিত্য-ভিত্তিক প্রকল্প-পত্র রচনা (মান : ৫০ / লিখিত : ৪০, মৌখিক : ১০)

**Common broad structure of syllabus under Choice Based
Credit System (CBCS) for all Post Graduate Department of
Studies under Faculty of Science, BU.**

Revised Framing of M.Sc. Biotechnology CBCS Syllabus, 2020

Semester I

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSBT101 Unit I Unit II	Core	T	Biochemistry & Cell Biology	2T 2T	2H	10	20 20	50	4
MSBT102 Unit I Unit II	Core	T	Developmental Biology & Molecular Biology	4T 2T	3H	15	40 20	75	6
MSBT103 Unit I Unit II	Core	T	Analytical Techniques & Biostatistics and Computer Application	2T 2T	2H	10	20 20	50	4
MSBT104 Unit I Unit II	Core	P	Biochemistry & Cell Biology	4P 4P	4H	10	20 20	50	4
MSBT105	Core	P	Molecular biology	4P	2H	5	20	25	2
MSBT106 Unit I Unit II	Core	P	Analytical Techniques & Biostatistics and Computer Application	4P 4P	4H	10	20 20	50	4
					Total credit				24

T/P: Theory/Practical

Semester II

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSBT201 Unit I Unit II	Core	T	Immunology & Genetics	2T 2T	2H	10	20 20	50	4
MSBT202 Unit I Unit II	Core	T	Microbiology & Industrial Applications & Genetic Engineering	2T 2T	2H	10	20 20	50	4
MSBT203	Core	T	Bioinformatics	2T	1H	5	20	25	2
MSBT204 Unit I Unit II	Core	T	IPR & Biosafety Bioentrepreneurship	2T 2T	2H	10	20 20	50	4
MSBT205 Unit I Unit II	Core	P	Immunology & Genetics	4P 4P	1H 1H		20 20	50	4
MSBT206 Unit I Unit II Unit III	Core	P	Microbiology & Industrial Applications & Genetic Engineering & Bioinformatics	4P 4P 4P	1H 1H 1H	15	20 20 20	75	6
					Total credit				24

Semester III

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSBT301 Unit I	Core	T	Bioprocess Engineering & Technology & Immunotec hnology	2T	2H	10	20	50	4
Unit II				2T			20		
MSBT302	Core	T	Molecular Virology	4T	2H	10	40	50	4
MSBT303 Unit I	Core	P	Bioprocess Engineerin g & Technology	4P	2H	10	20	50	4
Unit II			Immunotec hnology	4P			20		
MSBT304	GE	T	A general idea on Basic & Applied Biotechnol ogy	2T	1H	5	20	25	2
OR									
MSWM304	GE	T	One GE course may be opted from SWAYAM	2T	1H	5	20	25	2
MSBT305	DE	T	305-1/305- 2/305- 3/305-4	4T	2H	10	40	50	4
MSBT306	DE	P	306-1/306- 2/306- 3/306-4	8P	2H	10	40	50	4
MSBT307	CE	P.	N.A.	N.A.	N.A.	5	20	25	2
					Total credit				24

CE: Community Engagement Activities; DE: Discipline-centric Elective; GE: Generic elective

MSBT 305&306-1: Plant Biotechnology; 305&306 -2 : Animal Biotechnology

MSBT 305&306 -3: Microbial Biotechnology; 305&306 -4: Computer Skills for Biological Research

***MSWM304- One GE course may be opted from SWAYAM**

Semester IV

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSBT401	Core	T	Proteomics	4T	2H	10	40	50	4
MSBT402	Core	T	Genomics	4T	2H	10	40	50	4
MSBT403	Review of Literature on Project topic and Seminar presentation	P	N.A.	4	---	10	40	50	4
MSBT404	DE	T	404-1/404-2/404-3/404-4	4T	2H	10	40	50	4
MSBT405	DE	P	405-1/405-2/405-3/405-4	8P	2H	10	40	50	4
MSBT406	Project/ Term paper	P	N.A.	4	---	10	40	50	4
					Total credit				24

MSBT404&405 -1 : Advanced Plant Biotechnology : 404&405-2: Advanced Animal Biotechnology
 MSBT404&405-3: Advanced Microbial Biotechnology: 404&405-4: Advanced Bioinformatics

Semester – I (THEORY)		
MBT 101	CHEMISTRY OF BIOMOLECULES	MARKS: 50 (45 + 5)
1. Thermodynamics:		
a) Principles: First and Second laws of thermodynamics, Details of thermodynamic variables and functions. Application of there laws in Life Science with examples.		
b) Bioenergetics: Energy rich bonds; Coupled reactions; Group transfer; Autotrophic and Heterotrophic Principle of Energy Transductions. Gibbs Free-Energy Calculation for Bio-redox Reactions. Thermodynamics of ligand bindings; Association and Dissociation Constant.		12 L
2. Bondings: Weak and co-valent interactions [Van der Waals, Electrostatic, Hydrogen Bonding, Hydrophobic, Disulfide] in aqueous and extreme solution conditions.		6 L
3. Structure and Stability:		
a) Proteins: Peptide bond; Ramachandran Plot; Calculation of conformation of different states of proteins; Properties of α -helix and β -sheets; Secondary structure prediction and determination; connectivities. Tertiary structure: Determination of state of tertiary structure; characteristic balance in rigidity and flexibility; Domain concept (α -, β -, α/β - and $\alpha+\beta$ -domains) and interacting motifs. Quaternary structure: Geometry, Symmetry and intermolecular interfaces.		
b) Carbohydrates: configuration and Conformation; Step Up and Step down reactions; Conversion of Aldos to Ketos and vice versa. Conformational stability ratings, Anomeric effect, Reverse anomeric effect; Structure and stability of polysaccharides, glycoproteins, glycolipids and proteoglycans.		
c) Nucleic acids: Structure and stability of Nucleic acids (DNA and RNA), topological structure, fine structure of DNA and its organization in genome.		20 L
4. Stereochemistry: Configuration and conformation and stability; Elements of symmetry, Chirality; RS-, EZ-, DL- and dl- system of nomenclature; Stereo-specific and stereo-selective reactions; Determination of relative configuration by asymmetric synthesis.		7 L

(THEORY)		
MBT 102	MOLECULAR BIOLOGY	MARKS: 50 (45 + 5)
1. DNA: Replication, DNA topology, DNA damage and repair in relation to aging and diseases.		6 L
2. RNA: transcription, processing, regulation, post-transcriptional control and degeneration, gene silencing.		7 L
3. Translation: protein synthesis and regulation in prokaryotes and eukaryotes, protein targeting, signal peptides.		7 L
4. Gene expression: genetic code, principles of gene regulation; regulation of gene expression in prokaryotes and eukaryotes.		7 L
5. Biosignaling: signal perception, molecular mechanisms of signal transduction and gated ion channels, regulation of signal transduction pathways.		6 L
6. Transposons and retrotransposons: prokaryotic and eukaryotic transposable elements and their role in evolution.		6 L
7. Regulation of Gene Expression: RNAi, Si RNA, Anti-sense RNA technology, Alternate pathways (Lytic vs. Lysogenic)		6 L

(THEORY)		
MBT 103	CELL AND DEVELOPMENTAL BIOLOGY	MARKS: 50 (45 + 5)
1. Structure and function of a cell and its organelles.		6 L
2. Membrane system: Biological membranes - architecture & kinetics (transport, ion channels, diffusion, Na-K pump, proton pump).		6 L
3. Protein localisazation: Synthesis of secretory & membrane protein, import into nucleus, mitochondria, chloroplast & peroxisome; Receptor-mediated endocytosis.		6 L
4. Cell cycle: phages, duration of different phages and the methods for their determination, Cell cycle synchronization, arrest and delay in case of diseases.		6 L
5. Cancer: An elementary genomic insight, Apoptosis.		6 L
6. Genetic control of development:		
a) Nuclear transplantation; organizer action; teratogenecity; mitochondrial gene-maternal inheritance; floral genes; phy-genes.		6 L
b) Zygotic genes (e.g. gap genes, segmental polarity and homeotic genes) in pattern formation, antero-posterior embryogenesis.		4 L
c) Homoetic gene expression in animals (<i>Drosophila</i>) and plants (<i>Arabidopsis</i>).		2 L
d) Hox-group of genes; organ regeneration.		3 L

(THEORY)		
MBT-104	BIOSTATISTICS AND COMPUTER APPLICATION	MARKS-50
1. Brief description and tabulation of data and its graphical representation.	6 L	
2. Measurement of central tendency: Mean Median, Mode, Range, Standard Deviation, and Variance, Idea of two types of error and its level of significance, Chi-Square Test, Simple linear regression and correlation, Probability Distribution (Binomial, Poisson, Gaussian).	15 L	
3. Introduction of digital computer: Low level and high-level language, the binary system.	2 L	
4. Programming in C: Data Types, Condition checking and looping, Function, Array, Pointer, String Handling.	14 L	
5. Introduction of R language and Bioconductor and their application in Bioinformatics.	4 L	
6. Computer oriented statistical techniques employing C language: Bubble Sorting, Computation of Median, Variance, Standard Deviation, and Correlation Coefficient.	4 L	

(PRACTICAL)		
MBT 105	(CELL AND MOLECULAR BIOLOGY PRACTICAL)	MARKS: 50
CELL BIOLOGY:		

1. Study of different stages of mitosis; mitotic index & chromosome complement in *Allium cepa*
2. Study of different stages of meiosis in *Allium cepa* & grasshopper.
3. Preparation and analysis of giant chromosome.
4. Experiments for demonstration of Barr body & drumstick.

MOLECULAR BIOLOGY:

1. Isolation of genomic DNA from bacteria & plants.
2. Agarose gel electrophoresis.
3. Phage titration by plaque assay
4. SDS-PAGE of proteins

(PRACTICAL)		
MBT 106	(BIOSTATISTICS AND COMPUTER APPLICATION)	MARKS: 50

1. Computer Application: Programming for Solving a) Statistical problems (eg. Median, Std. Deviation, Correlation Coefficient) through C programming.
b) Sequence analysis.
2. Solving the problems of Biostatistics (Average, Median, Mode, Chi square, correlation coefficient, Normal/Poisson Distribution) through SPSS/MS- Excel.

Semester – II (THEORY)		
MBT 201	BIOCHEMISTRY	MARKS: 50 (45 + 5)
1. General Metabolism: Glycolysis, TCA, Gluconeogenesis, Pentose phosphate pathway: Mechanism of selective reactions, Radioisotope distribution study and regulation. Glycogen metabolism: Break down, synthesis, hormone control and regulation.	7 L	
2. Amino acids: Catabolism of proteins and amino acids, Urea cycle, Fate of carbon skeleton of amino acids, Mechanism of selective reactions. Biosynthesis of amino acids: Nitrogen fixation, Biosynthesis of essential amino acids, and Mechanism of selective reactions, Regulation. Biomolecules obtained from amino acids.	9 L	
3. Fatty acid: oxidation (Even, odd, saturated and unsaturated) and Biosynthesis of fatty acids, tri-glycerides, phospholipids and sterols. Regulation of fatty acid metabolism.	6 L	
4. Nucleic Acids: Biosynthesis and degradation of purine and pyrimidine, nucleotides, Mechanism of selective reactions and regulation.	6 L	
5. Enzymes: Mechanism of actions, binding site and active site, Factors affecting the rate of enzymatic reaction, Enzyme kinetics for mono- and bi-substrate reactions, Inhibitions –competitive, uncompetitive mixed and non-competitive type, Allosteric regulation, covalent modifications, Isozymes, ribozymes, abzymes.	12 L	
6. Protein: Denaturation, Folding, outline of protein synthesis, Protein-ligand interactions.	5 L	

(THEORY)		
MBT 202	IMMUNOLOGY	MARKS: 50 (45 + 5)

1. **Introduction to immunology:** innate and acquired immunity, humoral and cell mediated immune response, organization and structure of lymphoid organs. 5 L
2. **Antigens and immunogenicity.** 3 L

3. **Immunoglobulins:** structure and function and application; the molecular genetics of antibody diversity monoclonal and polyclonal antibodies. **14 L**
4. **The major histocompatibility complex (MHC),** its associated predisposition to the diseases; transplantation immunology **6 L**
5. **Immune response mechanisms:** B-lymphocytes and the clonal selection theory; T-lymphocyte activation. **5 L**
6. **Interleukins and interferons** **3 L**
7. **Hypersensitivity:** immune tolerance and autoimmunity. **3 L**
8. **Tumor immunology.** **3 L**
9. **Immunity against infectious diseases:** immunization, epitope mapping, vaccine development. **3 L**

MBT 203

MICROBIOLOGY

MARKS: 50 (45 + 5)

1. **Bacterial structure:** ultrastructure and chemistry of capsule, pili, flagella, flagellar movement, tactic movement, endospore. Cell wall of Archaeobacteria, Gram positive and Gram negative bacteria; Outer membrane; different types of staining. Reserve materials and other cytoplasmic inclusions of bacteria. **10 L**
2. **Classification of prokaryotes and bacterial taxonomy:** short description of different groups under Archaeobacteria (Thermophiles, Halophiles and Acidophiles), under Eubacteria (Myxobacteria, Mycoplasma, Actinomycetes, Rickettsias and Chlamydiae) and auxotrophs including Cyanobacteria. **5 L**
3. **Bacterial growth:** in liquid media, growth requirements, growth factors, kinetics of growth, continuous culture, synchronous culture, enrichment culture. **4 L**
4. **Bacterial mutation:** nature and basis of mutation, mode of action of mutagens, types of mutants and their selection; mutation rate. **4 L**
5. **Genetic recombinations:** in bacteria; operon concept, lac, ara and trp operons, attenuation; allosteric control and feedback inhibition; isozymes, catabolite repression and diauxic growth. **4 L**
6. **Nitrogen cycle:** nitrification, denitrification, biological nitrogen fixation. **4 L**
7. **Fermentation** of useful microbial products, alcohol and antibiotics **7 L**
8. **Classification and structural organization:** DNA and RNA viruses. Replication strategies of different viruses, viroids and virusoids, Prions. **5 L**
9. **Application of microbes** for probiotics, SCP and other beneficial purposes. **3 L**

(THEORY)

MBT 204

MOLECULAR BIOPHYSICS

MARKS: 50 (45 + 5)

1. **Applications in biology.** Energy equations, free energy, chemical potential, Gibbs free energy, elementary idea of chemical thermodynamics and chemical kinetics, Arrhenius equation. **10 L**
2. **Basic atomic and radiation physics,** basic molecular physics. Interaction of UV, VIS and IR radiation and LASER with bio-molecules and living system, Bio- and chemi-luminescence, photochemical reaction. Thermal changes in cells and tissues, thermal modeling in biological tissues, Biological transport processes, Nernst potential and Donnan potential – surface potential and potential across bio-membranes, experimental determination, biological energy conversion. **14 L**
3. **Electromagnetic energy spectrum – their effects on the molecules and method of studying them,** Raman, NMR, NOESY and TOCSY, ESR spectroscopy and Mass spectrometry, and their biological applications, optical rotatory dispersion, fluorescence, phosphorescence spectroscopy, X-ray diffraction (structure of DNA, RNA and Proteins), ultrastructure determination, electron microscopy – transmission and scanning. **14 L**
4. **Radioactivity:** Radioactive transformation, detection and measurement of dose, autoradiography, G.M. counter, scintillation counter, radiation safety. **7 L**

(THEORY)

MBT 205

MICROBIOLOGY AND IMMUNOLOGY
(PRACTICAL)

MARKS: 50 (30 + 20)

(a) Microbiology

(Marks: 30)

1. Aseptic methods:
 - (a) Use of autoclave, hot air oven and bacterial filter.
 - (b) Preparation and sterilization of culture media.
 - (c) Preparation of agar slants, pouring of plates, subculturing.
2. Pure culture methods: methods of isolation of microorganisms from air and soil.
3. Staining methods: simple staining by carbol fuchsin stain; differential staining – Gram staining.
4. Preparation of bacterial growth curve.
5. Assay of antibiotics by agar cup method and tube dilution method.
6. Determination of minimum inhibitory concentration (MIC) of antibiotic.
7. Enrichment culture for:

Aerobic nitrogen fixing bacteria. Endospore forming bacteria, Sulphate reducing bacteria, Cellulose degrading microorganisms, Phosphate and potash solubilisers.
8. Physiological and biochemical tests for identification of bacteria. Tests for catalase, protease, amylase and oxidase. Indole production, Voges Proskauer test, acid and gas production after fermentation of glucose and lactose.

(b) Immunology

(Marks: 20)

1. Lymphoid organs and their microscopic organization.
2. Immunization, collection of serum. ELISA, Dot-blot, Western blot.

(THEORY)

MBT 206

(BIOCHEMISTRY)
(PRACTICAL)

MARKS: 50

1. Titration of amino acids.
2. Colorimetric determination of pK.
3. Tests for amino acids, sugars and lipids.
4. Quantification of DNA and RNA.
5. Quantification of proteins and sugars.
6. UV- Visible Absorption spectra.

Semester – III
(THEORY)

MBT 301

(PLANT & AGRICULTURAL BIOTECHNOLOGY)

MARKS: 50 (45+ 5)

1. **Plant cell, tissue and organ culture:** A brief idea about totipotency, somatic embryogenesis, organogenesis & somaclonal variation. **4 L**
2. Protoplast isolation, culture & fusion; selection of hybrid cells & regeneration of hybrid plants; symmetric & asymmetric hybrids **5 L**
3. **Pollen biotechnology:** Anther and pollen culture – role in crop improvement. An outline of pollen based gene transfer technology, self-incompatibility and pollen pistil interactions. **4 L**
4. **Micropropagation:** Technology and applications; *in vitro* propagation of horticultural and agricultural crops; *in vitro* propagation of tree. **5 L**
5. **Natural product synthesis by cell and tissue culture:** Secondary product accumulation by plant cell and suspension culture; role of differentiated cultures in product synthesis – shoot culture, hairy root culture, shooty teratomas, co-culture techniques. **4 L**
6. **Plant transformation:** The basis of tumor formation, hairy root, features of Ti & Ri plasmids, mechanisms of DNA transfer, role of virulence gene, use of Ti & Ri plasmid as vectors, binary vectors, use of 35s & other promoters, genetic markers use of reporter gene, molecular farming, benefits & risks, long shelf life of fruits & flowers, use of ACC synthase, polygalacturonase, ACC oxidase; male sterile lines, bar & barnase system. **10 L**
7. **Chloroplast transformation:** Advantages, vectors, success with tobacco & potato. **2 L**
8. **Cryobiology of plant cell cultures and establishment of gene banks:** Introduction, technology of freeze preservation, factors influencing revival of frozen cells, prospects. **3 L**
9. **Biofertiliser and plant productivity:** Bacterial – Nitrogen fixers- symbiotic (*Rhizobium*), non-symbiotic (*Azotobacter*); Algal - symbiotic (*Azolla*); non-symbiotic (BGA), Fungal – phosphate solubiliser (*Trichoderma*) and phosphate mobiliser (VAM). **6 L**
7. **Technology for rapid enriched compost:** Microbial and vermi composting. **2 L**

(THEORY)		
MBT 302	(ANIMAL BIOTECHNOLOGY)	MARKS: 50 (45+ 5)
1.	In vitro fertilization: superovulation, embryo culture and embryo transfer protocols (specially in farm animals), Assisted Reproductive Technology (ART).	10 L
2.	Transfixion and transgenesis: targeted gene replacement <i>in vitro</i> and <i>in vivo</i> . Stem cells (both embryo derived and adult) – application, tissue healing, therapy knock-out animal models of human diseases, pharmaceutical use of animal models.	10 L
3.	Transgenic animals: methods of transgenesis, transgenic animal models in drug discovery, bioreactors (production of foreign proteins in blood, milk and egg white).	6 L
4.	Animal cloning, Embryo splitting,	4 L
5.	Vaccine preparation: Hepatitis B virus, foot and mouth disease (cattle), bird flue, Chikangunya	8 L
6.	Basic principles of animal: cell and tissue culture (with special reference to mammals). Three-dimensional culture and tissue engineering.	7 L

(THEORY)		
MBT 303	(TECHNIQUES IN BIOTECHNOLOGY)	MARKS: 50 (45+ 5)
1.	Microscopy: light, fluorescence microscopy; electron microscopy, photomicrography, Confocal microscopy.	5 L
2.	Chromatography (gel filtration, ion-exchange, affinity, TLC, HPLC); electrophoresis, electrofocussing, centrifugation.	8 L
3.	Sequencing procedures (for nucleotides and amino acids).	6 L
4.	Hybridization and blotting techniques: PCR, ELISA, DNA finger printing and foot printing, chromosome walking, chromosome jumping, DNA micro arrays, DNA chips, radioimmunoassay.	8 L
5.	Serological and nucleic acid based diagnostic (authenticated) methods for detection of diseases.	18L

(THEORY)		
MBT 304	(MEDICAL BIOTECHNOLOGY)	MARKS: 50 (45+ 5)
Part-I		
1.	Diagnostic virology: detection of HIV, HPV and HBV, herpes virus, polio virus.	5 L
2.	Development of drugs: mechanism of drug action of a few selective drugs, biotechnological approach of drug designing and drug resistance.	5 L
3.	Biotechnological approach of drug designing	4 L
4.	(a) Mechanism of oncogenesis. (b) Oncogene detection by DNA transfection assay. (c) Carcinogen/mutagen detection by Ames' <i>Salmonella</i> assay.	8 L

Part-II		
5.	Molecular diseases and diagnostic tools: Detection of genomic changes by: (i) RFLP, (ii) VNTR, (iii) Haplotype, (iv) Probe, (v) Ligase mediated (single nucleotide polymorphism detection).	5 L
6.	Somatic Cell Genetics	2 L
7.	Detection of sickle cell anemia, thalasemia, cystic fibrosis, haemophilia, Duchenne muscular dystrophy, Parkinsons, Alzheimers, Huntington's Disease.	6 L
8.	Gene therapy: (a) Different strategies for gene therapy: targeted approach – killing of cells, mutation correction, inhibition of gene expression. (b) Approaches of gene delivery (i) <i>in vitro</i> , (ii) <i>in vivo</i> , and (iii) <i>ex vivo</i> . (c) Delivery systems: viral vectors, bacterial vectors, mechanical vectors, liposomes. (d) Human gene therapy: (i) ADA – SCID, (ii) TIL, (iii) Neoplastic disorder, (iv) Infectious diseases, (v) Brain tumor.	10 L

(PRACTICAL)

MBT 305	(PLANT TISSUE CULTURE)	MARKS: 50

1. General process of sterilization: Autoclaving,
2. Preparation of different culture media.
3. Initiation and maintenance of callus.
4. Suspension culture.
5. Study of organogenesis.
6. Shoot tip and node cultures.
7. Strategies of micropropagation.
8. Protoplast culture.

(PRACTICAL)

MBT 306	(TECHNIQUES FOR MACROMOLECULAR STUDY)	MARKS: 50

1. Separation techniques – Centrifugation, Chromatography (Gel permeation, Ion exchange, TLC etc.) and Electrophoresis
2. Total Nitrogen estimation in different tissues of plants
3. Enzyme isolation from animal tissues, precipitation methods for purification of enzyme proteins.

**Semester – IV
(THEORY)**

MBT-401	(BIOINFORMATICS AND BIOETHICS)	MARKS-50 (45+5)

1. Concept of Object Oriented Programming (C++) and PERL and their application in Bioinformatics. **5 L**
2. Some basic commands of UNIX, Concept of DBMS and SQL. Commands of SQL for database management using Oracle. **5 L**
3. Scoring matrices: PAM and BLOSUM series, Definition and significance of Pairwise and Multiple Sequence Alignment, Methods and algorithms used in Pairwise alignment: Dot Matrix, Dynamic Programming Algorithm and k-tuple. Methods for doing MSA: CLUSTALW and PILEUP, Scoring MSA. **10 L**
4. Algorithms used in Database similarity searching: BLAST and FASTA. Definition of Profile and Pattern. PSI-BLAST and PHI-BLAST. **8 L**
5. Phylogenetic analysis: Concept and method: Distance based (Fitch and Margoliash & UPGMA) and character based methods (Parsimony). **8 L**

6. Introduction of protein structure prediction and gene prediction.	4 L
7. Ethical, legal and social implications of Biotechnological products.	2 L
8. IPR and Patents.	2 L
9. Genetically modified organisms and their acceptability.	1 L

(THEORY)

MBT 402	(RECOMBINANT DNA TECHNOLOGY)	MARKS: 50 (45+ 5)

1. **Gene Manipulation:** general concept of various tools and methods **5 L**
2. **Cloning in E-coli:** plasmids, bacteriophage, cosmid, phagemid vectors, cloning strategies and cDNA library, promoters, expression of cloned DNA and its analysis. **10 L**
3. **Cloning in yeast:** yeast vectors cloning and expression, yeast artificial chromosome. **6 L**
4. **Cloning in plants:** agrobacterium and genetic engineering in plants, Ti and Ri plasmids, binary vectors, plant specific promoters, incorporation of T-DNA into nuclear DNA of plant cells. Transformation strategies for transgenic plants for resistance, herbicide resistance, and tolerance, RFLP/AFLP/RAPD mapping in plant breeding. **15 L**
5. **Cloning in animals:** integration of DNA into mammalian cell, isolation of transgene from transformed animal cell culture. **9 L**

(THEORY)

MBT 403	(GENOMICS AND PROTEOMICS)	MARKS: 50 (45+ 5)

Genomics

1. **Definition, classification, scope.** **3 L**
2. **Structural genomics:** E-coli, fruitfly, *Arabidopsis*, and human. **8 L**
3. **Chromosome specific libraries:** ordering genomic clones into contigs by FISH, clone finger-prints, STSs (Sequence Tagged Sites), ESTs (Expressed Sequence Tags), etc. **5 L**
4. **Location-oriented entities:** SINEs and LINEs, Repeats. **4 L**
5. **Applied genomics:** DNA chips, robotics, microarray protection for ecological ravages. **4 L**

Proteomics

6. **Definition, classification, scope.** **3 L**
7. **The emergence of proteome concept:** structural and functional proteomes, protein structure related to functional kinetics, e.g. prions, bridging genomics to proteomics. **6 L**
8. **Transcriptomes:** measurement of gene expression. **3 L**
9. **Proteome analysis:** by methods, 2-D PAGE including protein detection on electro-blot membrane, mass spectrometry and phosphorylation site analysis. **6 L**
10. **Proteomics in relation to animal and plant health and welfare.** **3 L**

(THEORY)

MBT 404	(ELECTIVE PAPER)	MARKS: 50 (45+ 5)

In view of the expanding horizon of research over the last ten years, in the field of Biotechnology and Satellite areas, each student will suggest 3 areas/topics as the integral part of the comprehensive interactive course. The HOD

will select any one of the topics, or may suggest any topics other than the three suggested, on which candidate will be enrolled for the comprehensive study. The details of the procedure will be framed by the HOD in consultation with the member of the courses.

(PRACTICAL)

MBT-405	(BIOINFORMATICS AND RECOMBINANT DNA TECHNOLOGY)	MARKS-50

BIOINFORMATICS:	20 Marks

1. Searching for a particular protein through PubMed.
2. Use of Public Domain Interfaces for downloading different DNA and Protein sequences from authenticated Databases (Using NCBI, SWISS-SPROT)
3. Performing BLAST and interpretation of the results.
4. Performing MSA by using CLUSTALW and presentation of the phylogenetic tree.

RECOMBIANT DNA TECHNOLOGY:	30 Marks

1. Isolation and purification of genomic DNA (plant / animal).
2. Restriction digestion of genomic DNA and its separation by agarose gel electrophoresis.
3. Ligation of a restricted fragment from genomic DNA into a suitable plasmid phage vector.
4. Transformation and selection of positive clones (colony blot) replica plating.
5. PCR amplification of a selected fragment and its separation of AGE/PAGE.
6. Restriction Map preparation of a selected genomic DNA fragment and RFLP pattern study.
7. Bacteriophage and its titration.

MBT-406	(PRACTICAL) (PROJECT/TERM PAPER)	Marks-50

**Department of Botany
THE UNIVERSITY OF BURDWAN**



**M. Sc. SYLLABUS SEMESTER SYSTEM [CHOICE BASED CREDIT SYSTEM]
[w. e. f. 2020- '21]**

Prepared by The Department of Botany
The University of Burdwan
Burdwan 713104

Broad Structure of Syllabus under CBCS for the P.G.

Department of Botany, BU

Semester-I

Course				Lect. Hour/Week	Duration of the Exam (in Hour)	Marks			Credit
Course code	Type/ Cat.	T/P	Name			I.A.	E.T	Total	
MSBO101	Core	T	Microbiology	4T	2	10	40	50	4
MSBO102	Core	T	Phycology	4T	2	10	40	50	4
MSBO103	Core	T	Unit I: Mycology Unit II: Plant Pathology	4T	2	10	40	50	4
MSBO104	Core	T	Unit I: Bryology Unit II: Pteridology	4T	2	10	40	50	4
MSBO105	Core	P	Unit I: Microbiology Unit II: Phycology	8P	4	10	40	50	4
MSBO106	Core	P	Unit I: Mycology & Plant Pathology Unit II: Bryology & Pteridology	8P	4	10	40	50	4
Total Credit									24

Semester II

Course				Lect. Hour/Week	Duration of the Exam (in Hour)	Marks			Credit
Course code	Type/ Cat.	T/P	Name			I.A.	E.T	Total	
MSBO201	Core	T	Plant Physiology	4T	2	10	40	50	4
MSBO202	Core	T	Plant Biochemistry	4T	2	10	40	50	4
MSBO203	Core	T	Unit I: Taxonomy of Angiosperm Unit II: Phytogeography	4T	2	10	40	50	4
MSBO204	Core	T	Gymnosperm, Paleobotany & Palynology	4T	2	10	40	50	4
MSBO205	Core	P	Unit I: Plant Physiology Unit II: Plant Biochemistry	8P	4	10	40	50	4
MSBO206	Core	P	Unit I: Taxonomy of Angiosperm & Phytogeography Unit II: Gymnosperm, Paleobotany & Palynology	8P	4	10	40	50	4
Total Credit									24

Semester III

Course				Lect. Hour/Week	Duration of the Exam (in Hour)	Marks			Credi t
Course code	Type/ Cat.	T/P	Name			I.A.	E.T	Total	
MSBO301	Core	T	Ecology & Plant Anatomy	4T	2	10	40	50	4
MSBO302	Core	T	Pharmacognosy & Instrumentation	4T	2	10	40	50	4
MSBO303	Core	P	Unit I: Ecology & Plant Anatomy Unit II: Pharmacognosy & Instrumentation	8P	4	10	40	50	4
MSBO304	GE	T	Plant System and Function / Plant Diversity and Evolution	2T	2	05	20	25	2
MSBO 305-1	DE	T	1. Plant Physiology and Biochemistry	4P	4	10	40	50	4
305-2			2. Applied and Molecular Mycology and Plant Pathology						
305-3			3. Microbiology						
305-4			4. Plant Genetics and Biotechnology						
305-5			5. Taxonomy of Angiosperms and Biosystematics						
305-6			6. Phycology						
MSBO 306-1	DE	P	1. Plant Physiology and Biochemistry	8P	4	10	40	50	4
306-2			2. Applied and Molecular Mycology and Plant Pathology						
306-3			3. Microbiology						
306-4			4. Plant Genetics and Biotechnology						
306-5			5. Taxonomy of Angiosperms and Biosystematics						
306-6			6. Phycology						
MSBO307	CE	P	Workshops on Awareness campaign on preservation of Biodiversity, agrobiodiversity, medicinal plants etc.			05	20	25	2
Total Credit									24

Semester IV

Course				Lect. Hour/Week	Duration of the Exam (in Hour)	Marks			Credi t
Course code	Type/C at.	T/ P	Name			I.A.	E.T	Total	
MSBO401	Core	T	Genetics, Plant Breeding & Biostatistics	4T	2	10	40	50	4
MSBO402	Core	T	Cell Biology & Bioinformatics	4T	2	10	40	50	4
MSBO403	Core (Floati ng)	P	Unit I: Genetics, Plant Breeding & Biostatistics Unit II: Cell Biology & Bioinformatics	4T	2	10	40	50	4
MSBO 404-1	DE	T	1. Plant Physiology and Biochemistry	4T	2	10	40	50	4
404-2			2. Applied and Molecular Mycology and Plant Pathology						
404-3			3. Microbiology						
404-4			4. Plant Genetics and Biotechnology						
404-5			5. Taxonomy of Angiosperms and Biosystematics						
404-6			6. Phycology						
MSBO 405-1	DE	P	1. Plant Physiology and Biochemistry	4P	4	10	40	50	4
405-2			2. Applied and Molecular Mycology and Plant Pathology						
405-3			3. Microbiology						
405-4			4. Plant Genetics and Biotechnology						
405-5			5. Taxonomy of Angiosperms and Biosystematics						
405-6			6. Phycology						
MSBO406	Project / Term paper	P	Based on DE	4P		10	40	50	4
Total Credit									24

STRUCTURE OF M.Sc. SYLLABUS (SEMESTER COURSE, 2007-2008)

SEMESTER-I		
Bot/General/Theory/(101)	Microbiology (45 + 5) = 50	50
Bot/General/Theory/(102)	Mycology (45 + 5) = 50	50
Bot/General/Theory/(103)	Phycology (45 + 5) = 50	50
Bot/General/Theory/(104 Unit-I & II)	Bryology (Unit-I) (22.5 + 2.5) = 25 Anatomy (Unit –II) (22.5 + 2.5) = 25	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac./(105)	Microbiology (25) & Mycology (25)	50
Bot/General/Prac./(106)	Phycology (20), Bryology (15) & Anatomy (15)	50
SEMESTER-II		
Bot/General/Theory/(201)	Pteridology	50
Bot/General/Theory/(202)	Paleobotany (Unit-I), Palynology and Reproductive Biology (Unit-II).	50
Bot/General/Theory/(203)	Taxonomy of Angiosperms - & Plant Geography	50
Bot/General/Theory/(204)	Cell Biology and Genetics	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac./(205)	Pteridology, Paleobotany, Palynology and Reproduction Biology	50
Bot/General/Prac./(206)	Taxonomy of Angiosperms (25), Cell Biology and Genetics (25)	50
SEMESTER-III		
Bot/General/Theory/(301)	Plant Pathology (45 + 5) = 50	50
Bot/General/Theory/(302)	Gymnosperms	50
Bot/Spl./Theory/(303)	Special theory – 1 (45 + 5) = 50	50
Bot/Spl./Theory/(304)	Special theory – 2 (45 + 5) = 50	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac./(305)	Plant Pathology (25), Gymnosperms (25)	50
Bot/Special/Prac/(306)	Special Practical	50
SEMESTER-IV		
Bot/General/Theory/(401)	Plant Physiology (45 + 5) = 50	50
Bot/General/Theory/(402)	Biochemistry (45 + 5) = 50	50
Bot/General/Theory/(403)	Ecology (25), Molecular Biology & Plant Breeding (25)	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac/(404)	Plant Physiology & Bio Chemistry	50
Bot/General/Prac/(405)	Special Practical – Ecology (25) & Plant Breeding & Biometry (25)	50
Bot/Diss/(406)	Dissertation	50
Total		1200

Special papers to be offered :-

- (1) Cytogenetics & Molecular Biology, (2) Microbiology & Microbial Biotechnology
- (3) Mycology & Plant Pathology, (4) Paleobotany & palynology
- (5) Phycology , (6) Plant Physiology & Biochemistry
- (7) Pteridology, (8) Taxonomy of Angiosperms and Bio-Systematics

1. Early history and milestone discoveries in Microbiology. (2L)
2. Position of microorganisms in living world. Brief idea about the basis of bacterial classification. (2L)
3. Ultra structure and function of cell wall and cell membrane of bacteria and archaea
Murein biosynthesis: ultra structure of capsule, pill, and flagella. Mechanism of flagella movement and chemotaxis; Reserve material and other cytoplasmic inclusions; Endospore - structure, formation and regulation of endospore formation and germination. (8L)
4. Bacterial genetic material :- structure and reproduction of bacterial chromosome.
Plasmid - structure type and properties, episome. (2L)
5. Bacterial growth in liquid medium, growth curve, growth factor, kinetics of growth, batch and continuous culture; synchronous culture, enrichment culture, diauxic growth. (2L)
6. Microbial growth control:- disinfectant antiseptic and chemotherapeutic agents – a brief account of their types and mode of action (2L)
7. Metabolic diversity in bacteria :- Brief idea about Autotrophy, heterotrophy and Mixotrophy (2L)
8. Genetic recombination in bacteria :- Molecular mechanism of Transformation, Conjugation, Transduction, Gene mapping and Complementation test (6L)
9. Bacterial mutation :- Spontaneous and induced mutation of bacteria, molecular basis of Mutation. Mutagen and their action, types of mutant, selection of mutant, and Ames test. (4L)
10. Metabolic regulation and inhibition in bacteria :- Operon concept : *lac* and *trp* operon : catabolic repression, attenuation, allosteric control, types of feed back inhibition and isozyme. (4L)
11. Microbes in N₂ and Sulphur Cycle :- Nitrification, Denitrification, Ammonification, Mechanism of biological N₂ fixation and structure and regulation of *nif* Gene. Microbial oxidation and reduction of sulphur. (3L)
12. Virus :- Organization and structure of Capsid Viral genome -types and structure. Replication of virus and viral nucleic acid. Assay of Virus; Virus and Prion (4L)
13. Lytic and Lysogenic Cycle :- Lytic cycle of bacteriophage : Regulation of lysogeny, induction of lysogeny and significance of lysogeny. (3L)
14. Fundamentals of Immunology :- Innate and acquired immunity, T-cell. B-cell, MHC, Cytokines, Antigen - types and characteristics : Structure and functions of immunoglobulins, Cell mediated and Humoral Immunity; Ag-Ab reactions and

Immunological techniques.

(6L)

Mycology

Bot/Gen/Th/102

Full Marks – 50

Lecture hrs. : 50

1. Position of fungi in modern systematics, modern approaches towards classification of fungi (2L)
2. Ultrastructural features of fungal cell structures-nucleus and its division, cell wall and its biochemical composition, tissue organization, modifications of fungal hyphae. (6L)
3. Life cycle patterns and basic pattern of sexuality, sexual mechanisms and their correlations in different groups of fungi, Parasexual cycle-basic concept. (6L)
4. Fungal symbionts : Mycorrhizae-basic concept and their applications. Lichen-Phycobiont and mycobiont, histology, biology and physiology of lichen thallus, economic importance of lichen. (6L)
5. Beneficial uses of fungi, industrial production of alcohol and penicillin. (6L)
6. Edible Mushrooms-cultivation technology, nutritional and medicinal properties of mushrooms. (5L)
7. Fungi as animal parasites, mycoses of vertebrates-types and symptoms, insect fungus association. (4L)
8. Mastigomycotina : A comprehensive knowledge with emphasis on occurrence of sex hormones and sporangia to conidia transition. (4L)
9. Ascomycotina : A comprehensive knowledge with emphasis on types of ascocarps and methods of spore dispersal. (3L)
10. Basidiomycotina : A comprehensive knowledge with emphasis on fruiting structures and methods of spore dispersal. (3L)
11. Deuteromycotina : A general account with emphasis on sporulating structures of the members, classification with special reference to conidial ontogeny. (3L)

Phycology

Bot/Gen/Th/103

Full Marks – 50

Lecture hrs. : 50

1. Modern criteria of algae classification with special emphasis on chloroplast ultrastructure, flagella and pigments.
2. Cyanophyta : General features & ecology; genetic recombination; heterocyst structure and function; affinities.
3. Rhodophyta : General features; specialities in sexual reproduction and

postfertilization changes.

4. Chlorophyta; Characteristic features of different classes highlighting distinctive features of different orders; evolutionary trends.

5. Ochrophyta :

a) Xanthophyceae : General features, parallelism with green algae & affinities.

b) Bacillariophyceae : Cell structure; auxospore formation in Centrales and Pennales.

c) Phaeophyceae : General features and ecology, life patterns.

6. Economic and applied aspects of algae.

Bryology

Bot/Gen/Th/104 (Unit-I) (25 marks, 25 lecture hours).

1. Introduction : Diversity in forms, habitats and values.

2. Classification of Bryophytes – traditional and modern systems with reference to Hepaticopsida, Anthocertopsida and Bryopsida.

3. Origin and evolution of Bryophytes.

4. Brief idea about :

a) Fossil Bryophytes

b) Photoperiodism

c) Apogamy and apospory

d) Water relations

e) Regeneration techniques

f) Ecology of Bryophytes

g) Monitoring of environmental state with Bryophytes

h) Peristome characteristics and their importance

i) Vegetative modes of reproduction.

5. Characteristics, affinities and systematic position of Sphaerocarpales, Takakiales and Monocleales

Plant Anatomy

Bot/Gen/Th/104 (Unit-II)

[25 marks, 25 lecture hours]

1. Organisation of shoot and root apical meristems. Changes in shoot apex during transition to flowering.

2. Differentiation : Polarity, symmetry, pattern formation (outline idea of genetic control of differentiation and organogenesis).

3. Anatomico-physiological basis of tissue classification.

4. Origin, differentiation and phylogeny of xylem and phloem.

5. Origin, histology, tissue differentiation and vascularisation of leaf.

6. Nodal anatomy and its phylogenetic significance.

Microbiology

Full Marks – 25

1. Aseptic method :- Autoclave, hot air oven, incubator, bacterial filter and Laminar air flow.
2. Preparation and sterilization of culture media :- idea about different kinds of bacterial media, preparation of media, slants, stabs and pouring of plates.
3. Methods of isolation or pure culture by streak plate and pour plate method.
4. Morphological characteristics of bacteria and microscopic examination of stained cell preparation – Simple staining, gram staining, staining of bacterial Endospore, Capsule and flagella.
5. Direct examination of root nodule bacteria in microscope and isolation of *Rhizobium* from root nodule.
6. Measurement of bacterial growth by turbidimetry and by direct cell count by Breed method or Haemocytometer method.
7. Isolation and enumeration of microorganisms from natural samples (soil and water) by agar plate technique.
8. Determination of antibiotic sensitivity of some bacteria by disc diffusion method.
9. Demonstration of the following experiments :-
 - a) Subculturing.
 - b) Replica plating technique for isolation of auxotrophic mutants.
 - c) Isolation of pure culture from streak plate method.
 - d) Assay of bacteriophage.
10. Demonstration of following instruments :-
 - (a) Colorimeter, (b) Spectrophotometer, (c) Autoclave, (d) Hot air oven,
 - (e) Incubator, (f) Bacterial filter, (g) Laminar air flow, (h) Haemocytometer.

Mycology

Full Marks –25

1. Study of fungal tissue organization.
2. Study of different spore forms in fungi.
3. Study of vegetative and reproductive structures of some important members of the following groups and their identification : (a) Phycomycetes, (b) Ascomycetes, (c) Basidiomycetes, (d) Deuteromycetes.
4. Study of some important rusts showing different spore forms.
5. Smut spore forms.

6. Principles of sterilization, autoclave-demonstration.
7. Preparation of fungal culture media, preparation of slants, stubs and sterilization of media.
8. Demonstration for subculturing of fungal cultures and inoculation technique.

[Students are required to submit field and laboratory records, preserved and dried specimens and permanent slides]

Bot/Gen/Prac/106

Phycology

Full marks : 20

1. Collection and identification of local algae of West Bengal.
2. Study of common phytoplankton.
3. Study of representative marine algae.

Bryophytes:

Full Marks:15

1. Methods of collection and preservation of Bryophytes.
2. Identification of unknown bryological specimens up to Genus level using a suitable artificial key.
3. Methods of preparation of permanent slides.

[Students are required to submit field and laboratory records, preserved and dried specimens and permanent slides]

Plant Anatomy

Full marks : 15

1. Study of stomatal index, Palisade ratio, Vein-islet number.
2. Comparative study of nodal vascular : Unilacunar, Trilacunar, Multiacunar.
3. Comparative study of laticifers.
4. Structural analysis of secondary xylem and secondary phloem in section.
5. Study of sieve elements in angiosperms and gymnosperms.

[Submission of laboratory records including permanent slides]

Semester-II

Pteridology

Bot/Gen/Th-/201

Full Marks : 50

Lecture hrs. : 50

1. Introduction about pteridophytes. (1L)
2. Comparative studies on the vegetative and reproductive organographies, evolutionary tendencies and affinities of the members belonging to different groups of Rhyniopsida. Zosterophyllopsida, Trimerophytopsida, Psilopsida, Lycopsidea (Drepanophycales, Protolepidodendrales, Lycopodiales, Selaginellales, Lepidodendrales and Isoetales) and Sphenopsida (Hyeniales, Sphenophyllales, Calamitales and Equisetales). (14L)
3. An idea about the outline system of classifications of ferns by Copeland (1947), Christensen (1938) and Pichi Sermolli (1977). (3L)
4. Sporangial development, annulus, tapetum (types and functions) (2L)
5. A comparative study of the members belonging to the following taxonomic groups and also their systematic treatments, evolutionary tendencies and affinities: (a) Cladoxylales (b) Coenopteridales, (c) Marattiales, (d) Ophioglossales, (e) Osmundales, (f) Filicales (Schizaeaceae, Gleicheniaceae, Cyatheaceae, Polypodiaceae), (g) Salviniales, (h) Marsileales. (15L)
6. Stellar concept, types and evolution (2L)
7. Soral evolution in ferns (1L)
8. Spores : Types, germination pattern, gametophyte development. (2L)
9. Mating systems in ferns, control of sexuality in homosporous pteridophytes by Antheridogen activity, Apogamy and Apospory, vivipary in pteridophytes. (15L)
10. Heterospory and evolution of seed habit (1L)
11. Morphogenesis of sporophytes. (4L)

Bot/Gen/Th-/202

F.M.50, 50 lecture hrs.

Palaeobotany (Unit-I)

(Full marks :20, 20 lectures hrs)

1. Definition of fossil, different types of plant-fossils as per their mode of preservation, concept of form-genus.
2. Principles of correlation and stratigraphy; dating of rocks; outline of Standard Geologic lime Scale.
3. Origin of life; early life forms recovered from Precambrian strata.
4. Major events of plant life through geologic history.
5. Indian Gondwana Sequence. Classification, distribution, megaflora succession through the sequence.

6. Introductory idea of Continental Drift Hypothesis with reference to Sea-door Spreading and Plate Tectonics.
7. Fossil plants in palaeoecological deductions.

Bot/Gen/Th-/202

Palynology and Reproductive Biology (Unit-II):

(Full marks 30, 30 Lecture hours)

1. Microspore tetrads and polarity of spores and pollen grains.
2. Spore-pollen morphology: Symmetry, shape, size, aperture patterns, NPC System for numerical expression of apertural details, exine stratification, surface structures and sculptures of sporoderm; LO-analysis and edge-analysis.
3. Chemical nature of sporopollenin, development of pollen wall, Utricle body, exineless pollen grains.
4. Extraexinous wall material - perine, viscin-threads. pollen-kitt.
5. Evolution of spore-pollen exine with reference to adaptive significance.
6. Application of palynology in taxonomic and phylogenetic deductions.
7. Aeropalynology with reference to allergy. Aeroallergens, introductory idea of Immune System with special reference to IgE. study of airspora, identification of allergic taxa by *in-vivo* and *in-vitro* tests with spore-pollen extracts, chemical nature of exine-borne allergens, allergic taxa of West Bengal plains.
8. Melissopalynology. Indian species of honey bees, importance of pollen grains as constituent of bee-bread, pollen-collecting mechanism of honey bees, analysis of pollen load and honey sample in understanding bee forage, objectives of melissopalynological studies, important bee plants of West Bengal plains.
9. Palaeopalynology. Introductory idea about palaeopalynological remains, significance of palaeopalynology.
10. Forensic palynology : Definition and significance, a few well-known case studies.
11. Pollination Biology : Pollen dispersal units; pollination types, contrivances for cross- and self-pollination; pollen vectors, pollination modes and flora organization, evolutionary trends in pollination modes.
12. Breeding systems, self-incompatibility and compatibility control with reference to pollen-pistil interactions.

Bot/General/Theory/(203)**Angiosperms- Taxonomy & Phytogeography**

(Full Marks 50 ; 50 Lecture Hours)

1. Taxonomy - Concept, objective and relevance to conservation
2. Plant Nomenclature – ICBN, Principles, Rules, Recommendations and Appendices, Type concept, Valid publication and rejection of names.
3. Taxonomic hierarchy, delimitation of taxa and attribution of rank. Species concept.
4. Recent Systems of Angiosperm classification including APGII(2003).
5. Taxonomic literature : Types, definition and examples.
6. Taxonomic evidences : Phytochemistry and ultrastructure.
7. Numerical Taxonomy / Phenetics and Cladistics : Principles, Methods. Merits and Demerits.
8. Concept of Homology, Morphocline, Homoplasy, Monophyly (Holophyly and Paraphyly), Polyphyly.
9. Biosystematics-methods, categories and relationship with traditional taxonomy.
10. Circumscription and phylogeny : Magnoliales, Amentiferae, Umbelliferae, Tubiflorae, Campanulales, Helobiae, Pandanales, Poaceae and Orchidales.
11. Biodiversity : components, levels, values and conservation.
12. Concept of Phytogeography : Endemism, Hot spots, alien species, invasion and introduction.
13. Plant migration, vicariance and disjunction
14. Major Phytochora of the world and India.
15. Local plant diversity and its socioeconomic importance.

Bot/General/Theory/(204)

Full marks : 50

CELL BIOLOGY AND GENETICS**Cell Biology -**

1. Basic chemical and Physical concept. Molecular structures, Elementary Biophysical concepts. Macro molecules and its assembly.
2. Plasma membrane- Structure Dynamics channels, pumps and carriers
3. Storage and expression of Genetic information:
 - (a) Chromosomal organization
 - (b) Basics of Nuclear structure and dynamics
4. Biogenetics. Traffic and functions of cellular membrane system
 - (a) Protein synthesis and folding
 - (b) Post translation targeting of proteins.
 - (c) Biosynthesis of endoplasmic reticulum (ER) and Golgi apparatus (GA), Vesicular traffic from ER through GA.

- (d) Mitochondria and cell energetics, chloroplast
- 5. Resection and transduction of cellular information
 - (a) Introduction to signalling pathway.
 - (b) Plasma membrane receptors.
- 6. Cytoskeleton and cell motility
 - (a) Actin and Actin binding proteins
 - (b) Microtubules and microtubule associated proteins
 - (c) Cellular motility
- 7. Cell cycle and Cancer.
 - (a) G₁ Phase, S Phase, G₂ phase: Regulation of cell proliferation, DNA replication, entry into mitosis.
 - (b) Programmed cell death (Apoptosis)
 - (c) Cancer: Biochemistry and molecular events, Proto oncogene, Oncogene, Tumour suppressor gene, Therapy.

Genetics :

1. Post-Mendelian Genetics : Development extension, application, linkage-principle mechanism, examples, gene mapping, crossing over cytological and molecular basis significance Population genetics- multiple alleles Polygenic inheritance.
2. Chromatin organization, chromatin structure, and packaging of DNA, nuclear DNA, content and C-value paradox reassociation kinetics and repeated sequence.
3. Structural and numerical alterations at chromosomes origin and meiotic behavior of duplication deficiency, inversion and translocation heterozygote of origin haploids. Aneuploid, euploids, autopolyploids and allopolyploids
4. Mutation types of mutation and mutagens, molecular basis of gene mutation Transposable elements-structure, mechanism of transposition, importance, mutation induced by transposition site directed mutagenesis DNA damage and repair mechanism.
5. Replication and transcription process in prokaryotes and eukaryotes, Mendelianism and control, processing of RNA, splicing process, RNA editing , Antisense RNA,
6. Translational and Genetic code: Principle and mechanism of translation and protein synthesis; Genetic code- properties, experimental evidences, evolution
7. Gene regulation, Lac and *TRP* operon induction, general regulatory process in eukaryote.

Bot/General/Pract/(205)
Pteridology

(Full Marks 50)
(F.M.20)

1. Anatomical, morphological and palynological studies of some members of Pteridophytes occurring in West Bengal, Identification up to the genus.
 2. Study of some fossils (slide and megafossils).
 3. Field work
- ** (Submission of field and laboratory records)

Palaeobotany

(10 Marks)

1. Palaeobotanical field work.
 2. Study of representative megafloral assemblages and determination of age.
- ** (Submission of field and laboratory records including permanent slides)

Palynology and Reproductive Biology

(20 Marks)

1. Pollen morphological studies of some pteridophytes, gymnosperms, and angiosperms representing different morphological types using acetolysis / alkali maceration method.
 2. Extraction of pollen grains from honey sample and study of the frequency of different morpho-types.
 3. Study of *in vivo* and *in vitro* germination of pollen grains.
 4. Morpho-anatomical study of stigma and style.
 5. Study of the growth of pollen tube through stigma and style.
- ** (Submission of laboratory records including permanent slides)

Bot/General/Pract/(206)
Cell Biology and Genetics

(F.M.50)
(25 Marks)

1. Study of mitosis, karyotype analysis, determination of mitotic index.
2. Study of meiosis in pollen mother cells, determination of chiasma frequency and terminalization co-efficient.
3. Study of meiosis in grasshopper.
4. Nucleolar staining.
5. Frequency distribution analysis of probability distribution and testing goodness of fit.
6. Estimation of heritability and genetic advance, ANOVA, ANCOVA, correlation coefficient.

Taxonomy :

(25 marks)

1. Acquaintance with different types of taxonomic literatures – Flora, Manual, Monograph, Glossary, Index, Dictionary, Keys and Periodicals.
2. Application of taxonomic methods for identification of Species of different families of angiosperms.
3. Acquaintance with flora of local and any other phytogeographical region and preparation of field notes.

STRUCTURE OF M.Sc. SYLLABUS (SEMESTER COURSE, 2007-2008)

SEMESTER-I		
Bot/General/Theory/(101)	Microbiology (45 + 5) = 50	50
Bot/General/Theory/(102)	Mycology (45 + 5) = 50	50
Bot/General/Theory/(103)	Phycology (45 + 5) = 50	50
Bot/General/Theory/(104 Unit-I &II)	Bryology (Unit-I) (22.5 + 2.5) = 25 Anatomy (Unit –II) (22.5 + 2.5) = 25	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac./ (105)	Microbiology (25) & Mycology (25)	50
Bot/General/Prac./ (106)	Phycology (20), Bryology (15) & Anatomy (15)	50
SEMESTER-II		
Bot/General/Theory/(201)	Pteridology	50
Bot/General/Theory/(202)	Paleobotany (Unit-I), Palynology and Reproductive Biology (Unit-II).	50
Bot/General/Theory/(203)	Taxonomy of Angiosperms - & Plant Geography	50
Bot/General/Theory/(204)	Cell Biology and Genetics	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac./ (205)	Pteridology, Paleobotany, Palynology and Reproduction Biology	50
Bot/General/Prac./ (206)	Taxonomy of Angiosperms (25), Cell Biology and Genetics (25)	50
SEMESTER-III		
Bot/General/Theory/(301)	Plant Pathology (45 + 5) = 50	50
Bot/General/Theory/(302)	Gymnosperms	50
Bot/Spl./Theory/(303)	Special theory – 1 (45 + 5) = 50	50
Bot/Spl./Theory/(304)	Special theory – 2 (45 + 5) = 50	50
Internal assessment of Theory papers (10%)		
Bot/General/Prac./ (305)	Plant Pathology (25), Gymnosperms (25)	50
Bot/Special/Prac/ (306)	Special Practical	50
SEMESTER-IV		
Bot/General/Theory/(401)	Plant Physiology (45 + 5) = 50	50
Bot/General/Theory/(402)	Biochemistry (45 + 5) = 50	50
Bot/General/Theory/(403)	Ecology (25), Molecular Biology & Plant Breeding (25)	50

Internal assessment of Theory papers (10%)		
Bot/General/Prac/(404)	Plant Physiology & Bio Chemistry	50
Bot/General/Prac/(405)	General Practical – Ecology (25) & Plant Breeding, Biometry & Molecular Biology (25)	50
Bot/Diss/(406)	Dissertation	50
	Total	1200

Special papers to be offered :-

- (1) Cytogenetics & Molecular Biology, (2) Microbiology & Microbial Biotechnology
- (3) Mycology & Plant Pathology, (4) Paleobotany & palynology
- (5) Phycology , (6) Plant Physiology & Biochemistry
- (7) Pteridology, (8) Taxonomy of Angiosperms and Bio-Systematics

Syllabus for M.Sc. (Bot.) Third semester

Bot/General/Theory/(301)

Plant pathology:
hrs: 50

Full Marks -50, Lecture

1. History of the development of Plant Pathology
2. Pathogenesis: Contact, entry and disease development
3. Plant pathogen in offence: enzymes, toxins and growth regulators
4. Host plant in defense: structural and biochemical defense-concept of horizontal and vertical resistance
5. Physiological (photosynthesis, respiration translocation of water & nutrients); and molecular changes in (protein and nucleic acid) in diseased plants.
6. Environment and Nutrition in relation to disease development; Plant disease epidemiology and disease forecasting
7. Strategies of plant disease management: Cultural, chemical, biological and integrated management
8. Symptoms, etiology and control measures of some important diseases of the following crops: Rice, Wheat, Potato, Sugarcane and Tea.
9. Seed storage: factors responsible for seed deterioration, effect of seed deterioration, mycotoxin production and control of seed deterioration.

Bot/General/Theory/(302)

Gymnosperms:

Full marks 50, 50 Lecture hours

1. Introduction: Concept of Gymnospermae, general features of gymnosperms.
2. Origin of seed-habit: Origin and evolution of nucellus and integument; switchover from zooidogamy to siphonogamy - hydrasperman reproduction, prepollen, origin and evolution of gymnospermous pollen grains.
3. Progymnospermopsida: Vegetative morphology, stellar organization and reproductive structures of Aneurophytales, Archaeopteridales and Prototypiales; the plexus progymnosperms as the progenitor of gymnosperms.
4. Pteridospermales: Characteristic features, evolutionary trends and geologic range of Calamopityaceae, Lyginopteridaceae, Medullosaceae and Callistophytaceae.
5. Glossopteridales: Geologic range and geographic distribution; morphology of important types of leaves, male- and female fructifications; reconstructions of *Glossopteris*-plant; organography of *Glossopteris*-seedling.
6. Caytoniales: General features, geologic and geographic distribution of Peltaspermaceae, Corytospermaceae and Caytoniaceae; morphology of *Caytonia*-fruit.
7. Cycadales: General features, geologic history; evolutionary trends of megasporophylls among extinct and extant members; geographic distribution of extant cycads in India and abroad.
8. Bennettitales: Characteristic features and geographic range of Williamsoniaceae and Cycadeoidaceae, reconstructions of *Williamsonia*-plant, comparative account of *Cycadeoidea* and *Amarjolia* fructifications.

9. Pentoxylales: Brief account of different organs and reconstruction of the *Pentoxylon*-plant; geologic and geographic occurrences in India and abroad; affinities.
10. Coniferales: Characteristic features; families of modern conifers, their distinguishing features, and distribution in India and abroad; evolution of female cone with reference to 'transition conifer' as evolutionary link between Cordaitales and Coniferales.
11. Ginkgoales: Characteristic features, antiquity, relationships with pteridosperms (peltasperms) and conifers.
12. Gnetopsida: Comparative account of the reproductive structures of *Ephedra*, *Gnetum* and *Welwitschia*; angiospermic features within the group.
13. Development of female gametophyte, pollination biology, embryogeny including polyembryony and karyology of extant gymnosperms.
14. Economic importance of gymnosperms with reference to wood, resin, essential oils, drugs and food.

Bot/Spl./Theory/(303)

1. CYTOGENETICS AND MOLECULAR BIOLOGY

Special – I

Marks: 50, 50

Lectures

- 1) Cytotaxonomy and Molecular Taxonomy: Basic Principle, Modern concept and Application; Computer Assisted chromosome analysis (CHIAS) and Manipulation.
- 2) Specialized regions of chromosomes: Organization and Function of Centromere Telomere and Nucleolar Organizer Region (NOR).
- 3) Molecular Genetics Analysis of :-
 - a) Plant Nodulation and Nitrogen Fixation.
 - b) Host-Pathogen Interaction.
 - c) Agro infection in Crown Gall Tumour Development.
 - d) RUBISCO regulation and Assembly of Photosystem LHC-I and LHC- II during Photosynthesis.
 - e) Pigmentation Genetics in Higher Plants.
- 4) Developmental Genetics: Regulatory Cascades, Cell fate and pattern, Spatio-Temporal Gene Expression in the development of *Drosophila* and *Arabidopsis*.
- 5) Molecular Breeding: General concept of Molecular Markers (RFLP, RAPD, AFLP markers) and their use in breeding, Quantitative Trait Loci (QTL) mapping, Marker Assisted Selection (MAS) in Crop Improvement.

2. Microbiology and Microbial Biotechnology

Theory:

F.M. – 50 (45+5),

50L

Special Paper - I :

- 1. Modern concept of bacterial Taxonomy:-** Classical and Molecular taxonomy, Numerical taxonomy. Bergey's manual of Determinative & Systematic Bacteriology, Type culture collection centre. 5L

2 Domain of Archaea and bacteria :- Characteristics and taxonomy of Archaea ;Gram (+) and Gram (-) bacteria and their taxonomy. 2L

3. Concise account of the following groups:-

a) Mycoplasma b) Myxobacteria c) Stalked bacteria d) Bdellovibrio e) Actinobacteria 5L

4. Bacterial photosynthesis:- Photosynthetic bacteria and mechanism of bacterial photosynthesis. 5L

5. Chemolithotrophic bacteria and others:- types, modes of metabolism and energy transfer; heterotrophic CO₂ fixation. 5L

6. Membrane Transport system of bacteria :- Active and passive transport, facilitated diffusion, group translocation, ion transport through ionophores and protein transport. 5L

7. Aerobic, Anaerobic respiration in bacteria & Bacterial Fermentation:- EMP pathway, HMP pathway, ED pathway, Phosphoketolase pathway, Bifidum pathway, TCA Cycle, Glyoxalate Cycle, ETC, Proton motive force, Chemiosmotic theory; Denitrification, Metal reduction, Sulfidogenesis, Methanogenesis, Homoacetogenesis; Alcohol Fermentation, Lactate Fermentation, Propionate fermentation, Butyric acid-Butanol fermentation, Mixed acid fermentation. 9L

8. Biosynthesis of Amino acids & Nucleic acids in Bacteria : Glutamate and Aspartate families of amino acids and their regulation. Purine & Pyrimidine biosynthesis. 4L

9. Fermentation Technology- Fermenter –Basic principles, types, operation, sterilization, aeration, control of temperature, surfactant. 3L

10. Microbial Fermentation of Butanol, Citric acid, and Lysine. 3L

11. Milk Microbiology:- Sources of microorganisms in milk, microbiological examination of milk and fermented milk products. 2L

12. Biofertilizers - Types, production and importance in Agriculture. 2L

3. MYCOLOGY AND PLANT PATHOLOGY

Special Theory-1

**FM- 50
Lecture hrs: 50**

1. Origin of fungi and their interrelationships
2. Role of sex hormones in reproduction of fungi
3. Genetic variation in fungi- heterocaryosis and parasexual cycle and their significance.
4. Fungal metabolism-carbon, nitrogen and vitamins.
5. Role of saprotrophs in ecosystems
6. Fungal sporocarps, spores, methods and mechanisms of spore discharge of different groups of fungi
7. Fungi and Biotechnology: i) Fungal enzymes of commercial importance, ii) fungal products-antibiotics, organic acids, and industrial alcohol, iii) gene cloning and the future of fungal biotechnology, industrial strain improvement iv) mushroom cultivation technology, fungal competitors associated with mushroom crop

4. Palaeobotany and Palynology

Special paper-I
hours

Full marks 50, 50 Lecture

1. Outline classification of rocks according to their origin and composition; sedimentary processes; diastrophic changes in sedimentary strata (dip-strike, fold, fault); unconformity.
2. Principles of correlation and stratigraphy, geochronology; stratigraphic systems and the units of classification; Standard Geologic Time Scale.
3. Prebiotic environment; chemical evolution and origin of life; Precambrian life-forms. Indian Precambrian stratigraphy; palaeobiology of Vindhya.
4. Diversification of algae, fungi and bryophytes through ages.
5. Siluro-Devonian land floras; Permo-Carboniferous floral provinces; Devonian and Carboniferous floras of North-West India.
6. Early Mesozoic floras of Molteno and Chinle formations, later Mesozoic floras of Yorkshire and Jura.
7. Concept of Indian Gondwana Sequence, stratigraphy and correlation of Gondwana Sequence in Peninsular Indian basins, mega- and microfossils of Peninsular Indian Gondwana formations; Indian Perigondwana floras.
8. Angiosperm palaeofossils; Distribution of Tertiary strata in India; Palaeogene palaeofossils and palaeoecology of Peninsular India; Neogene palaeofossils and palaeoecology of Peninsular (Cuddalore Group and Bengal Basin) and Extrapeninsular (Siwalik Group) India.

5. Phycology, Spl Paper-I
50

FM- 50, LH-

Work done on freshwater algae with special reference to India & Contributions of Prof. M. O. P. Iyengar.

1. Distribution pattern of Marine algae in Indian coasts. 3
2. Endosymbiosis and origin of Eukaryotic algae 4
3. Green cyanobacteria: their taxonomic status. 3
4. Charophytes & origin of land plants. 3
5. Dinoflagellates: distinctive features & importance. 4
6. Desmids: taxonomy & importance. 4
7. A brief study of the following classes of algae: 12
 - a) Prymnesiophyceae
 - b) Raphidophyceae
 - c) Chrysophyceae
 - d) Euglenophyceae
8. Biochemical taxonomy of algae. 5
9. Fossil algae & their importance. 4

6. Plant Physiology and Biochemistry

Special Theory-1

Marks
45+5

1. Polyamines, Brassinosteroids, Jasmonic acid and Salicylic acid: Chemical, structural, functional characteristics physiological role; biosynthetic pathway of polyamines.
2. Cyanide resistant respiration: Characteristics of the alternate pathway, mechanism, energetics, significance.
3. Senescence and programmed cell death : Types of cell death in plants, role of PCD in plants, senescence associated genes, pigment metabolism during senescence, impact of senescence on photosynthesis and respiration, oxidative stress and senescence metabolism, endogenous plant growth regulators and significance.
4. Physiology and biochemistry of seed development and role of plant hormones.
5. Seed viability and seed vigour: Orthodox and recalcitrant seeds, biochemical changes during seed deterioration, seed invigouration, accelerated ageing, viability tests, synthetic seeds.
6. Herbicides and their action: Chemical diversity of herbicides, selective and nonselective herbicides, general mode of action.
7. Stress physiology: Types of environmental stresses; plant response of abiotic stress; osmotic adjustment and its role in tolerance to drought and salinity; impact of salinity and water deficit stress on transport across plant membranes, stress-inducible proteins and genes.
8. Physiological basis of crop yield with special reference to source-sink relationship, designer crops, ideotypic characters of rice and sunflower.

7. Pteridology

Special Paper I:
50

FM-

1. Pteridophytic flora of India. Endangered pteridophytes and their conservation.
2. Ecological Diversity of pteridophytes- A brief mention of climates and flora of the past geological era.
3. Experimental approach to the ecology of pteridophytes.
4. Mycorrhizic association of *Azolla* with *Anabaena azollae* and myrmecophily in the genus *Lecanopteris*.
5. A brief account of the Palaeozoic and Mesozoic Lycopods, Sphenopsids and Filicopsids found in India.
6. Recent taxonomic circumscriptions of extant *Lycopodium*, *Selaginella*, *Equisetum* and Gleicheniaceae, Polypodiaceae.
7. Origin of arborescent Lycopods.
8. Origin and evolutionary trends in the Sphenopsids.
9. Different Systems of classification of major groups of Filicopsida.
10. Biology and control of Bracken Fern.
11. Anatomy of the petiole and rachis of Pteridophyta.
12. Morphotypes and ontogeny of stomata.

8. Taxonomy of Angiosperms and Biosystematics

Special paper –I

FM- 50

1. Principles of the Cronquist system of classification and general evolutionary trends in flowering plants.
2. Circumscription and Phylogeny of Dilleniidae, Hamamelidae, Caryophyllidae, Rosidae, Asteridae; Alismatidae, Arecidae, Commelinidae, Zingiberidae and Liliidae sensu Cronquist (1988).
3. Taxonomy of Parasitic, Saprophytic and Insectivorous plants and their specializations.
4. Floristic elements and Phytogeography of India.
5. Centres of origin and diversity of cultivated plants

Bot/Spl./Theory/ (304)

1. CYTOGENETICS AND MOLECULAR BIOLOGY

Special – II

Marks:

50

- 1) Ultrastructure of chromatin and its activation – Histone modifications, Chromatin remodelling complexes (CRC), Transcription and activation of Class II genes.
- 2) Transcription, and Translational Control In Eukaryotes : mRNA, tRNA regulation & splicing, capping, polyadenylation, RNA Editing, RNA interference, Antisense RNA, snRNAs, microRNA, silencing of RNA. Post- Translation Regulation, Protein sorting, Folding & Targeting.
- 3) Genomics and Proteomics: Structural Genomics - Genome anatomy of prokaryote and eukaryote, tools and strategy to decipher genome.
Functional Genomics - Regulation of Genomic activity, Genome profiling, Microarray, Genome Projects (*Arabidopsis* & Human).
Proteomics - Basic principles and application, 2D Gel analysis, Importance
- 4) Recombinant DNA Technology & Gene Manipulation: General concepts, Various vectors, Enzymes, Cloning strategy in *E. coli* (plasmid, phage, cosmid, phagemid) and Yeast vectors (YAC), Plants (Ti / Ri plasmids of *Agrobacterium*), Genomic DNA library and cDNA library, Expression of cloned DNA and its analysis.
- 5) Plant Biotechnology: Plant Tissue Culture, basis principle, Tools Totipotency and Embryogenesis, Organogenesis, Micropropagation, Protoplast culture and Somatic hybridization, Genetic Engineering of plant – Manipulation of chloroplast and nuclear genome, Agroinfection and Ti / Ri plasmid based transformation.
Biotechnology of Crop Improvement: Insect resistance, Salt tolerance, Drought tolerance, Herbicide tolerance, Molecular pharming, Cryobiology.

2. Microbiology and Microbial Biotechnology

Special Paper Theory II -
(45+5)

F.M. – 50

50L

1. Concise account of the following groups:-

- a) Rickettsiales
- b) Chlamydiae
- c) Thermophiles
- d) Halophiles

4L

2. **Hydrocarbon Microbiology** – Organisms and pathways of Hydrocarbon utilization

Methane bacteria & Biogas Production. 3L

3. **Plasmid**- Types, Compatibility, Copy numbers, maintenance & amplification;

Ti plasmid & its application in biotechnology 4L

4. Transposable **genetic elements** :-Bacterial transposons and transposon mutagenesis. In bacteria.

3L

5. **DNA damage and repair**:- DNA damage & repair mechanisms in bacteria 2L

6. **Recombinant DNA Technology**- Principles, Enzymes, Vectors, Methods, application of Recombinant DNA Technology. 5L

7. **Chemotherapy**:- Sulfa drugs & their mode of action ; Antibiotics – classification, mode of actions, antibiotic assay and sensitivity test, non-medical uses of antibiotics. Antiviral drugs and their mode of action; Drug resistance – origin, causes and clinical implications. 6L

8. **Interferon** –Chemical nature, mechanism of action, production and application.

3L

9. **Water Microbiology**:-Bacteriological examination of domestic water, purification of

water, sewage & its disposal, bioremediation of pollutants. 2L

10. **Pathogenicity of human diseases**: - Pathogenicity due to invasiveness, exotoxin, endotoxin, toxoid and their practical application. 4L

11. **Epidemiology, Symptoms, prevention and control of following diseases** –

a)Cholera b) Typhoid, c)Tuberculosis, d) Rabies e) AIDS. 6L

12. **Immunotechnology**- Innate & Adaptive immunity; Cell mediated and Humoral immunity; MHC types and function; Cytokines; Complement–types, pathways of fixation; Antibody diversity and Class switching; Hypersensitivity-and their types; Monoclonal antibody production and application; Ag-Ab reaction; Diagnostic serological test - Immunofluorescence, ELISA, RIA, RIST, RAST, and FACS; Vaccines. 8L

3. MYCOLOGY AND PLANT PATHOLOGY

Special Theory-1I

Full marks: 50

Lecture hrs: 50

1. Epidemiology of plant diseases: Disease pyramid-components, measurement and simulation of plant disease epidemics; forecasting and remote sensing.
2. Disease incidence: Molecular basis of appressorium formation and its role.
3. Plant disease resistance: genetical and biochemical basis of plant disease resistance; systemic acquired resistance (SAR) and induced resistance. Molecular aspect of plant disease resistance- role of phenolics, phytoalexins and phytoanticipins, PCD, ROS and lipoxygenase, PR- proteins- their classes and functions in plant disease resistance. Hypersensitive reactions- the mechanism of elicitor-receptor concept. Basic knowledge about the defense enzymes of host plants, alarm signal and signal transduction mechanism.
4. Rhizosphere and phyllosphere microflora: Types, extent and effect on host plant, their importance in plant pathology

5. Deterioration of seeds in storage, biosynthesis of mycotoxins, effect of mycotoxin contamination in food and feed: control of seed deterioration and mycotoxin contamination
6. Fungicides in disease control; topical and systemic fungicides, mechanism of fungicidal action- mode of action of systemic fungicides (belonging to some common chemical groups), application of fungicides.
7. Biological control-current status, problems and future application
8. Mycorrhizae: types, distribution co-evolution, applications of mycorrhizae in agriculture and forestry and their possible use as biofertilizers. Molecular aspects of mycorrhization-molecular mechanism involved in signaling for mycorrhization and signal transduction pathway. Mycorrhizal inoculum production.
9. development of disease resistant crop varieties: mutation selection, application of tissue culture and recombinant DNA technology.
10. Host-parasite interaction: enzymes, toxins and hormonal imbalances, molecular basis of host-parasite interactions and disease development

4. Palaeobotany and Palynology

Special Theory 1I

Full marks 50, 50 Lecture

hours

1. International Code of Botanical Nomenclature with special reference to the nomenclature of fossil plants.
 2. Continental Drift hypothesis, Sea-floor Spreading, Plate Tectonics.
 3. Evolution of miospores through ages.
 4. Taxonomy of dispersed miospores with reference to Potonie's Turmal System; Microfossils other than spores and pollens.
 5. Pollen analysis with reference to Quaternary vegetational history of India: Pleistocene vegetational history of Kashmir Valley, Holocene vegetational history of Western India and Bengal Basin.
 6. Palaeobotany in relation to Palaeoclimatology and Palaeoecology.
 7. Life as a fuel maker; sources of natural fuels; peat; coal and its varieties, constitution of coal, coal palynology; petroleum, its origin, migration and concentration, palynology in oil exploration.
 8. Archaeobotany of Indian cultivated plants.
5. Phycology Special paper-II **F.M. 50,50L**

1. Phylogeny of algal plastids.
4L
2. Ultrastructure of flagella and its taxonomic importance.
5L
3. Carbon dioxide concentrating mechanism (CCM) in algae.
4L
4. Ecology of freshwater algae: factors (light, temperature, chemical & current) and distribution.

6L

5. Algae of unusual habitats: thermal algae, cryoalgae & halotolerant forms; endozoic and endophytic forms.
4L
6. Extracellular products of algae & toxic algae.
3L
7. Algae in Biotic associations.
8. Algal biotechnology with special reference to health food, biocosmetics, medicine, hydrocarbon production, biomonitoring and bioremediation.
6L
9. Control of aquatic algae.
3L
10. Biogeochemical role of algae
4L
11. Isolation, purification & growth characteristics in relation to algal culture; indoor and outdoor cultivation culture; photobioreactors.
6L

6. Plant physiology and Biochemistry:

Semester
Marks 45+5

III:

Special

Theory-II

1. Concept of free energy: Thermodynamic principles, energy-rich bonds, coupled reactions and oxidative phosphorylation, bioenergetics.
2. Membrane transport: An overview of transport; pumps, carriers and channels; mechanism of transport of micromolecules.
3. Signal perception and transduction: An overview, receptors, specific example of plant receptors, G-proteins and phospholipid signalling, cyclic nucleotides, calcium and protein kinases.
4. The cell cycle: An overview, cell cycle regulation factors modifying the cycle, gene regulation of cell cycle.
5. Post-translational modification and folding of newly synthesized polypeptides.
6. Phytochrome and light control of development: photochemical and biochemical properties of phytochrome, localization, phytochrome functional domains, cellular and molecular mechanisms of action, PHY genes, blue light response; stomatal movement and photomorphogenesis.
7. Cellular oxidations and the mitochondrion: Pathways of ATP production, mitochondrial electron transport system, mitochondrial F_0F_1 , ATPase and mechanism of ATP synthesis.
8. Secondary metabolites and plant defense: Types and their basic role; biosynthesis of indole alkaloid, *in vitro* production of indole alkaloid; physiological role of alkaloids in plants, commercial uses of alkaloids.
9. Photophysiology: Z-scheme and management of light energy.

7. Pteridology

Special Paper Theory II:

FM- 50

1. The contribution of pteridophytes to an understanding of the life history of vascular plants (Sexuality in gametophytic growth; Significance of isolation in relation to cyclic alternation, determination of femaleness in free sporing homosporous plants; relationship between heterospory and anisospory; cyclical alternation in heterosporous plants.)
2. Cytogenetics of ferns: Chromosome numbers and morphology; polyploidy; cytogenetic analysis of species complexes; apospory, apogamy and apomixes; hybridization.
3. Role of cytology in Fern Taxonomy.
4. Genetics and Reproductive Biology of ferns: Nature of fern breeding systems: homozygosity Vs heterozygosity, genetic load.
5. Experimental investigation of fern sporophyte development (Shoot Apical Meristem, Lateral Primordia and Leaf determination, Induction of sporogenous tissue.
6. Structure and development of spore wall.
7. Culture of fern gametophytes. Photomorphogenesis in Fern gametophytes.

8. Taxonomy of Angiosperms and Biosystematics:

Special Theory II:

F.M.=50

1. Biosystematics principles, practice, limitations and scope ;phenotypic plasticity ;
2. Biodiversity: general concept, importance, assessment of variation and isolation.
3. Distribution of endemic plant families in the southern hemisphere of the globe.
4. Conservation: Principles, categories of threatened plants (IUCN), strategies of conservation, Red Data Book.
5. Botanic Garden, Herbaria and Botanical Survey of India.

Molecular markers in Plant Systematics and phylogenetic analysis: Nuclear ribosomal DNA, Chloroplast DNA and Mitochondrial DNA.

Bot/General/Pract./ (305)

Plant Pathology

Full Marks: 25

1. Study of different types of symptoms of plant diseases
 2. Study of some important plant pathogens in relation to suspect and symptoms produced by members of a) Phycomycetes b) Ascomycetes c) Basidiomycetes d) Deuteromycetes.
 3. Principles of sterilization and application of sterilization technique
 4. Isolation of plant pathogens from diseased plants
 5. Inoculation technique of different plant parts and study of Koch's postulates
- ** Students are required to submit field and laboratory records, preserved and dried specimens and permanent slides.

Gymnosperms

Full marks

1. A comparative study of the vegetative and reproductive parts of extinct gymnosperms.
2. A comparative study of the vegetative and reproductive parts of extant Cycads and Conifers.
3. Fieldwork.

** (Submission of field and laboratory records including permanent slides).

Bot/Spl./Pract./ (306)

1. Cytogenetics and Molecular Biology:

Practical

FM: 50

- 1) Comparative study of karyotypes of selected plant materials (both from root tips and leaf tips).
- 2) Scanning of chromosome aberrations (Mitotic and meiotic).
- 3) Effect mutagenic agent on plant system to note chromosomal irregularities.
- 4) Demonstration of alkaline phosphate activity of plant chromosome.
- 5) Chromosome banding technique.
- 6) Extraction, identification and estimation of plant DNA, RNA and protein.
- 7) Gel electrophoresis study of plant genetic DNA and plant protein.
- 8) PCR amplification on selected DNA fragment extracted from plant material.
- 9) Restriction digestion of genomic DNA and construction of restriction map.
- 10) Transformation of *E. coli* by suitable plasmids, transposon mutagenesis.
- 11) Micropropagation and induction of embryogenesis (Somatic and Gametic).
- 12) Demonstration of sophisticated instruments: Ultracentrifuge, fraction collector, Gel documentation, HPLC, PCR, AAS

2. Microbiology and Microbial Biotechnology

Practical

F.M. – 50

1. Quantitative estimation of Sugar, Protein, DNA and RNA by colorimetric method.
2. Separation of mixture of sugars and amino acids by paper Chromatography and Thin Layer Chromatography method and their identification.
3. Microbial growth measurement by turbidity, total count, construction of growth curve, determination of generation time..
4. Determination of MIC of antibiotic by tube dilution assay method. Assay of antibiotic by agar cup assay method.
5. Determination of phenol co-efficient.
6. Determination of thermal death point of bacteria.
7. Enrichment culture
 - a) Aerobic N_2 fixing bacteria
 - b) Nitrifying bacteria
 - c) Photosynthetic bacteria
 - d) Endospore forming bacteria
 - e) Cellulase producing bacteria,
 - f) Phosphate solubilizing bacteria.
8. Effect of pH, temperature and substrate concentration on bacterial amylase activity.
9. Determination of quality of milk by methylene blue reductase test method
10. Physio-biochemical test for identification of bacteria:-

- a) Catalase b) Protease, c) Amylase d) Acid & Gas Production, e) Indole production f) V-P Test, g) Lysine decarboxylase, h) Citrate utilization test.
- 11 Isolation of Plasmid / genomic DNA from bacteria and Agarose gel Electrophoresis of isolated DNA. DNA amplification by PCR. Restriction enzyme digestion, electrophoresis & documentation. SDS-PAGE of protein and determination of Mol. wt., Transposon mutagenesis. Transformation of E. coli by suitable plasmids.
- 12. Standard Quality analysis of water-
 - a) Presumptive test b) Confirmed test c) Completed test d) IMVIC test
- 13 Isolation of Rhizobium from nodule of Leguminous plant. Production of Rhizobium inoculant in laboratory fermenter.
- 14. Demonstration of the operation of following Instruments
 - a) Spectrophotometer UV-Vis, b) Lyophilizer c) Sonicator d) Fraction collector
 - e) GC-MS f) Laboratory fermenter g) Chemostat h) Cold Centrifuge
 - i) Ultracentrifuge j) Atomic Absorption k) HPLC l) SEM m) PCR
 - n) Gel documentation System

3. MYCOLOGY AND PLANT PATHOLOGY

PRACTICAL

FM 50

1. Identification of fungi by microscopic examination: i) members of Mastigomycotina of particular interest ii) members of Ascomycotina of particular interest iii) members of Basidiomycotina of particular interest iv) members of Deuteromycotina of particular interest
2. Study of hyphal types in fungal sporocarps
3. Estimation of total phenols in diseased and healthy host tissue.
4. Study of symptomatology and histopathology and identification of some plant diseases: a) diseases of particular interest caused by fungi of different groups b) some common diseases of plants caused by bacteria and viruses
5. Methods of differential staining of host and fungal pathogens in diseased tissues
6. Determination of role of pectic enzymes produced by pathogens in host tissue maceration
7. Determination of role of cellulase enzymes produced by pathogens in host tissue decay
8. Laboratory testing of fungicides: a) standard procedure for preparation of calibrated spore suspension b) standard procedure for preparation of stock solution of test chemicals c) standard procedure for fungicidal bioassay using spore germination technique.
9. Antibiotic bioassay: preparation of nutrient agar medium, preparation of standard dose of antibiotics and bioassay of antibiotics following standard protocols.
10. Study of mycorrhizal association on root samples of some common plants.
11. Demonstration of ELISA and GEL electrophoretic techniques

4. Palaeobotany and Palynology Special Paper

Full

marks 50

Practical

1. Field techniques in palaeobotany.
2. Laboratory preparations of fossils preserved as impressions, incrustations and petrifications.
3. Study of megafossil assemblages from different geological horizons especially from India.
4. Study of spore / pollen morphology of some extant representatives of pteridophytes, gymnosperms and angiosperms.
5. Laboratory extraction techniques of spores and pollen grains from coal, shale and other sedimentary rocks. Quantitative analysis of spore-dispersal in rock samples from different geologic horizons. Graphic representation of data for the determination of horizon and age.
6. Extraction, identification and quantitative analysis of spore / pollen assemblages from air and soil.

5. Phycology

Practical

F.M. 50

1. Collection, fixation & preservation techniques for different types of algae for different purposes.
2. How to study, describe, & prepare key up to species level using standard characters.
3. Study of Indian marine algae.
4. Determination of plankton; species diversity index and algal pollution index of a water body using phytoplankton; study of common phytoplanktons.
5. Culture of algae.
6. Cytology of algae.

6. Plant Physiology and Biochemistry

Practical Marks 50

1. Quantitative estimation of ascorbic acid in plant tissue.
2. Evaluation of seed viability by reliable physiological and biochemical methods.
3. Quantitative estimation of proline in salt-stressed leaf-tissues.
4. Effect of water stress on root metabolic activity.
5. Colorimetric estimation of Iron.
6. Extraction and estimation of fat.
7. Separation of amino acids by paper chromatographic technique.
8. Extraction and estimation of nucleic acids from plant samples.
9. Extraction and estimation of the enzyme catalase and amylase from plant samples.
10. Separation of phenolic compounds by thin layer chromatography
11. Purification of protein by SDS-PAGE

7. Pteridology: Practical

Marks 50

1. Study of different types of venation patterns and stomata through leaf clearings
2. Study of epidermal emergences
3. Study of petiole anatomy in different groups of Pteridophytes
4. Morphoanatomical studies of members of the following families: Polypodiaceae, Thelypteridaceae, Pteridaceae, Davalliaceae, Hymenophyllaceae, Dryopteridaceae, Athyriaceae, Azollaceae
5. Study and preparation of slides of spores through acetolysis method
6. Meiotic study of chromosomes from sporangia

8. Taxonomy and Biosystematics: Practical
Marks 50

1. Study of the representative species selected from the Subclasses mentioned in the Theory Syllabus.
2. Phytography as per the pattern followed in the recent Floras.
3. Application of ICBN with examples and problems.
4. Application of objective methods in taxonomy.

Syllabus for M.Sc. (Bot.) Fourth (IV) semester:

Bot/General/Theory/(401)

Plant Physiology Marks
45+5

1. A general discussion on phytohormones and plant growth regulators: Definitions; members of phytohormone family; growth promoting and retarding chemicals; general mode of hormone action; hormone binding proteins; second messengers; gene activation; examples of target cells for hormone action; a brief idea about modern techniques for hormone assay.
2. Auxins : Biosynthesis and degradation/deactivation of IAA; a brief account of the auxin structure and activity relationship; antiauxins and auxin antagonists; mechanism of auxin action – acid growth theory, auxin mutants.
3. Gibberellins : Chemical and structural characteristics of gibberellins; biosynthesis of GA_s, antigibberellins and their site of action, role of gibberellins in cereal seed and gene mediated action. germination, dwarfism and flowering; mode of action of gibberellins, gibberellin mutants.

4. Cytokinins: Chemical and structural characteristics, biosynthesis and degradation; role of cytokinins in cell division, organogenesis, embryogenesis; mode of action, cytokinin mutants.
5. Abscissic acid : Chemical and structural characteristic, biosynthesis and degradation; role of ABA in seed maturation, germination, gravitropism and stomatal closure; mode of action, ABA mutants.
6. Ethylene : Hormonal status; chemical characteristics, biosynthesis and metabolism; Yang cycle; factors regulating ethylene biosynthesis; mode of ethylene action; its role in higher plants, ethylene mutants.
7. Seed dormancy : Types, control mechanism, chemical and physical manipulative methods of breaking seed dormancy; ecological significance of dormancy.
8. Flowering : Photoperiodic control, hormonal regulation; nature of floral stimulus; experimental evidence to prove the mobile nature of floral stimulus, ABC model of flowering, second messenger and flowering.
9. Senescence : Types of senescence, biochemical indices of senescence, physiobiochemical changes occurring during leaf senescence, senescence regulatory genes.
10. Fruit ripening : Climacteric and nonclimacteric fruits; hormonal regulation of fruit ripening, biochemical changes occurring during fruit ripening.

Bot/General/Theory/(402)

Plant

Biochemistry

Marks 45+5

1. Carbohydrate metabolism : Glycolysis-control and significance; pentose phosphate pathway, its control and significance; Gluconeogenesis; control and significance.
2. Glyoxylate cycle: Control and significance;
3. Lipids: Biosynthesis and degradation, energetics of β -oxidation.
4. Enzyme kinetics: Deduction of Michaelis-Menten equation, Lineweaver-Burk plot; enzyme inhibition, isozymes, allosteric enzymes, ribozymes and abzymes.
5. Amino acids : Classification and structures, properties, determination of amino acid sequence in a polypeptide.
6. Proteins : Primary, secondary and tertiary structures; protein targeting in endoplasmic reticulum, chloroplast and mitochondrion; Ramachandran plot.
7. Photorespiration : Compartmentalized reactions; structural and functional characteristics of Rubisco and its regulation C-2 cycle, energetics and significance of the cycle.
8. Photosynthetic carbon reduction cycle: Different modes of CO₂ concentrating mechanisms, energetics and significance.
9. Principles and applications of chromatography, tracer techniques.

Bot/General/Theory/(403)

ECOLOGY:

Marks 25, 25 lecture

hours

1. **Scope of plant ecology**; its relation to other disciplines and relevance to human civilization.
2. **The Environment**: Physical environment; biotic environment; biotic and abiotic interactions.
3. **Habitat and niche**: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
4. **Population ecology**: Characteristics of a population; population growth curves; population regulation; life history strategies (*r* and *K* selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.
5. **Species interactions**: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.
6. **Community ecology**: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.
7. **Ecological succession**: Types; mechanisms; changes involved in succession; concept of climax.
8. **Ecosystem**: Structure and function; energy flow and mineral cycling; primary production and decomposition; some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine)
9. **Applied ecology**: Environmental pollution; global environmental change; biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches.
10. **Conservation biology**: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

Molecular Biology & Plant Breeding

Marks:

25

- 1) DNA & RNA Metabolism: DNA topology, DNA damage and repair transcription, processing, regulation, post-transcriptional control and gene silencing, Protein synthesis and its regulation, protein targeting
- 2) Gene expression: Principles of gene regulation; Regulation of gene expression in prokaryotes and eukaryotes.
- 3) Bio-signalling: Signal perception, molecular mechanisms of signal transduction and regulation
- 4) Centre of origin & diversity of crops, Principle & technique in plant breeding & its genetic basis, Breeding method for self & cross pollinated crops, Ploidy, Heterosis, Mutation Breeding
- 5) Population Genetics: Polygene hypothesis, Gene frequency in population & Hardy-Weinberg Law, Genetic drift

Bot/General/Prac/(404)

General Practical Plant Physiology, and Biochemistry,

Marks:

50

Plant Physiology**Marks 25**

1. Determination of water potential of plant samples by Chardakov's method.
2. Quantitative estimation of accumulated chloride ion in cell sap.
3. Study of photolysis of water by demonstration of Hill reaction.
4. Effect of high temperature stress on membrane deterioration in terms of electrical conductivity test.
5. Effect of respiratory inhibitor on the rate of respiration.
6. Quantitative estimation of dissolved oxygen due to photosynthesis by Winkler's method.
7. Effect of sodium azide on water uptake by plants.
8. Bioassay of IAA by wheat coleoptile test.

Biochemistry**25 marks**

1. Quantitative estimation of amino acids by spectrophotometric method using ninhydrin reagent.
2. Quantitative estimation of protein by spectrophotometric method using folin-Ciocalteu reagent.
3. Quantitative estimation of carbohydrate by spectrophotometric method using Anthrone reagent.
4. Determination of Acid value of fat sample.
5. Determination of total titratable acidity of cell sap.
6. Preparation of a standard curve for IAA and determination of unknown concentration of IAA.
7. Preparation of a standard curve for phenolic compound and determination of the concentrations of unknown phenolic compound.
8. Spectrophotometric estimation of reducing sugar by 3, 5,- dinitrosalicylic acid (DNS).

Bot/General/Prac/(405)- FM- 50**Ecology****Marks 25**

1. Determination of species area curve by Quadrat method.
2. Determination of density, frequency and basal cover of species.
3. Determination of association index of species.
4. Determination of index of similarity / dissimilarity between two communities.
5. Estimation of organic matter content of soil.
6. Determination of total soluble salts of soil / water.
7. Some field tests for the determination of soil texture.
8. Determination of nutrient content of soil by kit- method.
9. Colorimetric determination of nitrogen and phosphorus of soil.
10. Determination of dissolved oxygen in unpolluted and polluted water.
11. Determination of biodiversity in a plant community.

Plant Breeding Biometry Molecular Biology**Marks: 25****Practical**

1. Vegetative propagation: Layering, cutting, inarching, grafting, T-budding.
2. Weathering of micropropagules.

3. Isolation of chlorophyll mutants following irradiation and / or with chemical mutagens (Demonstration).
4. Diallel-breeding analysis
5. Genotype-Environment Interaction, Correlation coefficient.
6. Different techniques of emasculation and hybridization in self and cross pollinated plants.
7. Yield component analysis.
8. Isolation of plant nuclear DNA and protein and their spectrophotometric analysis (Demonstration).

Bot/Diss/(406)

Dissertation of Special Paper(S):

FM: 50

SYLLABUS

M. Sc. Course in Chemistry

To be effective from the session 2020-22



THE UNIVERSITY OF BURDWAN

BURDWAN 713 104

WEST BENGAL, INDIA

www.buruniv.ac.in

Semester I

Course				Lecture Hour /week	Duration of Exam (Hour)	Marks			Credit
Course code	Type	T/ P	Name			I.A	E.T	Total	
MSCH101	Core	T	Inorganic Gen-I	4H	2H	10	40	50	4
MSCH102	Core	T	Nuclear Analytical Gen-I	4H	2H	10	40	50	4
MSCH103	Core	T	Organic Gen-I	4H	2H	10	40	50	4
MSCH104	Core	T	Physical Gen-I	4H	2H	10	40	50	4
MSCH105	Core	P	Inorganic Practical	8H	4H	10	40	50	4
MSCH106	Core	P	Nuclear Analytical Practical	8H	4H	10	40	50	4
					Total credit				24

Semester II

Course				Lecture Hour /week	Duration of Exam (Hour)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSCH201	Core	T	Inorganic Gen-II	4H	2H	10	40	50	4
MSCH202	Core	T	Nuclear Analytical Gen-II	4H	2H	10	40	50	4
MSCH203	Core	T	Organic Gen-II	4H	2H	10	40	50	4
MSCH204	Core	T	Physical Gen-II	4H	2H	10	40	50	4
MSCH205	Core	P	Organic Practical	8H	4H	10	40	50	4
MSCH206	Core	P	Physical Practical	8H	4H	10	40	50	4
					Total credit				24

Semester III

Course				Lecture Hour /week	Duration of Exam (Hour)	Marks			Credit
Course code	Type	T/ P	Name			I.A.	E.T	Total	
MSCH301	Core	T	Inorganic Advanced General	4H	2H	10	40	50	4
MSCH302	Core	T	Nuclear Analytical Advanced General	4H	2H	10	40	50	4
MSCH303	Core	T	Organic Advanced General	4H	2H	10	40	50	4
MSCH304-M*	GE	T	Basics in Medicinal Chemistry	2H	1H	05	20	25	2
MSCH304-I*	GE	T	Basics in Industrial Chemistry	2H	1H				
MSCH305-I	DE	T	Inorganic Major-I	4H	2H	10	40	50	4
MSCH305-N	DE	T	Nuclear Analytical Major-I	4H	2H				
MSCH305-O	DE	T	Organic Major-I	4H	2H				
MSCH305-P	DE	T	Physical Major-I	4H	2H				
MSCH306-I	DE	P	Inorganic Major-I Practical	8H	4H	10	40	50	4
MSCH306-N	DE	P	Nuclear Analytical Major-I Practical	8H	4H				
MSCH306-O	DE	P	Organic Major-I Practical	8H	4H				
MSCH306-P	DE	P	Physical Major-I Practical	8H	4H				
MSCH307	CE	N. A.	Social Outreach	N.A.	N.A.	5	20	25	2
					Total credit				24

***Minor elective**

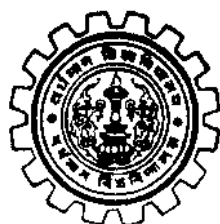
Abbreviation used: CE → Community Engagement Activities; DE → Discipline-centric Elective; GE → Generic elective (One generic elective course in Semester III may be opted from SWAYAM)

Semester IV

Course				Lect. Hour /week	Durati on of Exam (Hour)	Marks			Credit	
Course code	Type	T/P	Name			I.A	E.T	Total		
MSCH401	Core	T	Physical Advanced General	4 H	2 H	10	40	50	4	
MSCH402	Core	T	Medicinal Chemistry	4 H	2 H	10	40	50	4	
MSCH403-I	Floating	T	Inorganic Major-II	4 H	2 H	10	40	50	4	
MSCH403-N	Floating	T	Nuclear Analytical Major-II	4 H	2 H					
MSCH403-O	Floating	T	Organic Major-II	4 H	2 H					
MSCH403-P	Floating	T	Physical Major-II	4 H	2 H					
MSCH404-I	DE	T	Inorganic Major-III	4 H	2 H	10	40	50	4	
MSCH404-N	DE	T	Nuclear Analytical Major-III	4 H	2 H					
MSCH404-O	DE	T	Organic Major-III	4 H	2 H					
MSCH404-P	DE	T	Physical Major-III	4 H	2H					
MSCH405-I	DE	P	Inorganic Major-II Practical	8 H	4H	10	40	50	4	
MSCH405-N	DE	P	Nuclear Analytical Major-II Practical	8 H	4H					
MSCH405-O	DE	P	Organic Major-II Practical	8 H	4H					
MSCH405-P	DE	P	Physical Major-II Practical	8 H	4H					
MSCH406-I	Project/ Term paper	N.A	Inorganic	4H	---	10	40	50	4	
MSCH406-N	Project/ Term paper	N.A	Nuclear Analytical	4H	---	---				
MSCH406-O	Project/ Term paper	N.A	Organic	4H	---	---				
MSCH406-P	Project/ Term paper	N.A	Physical	4H	---	---				
					Total credit					24

SYLLABUS
for
M. Sc. Course in
Chemistry

To be effective from the session 2007-09



THE UNIVERSITY OF BURDWAN
BURDWAN 713 104
WEST BENGAL, INDIA

THE UNIVERSITY OF BURDWAN

Syllabus for M. Sc. Course in Chemistry Distribution of papers and marks

(A) SEMESTER-I

THEORETICAL

Paper*	Division	Marks	Lect. Hrs.	Exam. Hrs.
CG 101	A + B	45	54	3
CG 102	A + B	45	54	3
CG 103	A + B	45	54	3
CG 104	A + B	45	54	3
Internal assessment		20**		
Subtotal:		200		

*General paper

**Each paper with 5 marks for internal assessment

PRACTICAL

Paper	Division [¶]	Marks	Lab. Hrs.	Exam. Hrs.
CGP 105	15 + 10 + 25	50	50	5
CGP 106	-Do-	50	50	5
Subtotal:		100		

[¶]15 sessional, 10 viva, 25 examination

Total of Semester-I (Theory + Practical): 300 Marks

(B) SEMESTER-II

THEORETICAL

Paper*	Division	Marks	Lect. Hrs.	Exam. Hrs.
CG 201	A + B	45	54	3
CG 202	A + B	45	54	3
CG 203	A + B	45	54	3
CG 204	A + B	45	54	3
Internal assessment		20**		
Subtotal:		200		

*General paper

**Each paper with 5 marks for internal assessment

PRACTICAL

Paper	Division [¶]	Marks	Lab. Hrs.	Exam. Hrs.
CGP 205	15 + 10 + 25	50	50	5
CGP 206	-Do-	50	50	5
Subtotal:		100		

[¶]15 sessional, 10 viva, 25 examination

Total of Semester-II (Theory + Practical): 300 Marks

(C)

SEMESTER-III

THEORETICAL

Paper ^{¶¶}	Division	Marks	Lect. Hrs.	Exam. Hrs.
CAG 301	A + B	45	54	3
CAG 302	A + B	45	54	3
CAG 303	A + B	45	54	3
CS 304	A + B	45	54	3
Internal assessment		20**		
Subtotal:		200		

^{¶¶}Papers CAG 301, CAG 302 and CAG 303 (advanced general) common to all and Paper CS 304 to respective specials

** Each paper with 5 marks for internal assessment

PRACTICAL

Paper ^{¶¶}	Division [¶]	Marks	Lab. Hrs.	Exam. Hrs.
CGP 305	15 + 10 + 25	50	50	5
CSP 306	-Do-	50	50	5
Subtotal:		100		

[¶]15 sessional, 10 viva, 25 examination

^{¶¶}Paper CGP 305 common to all and Paper CSP 306 to respective specials

Total of Semester-III (Theory + Practical): 300 Marks

(D) SEMESTER-IV
THEORETICAL

Paper ^{¶¶}	Division	Marks	Lect. Hrs.	Exam. Hrs.
CAG 401	A + B	45	54	3
CS 402	A + B	45	54	3
CS 403	A + B	45	54	3
Internal assessment		15**		
Subtotal:		150		

^{¶¶}Paper CAG 401 (advanced general) common to all and Papers CS 402 and CS 403 to respective specials

**each paper with 5 marks for internal assessment

PRACTICAL

Paper ^{¶¶}	Division	Marks	Lab. Hrs.	Exam. Hrs.
CSP 404	50 [§]	50	50	5
CCA 405	50 [§]	50	50	5
CTP 406 ^{§§}	35 + 10 + 5 ^{§§§}	50	50	-
Subtotal:		150		

^{¶¶}Paper CSP 404 to respective specials and Paper CCA 405 (computer application in chemistry) and CTP 406 (term paper) common to all

[§]15 sessional, 10 viva, 25 examination

^{§§}Focusing contents of Papers CS 402 and CS403

^{§§§}35 For preparation of term papers, 10 seminar, 5 viva

Total of Semester-IV (Theory + Practical): 300 Marks

Grand Total (Semester-I + Semester-II + Semester-III + Semester-IV): 1200 Marks

Semester-I
Theoretical
CG 101: Inorganic General
Group A

1. Valency theories — quantum chemical approach: (13 lectures)

Variation method, LCAO and Huckel approximation applied to H_2^+ and H_2 type systems, sigma and pi MO's (ethylene, allyl systems, butadiene, benzene etc.); comparative study of the application of VB and MO methods to diatomic species; MO of polyatomic molecules; Walsh diagram, configuration interaction, orbital construction for H_n type systems, isolobal analogy

2. Coordination chemistry — bonding, stereochemistry and structure: (14 lectures)

Crystal field theory, crystal field diagram, ligand field theory, molecular orbital theory and angular overlap model; spectral properties, vibronic coupling, intensity stealing, band broadening, spectrochemical series, nephelauxetic series; magnetic properties; structural distortion and lowering of symmetry, electronic, steric and Jahn-Teller effects on energy levels, conformation of chelate ring, structural equilibria

Group B

3. Cluster compounds: (13 lectures)

Introduction, clusters in elemental states, cluster classification, skeletal electron (Elm) counting, higher boron hydrides-structures and reactions, equation of balance, Lipscomb topological diagrams, polyhedral skeletal electron pair theory (PSEPT), carboranes, metalloboranes and heteroboranes, metallocarboranes, zintl ions, chevreton compounds, infinite metal chains, cluster-surface analogy.

4. Bioinorganic chemistry: (14 lectures)

Metal ions in biology, myoglobin, hemoglobin, hemocyanin, hemerythrin, cytochromes, rubredoxin, ferredoxins; biological fixation of nitrogen, chlorophyll and photosynthesis; PS-I, PS-II, bioenergetics and ATP cycle, glucose storage, Na^+/K^+ ion pump, ionophores, DNA polymerization, metal ion interaction with nucleoside and nucleotide; metal-protein interaction — storage, transfer and activity; study of metalloprotein and metalloenzyme — catalase, peroxidase, ceruloplasmin, cytochrome oxidase, carbonic anhydrase, carboxy peptidase, metallothionein, xanthine oxidase,

sulphite oxidase, nitrate reductase, superoxide dismutase, chemistry of respiration; vitamin B₁₂ and B₁₂-enzyme; toxicity and detoxification of metal ions; chelation therapy.

Tentative List of Recommended Books/Journals

- R. McWeeney, *Coulsons' Valence*, 3rd Edn, Oxford University Press, Oxford, 1979.
- T. A. Albright, J. K. Burdett and M. H. Whangbo, *Orbital Interactions in Chemistry*, Wiley, New York, 1985.
- K. Fukui and Fujimoto, *Frontier Orbital and Reaction Paths*, World Scientific, Singapore, 1995.
- G. Wulfsberg, *Inorganic Chemistry*, Viva Books Private Ltd., New Delhi, 2001.
- D. F. Shriver, P. W. Atkins and C. H. Langford, *Inorganic Chemistry*, Oxford University Press, New York, 1990.
- B. Douglas, D. McDaniel and J. Alexander, *Concepts and Models of Inorganic Chemistry*, 3rd Edn, John Wiley and Sons, Inc., New York, 2001.
- J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th Edn, Harper Collins College Publishers, New York, 1993.
- T. P. Fehlner, J. -F. Halet and J. -Y. Saillard, *Molecular Clusters — A Bridge to Solid State Chemistry*, Cambridge University Press, Cambridge, 2007.
- M. Driess and H. Noth (Eds.), *Molecular Clusters of the Main Group Elements*, Wiley-VCH, Weinheim, 2004.
- D. M. P. Mingos and D. J. Wales, *Introduction to Cluster Chemistry*, Prentice Hall, New York, 1990.
- D. M. P. Mingos (Ed.), *Structural and Electronic Paradigms in Cluster Chemistry*, Springer, Berlin, 1997.
- D. F. Shriver, H. D. Kaesz and R. D. Adams (Eds.), *The Chemistry of Metal Cluster Complexes*, VCH, New York, 1990.
- P. Braunstein, L. A. Oro and P. R. Raithby (Eds.), *Metal Clusters in Chemistry*, Wiley-VCH, Weinheim, 1999.
- M. H. Chisholm (Ed.), *Early Transition Metal Clusters with π -Donor Ligands*, VCH, New York, 1995.
- K. J. Klabunde, *Free Atoms, Clusters and Nanoscale Particles*, Academic Press, New York, 1994.
- J. G. Verkade, *A Pictorial Approach to Molecular Bonding*, 2nd Edn, Springer-Verlag, New York, 1997.
- O. Kahn, *Molecular Magnetism*, VCH, New York, 1993.
- A. Das and G. N. Mukherjee, *Elements of Bioinorganic Chemistry*, 2nd Edn, U. N. Dhur and Sons, Kolkata, 2002.
- I. Bertini, H. B. Gray, S. J. Lippard and J. S. Valentine, *Bioinorganic Chemistry*, Viva Books Pvt. Ltd., New Delhi, 1998.
- W. Kaim and B. Schwederski, *Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life*, Wiley, New York, 1994.
- S. J. Lippard and J. M. Berg, *Principles of Bioinorganic Chemistry*, University Science Books, Mill Valley, CA, 1993.
- P. M. Harrison and R. J. Hoare, *Metals in Biochemistry*, Chapman and Hall, 1980.
- C. A. McAuliffe (Ed) *Techniques and Topics in Bioinorganic Chemistry*, Halsted, New York, 1975.
- R. W. Hay, *Bioinorganic Chemistry*, Ellis Horwood, Chichester, New York, 1984.

CG 102: Nuclear-Analytical General

Group A

1. Nuclear properties and structure: (22 lectures)

Fundamentals, mass-energy relationship, nuclear binding energy and its role in nuclear stability, concept of nuclear angular momentum, magnetic dipole moment and electronic quadrupole moment (elementary idea), parity of nuclear energy states; liquid drop model, formulation of semi-empirical binding energy equation, mass parabola and application of binding energy equation; nuclear reactions, Q-value and cross section of nuclear reaction, compound nucleus theory (qualitative approach), calculation of fission probability using binding energy equation, shell model, nuclear magic number and its derivation from nuclear potential well, calculation of nuclear spin, nuclear isomerism and non-optical transitions

2. Statistics of radioactivity measurements: (05 lectures)

Statistical models, application of counting statistics in nuclear measurements

Group B

3. Radioactive equilibrium: (08 lectures)

Successive disintegration, Bateman equation, secular and transient equilibrium, no equilibrium; analysis of special types of successive disintegration, formation of radioelement in a nuclear reaction, activation analysis

4. Cosmochemistry: (04 lectures)

Different geological systems, age of rocks and earth, cosmic rays and its effect in meteorites, nuclear reactions in stars

5. Nuclear detection techniques and spectroscopy: (15 lectures)

Principle of nuclear detection, gas detector, ionization chamber, proportional and G. M. detector, dead time of detectors; Mossbauer spectroscopy: Mossbauer effect — conditions, nuclear recoil, Doppler effect, instrumentation, chemical shift examples, quadrupole effect, effect of magnetic field, effect of simultaneous electric and magnetic fields, typical spectra of iron and tin compounds, NQR

Tentative List of Recommended Books/Journals

- H. J. Arnika, *Essentials of Nuclear Chemistry*, 4th Edn Reprint, New Age International (P) Ltd Publications, New Delhi, 2001.
- R. D. Evans, *The Atomic Nucleus*, McGraw-Hill, New York, 1979.
- B. Harvey, *Introduction to Nuclear Physics and Chemistry*, Prentice Hall, 1965.
- S. Glasstone, *Source Book of Atomic Energy*, East-West Press Private Ltd, New Delhi, 1967.
- G. R. Choppin and J. Rydberg, *Nuclear Chemistry: Theory and Applications*, Pergamon Press, Oxford, 1980.
- G. Friedlander, J. W. Kennedy, E. S. Macias and J. M. Miller, *Nuclear and Radiochemistry*, 3rd Ed., Jhon Wiley & Sons Inc., New York, 1981
- D. D. Sood, A.V. R Reddy, N. Ramamoorthy, *Fundamentals of Radiochemistry*, Yancas, Mumbai, 2004
- V. I. Goldanskii and R. H. Herber, *Chemical Applications of Mossbauer Spectroscopy*, Academic Press, New York, 1968.
- N. N. Greenwood and T. C. Gibb, *Mossbauer Spectroscopy*, Chapman and Hall, London, 1971.
- C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1994.
- R. S. Drago, *Physical Methods for Chemists*, Saunders, Philadelphia, 1992.
- J. M. Hollas, *Modern Spectroscopy*, Wiley, New York, 1996.

CG 103: Organic General

Group A

1. Stereochemistry: (20 lectures)
 Molecular symmetry and chirality; stereoisomerism: definitions, classifications; configuration and conformation; relative and absolute configuration; determination of relative configuration: Prelog's rule, Cram's rule (Felkin modification), and Sharpless rule; conformations of acyclic and cyclic system (3 to 8 membered rings), fused (5/5 & 6/6), spiro and bridged bicyclo systems; stability, reactivity and mechanism; allylic strain; reactions of 5/6-membered ring containing one or more trigonal carbon(s)

2. Quantitative relationship between structure and reactivity: (07 lectures)
 Linear free energy relations: Hammett equation; equilibria and rates in organic reactions; separation of polar, steric and resonance effects: Taft equation, Grunwald - Winsten equation

Group B

3. Application of spectroscopy in structural elucidation: (27 lectures)

Ultraviolet Spectroscopy

Transitions, vacuum ultraviolet, applications in conjugated dienes, some correlation studies, trienes, polyenes, steroids and triterpenoids, stereochemical applications, α,β -unsaturated carbonyl compounds; solvent effect, applications in aromatic and heterocyclic compounds (05 lectures)

Infrared Spectroscopy

Concept of vibrational spectra, stretching and bending vibrations, application identification of functional groups, applications in sequence of organic synthetic reactions and in the structure elucidation of simple organic molecules, FTIR (06 lectures)

NMR spectroscopy

Chemical shift, coupling constant and application in organic molecules (06 lectures)

Mass Spectrometry

Electron impact mass spectroscopy, low and high resolution, exact masses of nucleides, molecular ions, isotope ions, mass marking techniques, fragment ions of odd and even electron types, rearrangement ions, factors affecting cleavage patterns (10 lectures)

Tentative List of Recommended Books/Journals

- F.A. Carey and R.J. Sundberg, *Advanced Organic Chemistry Part A and Part B*, 4th Edn., Plenum Press, New York, 2001.
 I.L. Finar, *Organic Chemistry*, Vol I, 6th Edn., Addison Wesley Longmann, London, 1998.
 I.L. Finar, *Organic Chemistry*, Vol II, 5th Edn., ELBS, London, 1995.
 W. J. I. Noble, *Highlights of Organic Chemistry*, Mercel Dekker, 1974.
 E.L. Eliel, S.H. Wilen and L.N. Mander, *Stereochemistry of Organic Compounds*, John Wiley & Sons, New York, 1994.
 D. Nasipuri, *Stereochemistry of Organic Compounds*, 2nd Edn., Wiley Eastern, New Delhi, 1993.
 W. Kemp, *Organic Spectroscopy*, 3rd Edn., McMillan, Hong Kong, 1991.
 D. H. Williams and I. Fleming, *Spectroscopic Methods in Organic Chemistry*, 5th Edn., Tata McGraw-Hill, New Delhi, 2005.
 J. R. Dyer, *Applications of Absorption Spectroscopy of Organic compounds*, 2nd print Prentice_Hall, New Jersey, 1971.

R. M. Silverstein and F. Webster, *Spectrometric Identification of Organic Compounds*, 6th Edn., John Wiley, New York, 1998.

K. Biemann, *Mass Spectrometry – Application to Organic Chemistry*, McGraw-Hill, New York, 1962.

H. Budzikiewicz, C. Djerassi and D.H. Williams, *Mass Spectrometry of Organic Compounds*, Holden-Day, 1967.

R.C. Banks, E.R. Matjeka and G. Mercer, *Introductory Problems in Spectroscopy*, Benjamin/Cummings Publishing Co., 1980.

R.T. Morison, and R. N. Boyd, *Organic Chemistry*, 6th Edn., Prentice-Hall India Private Ltd., New Delhi, 1992.

J. Barker, *Mass Spectrometry*, 2nd Edn., John Wiley, New York, 2000.

K. Downard, *Mass Spectrometry: A Foundation Course*, Royal Society of Chemistry, UK, 2004.

G. Siurdek, *The Expanding Role of Mass Spectrometry in Biotechnology*, MCC Press, San diego, 2004

C. Dass, *An Introduction to Biological Mass Spectrometry*, Wiley, USA, 2002.

CG 104: Physical General

Group A

1. Symmetry and group theory I: (09 lectures)

Point symmetry operations, groups and group multiplication tables, similarity transformation and conjugate classes, identification of point groups and stereographic projection, representation of symmetry operators and groups; characters of symmetry operators in a representation, invariance of character under similarity transformation, rules (without derivation) for construction of character tables with illustrations, symmetry elements and symmetry operations of the Platonic solids, symmetry of the fullerene [60] structure

2. Quantum mechanics I: (09 lectures)

Summarization of the results of some experiments — black-body radiation, photoelectric effect, Davison and Germer experiment, Franck-Hertz experiment, Young's double slit experiment; identification of classical and quantum systems, Bohr's correspondence principle with examples; postulates of quantum mechanics, properties of wave functions, operators and related theorems

3. Atomic spectra: (09 lectures)

Quantum numbers, orbital and spin angular momenta of electrons, Stern-Gerlach experiment, vector atom model, term symbols (one and two optical electron systems), normal and anomalous Zeeman effect, Paschenback effect.

Group B

4. Thermodynamics and statistical mechanics: (12 lectures)

Legendre transformation with applications; Maxwell-Boltzmann distribution with degeneracy (for both distinguishable and indistinguishable particles), partition function and its properties, interpretation of thermodynamic laws, thermodynamic function in terms of partition functions, molecular partition functions (translational, rotational, vibrational and electronic) for ideal gas, calculation of thermodynamic functions for monoatomic and diatomic gases, equipartition principle, equilibrium constant in terms of partition function

5. Principles of molecular spectroscopy: (15 lectures)

Electromagnetic spectrum and molecular processes associated with the regions; rotational spectra: classification of molecules into spherical, symmetric and asymmetric tops; diatomic molecules as rigid rotors — energy levels, selection rules and spectral features, isotope effect, intensity distribution, effect of non-rigidity on spectral features; vibrational spectra of diatomics: potential energy of an oscillator, Harmonic Oscillator approximation, energy levels and selection rules, anharmonicity and its effect on energy levels and spectral features: overtones and hot bands, vibration-rotation spectra of diatomics: origin; selection rules; P, Q and R branches; Raman spectra: origin, selection rules, rotational and vibrational Raman spectra of diatomics; NMR spectra: theory, relaxation process, instrumentation, chemical shift and shielding, factors contributing to magnitude of shielding, spin interactions — its origin, equivalent protons, qualitative idea of energy levels of AX and A₂ systems, a few representative examples

Tentative List of Recommended Books/Journals

- G. W. Castellan, *Physical Chemistry*, 3rd Edn, Narosa Publishing House, 1995.
 I. N. Levine, *Physical Chemistry*, Tata McGraw-Hill, 1978.
 G. K. Vemulapalli, *Physical Chemistry*, Prentice-Hall, India, 1997.
 R. S. Berry, S. A. Rice and J. Ross, *Physical Chemistry*, Oxford University Press, Oxford, 2000.
 P. W. Atkins, *Physical Chemistry*, Oxford University Press, Oxford, 1998.
 F. A. Cotton, *Chemical Applications of Group Theory*, 3rd Edn Reprint, John Wiley and Sons, New York, 1999.
 A. Vincent, *Molecular Symmetry and Group Theory*, John Wiley and Sons, New York, 1998.
 H. Eyring, J. Walter and G. F. Kimball, *Quantum Chemistry*, Wiley, New York, 1944.

- A. K. Chandra, *Introductory Quantum Chemistry*, Tata McGraw-Hill Publishing Co, New Delhi, 1989.
- F. L. Pilar, *Elementary Quantum Chemistry*, Tata McGraw-Hill, 1990.
- P. W. Atkins, *Molecular Quantum Mechanics*, Clarendon Press, Oxford, 1980.
- E. Merzbacher, *Quantum Mechanics*, John Wiley and Sons, 1970.
- L. I. Schiff, *Quantum Mechanics*, McGraw-Hill, 1985.
- L. Pauling and E. B. Wilson, *Introduction to Quantum Mechanics*, McGraw-Hill, 1939.
- C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Edn, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1994.
- G. M. Barrow, *Introduction to Molecular Spectroscopy*, McGraw-Hill International Book Company, Tokyo, 1982.
- H. E. White, *Introduction to Atomic Spectra*, McGraw-Hill Kogakusha Ltd., Tokyo, 1934.
- K. Denbigh, *Principles of Chemical Equilibrium*, Cambridge University Press, Cambridge, 1981.
- N. A. Gokcen and R. G. Reddy, *Thermodynamics*, Plenum Press, New York, 1996.
- I. M. Klotz and R. M. Rosenberg, *Chemical Thermodynamics*, John Wiley, New York, 1994.
- F. Reif, *Fundamentals of Statistical and Thermal Physics*, McGraw-Hill, 1965.

Practical

CGP 105: Inorganic General

1. Experiments on quantitative estimation: analysis of selected ores, minerals and alloys
2. Synthesis and characterization of inorganic and coordination compounds: selected simple salts, double salts and coordination compounds with some common inorganic and organic ligands

CGP 106: Nuclear-Analytical General

1. Radioactivity measurements
2. Separation techniques involving ion exchange and solvent extraction
3. Titrimetric estimation of different organic compounds
4. Beer's law: application in different chemical matrices

Semester-II

Theoretical

CG 201: Inorganic General

Group A

1. Chemistry of elements — comparative accounts: (27 lectures)

Design and synthesis, geometric and electronic structures, stereochemistry and bonding, reactivity and reaction pathways of various coordination compounds of

transition and non-transition metal ions with halide, pseudohalide, aquo, hydroxo, oxo, carboxylate, amine, amide, polypyridine, azoimine, phosphine, carbonyl, nitrosyl, dioxolene, azophenol, macrocycle, Schiff base etc. and their mixed mono-, bi-, and polynuclear complexes; a closer look at the applications of coordination molecules in different fields of chemistry and related disciplines

Group B

2. Structure and properties of solids: (18 lectures)

Bonding in metals, ionic, covalent and hydrogen bonded solids; perovskite, ilmenite and rutile; spinel and inverse spinel, silicates: pyroxene, amphibole, talc, mica, clay, zeolite, ultramarine; crystal defects, non-stoichiometric compounds; electronic properties of solids, conductors, semiconductors, insulators, superconductors; ferroelectricity, antiferroelectricity, piezoelectricity, liquid crystals, cooperative magnetism

3. Organometallic chemistry I: (09 lectures)

Historical development, classification, nomenclature, valence electron count, oxidation number and formal ligand charge; structure and bonding of carbonyls, nitrosyls and related pi- acids, alkyl, alkene, alkyne, π -allyl, polyene and cyclopolyene compounds; metal carbenes and carbynes, isolobal analogy, Dewar-Chatt model, oxophilicity, Agostic interaction

Tentative List of Recommended Books/Journals

- N. N. Greenwood and A. Earnshaw, *Chemistry of the Elements*, 2nd Edn, Pergamon, New York, 1997.
- G. L. Miessler and D. A. Tarr, *Inorganic Chemistry*, Prentice-Hall, New Jersey, 1999.
- A. F. Holleman and E. Wifrig, *Inorganic Chemistry*, Academic Press, New York, 1995.
- G. Wulfsberg, *Inorganic Chemistry*, Viva Books Private Ltd., New Delhi, 2001.
- J. D. Lee, *Concise Inorganic Chemistry*, Chapman and Hall, London, 1991.
- G. Wulfsberg, *Principles of Descriptive Inorganic Chemistry*, University Science Books, Mill Valley, CA, 1991.
- F. A. Cotton, G. Wilkinson, C. M. Murillo and M. Bochmann, *Advanced Inorganic Chemistry*, 6th Edn, John Wiley and Sons, Inc., New York, 1999.
- B. Douglas, D. McDaniel and J. Alexander, *Concepts and Models of Inorganic Chemistry*, 3rd Edn, John Wiley and Sons, Inc., New York, 2001.
- J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th Edn, Harper Collins College Publishers, New York, 1993.

- G. B. Richter-Addo and P. L. Legzdins, *Metal Nitrosyls*, Oxford University Press, New York, 1992.
- F. A. Cotton and R. A. Walton, *Multiple Bonds Between Metal Atoms*, 2nd Edn, Clarendon Press, Oxford, UK, 1993.
- D. L. Kepert, *Inorganic Stereochemistry*, Springer, Berlin, 1982.
- A. von Zelewsky, *Stereochemistry of Coordination Compounds*, Wiley, New York, 1996.
- S. P. Sinha, *Systematics and Properties of Lanthanides*, Riedel, Dordrecht, 1983.
- J. J. Katz, G. T. Seaborg and L. R. Morss (Eds), *The Chemistry of the Actinide Elements*, Vols I and II, 2nd Edn, Chapman and Hall, London, 1986.
- A. F. Wells, *Structural Inorganic Chemistry*, 5th Edn, Oxford University Press, Oxford, 1984.
- D. M. Adams, *Inorganic Solids*, Wiley, New York, 1992.
- S. R. Elliot, *The Physics and Chemistry of Solids*, John Wiley & Sons, Chichester, 1998.
- W. A. Harrison, *Electronic Structure and the Properties of Solids: The Physics of the Chemical Bonds*, Dover Publications, New York, 1989.
- M. Cox, *Optical Properties of Solids*, Oxford University Press, Oxford, 2001.
- T. C. W. Mak and G. -D. Zhou, *Crystallography in Modern Chemistry*, Wiley, New York, 1992.
- G. A. Jeffrey, *An Introduction to Hydrogen Bonding*, Oxford University Press, Oxford, 1997.
- G. A. Jefferey and W. Saenger, *Hydrogen Bonding in Biological Structures*, Springer, Berlin, 1991.
- A. J. Stone, *The Theory of Intermolecular Forces*, Clarendon Press, Oxford, 1996.
- J. W. Steed and J. L. Atwood, *Supramolecular Chemistry*, John Wiley and Sons, New York, 2000.
- P. Powell, *Principles of Organometallic Chemistry*, 2nd Edn, Chapman and Hall, London, 1988.
- G. W. Parshall, *Homogeneous Catalysis*, Wiley, New York, 1980.
- C. N. Satterfield, *Heterogeneous Catalysis in Practice*, McGraw-Hill, New York, 1980.
- J. D. Atwood, *Inorganic and Organometallic Reaction Mechanisms*, 2nd Edn, VCH, New York, 1997.

CG 202: Nuclear-Analytical General

Group A

1. Separation techniques: (18 lectures)
 Solvent extraction: principle, distribution ratio and partition coefficient, successive extraction and separation; different methods of extraction systems; Craig extraction and counter current distribution; problems; Chromatography: general principle; classification, mathematical relations of capacity, selectivity factor, distribution constant and retention time; chromatogram, elution in column chromatography: band broadening and column efficiency; van Deemter equation; column resolution, numerical problems, gas chromatography, high performance chromatography and supercritical fluid chromatography: principles, methods, comparison and applications; thin-layer chromatography, size-exclusion chromatography, ion chromatography and capillary electrophoresis: principles, methods and applications

2. Environmental chemistry: (09 lectures)

Greenhouse effect monitoring, mechanistic pathways of smog formation and ozone hole, acid rain; major, minor and trace constituents of the atmosphere; water quality parameters, biochemical effects of As, Pb, Cd, Hg and their chemical speciation; eutrophication, waste water treatment — primary, secondary and tertiary treatment nuclear waste; nuclear accidents, control of air pollution: different methods — gravitational settling chamber, cyclone separators, electrostatic precipitation; role of plants, various sources of soil pollution; noise pollution: classification, hazards

Group B

3. Thermal methods: (09 lectures)

Different methods of analysis: TGA, DTA, DSC; thermogram, thermal stability of covalent and non-covalent bonds, thermal degradation, single crystal phase transformation, thermochemiluminescence, thermometric titration, solid state reaction kinetics

4. Electroanalytical methods I: (12 lectures)

Electrochemical cell, electrodes: reference and indicator electrodes, membrane electrodes, electrode-solution interface layer, gas-sensing probe, electrolytic process, three electrode system; supporting electrolyte, DME; Cottrell equation, Ilkovic equation, Ilkovic-Heyrofsky equation, test of reversibility, current-voltage diagram, DC and AC polarography, stripping voltammetry, amperometric titration

5. Synthetic elements: (06 lectures)

Man made elements: theoretical background, production and separation with special reference to actinoids and superheavy elements, solution chemistry in terms of electronic configuration

Tentative List of Recommended Books/Journals

- Y. Marcus and A. S. Kertes, *Ion Exchange and Solvent Extraction of Metal Complexes*, Wiley Interscience, 1969.
 H. F. Walton and W. Reiman, *Ion Exchange in Analytical Chemistry*, Pergamon Press, 1970.
 A. Tarter, *Advanced Ion Chromatography*, Wiley Interscience, New York, 1989.
 E. Heftman, *Chromatography*, Reinhold, New York, 1969.
 G. D. Christian, *Analytical Chemistry*, 5th Edn. Wiley, New York, 1994.
 J. A. Dean, *Chemical Separation Methods*, Van Nostrand Reinhold, London, 1970.

- D. A. Skoog, D. M. West and F. J. Holley, *Fundamentals in Analytical Chemistry*, 5th Edn, Saunders, Philadelphia, 1988.
- S. Lindsay and J. Barnes, *High Performance Liquid Chromatography*, John Wiley, New York, 1992.
- D. G. Peters, J. M. Hayes and G. M. Hieftje, *Chemical Separations and Measurements: Theory and Practice of Analytical Chemistry*, Saunders, Wiley Interscience, New York, 1974.
- S. M. Khopkar, *Basic Concepts of Analytical Chemistry*, Wiley Eastern Ltd., New Delhi, 1998.
- S. E. Manahan, *Environmental Chemistry*, Lewis Publishers, Boston, 1991.
- J. H. Seinfeld, *Air Pollution: Physical and Chemical Fundamentals*, McGraw-Hill, New York, 1975.
- R. M. Harrison (Ed), *Pollution: Causes, Effects and Control*, Royal Society of Chemistry, Great Britain, 1990.
- J. E. Fergusson, *The Heavy Elements: Chemistry, Environmental Impact and Health Effects*, Pergamon Press, Oxford, 1990.
- A. K. De, *Environmental Chemistry*, 4th Edn, New Age International (P) Ltd. Publications, New Delhi, 2000.
- D. F. S. Natusch and P. K. Hopke, *Analytical Aspects of Environmental Chemistry*, John Wiley and Sons, New York, 1983.
- O. Hutzinger (Ed.), *The Handbook of Environmental Chemistry*, Springer-Verlag, Weinheim, 1980.
- W. W. Wendlandt, *Thermal Methods of Analysis*, Interscience Publishers, New York, 1964.
- D. Dollimore, *General Review on Thermal Analyses*, Anal. Chem., 1994, 66, 17R.
- R. C. McKenzie (Ed.), *Differential Thermal Analysis*, Academic Press, New York, 1970.
- C. Duval, *Inorganic Thermogravimetric Analysis*, Elsevier Publishing Co, New York, 1963.
- D. R. Crow, *Polarography of Metal Complexes*, Academic Press, London, 1979.
- C. G. Zoski (Ed) *Handbook of Electrochemistry*, Elsevier, New York, 2007
- A. J. Bard and L. F. Faulkner, *Electrochemical Methods – Fundamentals and Applications*, 2nd Edn., Wiley, New York, 1998.
- G. Seaborg, *Modern Alchemy*, World Scientific, 1994.

CG 203: Organic General

Group A

1. Reactive intermediates with allied organic reaction mechanism: (15 lectures)
 Classical and non-classical carbocations and carbanions; radicals, radical cations, radical anions, carbenes, arynes and nitrenes; general methods of generation, detection, stability, reactivity and structure of the intermediates; olefin metathesis
2. Carbohydrate chemistry: (12 lectures)
 Conformational analysis of monosaccharides (pentoses and hexoses) and relative instability ratings; anomeric effect, reverse anomeric effect and their origin; mutarotation and abnormal mutarotation; use of complexing agents: borates, phosphates and copper compound; synthesis of glycosides; general treatment of polysaccharide chemistry: isolation, purification, hydrolysis, methylation and periodic oxidation, Smith degradation, Barry degradation

Group B

1. Heterocyclic chemistry: (09 lectures)

Synthesis, reactivity and uses of the following compounds and their derivatives: imidazole, pyrazole, oxazole, iso-oxazole, thiazole and iso-thiazole

2. Protein chemistry: (18 lectures)

Classification (according to their composition, shapes or structures, nutrition, function of essential amino acids); evaluation of protein quality: biological value, digestibility co-efficient, PER and NPU; peptide bond, Pauling's studies and conclusion on peptide bond, denaturation of proteins, factors effecting denaturation, essential criteria for structure elucidation of protein; primary structure, solubility studies, amino acid analysis, molecular weight determinations (chemical method, ultracentrifugation, gel-filtration, gel-electrophoresis), C-terminal and N-terminal amino acid determinations, secondary, tertiary and quaternary structures, factors responsible for stabilization of secondary and tertiary structures, Merrifield's solid state peptide synthesis

Tentative List of Recommended Books/Journals

- J. March, *Advanced Organic Chemistry: Reactions, Mechanisms and Structure*, 5th Edn., John Wiley, New York, 1999.
- S. P. McManus, *Organic Reactive Intermediates*, Academic Press, New York, 1973.
- F.A. Carey and R.J. Sundberg, *Advanced Organic Chemistry Part A and Part B*, 4th Edn., Plenum Press, New York, 2001.
- T. L. Gilchrist and C. W. Rees, *Carbenes, Nitrenes and Arynes*, Nelson, New York, 1973.
- T. H. Lowry and K.C. Richardson, *Mechanism and Theory in Organic Chemistry*, 3rd Edn., Harper and Row, New York, 1998.
- I.L. Finar, *Organic Chemistry*, Vol I, 6th Edn., Addison Wesley Longmann, London, 1998.
- I.L. Finar, *Organic Chemistry*, Vol II, 5th Edn., ELBS, London, 1995.
- D. L. Nelson and M.M. Cox, *Lehninger: Principles of Biochemistry*, W.H. Freeman Co, London, 2005.
- H. Neurath, *The Proteins: Composition, Structure and Function*, Vols. 1-5, Academic Press, New York, 1963.
- J. P. Greenstein and M. Winitz, *Chemistry of the Amino Acids (3 Vols.)*, Wiley, New York, 1961.
- W. J. I. Noble, *Highlights of Organic Chemistry*, Mercel Dekker, 1974.
- S.W. Fox and J.F. Foster, *Introduction to Protein Chemistry*, John Wiley, New York, 1957.
- E. A. Davidson, *Carbohydrate Chemistry*, Holt, Rinehart and Winston, New York, 1967.
- R. D. Guthrie and J. Honeyman, *An Introduction of Chemistry of Carbohydrate*, 3rd Edn., Clarendon Press, Oxford, 1988.
- J. Kennedy, *Carbohydrate Chemistry*, Clarendon Press, Oxford, 1988.
- A.R. Kartiritzky, *Handbook of Heterocyclic Chemistry*, Pergamon Press, 1986.
- K. Nakanishi, T. Goto, S. Ito, S. Natori and S. Nozoe, *Natural Products Chemistry*, Vol. I, Academic Press, New York, 1974.
- James R-Hanson, *Organic Synthetic Methods*, Royal Society of Chemistry, London, 2002.

- R.S. Ward, *Selectivity in Organic Synthesis*, John Wiley & Sons, 1999, New York.
 J. Clayden, N. Greeves, S. Warren and P. Wothers, *Organic Chemistry*, Oxford University Press, Oxford, 2001.
 J.H. Fuhrhop and G. Li, *Organic Synthesis, Concepts and Methods*, Wiley VCH, New York, 2003.
 R. Kartritzky, *Handbook of Heterocyclic Chemistry*, Pergamon Press, London, 1986.

CG 204: Physical General

Group A

1. Group theory II: (09 lectures)

The Great Orthogonality Theorem: statement and interpretation, proof of important corollaries; construction of character tables, cyclic groups and construction of their character tables, direct product groups and construction of their character tables, direct product representations, projection operators (without derivations) and vanishing of integrals, invariance of the Hamiltonian operator and eigenfunctions of H as bases of irreducible representations

2. Quantum mechanics II: (09 lectures)

Degeneracy; Schrödinger equation, energy-eigenvalue equation, expectation value, eigenvalue and spread of observation, definition of uncertainty; equation of motion, constants of motion; exactly solvable problems: harmonic oscillator, rigid rotator, step potential and tunneling; elementary discussion of the H-atom solution

3. Electrochemistry: (09 lectures)

Introduction, ion-solvent interaction: Born model and Born equation, enthalpy of ion-solvent interaction and its calculation, Eley-Evan model, solvation number and methods for determination of solvation number, ion association: Bjerrum equation, fraction of ions associated, ion association constant; electrode kinetics: relation between current and rate of electrode reaction, current-overpotential relationship, Tafel equation and its importance

Group B

4. Chemical kinetics: (12 lectures)

Theories of reaction rates: applications to uni-, bi- and termolecular reactions, thermodynamic formulation of reaction rate, reactions in solution — cage effect, diffusion and activation controlled reactions (elementary idea), dielectric effect on ion-

ion reaction, electrostriction, volume of activation, effect of pressure on reaction rate, classification of reactions on the basis of volume of activation, Curtin-Hammett principle, linear free energy relationship, Hammett and Taft equation; study of fast reactions — flow process and relaxation techniques

5. Crystal structure: (15 lectures)

Crystal symmetry: translation, glide plane and screw axis; diffraction of X-rays by crystals: Laue and Bragg conditions; concept of reciprocal lattice, crystal structure factor, systematic absence; B-zones and Fermi level in lattice, concept of particle-hole in conduction process, Band theory, theory of conductors, semiconductors and insulators

Tentative List of Recommended Books/Journals

- G. W. Castellan, *Physical Chemistry*, 3rd Edn, Narosa Publishing House, New Delhi, 1995.
 R. A. Alberty and R. J. Silbey, *Physical Chemistry*, 1st Edn, John Wiley & Sons, Inc., 1995.
 R. S. Berry, S. A. Rice and J. Ross, *Physical Chemistry*, Oxford University Press, Oxford, 2000.
 F. A. Cotton, *Chemical Applications of Group Theory*, 3rd Edn Reprint, John Wiley and Sons, New York, 1999.
 A. Vincent, *Molecular Symmetry and Group Theory*, John Wiley and Sons, New York, 1998.
 S. C. Rakshit, *Molecular Symmetry Group and Chemistry*, The New Book Stall, Kolkata, 1988.
 Volker Heine, *Group Theory in Quantum Mechanics: An Introduction to Its Present Usage*, Dover Publication, New York, 1991.
 H. Eyring, J. Walter and G. F. Kimball, *Quantum Chemistry*, Wiley, New York, 1944.
 A. K. Chandra, *Introductory Quantum Chemistry*, Tata McGraw-Hill Publishing Co, New Delhi, 1989.
 F. L. Pilar, *Elementary Quantum Chemistry*, Tata McGraw-Hill, 1990.
 P. W. Atkins, *Molecular Quantum Mechanics*, Clarendon Press, Oxford, 1980.
 E. Merzbacher, *Quantum Mechanics*, John Wiley and Sons, 1970.
 L. I. Schiff, *Quantum Mechanics*, McGraw-Hill, 1985.
 L. Pauling and E. B. Wilson, *Introduction to Quantum Mechanics*, McGraw-Hill, 1939.
 P. C. W. Davies, *Quantum Mechanics*, ELBS, 1985.
 J. L. Powell and B. Crasemann, *Quantum Mechanics*, Addison-Wesley, London, 1961.
 D. Bohm, *Quantum Theory*, Asia Pub. House, Bombay, 1960.
 S. Glasstone, *An Introduction to Electrochemistry*, D. Van Nostrand Company, 1962.
 J. O'M. Bockris and A. K. N. Reddy, *Modern Electrochemistry*, Vol. I, Plenum Press, New York, 1970.
 K. J. Laidler, *Reaction Kkinetics*, Vols. I & II, Pergamon Press, London, 1970.
 K. J. Laidler, *Chemical Kinetics*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1988.
 L. P. Hammett, *Physical Organic Chemistry*, McGraw-Hill Book Company, New Delhi, 1970.
 M. R. Wright, *Fundamental Chemical Kinetics*, Horwood Publishing, 1999.
 J. Albery, *Electrode Kinetics*, Oxford Chemistry Series, Clarendron Press, Oxford, 1975.
 G. D. Mahan, *Many Particle Physics*, Kluwer Academy, Plenum Publisher, 2000.
 C. Kittel, *Introduction to Solid State Physics*, John Wiley & Sons, 4th Ed.
 M. F. C. Ladd and R. A. Palmer, *Structure Determination by X-ray Crystallography*, Plenum Press, New York, 3rd Ed., 1994.
 P. A. Cox, *The Electronic Structure & Chemistry of Solids*, Oxford University Press, 1987.
 X. Clegg, *Crystal Structure Determination*, Oxford University Press, 2005.

Practical

CGP 205: Organic General

1. Separation of binary mixtures of solid-solid/liquid-solid/liquid-liquid organic compounds and identification of individual components
2. Synthesis of organic compounds involving important chemical reactions (nitration, diazotisation, Beckmann transformation, photochemical reaction, Sandmeyer reaction, pinacol-pinacolone rearrangement)

CGP 206: Physical General

1. Experiments in kinetics
2. Experiments in equilibrium
3. Instrumental methods: potentiometry, polarimetry, colorimetry and conductometry
4. Data processing and elementary numerical techniques

Semester-III

Theoretical

CAG 301: Advanced General

Group A

1. Group theory III: (18 lectures)

Application of group theoretical methods for (i) construction of SALC's and their use in calculation of π MO's under the Huckel approximations, (ii) calculation of MO's of AB_n type and sandwich type molecules, (iii) study of hybridization, selection rules, allowedness/forbiddenness of $n-\pi^*$ and $\pi-\pi^*$ transitions, (iv) splitting of terms in octahedral and tetrahedral ligand fields, Orgel and Tanabe-Sugano diagrams, (v) symmetry aspects of molecular vibrations — infrared and Raman activity, conservation of orbital symmetry in pericyclic reactions

2. Surface chemistry (09 lectures)

Introduction, adsorption isotherms, surface excess; BET isotherm, LB film, membrane equilibrium, micellisation

Group B

3. Macromolecules: (12 lectures)

Introduction; Carother's equation, osmotic pressure, viscosity, sedimentation and light scattering experiments for determination of molecular weight; kinetics of addition and condensation polymerization, stereochemistry, flexibility of polymer chain, statistics of polymer dimensions and configurations, effect of solvent on the average dimensions; theories of polymer solutions: excluded volume and Flory-Huggins theory

4. Advanced spectroscopic methods: (15 lectures)

Instrumentation, presentation of spectra, active chemical system; INDOR, COSY, NOESY in ^1H NMR; functional group characterization, fluxionality, distortion and dynamic equilibria; long-range spin-spin interaction; ^{11}B , ^{13}C , ^{14}N , ^{17}O , ^{19}F and ^{31}P -NMR: instrumentation, chemical shift and application; EI, CI, FD, FAB-Mass, MALDI-TOF; isotropic effect, fragmentation patterns and application in structure elucidation; CD/ORD: methods, molecular dissymmetry and chiroptical properties, Cotton effect, Faraday effect in magnetic circular dichroism (MCD) and application; EPR: anisotropy, intensity, hyperfine splittin, Kramer's theorem, photoelectron spectroscopy, ESCA, UPS, Auger, AES, XRF and EXFAS; Synergistic benefit: spectroscopic and other tools in structure elucidation

List of Recommended Books/Journals

- F. A. Cotton, *Chemical Applications of Group Theory*, 3rd Edn Reprint, John Wiley and Sons, New York, 1999.
- A. Vincent, *Molecular Symmetry and Group Theory*, John Wiley and Sons, New York, 1998.
- S. C. Rakshit, *Molecular Symmetry Group and Chemistry*, The New Book Stall, Kolkata, 1988.
- V. Heine, *Group Theory in Quantum Mechanics: An Introduction to Its Present Usage*, Dover Publication, New York, 1991.
- W. Adamson, *Physical Chemistry of Surfaces*, John Wiley and Sons, New York, 1990
- H. -J. Butt, K. Graf and M. Kappl, *Physics and Chemistry of Interfaces*, Wiley-VCH, 2003.
- J. H. Clint, *Surface Chemistry*, Blackie and Son Ltd., 1992.
- G. S. Mishra, *Introductory Polymer Chemistry*, Wiley Eastern, New Delhi, 1993.
- G. W. Castellan, *Physical Chemistry*, 3rd Edn., Narosa Publishing House, 1995.
- R. A. Alberty and R. J. Silbey, *Physical Chemistry*, 1st Edn., John Wiley and Sons, Inc., New York, 1995.
- P. Ghosh, *Polymer Science and Technology of Plastic and Rubber*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1993.
- C. Tanford, *Physical Chemistry of Macromolecules*, John Wiley and Sons, Inc., New York, 1961.
- I. N. Levine, *Physical Chemistry*, 4th Edn., Tata McGraw-Hill, New Delhi, 1995.

- S. F. Sun, *Physical Chemistry of Macromolecules: Basic Principles and Issues*, John Wiley & Sons, New York, 1994.
- F. W. Billmeyer, *Text Book of Polymer Science*, 2nd Edn., Wiley-Interscience, New York, 1971.
- C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1994.
- R. S. Drago, *Physical Methods for Chemists*, Saunders, Philadelphia, 1992.
- J. G. Grasselli, M. K. Snavely and B. J. Bulkin, *Chemical Application of Raman Spectroscopy*, Wiley, New York, 1981.
- P. Hendra, C. Jones and G. Warnes, *FT-Raman Spectroscopy*, Ellis-Harwood, 1991.
- K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, 5th Edn, Part B, John Wiley and Sons, Inc., New York, 1997.
- W. Kemp, *NMR in Chemistry: A Multinuclear Approach*, Macmillan Press, 1986.
- H. Gunther, *NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry*, Wiley, New York, 1995.
- N. M. Atherton, *Principles of Electron Spin Resonance*, Ellis Horwood/Prentice-Hall, Hemel Hempsted, 1993.
- L. Kevan and R. N. Schwartz (Eds), *Time Domain Electron Spin Resonance*, John Wiley, New York, 1979.
- J. E. Wertz and J. R. Boulton, *Electron Spin Resonance: Elementary Theory and Practical Applications*, Chapman and Hall, London, 1986.
- D. W. Turner, C. Baker and C. R. Bundle, *Molecular Photoelectron Spectroscopy*, Wiley Interscience, New York, 1970.
- J. H. D Eland, *Photoelectron Spectra*, Butterworth, London, 1984.
- T. L. Barr, *Modern ESCA: the Principles and Practice of X-ray Photoelectron Spectroscopy*, CRC Press, Boca Raton, 1994.
- D. P. Woodruff and T. A. Delchar, *Modern Techniques of Surface Science*, Cambridge University Press, Cambridge, 1988.
- T. Thomson, M. D. Baker, A. Christie and J. F. Tyson, *Auger Electron Spectroscopy*, John Wiley, 1985.

CAG 302: Advanced general Group A

1. Metal ion promoted reactions: (12 lectures)

Fundamentals, simple cycle, catalytic cycle, pliancy of substrates, oxidative addition, reductive elimination, insertion; Tolman catalytic loop, homogeneous/heterogeneous catalysis: Wacker-Smith synthesis, hydroformylation reactions, Monsanto acetic acid process, hydrogenation by Wilkinson's catalyst, water gas shift reaction (WGSR), Fischer-Tropsch synthesis, alkene polymerization, hydrosilation, hydrophosphilnation, hydroamination, hydrocyanation and hydroboration reactions, Heck reaction

2. Electroanalytical methods II: (10 lectures)

Cyclic voltammetry, differential pulse voltammetry, coulometry, electrogravimetry, LSV; methods, choice of solvent, supporting electrolyte, working

electrode, switching potential, electrode potential, pathways of electron transfer: EEE, ECE; electro-induced reactions; conventional secondary batteries: Ni-Cd, Ni-Fe, Ag-Zn, ZEBRA system

3. Radiopharmaceuticals: (05 lectures)

Nuclear pharmacy: concept, pharmaceuticals and radiopharmaceuticals; radionuclide generators; ideal radiopharmaceuticals, methods of radiolabelling, specific radiopharmaceuticals for diagnostic and therapeutic purposes

Group B

3. Complexes in aqueous solution: (09 lectures)

Different (pH-potentiometric, spectrophotometric, voltammetric) tools and methods (slope-ratio, mole-ratio and Job's method of continuous variation) of measuring stability constants of complexes, Bjerrum half n method, stability of mixed ligand complexes and calculations; determination of composition, evaluation of thermodynamic parameters, factors influencing the stability of complexes, equilibria in biomolecular systems

4. Reaction mechanism: (09 lectures)

Fundamentals, analysis of rate data, H^+ -terms in rate laws, complex rate laws, kinetically indistinguishable schemes, rate scale, mechanistic simulation; associative, dissociative, interchange, nucleophilic, electrophilic pathways; Hammett relation, linear free energy relationship

5. Molecular magnetism I: (09 lectures)

Different magnetic materials, use of Pascal's constants in structure determination, van Vleck equation and its applications, Curie and Curie-Weiss laws, Lande interval rule, microstates, multiplet, multiplet width, hole formalism, zero-field splitting, spin-orbit coupling, quenching of orbital contribution, crystal field diagram, high spin/low spin equilibrium

Tentative List of Recommended Books/Journals

F. A. Cotton, G. Wilkinson, C. M. Murillo and M. Bochmann, *Advanced Inorganic Chemistry*, 6th Edn, John Wiley and Sons, Inc., New York, 1999.

G. Wulfsberg, *Inorganic Chemistry*, Viva Books Private Ltd., New Delhi, 2001.

G. Wulfsberg, *Principles of Descriptive Inorganic Chemistry*, University Science Books, Mill Valley, CA, 1991.

J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th Edn, Harper Collins College Publishers, New York, 1993.

- G. B. Richter-Addo and P. L. Legzdins, *Metal Nitrosyls*, Oxford University Press, New York, 1992.
- J. D. Atwood, *Inorganic and Organometallic Reaction Mechanisms*, 2nd Edn, VCH, New York, 1997.
- G. W. Parshall, *Homogeneous Catalysis*, Wiley, New York, 1980.
- C. N. Satterfield, *Heterogeneous Catalysis in Practice*, McGraw-Hill, New York, 1980.
- C. G. Zoski (Ed) *Handbook of Electrochemistry*, Elsevier, New York, 2007
- A. J. Bard and L. F. Faulkner, *Electrochemical Methods – Fundamentals and Applications*, 2nd Edn., Wiley, New York, 1998.
- R. M. Smith and A. F. Martell, *Critical Stability Constants*, 6 Vols, Plenum Press, New York, 1974-89.
- A. E. Martell and R. J. Motekaitis, *Determination and use of Stability Constants*, 2nd Edn, VCH, New York, 1992.
- M. Meloun, J. Havel and E. Hogfeldt, *Computation of Solution Equilibria: A Guide to Methods in Potentiometry, Extraction and Spectrophotometry*, Halsted, New York, 1988.
- F. Basolo and R. G. Pearson, *Mechanism of Inorganic Reactions*, 2nd Edn, Wiley, 1967.
- R. G. Wilkins, *Kinetics and Mechanism of Reactions of Transition Metal Complexes*, 2nd Edn, VCH, Weinheim, 1991.
- D. Katakis and G. Gordon, *Mechanisms of Inorganic Reactions*, John Wiley and Sons, New York, 1987.
- D. Benson, *Mechanism of Inorganic Reactions in Solution*, McGraw-Hill, London, 1968.
- R. B. Jordan, *Reaction Mechanisms of Inorganic and Organometallic Systems*, Oxford University Press, 1998.
- J. O. Edwards and W. A. Benjamin, *Inorganic Reactions Mechanism*, INC, New York, 1965.
- C. H. Langford and H. B. Gray, *Ligand Substitution Processes*, W. A. Benjamin, New York, 1966.
- O. Kahn, *Molecular Magnetism*, VCH, New York, 1993.
- J. S. Miller and M. Drillon (Eds), *Magnetism: Molecules to Materials, II; Molecule-Based Magnets*, Wiley-VCH, Weinheim, 2001.
- P. M. Lathi (Ed), *Magnetic Properties of Organic Materials*, Marcel Dekker, New York, 1999.

CAG 303: Advanced General

Group A

1. Photochemistry: (12 lectures)
 Photochemical energy, Jablonski diagram, photosensitisation and quenching, Norrish type-I and type-II processes, Paterno-Buchi reaction, photochemistry of unsaturated compounds: rearrangement of unsaturated compounds; photo-induced reactions in aromatic compounds

2. Pericyclic Reaction: (09 lectures)
 Definition, classification, cyclo-additions and cyclo-reversion reactions, [2+2], [2+4], [4+6] reactions, catalysis; electrocyclic reaction and the electroreversion reactions;

sigmatropic reactions of [i,j] and [j,j] types, regioselectivity, periselectivity in cycloadditions; generalised rules of pericyclic reactions

3. Reaction with cyclic transition states or cyclic intermediates: (06 lectures)

Tethering, Robinson annulations, iodolactonisation; synthesis of transfused ring; sulfur as a tether

Group B

3. Reagents in organic synthesis: (18 lectures)

Hydride transfer reagent: Boranes, trialkyl borohydrides, Diimide, Baker's yeast, trialkyl tin hydride; DIBAL, Na(CN)BH₃, Woodward and Prevost hydroxylation, Sharpless epoxidation, PCC, PDC, Mn(IV) oxide, RuO₄ (TPAP), Moffat oxidation, Swern oxidation, Dess-Martin Periodinane; Shapiro reaction, Peterson reaction, OsO₄, SeO₂

3. Enzyme chemistry and metalloproteins: (09 lectures)

Introduction, classification, formation and function of enzymes, co-enzymes, cofactors (elementary idea); Metalloproteins: Composition and functions of Haemoglobin, Hemocyanin, Ceruplasmin, Ferritin and Cytochrome 'C'

Tentative List of Recommended Books/Journals

T.L.Gilchrist and R.C. Storr, *Organic Reactions and Orbital Symmetry*, 2nd Edn., Cambridge University Press, 1979.

R.B. Woodward and R. Hoffman, *The Conservation of Orbital Symmetry*, Verlag Chemie GmbH, 1970.

T.H. Lowry and K.C. Richardson, *Mechanism and Theory in Organic Chemistry*, 3rd Edn., Harper and Row, 1998.

I. Fleming, *Frontier Orbitals and Organic Chemical Reactions*, John Wiley, 1980.

W. Caruthers, *Modern Methods of Organic Synthesis*, 3rd Edn., Low Price Edition, Cambridge University Press, 1996.

H. O. House, *Modern Synthetic Reactions*, 2nd Edn., Benjamin, 1971

J. Singh and J. Singh, *Photochemistry and Pericyclic Reactions*, 2nd Edn., New Age International (P) Ltd., 2005

CS 304: Inorganic special

Group A

1. Synthetic methodology for transition and non-transition metal compounds:

(12 lectures)

Ligand design and ligand synthesis: polypyridine, Schiff base, oxime, macrocycle, tripod, podand, coronand, cryptand, octopus, tailoring and appending of pendant arm, electron reservoir, ligand topology and molecular mechanics, coordination

compound design and synthesis: self-assembly, structure-directed synthesis, building block, metalloligand, polymeric ensembles (chain, sheet, network), supramolecular framework, molecular machine, biomodelling, molecular/crystal engineering

2. Inorganic reaction mechanism: (15 lectures)

Substitution reactions in square planar, tetrahedral and octahedral geometries with special reference to d^n ion complexes: operational tests, aquation and anation, inorganic nucleophilicity scales; Edward scale, n_{pt} scale, Gutmann donor number, Drago E & C scale, trans effect, cis effect, reactions without metal-ligand bond breaking, water exchange rates, proton ambiguity, kinetics of chelate formation, reaction mechanisms of organometallic systems, studies on fast reactions, kinetic and activation parameters - tools to propose a plausible mechanism; stereochemical changes: types of ligand rearrangements, isomerism in 4-, 5- and 6-coordinated complexes; reactions of coordinated ligands: model choice of metal and ligand, acid-base reaction, hydrolysis of esters, amides and peptides, aldol condensation, trans-amination, template reactions, organic synthesis with special reference to macrocyclic ligand; reactions in fluxional organometallic compounds

Group B

3. Application of IR, NMR, EPR, UV-Vis, Mossbauer, ESCA etc. techniques:

(27 lectures)

Background of the spectroscopic tools, selection rules, active chemical system, elucidation of molecular structure, electronic structure, stereochemistry, bonding and reaction pathways in halide, pseudohalide, carbonyl, nitrosyl, DMSO, phosphine, polypyridine, azopyridine, oxime, quinone, macrocyclic (porphyrin, phthalocyanine) and organometallic (acetyl acetonate, azobenzene, cyclopentadienyl anion, allyl, allene, carbocyclic) metal complexes; enumeration and characterization: geometrical (*cis/trans*, *fac/mer*) and stereo (optical) isomers in different polyhedra; Jahn-Teller distortion, effective π -acceptance centre, ligational motif and chelate loop, electron-transfer site, μ -bonding and hapticity, acidity/basicity of coordinate molecule, electrophilicity/nucleophilicity, quasi-aromaticity and super-aromaticity, fluxionality, metalloligand, probing reaction centre, reactivity and reaction pathways (intramolecular/intermolecular, stereoretentivity/stereodynamicity), evaluating Hammett

and Taft parameters, assignment of d-d, MLCT, LMCT, LLCT, IVCT transitions, covalency of ML bonding in coordination complexes

Tentative List of Recommended Books/Journals

- L. S. Hegedus, *Transition Metal in the Synthesis of Complex Organic Molecules*, University Science Press, Mill Valley, CA, 1994.
- M. Periasamy, *Organic Synthesis Using Iron-Carbonyl Reagents*, *Curr. Sci.*, 2000, 78, (11), 1307-1313
- G. Wulfsberg, *Inorganic Chemistry*, Viva Books Private Ltd., New Delhi, 2001.
- F. A. Cotton, G. Wilkinson, C. M. Murillo and M. Bochmann, *Advanced Inorganic Chemistry*, 6th Edn, John Wiley and Sons, Inc., New York, 1999.
- N. N. Greenwood and A. Earnshaw, *Chemistry of the Elements*, 2nd Edn, Pergamon, New York, 1997.
- J. W. Steed and J. L. Atwood, *Supramolecular Chemistry*, John Wiley and Sons, New York, 2000.
- G. R. Desiraju, *Crystal Engineering: Designing of Organic Solids*, Elsevier, New York, 1989.
- F. Basolo and R. G. Pearson, *Mechanism of Inorganic Reactions*, 2nd Edn, Wiley, 1967.
- R. G. Wilkinns, *Kinetics and Mechanism of Reactions of Transition Metal Complexes*, 2nd Edn, VCH, Weinheim, 1991.
- D. Katakis and G. Gordon, *Mechanisms of Inorganic Reactions*, John Wiley and Sons, New York, 1987.
- D. Benson, *Mechanism of Inorganic Reactions in Solution*, McGraw-Hill, London, 1968.
- R. B. Jordan, *Reaction Mechanisms of Inorganic and Organometallic Systems*, Oxford University Press, 1998.
- J. O. Edwards and W. A. Benjamin, *Inorganic Reactions Mechanism*, INC, New York, 1965.
- C. H. Langford and H. B. Gray, *Ligand Substitution Processes*, W. A. Benjamin, New York, 1966.
- G. Aruldas, *Molecular Structure and Spectroscopy*, 2nd Edn., Prentice-Hall of India, New Delhi, 2007.
- D. N. Sathyanarayana, *Electronic Absorption Spectroscopy and Related Techniques*, University press, 2001.
- R. S. Drago, *Physical Methods in Inorganic chemistry*, Saunders, Philadelphia, 1977.
- C. J. Ballhausen, *Molecular Electronic Structure of Transition Metal Complexes*, McGraw-Hill, London, 1979.
- A. B. P Lever, *Inorganic Electronic Spectroscopy*, Elsevier, New York, 1984.
- D. N. Sathyanarayana, *Vibrational Spectroscopy Theory and Applications*, New Age International, New Delhi, 1996.
- H. H. Jaffe and M. Orchin, *Symmetry, Orbitals and Spectra*, Wiley, New York, 1982.
- B. E. Douglas and C. A. Hollingsworth, *Symmetry in Bonding and Spectra, An Introduction*, Academic press, New York, 1985.
- K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, 5th. Edn, Part A, Wiley, New York, 1997.
- B. Schrader (Ed.) *Infrared and Raman Spectroscopy: Methods and Applications*, VCH Weinheim, 1995.
- W. Henderson and J. S. McIndoe, *Mass Spectrometry of Inorganic, Coordination and Organometallic Compounds: Tools-Techniques-Tips*, John Wiely & Sons, Ltd., Chichester, 2005.
- A. E. Derome, *Modern NMR Techniques in Chemical Research*, Pergamon Press, Oxford, 1987.
- W. Kemp, *NMR in Chemistry: A Multinuclear Approach*, Macmillan Press, 1986.

- J. K. M. Sanders, E. C. Constable and B. K. Hunter, *Modern NMR Spectroscopy: A Workbook of Chemical Problems*, Oxford University Press, Oxford, 1993.
- H. Gunther, *NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry*, Wiley, New York, 1995.
- A. Abragam and B. Bleaney, *Electron Paramagnetic Resonance of Transition Metal Ions*, Clarendon Press, Oxford, 1970.
- N. M. Atherton, *Principles of Electron Spin Resonance*, Ellis Horwood/Prentice-Hall, Hemel Hempsted, 1993.
- W. O. George and H. O. Willis, *Computer Methods in Ultraviolet, Visible and Infra-red Spectroscopy*, Royal Society of Chemistry, 1990.
- E. A. V. Ebsworth, D. W. H. Rankin and S. Cradock, *Structural Methods in Inorganic Chemistry*, 2nd Edn., Blackwell Scientific Publications, Oxford, 1991.
- F. Gerson, *High Resolution ESR. Spectroscopy*, John Wiley, New York, 1971.
- L. Kevan and R. N. Schwartz (Eds), *Time Domain Electron Spin Resonance*, John Wiley, New York, 1979.
- J. E. Wertz and J. R. Boulton, *Electron Spin Resonance: Elementary Theory and Practical Applications*, Chapman and Hall, London, 1986.

CS 304: Nuclear-Analytical Special

Group A

1. Theory of radioactive decay: (10 lectures)

Introduction, quantum mechanical aspects of radioactive disintegration, alpha decay paradox and its explanation in terms of tunnel effect, Geiger-Muller relationship, time-dependant perturbation theory, Golden rule and its application in explaining beta and gamma transition, selection rules

2. Nuclear force and structures: (17 lectures)

Two body problem — properties of deuteron and derivation of depth-range relationship, its applications in explaining nature of nuclear force, elementary particles; nuclear models — strong and weak interaction, nuclear magnetic dipole moment and electric quadrupole moment in terms of shell model, collective model, Fermi gas model, nuclear excitation, idea of nuclear temperature and entropy

Group B

3. Nuclear reaction: (10 lectures)

General features, types of nuclear reaction, conservation laws, nuclear reaction dynamics, mechanism of nuclear reaction, use of uncertainty principle, resonance and non-resonance reaction, optical model and calculation of mean free path, nuclear fission and fusion reaction, calculation of fission probability from Bohr-Wheeler's theory

4. Detectors: (12 lectures)

Proportional detectors: proportional counter performance, gas multiplication factor, space charge effects, resolution, time characteristics of signal pulse; scintillation detectors: different types, pulse shape analysis, resolution and detection efficiency, liquid scintillation detectors; semiconductor detector: general characterization, depletion depth, resolution and efficiency, pulse rise time, surface barrier detector; some basic ideas of pulse processing and shaping, single- and multi-channel analysers

5. Coincidence counting (05 lectures)

Determination of absolute disintegration rates, decay scheme studies

List of Recommended Books/Journals

- G. Friedlander, E. F. Macias, J. W. Kennedy and J. M. Miller, *Nuclear and Radiochemistry*, Wiley Interscience, New York, 1981.
- I. Kaplan, *Nuclear Physics*, Addison-Wesley, Cambridge, 1963.
- R. D. Evans, *The atomic nucleus*, McGraw-Hill, New York, 1979.
- G. F. Knoll, *Radiation Detection and Measurements*, John Wiley and Sons, New York, 1979.
- W. R. Leo, *Techniques of nuclear and particle physics experiments*, Narosa Publishing House, 1995.
- S. S. Kapoor and V. S. Ramamurthy, *Nuclear Radiation Detections*, New Age International, New Delhi, 1986.
- H. J. Arnikar, *Essentials of Nuclear Chemistry*, New Age International, 4th Edn, New Delhi, 2001.
- H. J. Arnikar, *Nuclear Chemistry through Problems*, 4th Edn, New Age International, 1995.
- S. B. Patel, *Nuclear Physics*, New Age International, New Delhi, 1996.
- G. Choppin, J. O. Lilienzin and J. Rydberg, *Radiochemistry and Nuclear Chemistry*, Butterworth-Heinemann, 2001.
- B. Harvey, *Introduction to Nuclear Physics and Chemistry*, Prentice-Hall, 1965.
- B. L. Cohen, *Concepts of Nuclear Physics*, McGraw-Hill, New York, 1971.
- M. Haissinsky, *Nuclear Chemistry Audits Application*, Addison Wesley, 1965.
- R. Eisberg and R. Resnick, *Quantum Physics of Atoms, Molecules, Nuclei and Particles*, 2nd Edn, John Wiley and Sons, New York, 1985.
- M. Lefort, *Nuclear Chemistry*, D. Van Nostrand, London, 1968.
- L. R. B. Elton, *Nuclear Sizes*, Oxford University Press, 1961.
- D. Holliday, *Introductory Nuclear Physics*, Wiley, New York, 1955.
- G. M. Mayer and J. H. D. Jensen, *Elementary Theory of Nuclear Shell Structure*, Wiley, New York, 1955.
- J. M. Blatt, V. F. Weissleopf, *Theoretical Nuclear Physics*, Wiley, New York, 1952.

CS 304: Organic Special Group A

1. Organometallic chemistry: (12 lectures)

Bonding in transition metal; organometallic complexes; some common properties of organometallic complexes; fluxionality, stabilisation of reactive or unstable molecules; catalytic hydrogenation, insertion reactions; organo-Cu, -Zn, -Cd, -Hg and -Pd compounds; metallocenes (Fe, Ru, Os); carbene and carbyne complexes

2. Terpenes: (08 lectures)

Structural studies on sesquiterpenes, diterpenes, triterpenes and carotenoids; chemistry of carophyllene, abietic acid, β -amyrin, α and β -carotenoids

3. ^{13}C NMR spectrometry: (07 lectures)

Introduction, theory, instrumentation, chemical shifts, coupling constants, application in organic molecule characterization

Group B

5. Stereo selective reactions of alkenes and carbonyl compounds: (18 lectures)

Nucleophilic addition: use of chiral substrates, auxiliaries, reagents and catalysts; asymmetric conjugate addition; addition of allyl boron derivative; reactions at alpha carbon: enolate formation (regioselectivity and stereoselectivity); stereoselective enolate alkylation (oxazolidinone, oxazoline); aldol reaction, asymmetric aldol reaction; hydroboration, hydrogenation, dihydroxylation, cyclopropanation, epoxidation

6. ORD-CD: (09 lectures)

Introduction, theory, cotton effect curves and applications, octant rule, axial haloketo rule, lactone sector rule

Tentative List of Recommended Books/Journals:

T.H. Lowry and K.C. Richardson, *Mechanism and Theory in Organic Chemistry*, 3rd Edn., Harper and Row, 1998.

J. March, *Advanced Organic Chemistry: Reactions, Mechanism and Structure*, 5th Edn., John Wiley, 1999.

F.A. Carey and R.J. Sundberg, *Advanced Organic Chemistry, Parts A and B*, 4th Edn., Plenum Press, 2001.

K.C. Nicolson and E.J. Sorensen, *Classics in Total Synthesis*, VCH, 1996.

P. Deslongchamps, *Stereoelectronic Effect in Organic Chemistry*, Pergamon Press, 1983.

R.O.C. Norman and J.M. Coxon, *Principles of Organic Synthesis*, 3rd Edn., ELBS, 2003..

W. Caruthers, *Modern Methods of Organic Synthesis*, 3rd Edn., Low Price Edition, Cambridge University Press, 1996.

- S. Hanessain, *Total Synthesis of Natural Products : The Chiron Approach*, Pergamon Press, 1984.
- K. Nakanishi, T Goto, Sho Ito, S. Natori, and S. Nozoe, *Natural Products Chemistry, Vol. I* (1974) and Vol. II (1975), Academic Press.
- K.J. Hale, *The Chemical Synthesis of Natural Products*, Sheffield Academic Press/CRC Press, 2000.
- I. L. Finar, *Organic Chemistry, Vol. II*, 5th Edn., ELBS, 1995.
- P. De Mayo, *The Higher Terpenoids*, Interscience Publishers, 1959.
- A. R. Pinder, *The Chemistry of Terpenes*, Chapman and Hall, 1960.
- F. Hill, *Organotransition Metal Chemistry*, Royal Society of Chemistry, 2002.
- J. Pearson, *Metalloorganic Chemistry*, 1985.
- R. H. Crabtree, *The Organometallic Chemistry of Transition Metals*, 2nd Edn., John Wiley, 1994.
- E. Abel, F.G.A. Stone and G. Wilkinson, *Comprehensive Organometallic Chemistry*, Vols. 3-10, Pergamon Press, 1980-1995.
- A. Yamamoto, *Organo-Transition Metal Chemistry*, John Wiley, 1986.
- J. Tsujiz, *Organic Synthesis by Means of Transition Metal Complexes*, Springer-Verlag, 1975.
- G. Davies, *Organo Transition Metal Chemistry : Application in Organic Synthesis*, Pergamon Press, 1982.
- J. P. Collman and S. L. Hegedus, *Principles and Applications of Organo-Transition Metal Chemistry*, University Science Book, 1986.
- R. C. Mehrotra and A. Singh, *Organometallic Chemistry : A Unified Approach*, 2nd Edn., New Age International Pvt. Ltd., New Delhi, 2000.
- R. M. Acheson, *Introduction of Chemistry of Heterocyclic Compounds*, 2nd Edn., Interscience Publisher, 1967.
- R. Kartritzky, *Handbook of Heterocyclic Chemistry*, 1st Print, Pergamon Press, 1986.
- E. Breitmaier and W. Voelter, *¹³C NMR Spectroscopy : Methods and Application in Organic Chemistry*, 3rd Edn., Verlag Chemie, 1987.
- R. S. Word, *Selectivity in Organic Synthesis*, John Wiley & Sons.
- J. R. Hanson, *Organic Synthetic Methods*, Royal Society of Chemistry, 2002.
- E.M. Carreira, O. Rerser, *Classics in Stereoselective Synthesis*, John Wiley & Sons, 2007.
- R. S. Atkinson, *Stereoselective Synthesis*, Wiley, 1995.
- C. Bolm, J. A. Gladysz, *Chemical Reviews* 2003, 103 (8).
- T. D. W. Claridge, *Tetrahedron Organic Chemistry Series Volume 19, High-Resolution NMR Techniques in Organic Chemistry*, Pergamon, 2004.
- M. Duer (Ed), *Introduction to Solid State NMR Spectroscopy*, Blackwell, 2004.

CS 304: Physical Special

Group A

1. Thermodynamics of irreversible processes: (15 lectures)

Limitations of classical (equilibrium) thermodynamics, entropy production in some simple irreversible processes, the concept of forces and fluxes, linear phenomenological relations; Onsager reciprocity relation — derivation from fluctuation theory; Curie-Prigogine principle — statement and proof using one scalar and one vector force, illustrations; Saxen's relations in connection with electrokinetic phenomena and their proof using Onsager reciprocity relations, stationary states:

variation of entropy production with time, Prigogine's criterion for establishment of stationary state, applicability of Le Chatelier's principle on stationary states

2. Kinetics: (12 lectures)

Introduction, autocatalysis, chain reactions: branched and non-branched kinetic rate equations, Semenov treatment for branched chain reactions; explosion: population explosion, upper and lower ignition/explosion limits; thermal ignition and ignition temperature; chemical oscillation: some models (Lotka, Oregonator and Brusselator); analysis of Lotka and Brusselator model, conditions for oscillation, chemistry of BZ reaction (Brusselator model); theories of unimolecular reactions: Lindemann, Hinshelwood and RRK theory

Group B

3. Mathematical methods: (09 lectures)

Elementary vector calculus, equation of continuity of fluid motion, diagonalisation of square symmetric matrices (real elements) by Jacobi method; coordinate transformation — the Jacobian and its use

4. Non-ideal systems: (09 lectures)

Virial equations, fugacity and standard state; gas mixtures, partition function of non-ideal gas, derivation of non-ideal equation of state, second Virial coefficient; existence of Boyle and inversion temperature for real gases, derivation of Van der Waals equation, thermodynamic functions of real gases; non-ideal solutions; activity and activity coefficients; different scales; methods of their determinations; partial molar quantities and their determinations, Duhem-Margules equation and its applications, regular solutions and excess thermodynamic functions

2. Photochemistry: (09 lectures)

Production of excited states, singlet and triplet states, spin-orbit coupling, radiative and non-radiative processes, fluorescence and phosphorescence: mirror image relationship, quantum yield, life-time and anisotropy; properties of excited states: dipole moment, pK_a , energy transfer, quenching, excimers and exciplexes, special photochemical reactions, flash photolysis, laser flash photolysis

List of Recommended Books/Journals

- I. Prigogine, *Introduction to Thermodynamics of Irreversible Processes*, Interscience Publishers, 1967.
- V. N. Kondrat'ev, *Chemical Kinetics of Gas Reactions*, Pergamon Press, 1964.
- P. C. Jordan, *Chemical Kinetics and Transport*, John Wiley and Sons, Inc., 1979.
- M. J. Pilling and P. W. Seakins, *Reaction Kinetics*, Oxford University Press, 1995.
- M. R. Wright, *Fundamental Chemical Kinetics*, Horwood Publishing, 1999.
- S. K. Scott, *Oscillations, Waves, and Chaos in Chemical Kinetics*, Oxford University Press, 1994.
- E. N. Yeregin, *The Foundation of Chemical Kinetics*, Mir Publishers, 1979.
- K. J. Laidler, *Chemical Kinetics*, TMH Publishing Company Limited, 1988.
- E. Kreyszig, *Advanced Engineering Mathematics*, 5th Edn., Wiley Eastern, 1988.
- G. Arfken, *Mathematical Methods for Physicists*, Academic Press, New York, 1966.
- M. K. Jain, *Numerical Methods for Scientific and Engineering Computation*, Wiley Eastern Ltd.
- R. A. McQuarrie and J. D. Simons, *Physical Chemistry* 1st Edn, Viva Books Private Limited, New Delhi, 1998.
- R. A. McQuarrie, *Statistical Mechanics*, Harper and Row, 1976.
- L. D. Landall and E. M. Lifshitz, *Statistical Physics* 2nd revised English Edn., Pergamon Press, Oxford, 1977.
- J. N. Murrell, *The Theory of Electronic Spectra of Organic Molecules*, John Wiley and Sons, 1963.
- J. B. Burks, *Photophysics of Aromatic Molecules*, Wiley-Interscience, 1969.
- G. M. Burnett and A. M. North, *Transfer and Storage of Energy by Molecule*, Vol. I, Wiley-Interscience, 1970

Practical

CGP 305: Inorganic, Nuclear-Analytical, Organic and Physical General

Inorganic

1. Solution electrical conductivity measurements, and spectral, thermal, electrochemical and magnetic studies of coordination compounds

Nuclear-Analytical

2. Spectrophotometric analysis of binary mixtures, and determination of indicator constant
3. Determination of water quality parameters

Organic

4. Spectrophotometric identification of simple organic compounds (IR, and UV-Vis)

Physical

5. Experiments on kinetics-I: effect of solvent, pH, ionic strength

CSP 306: Inorganic Special

1. Quantitative analysis of major and minor components in ores and alloys by volumetric, complexometric, gravimetric and other instrumental methods after separation of the components by solvent extraction or chromatographic techniques
2. Determination of composition and formation constants of selected systems by pH-metric and spectrophotometric methods

CSP 306: Nuclear-Analytical Special

1. Quantitative analysis of major, minor and trace components of ores and alloys by conventional and instrumental methods like spectrophotometer and AAS
2. Analysis of water, cement, fertilizer, food and drug
3. Experiments on separation techniques by ion exchange chromatography and solvent extraction processes

CSP 306: Organic Special

1. Different types of chromatography including low and medium pressure condition; purification techniques: vacuum distillation and sublimation, solvent purification, crystallization,
2. Quantitative estimation of organic compounds

CSP 306: Physical Special

1. Experiments on surface chemistry: determination of CMC by conductometric, tensiometric, viscometric and spectrophotometric methods
2. Experiments on kinetics-II: variable temperature, experiments on equilibrium, micelles

Semester-IV
Theoretical
CAG 401: Advanced General
Group A

1. Diffraction study: (12 lectures)

Bravis lattices, space group and its determination, stereographic projection, techniques in X-ray structure determination, Fourier series, electron density and structure factor, methods of solving the phase problem, Patterson and direct methods for determination of crystal structures

2. Supramolecular Chemistry I: (06 lectures)

Concept and language, designing of building blocks, molecular valences, supramolecular orbitals, supramolecular arrays: ribbon, ladder, rack, braded, grid; harnessing non-covalent forces to design functional materials

3. Luminescence, photoacoustic, Raman and flame atomic spectrometry: (09 lectures)

Molecular luminescence spectrometry — theory, instrumentation and applications; photoacoustic spectrometry; light scattering techniques including nephelometry and Raman spectroscopy flame spectrometric techniques — atomic absorption, atomic emission and atomic fluorescence, theory, instrumentation and applications of these techniques

Group B

4. Quantum chemistry: (14 lectures)

Legendre, associated Legendre polynomials; Hermite polynomials; Lagurre and associated Lagurre polynomials; polynomials as orthonormal functions, their properties; complete solution of the H-atom problem; angular momentum: operators, their commutation properties, step-up and step-down operators, application to single electron and multi-electron atom, eigen-ket-ladder and formulation of spherical harmonics from angular momentum rules, finite rotation operation vs. angular momentum operators, spin angular momentum, Pauli spin matrices — spin eigenfunctions and their properties

5. Spectroscopy: (13 lectures)

Maxwell's field equations, transition between states, selection rules and forbidden transitions; NMR: Relaxation and exchange phenomena, theories of chemical shift and nuclear spin-spin coupling in 2-spin systems with applications, pulsed NMR (spin echo); Electronic: $n \rightarrow \pi^*$, $\pi \rightarrow \pi^*$ and CT transitions; vibrational: simple polyatomic molecules, normal modes, influence of nuclear spin on vibration-rotation spectra of polyatomics; Raman: classical and quantum treatment of rotational and vibrational Raman spectra, polarization and depolarization of Raman lines, resonance Raman spectroscopy

Tentative List of Recommended Books/Journals

- M. F. C. Ladd and R. A. Palmer, *Structural Determination by X-ray Crystallography*, 3rd Edn, Plenum, New York, 1994.
- R. C. Evans, *An Introduction to Crystal Chemistry*, 2nd Edn, Cambridge University Press, Cambridge, 1964.
- W. E. Addison, *Structural Principles in Inorganic Compounds*, John Wiley, New York, 1961.
- P. L. Huyskens and T. Zeegers-Huyskens, *Intermolecular Forces: An Introduction to Modern Methods and Results*, Springer-Verlag, Berlin, 1991.
- G. A. Jeffrey, *An Introduction to Hydrogen Bonding*, Oxford University Press, Oxford, 1997.
- G. A. Jeffrey and W. Saenger, *Hydrogen bonding in Biological Structures*, Springer, Berlin, 1991.
- S. T. Hyde, B. Ninham, S. Anderson, Z. Blum, T. Landh, K. Larsson and S. Liddin, *The Language of Shape*, Elsevier, Amsterdam, 1997.
- F. Vogtle, *Supramolecular Chemistry: An Introduction*, Wiley, Chichester, 1991.
- B. Dietrich, P. Viout and J. -M. Lehn, *Macrocyclic Chemistry – Aspects of Organic and Inorganic Supramolecular Chemistry*, VCH, Weinheim, 1993.
- J. -M. Lehn, *Supramolecular Chemistry: Concepts and Perspectives*, VCH, Weinheim, 1995.
- G. R. Newkome, C. N. Moorefield and F. Vogtle, *Dendritic Molecules*, VCH, Weinheim, 1996.
- J. W. Steed and J. L. Atwood, *Supramolecular Chemistry*, John Wiley and Sons, New York, 2000.
- A. K. Chandra, *Introductory Quantum Chemistry*, Tata McGraw-Hill Publishing Co, New Delhi, 1989.
- F. L. Pilar, *Elementary Quantum Chemistry*, Tata McGraw-Hill, 1990.
- P. W. Atkins, *Molecular Quantum Mechanics*, Clarendon Press, Oxford, 1980.
- E. Merzbacher, *Quantum Mechanics*, John Wiley and Sons, 1970.
- L. I. Schiff, *Quantum Mechanics*, McGraw-Hill, 1985.
- L. Pauling and E. B. Wilson, *Introduction to Quantum Mechanics*, McGraw-Hill, 1939.
- I. N. Levine, *Quantum Chemistry*, 4th Edn., Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
- C. N. Banwell and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Edn, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1994.
- G. M. Barrow, *Introduction to Molecular Spectroscopy*, McGraw-Hill International Book Company, Tokyo, 1982.
- P. Hendra, C. Jones and G. Warnes, *FT-Raman Spectroscopy*, Ellis-Harwood, 1991.
- K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, 5th Edn, Part B, John Wiley and Sons, Inc., New York, 1997.

- A. E. Derome, *Modern NMR Techniques in Chemical Research*, Pergamon Press, Oxford, 1987.
 W. Kemp, *NMR in Chemistry: A Multinuclear Approach*, Macmillan Press, 1986.
 J. K. M. Sanders, E. C. Constable and B. K. Hunter, *Modern NMR Spectroscopy: A Workbook of Chemical Problems*, Oxford University Press, Oxford, 1993.
 H. Gunther, *NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry*, Wiley, New York, 1995.
 A. Abragam and B. Bleaney, *Electron Paramagnetic Resonance of Transition Metal Ions*, Clarendon Press, Oxford, 1970.
 N. M. Atherton, *Principles of Electron Spin Resonance*, Ellis Horwood/Prentice-Hall, Hemel Hempsted, 1993.
 W. O. George and H. O. Willis, *Computer Methods in Ultraviolet, Visible and Infra-red Spectroscopy*, Royal Society of Chemistry, 1990.

CS 402: Inorganic special

Group A

1. Electrochemical studies: (18 lectures)

Preamble, switching and action potentials, electrode potential and factors affecting; cyclic voltammetry, differential pulse voltammetry and coulometry; reversible, quasireversible and irreversible processes; E, EE, ECE, EC, ECEC paths, protic-electroprotic equilibria; electroinduced reactions — electrosynthesis, electrocatalysis, electropolymerisation, electrocrystallisation, electrochemiluminescence; OTTLE, surface-modified electrode, photoelectrochemistry, spectroelectrochemistry, excimer and its structure, excited state potential, redox orbital, redox series, redox isomer, electron hopping, spacially isolated orbitals; conjunctive study and simulations of electron transfer sites

2. Redox reactions: (09 lectures)

Classifications, kinetics and mechanism, outer-sphere reaction, self-exchange rate, electron tunneling hypothesis, heteronuclear redox reaction and simplified Marcus theory; Marcus cross relationship and its application, solvated electron; inner-sphere reaction, remote attack, doubly-bridged process, complementary and non-complementary redox reaction, ligand exchange, effect of bridging ligand in inner sphere reaction, intervalence electron transfer, induced reaction, electron-transport in metalloproteins

Group B

3. Inorganic photochemistry: (15 lectures)

Photoexcitation, fluorescence, phosphorescence, photosensitization, quenching, charge and energy transfer, excimer structure, substitution, prompt and delayed reaction, decomposition, fragmentation, isomerisation, exchange and redox reactions; chemiluminescence, photochromism; selective photochemistry using laser beams; chemical actinometry, inorganic photochemistry in biological processes and their model studies; applications of photochemical reactions of coordination compounds — synthesis and catalysis, solar energy conversion and storage

4. Organometallic chemistry II: (12 lectures)

Design and synthesis; structure, bonding, stereochemistry, reaction and reaction pathways; nucleophilic addition and abstraction; application to organic synthesis, enantioselective functional group interconversion, chiral synthesis, protection and deprotection; transmetallation and cyclisation reactions, metallo-fullerenes, bioorganometallics, organo-lanthanoids and actinoids, organo-dendrimer, surface organometallic chemistry

Tentative List of Recommended Books/Journals

- P. W. Atkins, *Physical Chemistry*, 5th Edn., Oxford University Press, Oxford, 1994.
 D. I. G. Ives and G. J. Janz, *Reference Electrodes*, Academic Press, New York, 1961.
 J. O'M. Bockris and A. K. N. Reddy, *Modern Electrochemistry*, Plenum Press, New York, 1970.
 D. T. Sawyer, A. Sobkowiak and J. L. Roberts, Jr., *Experimental Electrochemistry for Chemists*, 2nd Edn, Wiley, New York, 1995.
 S. R. Morrison, *Electrochemistry in Semiconductor and Oxidised Metal Electrodes*, Plenum Press, New York, 1980.
 J. Koryta and K. Stulik, *Ion-selective Electrodes*, Cambridge University Press, Cambridge, 1983.
 A. J. Bard, R. Parsons and J. Jordan, *Standard Potentials in Aqueous Solution*, Dekker, New York, 1985.
 S. Torii, *Electro-Organic Syntheses*, Part I: *Oxidations*, Part II: *Reductions*, VCH, Weinheim, 1985.
 A. J. Fry and W. E. Britton (Eds.), *Organic Electrochemistry*, Dekker, New York, 1985.
 E. Heitz and G. Kreysa, *Principles of Electrochemical Engineering*, VCH, Weinheim, 1986.
 D. E. Kyriacou and D. A. Jannakoudis, *Electrocatalysis for Organic Synthesis*, Wiley, New York, 1986.
 J. Goodisman, *Electrochemistry: Theoretical Foundations*, Wiley, New York, 1987.

- A. P. F. Turner, I. Karube and G. S. Wilson (Ed.), *Biosensors: Fundamentals and Applications*, Oxford University Press, Oxford, 1987.
- R. J. Gale (Ed.), *Spectroelectrochemistry: Theory and Practice*, Plenum Press, New York, 1988.
- M. I. Ismail (Ed.), *Electrochemical Reactors: Their Science and Technology*, Elsevier, Amsterdam, 1989.
- J. Janata, *Principles of Chemical Sensors*, Plenum Press, New York, 1989.
- D. Pletcher and F. C. Walsh, *Industrial Electrochemistry*, 2nd Edn., Chapman and Hall, London, 1990.
- R. Varma and J. R. Selman (Eds.), *Techniques for Characterization of Electrodes and Electrochemical Processes*, Wiley, New York, 1991.
- J. Koryta, *Ions, Electrodes, and Membranes*, Wiley, Chichester, 1991.
- J. O'M. Bockris and S. U. M. Khan, *Surface Electrochemistry*, Plenum Press, New York, 1993.
- C. M. A. Brett and A. M. O. Brett, *Electrochemistry: Principles, Methods and Applications*, Oxford University Press, Oxford, 1993.
- K. V. Kordesch, *Fuel Cells and Their Applications*, VCH, Weinheim, 1994.
- P. A. Christensen and A. Hammett, *Techniques and Mechanisms in Electrochemistry*, Blackie, Edinburgh, 1995.
- P. G. Bruce, *Solid-state Electrochemistry*, Cambridge University Press, Cambridge, 1995.
- F. Goodrich and K. Scott, *Electrochemical Process Engineering*, Plenum Press, New York, 1995.
- W. Schmickler, *Interfacial Electrochemistry*, Oxford University Press, Oxford, 1996.
- C. A. Vincent and B. Scrosati, *Modern Batteries*, 2nd Edn., Arnold, London, 1997.
- C. H. Hamann, A. Hammett and W. Vielstich, *Electrochemistry*, Wiley-VCH, New York, 1998.
- A. J. Bard and L. F. Faulkner, *Electrochemical Methods – Fundamentals and Applications*, 2nd Edn, Wiley, New York, 1998.
- H. Taube, *Electron Transfer Reaction of Complex Ions in Solution*, Academic Press, New York, 1970.
- A. Haim, *Inner-Sphere Reactions*, Progr. Inorg. Chem, 1983, 30, 273.
- N. Sutin, *Outer-Sphere Reactions*, Progr Inorg Chem. 1983. 30, 441.
- W. L. Reynolds and R. W. Lumry, *Mechanism of Electron Transfer*, Ronald Press, New York, 1966.
- C. J. Ballhausen, *Introduction to Ligand Field Theory*, McGraw-Hill, New York, 1962.
- A. N. Figgis, *Introduction to Ligand Field Theory*, Interscience, New York, 1966.
- S. C. Rakshit, *Molecular Symmetry Groups and Chemistry*, The New Book Stall, Kolkata, 1988.
- C. J. Ballhausen, *Molecular Electronic Structure of Transition Metal Complexes*, McGraw-Hill, London, 1979.
- V. Balzani and V. Carassiti, *Photochemistry of Coordination Compounds*, Academic Press, New York, 1970.
- A. W. Adamson and P. D. Fleischauer (Ed), *Concept of Inorganic Photochemistry*, Wiley, New York, 1975.
- G. L. Geoffroy and M. S. Wrighton, *Organometallic Photochemistry*, Academic Press, New York, 1970.
- B. R. Hollebone, C. H. Langford and N. Serpone, *Inorganic Photochemistry*, *Coord. Chem. Rev.*, 1981, 39, 181.
- A. D. Kirk, *Inorganic Photochemistry*, *Coord. Chem. Rev.*, 1981, 39, 225.
- D. Rendell and D. Mowthroe, *Fluorescence and Phosphorescence Spectroscopy*, John Wiley, New York, 1987.
- E. Wayne and R. P. Wayne, *Photochemistry*, Oxford University Press, Oxford, 1996.
- J. P. Collmann, L. S. Hegedus, J. R. Norton and R. G. Finke, *Principles and Applications of Organotransition metal Chemistry*, University Science Books, Mill Valley, CA, 1987.
- E. Abel, F. G. A. Stone and G. Wilkinson (Eds.) *Comprehensive Organometallic Chemistry*, Vols. 1-8, Pergamon Press, Oxford 1980-1995.

- L. S. Hegedus, *Transition Metal in the Synthesis of Complex Organic Molecules*, University Science Press, Mill Valley, CA, 1994.
- M. Periasamy, *Organic Synthesis Using Iron-Carbonyl Reagents*, *Curr. Sci.*, 2000, 78, (11), 1307-1313
- R. H. Crabtree, *The Organometallic Chemistry of the Transition Metals*, 2nd Edn, Wiley, New York, 1994.
- G. O. Spessard and G. L. Miessler, *Organometallic Chemistry*, Prentice-Hall, New Jersey, 1997.
- A. Yamamoto, *Organotransition Metal Chemistry*, Wiley, New York, 1986.

CS 402: Nuclear-Analytical Special

Group A

1. Chemistry of exotic atoms and hot atom chemistry: (09 lectures)

Positron annihilation, probability of positronium formation, reaction and mechanism of positronium ion, chemistry of muonium and pionium ions; hot atom chemistry, Szilard-Chalmer reaction and retention of activity, primary and secondary retention, synthesis of labelled compounds

2. Applications of radiotracers: (18 lectures)

Isotope dilution; DIDA, IIDA and substoichiometric methods of analysis, application and numerical problems; nuclear activation analysis: principles, classifications and methods of nuclear activation analysis: principle, different types, interferences, K_0 methods and comparative methods for analysis, special types of derivative activation analysis, depth profile activation analysis, cyclic activation analysis, secondary particle activation analysis; problems and applications, charged-particle activation analysis (CPAA): principles, calculation, applications, PGNA, PIXE, PIGE, IPAA, RBS; design of a new radiopharmaceutical: general considerations and factors; biosynthesis, factors in labeling: efficiency, isotope effect, storage conditions, radiolysis; specific methods of labeling; quality control; physicochemical and biological test

Group B

3. Chemical and biological effects of radiation: (15 lectures)

Ionizing radiation and its physical and chemical effect in target, water, radiolysis, (definition of different units in radiation chemistry, calculation of radiation dose, biological effects, source of human data, lethal dose, permissible level of radiation dose), primary radiological products of water and their characterization, dosimetric concepts and quantities,

different types of chemical dosimeters, thermoluminescence and lyoluminescence and explanation — different unusual reactions by lyoluminescence

4. Nuclear reactor and accelerators: (12 lectures)

General features and types of reactor, four-factor formula, charge particle accelerator, van de Graff generator, linear accelerator, cyclotron, synchrotron, synchrocyclotron

List of Recommended Books/Journals

- J. Green and J. Lee, *Positronium Chemistry*, Academic Press, 1964.
 J. Turner, *Atoms, Radiation and Radiation Protection*, Willey Interscience, 1995.
 S. Ahrland, J. O. Liljerzin and J. Rydberg, *Chemistry of the Actinides*, Pergamon Press, 1986.
 J. J. Katz, G. T. Seaborg, L. R. Morss (Ed), *Chemistry of the Actinide Elements*, Chapman and Hall, London, 1986.
 W. D. Ehmann and D. E. Vance, *Radiochemistry and Nuclear Methods of Analysis*, John Wiley, 1991.
 J. W. T. Spinks and R. J. Woods, *An Introduction to Radiation Chemistry*, Wiley, New York, 1964.
 J. F. Duncan and G. B. Cook. *Isotopes in Chemistry*, Clarendon Press, Oxford, 1968.
 I. M. Kolthoff, P. J. Elving and E. B. Sandell, *Treatise on Analytical Chemistry*, Pt-I, II, III, The Interscience Encyclopedia, Inc., New York. 1959,
 A. I. Vogel, *A Text Book of Quantitative Inorganic Analysis*, 3rd Edn, Longmans, 1961.

CS 402: Organic Special

Group A

1. Organic Photochemistry: (15 lectures)

Excited states (S1 and T1) of some photo excited organic molecules; mechanism of photo excitation; photo-induced reactivity of olefins, ketones, unsaturated ketones and various conjugated systems; photo-induced functionalisation in organic molecules involving Barton reaction, Norrish type reactions, Loeffler reaction; photochemical rearrangements, photo induced disproportion reaction, photo induced substitution reaction in aromatic systems, chemiluminescence in organic reactions

2. Alkaloids: (12 lectures)

Classification, general reactions of alkaloids, typical reactions, conversions and rearrangements of morphine, papaverine and cinchona alkaloids

Group B

4. Organic synthetic process: (15 lectures)

Retrosynthetic analysis; C-C bond formation reactions; ylide method, Si in C-C bond formation, organometallic; acetylides and nitriles, logistic and stereochemistry; synthesis of L-hexose (Sharplaeess and Masamune), synthesis of prostaglandins

5. Spectroscopy and stereochemistry: (12 Lectures)

NMR; ^3J variation with dihedral angle, fused rings, spreading out effect, vicinal coupling in other ring sizes, geminal coupling; shapes of NMR signals, pi contribution, NOE; 2D-NMR, EI-MS, MALDI-TOF-MS

Tentative List of Recommended Books/Journals

- G.J. Calvert and J.N. Pitts, *Photochemistry*, 2nd Print, John Wiley, New York, 1967.
 N. J. Turro, *Molecular Photochemistry*, Benjamin and Co., 1955.
 O.L. Chapman, *Some Aspects of Organic Photochemistry*, Dekker, 1967.
 W.A. Noyes, G.S. Hammond and J.N. Pitts, *Advances in Photochemistry*, Vol. I Interscience Publisher, 1964.
- P. de Mayo, *Organic Photochemistry*, IUPAC, Butterworths, London, 1960.
 J.M. Coxon and B. Halton, *Organic Photochemistry*, Cambridge University Press, Cambridge, 1974.
 C.H.J. Wells, *Introduction to M.L. Photochemistry*, Chapman and Hall, 1974.
 D.C. Neekers, *Mechanistic Organic Photochemistry*, Reinhold, 1967.
 T.L. Gilchrist and R.C. Storr, *Organic Reactions and Orbital Symmetry*, 2nd Edn., Cambridge University Press, 1979.
 R.B. Woodward and R. Hoffman, *The Conservation of Orbital Symmetry*, Verlag Chemie GmbH, 1970.
 R. Streitwieser, *Molecular Orbital Theory of Organic Chemists*, John Wiley, 1961.
 R. Noyori, *Asymmetric Catalysis in Organic Synthesis*, John Wiley, 1994.
 K.C. Nicolson and E.J. Sorensen, *Classics in Total Synthesis*, VCH, 1996.
 W. Caruthers, *Modern Methods of Organic Synthesis*, 3rd Edn., Low Price Edition, Cambridge University Press, 1996.
 R.S. Ward, *Selectivity in Organic Synthesis*, John Wiley & Sons., 2003
 K. Nakanishi, T Goto, Sho Ito, S. Natori, and S. Nozoe, *Natural Products Chemistry*, Vol. I (1974) and Vol. II (1975), Academic Press.
 K. W. Bentley, *The Alkaloids, Part II*, Interscience Publishers, 1965.
 S.W. Pelletier, *Chemistry of the Alkaloids*, Van Nostrand Reinhold Co., 1970.
 W. Kemp, *Organic Spectroscopy*, 3rd Edn., McMillan, Hong Kong, 1991.
 D. H. Williams and I. Fleming, *Spectroscopic Methods in Organic Chemistry*, 5th Edn., Tata McGraw-Hill, New Delhi, 2005.
 R. M. Silverstein and F. Webster, *Spectrometric Identification of Organic Compounds*, 6th Edn., John Wiley, New York, 1998.
 K. Biemann, *Mass Spectrometry – Application to Organic Chemistry*, McGraw-Hill, New York, 1962.

- H. Budzikiewicz, C. Djerassi and D.H. Williams, *Mass Spectrometry of Organic Compounds*, Holden-Day, 1967.
- H. Budzikiewicz, C. Djerassi and D.H. Williams, *Structure Elucidation of Natural Products by Mass Spectrometry*, Vol. I and Vol. II, Holden-Day, 1964.
- N. S. Bhacca, S. Norman and D. H. Williams, *Application of NMR Spectroscopy in Organic Chemistry*, Holden-Day, 1964.
- R.B. Woodward and R. Hoffman, *The Conservation of Orbital Symmetry*, Verlag Chemie GmbH, 1970.
- K. Downard, *Mass Spectrometry: A Foundation Course*, Royal Society of Chemistry, UK, 2004.
- G. Siurdek, *The Expanding Role of Mass Spectrometry in Biotechnology*, MCC Press, San diego, 2004
- C. Dass, *An Introduction to Biological Mass Spectrometry*, Wiley, USA, 2002.
- R. S. Word, *Selectivity in Organic Synthesis*, John Wiley & Sons.
- J. R. Hanson, *Organic Synthetic Methods*, Royal Society of Chemistry, 2002.
- E.M. Carreira, O. Rerser, *Classics in Stereoselective Synthesis*, John Wiley & Sons, 2007.
- R. S. Atkinson, *Stereoselective Synthesis*, Wiley, 1995.
- C. Bolm, J. A. Gladysz, *Chemical Reviews* 2003, 103 (8).
- T. D. W. Claridge, *Tetrahedron Organic Chemistry Series Volume 19, High-Resolution NMR Techniques in Organic Chemistry*, Pergamon, 2004.
- M. Duer (Ed), *Introduction to Solid State NMR Spectroscopy*, Blackwell, 2004.
- F. Hillenkamp, J. P. Katalinic, *A Practical Guide to MALDI MS: Instrumentation, Method and Applications*, 2006.

CS 402: Physical Special

Group A

1. Statistical mechanics: (27 lectures)

Classical equations of motion: Newton, Lagrange and Hamilton's forms, Poisson Bracket in classical mechanics, relation of Poisson Bracket's with commutators in quantum mechanics, phase space, Liouville's equation and theorem, microcanonical, canonical and grand canonical ensembles, statistical distribution and properties of distribution function, the H theorem and approach to equilibrium; Maxwell-Boltzmann (MB), Bose-Einstein (BE) and Fermi-Dirac (FD) distributions, the derivation of thermodynamic relations, thermodynamic and characteristic features of MB, BE and FD systems (ideal cases), black body radiation and photon gas; applications: (i) statistical thermodynamics of ideal systems (effect of nuclear spin and electronic angular momentum), (ii) specific heat of solids — Debye treatment, (iii) non-ideal gas

Group B

2. Electric and magnetic properties of matter: (12 lectures)

Dielectric polarization; Debye equation and its limitation; Onsager's reaction field model; electric polarizability of molecules; magnetic susceptibility — diamagnetic and paramagnetic, Curie law

3. Molecular interactions: (15 lectures)

Hamiltonian in absence and presence of external fields, forces in molecules, Hellmann-Feynmann theorem, perturbative treatment of electric polarisability, intermolecular interaction — calculation of dispersion energy, the London formula

Tentative List Recommended of Books/Journals

- E. S. R. Gopal, *Statistical Mechanics and Properties of Matter*, Ellis Horwood, England, 1974.
 R. K. Pathria, *Statistical Mechanics*, Butterworth-Heinemann, 1996.
 F. Reif, *Fundamentals of Statistical and Thermal Physics*, McGraw-Hill, 1965.
 S. K. Ma, *Statistical Mechanics*, World Sci., 1985.
 F. L. Pilar, *Elementary Quantum Chemistry*, Tata McGraw-Hill, 1990.
 P. W. Atkins, *Molecular Quantum Mechanics*, Clarendon Press, Oxford, 1980.
 A. J. Stone, *The Theory of Intermolecular Forces*, Clarendon Press, Oxford, 1996.
 C. J. F. Böttcher, *Theory of Electric Polarisation*, Elsevier Scientific Publishing Co., New York, 1973 (Vol. 1 & 2).
 D. W. Davies, *The Electric and Magnetic Properties of Molecules*,

CS 403: Inorganic Special

Group A

1. Supramolecular chemistry II: (15 lectures)

Definition, building block and spacer, molecular valency, supramolecular orbitals, non-covalent forces: pallet of hydrogen bondings, pi-pi and C-H...pi interactions, geometry setter, allostereism, proton and hydride sponges, principle of three C's, lock and key principle, host-guest interaction, self organization and self complementarity, receptors, superstructures in inorganic, metallo-organic, organometallic compounds, supramolecular devices

2. Inorganic materials: (12 lectures)

Designed synthesis – molecules and crystals to materials; art of interweaving, predictable crystalline architecture, intermolecular and interior interaction, secondary bonding, robust and directional interaction, functional materials, conducting materials,

superconducting materials, non-linear optical materials, porous materials and molecular sieves, luminous materials, liquid crystals, magnetic materials, catalysts, molecular devices, nano- and mesomaterials, biomineralisations, biosensors, molecular recognitions, structure and phase transition, thermochromism, light harvesting ferroelasticity, intercalation

Group B

3. Molecular magnetism II: (18 lectures)

Design and synthesis of different magnetic bodies, magnetic orbital, magnetic interactions in di- and polynuclear systems, effect of counter anion in crystal packing, cryogenic experiments, mechanisms of exchange interactions, Bleaney-Bowers equation, deliberate synthetic approach of ferromagnetically coupled systems, accidental orthogonality, canting, spin frustration, admixed-spin, spinflop, metamagnetism, long-range ordering, calculation of ground state and spin manifold, magnetization versus field studies, inorganic, organic and organometallic magnetic materials

4. Correlative study: (09 lectures)

Thermodynamic and kinetic parameters; diagnostic tools: spectroscopic, electrochemical, thermal, magnetic, crystallographic tools; parameters: stretching frequency, chemical shift, potential value, bond distance, bond angle and torsion angle, magnetic moment value, Mossbauer shift value, rate constant, half life, dissociation constant, correlation diagram, room temperature and variable temperature results

Tentative List of Recommended Books/Journals:

- J. E. Mark, H. R. Allcock and R. West, *Inorganic Polymers*, Prentice Hall, Englewood Cliffs, New Jersey, 1992.
 D. W. Bruce and D. O'Hare, *Inorganic Materials*, John Wiley and Sons, New York, 1992.
 R. B. King (Ed), *Encyclopedia of Inorganic Chemistry*, Wiley, Chichester, 1994.
 Special issue on Focus on Self-assembly, *Acc. Chem. Res.*, 1999, 32, Number 4.
 P. L. Huyskens and T. Zeegers-Huyskens, *Intermolecular Forces: An Introduction to Modern Methods and Results*, Springer-Verlag, Berlin, 1991.
 G. A. Jeffrey, *An Introduction to Hydrogen Bonding*, Oxford University Press, Oxford, 1997.
 G. A. Jeffrey and W. Saenger, *Hydrogen bonding in Biological Structures*, Springer, Berlin, 1991.
 S. T. Hyde, B. Ninham, S. Anderson, Z. Blum, T. Landh, K. Larsson and S. Liddin, *The Language of Shape*, Elsevier, Amsterdam, 1997.
 F. Vogtle, *Supramolecular Chemistry: An Introduction*, Wiley, Chichester, 1991.
 B. Dietrich, P. Viout and J. -M. Lehn, *Macrocyclic Chemistry – Aspects of Organic and Inorganic Supramolecular Chemistry*, VCH, Weinheim, 1993.

- J. -M. Lehn, *Supramolecular Chemistry: Concepts and Perspectives*, VCH, Weinheim, 1995.
- G. R. Newkome, C. N. Moorefield and F. Vogtle, *Dendritic Molecules*, VCH, Weinheim, 1996.
- J. W. Steed and J. L. Atwood, *Supramolecular Chemistry*, John Wiley and Sons, New York, 2000.
- V. Balzani and F. Scandola, *Supramolecular Photochemistry*, Ellis Horwood, Chichester, 1991.
- F. L. Caster, R. E. Siatowski and H. Woltzen (Eds.), *Molecular Electronic Devices*, North Holland, Amsterdam, 1999.
- D. J. Williams (Ed.), *Nolinear Optical Properties of Organic and Polymeric Materials*, ACS, Washington DC, 1983.
- S. R. Marder, J. E. Sohn and G. D. Stucky (Eds), *Materials for Non-linear Optics: Chemical Perspectives*, ACS Symposium Ser, 1991.
- R. W. Boyd, *Nonlinear Optics*, Academic Press, San Diego, 1992.
- R. L. Carlin, *Magnetochemistry*, Springer-Verlag, New York, 1986.
- O. Kahn, *Molecular Magnetism*, VCH, New York, 1993.
- J. S. Miller and M. Drillon (Eds.), *Magnetism: Molecules to Materials, II; Molecule-based Magnets*, Wiley-VCH, Weinheim, 2001.
- P. Day and A. E. Underhill (Eds.), *Metal-organic and Organic Molecular Magnets*, RSC, London, 2000.
- P. M. Lathi (Ed.), *Magnetic Properties of Organic Materials*, Marcel Dekker, New York, 1999.
- C. M. Sorensen, *Magnetism in Nanoscale Materials in Chemistry*, Wiley Interscience, New York, 2001.
- S. Chandrasekhar, *Liquid Crystals*, 2nd Edn, Cambridge University Press, 1992.
- G. R. Desiraju, *Crystal Engineering: Designing of Organic Solids*, Elsevier, New York, 1989.
- D. Braga, F. Grepioni and A. G. Orpen, *Crystal Engineering: from Molecules and Crystals to Materials*, Kluwer Academic Publishers, Dordrecht, 1999.
- U. Schubert and N. Husing, *Synthesis of Inorganic Material*, 2nd Edn., Wiley-VCH Verlag GmbH & Co., Weinheim, 2005
- J. N. Lalena and D. A. Cleary, *Principles of Inorganic Materials Design*, Wiley-Interscience, New Jersey, 2005.
- X. -D. Xiang and I. Takenchi (Eds.), *Combinatorial Synthesis*, Marcel Dekker, New York, 2003.
- E. I. Stiefel (Ed), *Dithiolene Chemistry: Synthesis, properties, and Applications*, John Wiley & Sons, New Jersey, 2004.
- P. Gomez-Romero and C. Sanchez (Eds.), *Functional Hybrid Materials*, Wiley-VCH, Weinheim, 2004.
- R. S. Drago, *Physical Methods for Chemists*, Saunders, Philadelphia, 1993.
- M. F. C. Ladd and R. A. Palmer, *Structural Determination by X-ray Crystallography*, 3rd Edn, Plenum, New York, 1994.
- R. C. Evans, *An Introduction to Crystal Chemistry*, 2nd Edb, Cambridge University Press, Cambridge, 1964.
- W. E. Addison, *Structural Principles in Inorganic Compounds*, John Wiley, New York, 1961.

CS 403: Nuclear-Analytical Special

Group A

1. Trace and ultra-trace analysis — an instrumental approach: (14 lectures)

Introduction to various instrumental methods for trace and ultra-trace analysis — atomic absorption, flame photometry, atomic emission, atomic fluorescence — theory,

instrumentation and application, Raman spectroscopy — Raman effect, applications, spectra of typical molecules, photochemistry — laws, quantum yield — problems, instrumentation, examples of photochemical reactions, actinometer, molecular luminiscence spectrometry — theory, instrumentation, application, effect of temperature and solvent effects in fluorescence

2. Kinetic method of analysis: (13 lectures)

Introduction, transition state theory, dielectric effect and ion-ion interaction, study of fast reaction, stopped flow, relaxation method, reaction involving structural changes and enzymatic processes; template reaction; self-exchange reaction, electron tunneling hypothesis, Marcus theory: inner-sphere and outer-sphere reaction, indicator reactions, application of kinetic methods in trace analysis.

Group B

3. Some recent analytical techniques: (09 lectures)

Hyphenated techniques — state of art, GC-MS, LC-MS, GC-FTIR, GC-MS-FTIR, GC-AED, LC-FTIR, LC-NMR

4. Applied analysis: (09 lectures)

Sampling, modern methods of sample digestion, typical analysis of ores, minerals, alloys, glass and ceramic materials, fuel, food, food additives, drug, pesticides in fruit juice and water

5. Basic electronics (09 lectures)

Characteristics and use of diodes, capacitors, inductors, transformers, FET, MOSFET, rectifier, power supply, clipper, oscillator and timer circuits, linear small signal amplifiers and their characteristics, integrated circuits, operational amplifier and its applications including applications in analytical and nuclear instruments, logic gates and elementary digital circuits

List of Recommended Books/Journals

- I. M. Kolthoff, P. J. Elving and E. B. Sandell, *Treatise on Analytical Chemistry*, Pt-I, II, III, The Interscience Encyclopedia, Inc., New York, 1959.
 A. I. Vogel, *A Test Book of Quantitative Inorganic Analysis*, 3rd Edn., Longmans, 1961.
 D. Harvey, *Modern Analytical Chemistry*, McGraw-Hill, New York, 2000.
 D. A. Skoog, *Principle of Instrumental Analysis*, 3rd Edn, Saunders College Publishing, New York, 1985.
 D. A. Skoog and J. J. Leory, *Principles of Instrumental Analysis*, Saunders, Philadelphia, 1994.

- G. D. Christian, *Analytical Chemistry*, 5th Edn. John Wiley, New York, 1994.
- R. J. H. Clark and R. E. Hester, *Advances in Infrared and Raman Spectroscopy*, John Wiley, 1985.
- D. Rendell and D. Mowthrope, *Fluorescence and Phosphorescence Spectroscopy*, John Wiley, 1987.
- E. Metcalfe and F. E. Prichard, *Atomic Absorption and Emission Spectroscopy*, John Wiley, 1987.
- P. W. J. M. Boumans, *Inductively Coupled Plasma Emission Spectroscopy*, John Wiley, 1987.
- K. E. Jarvis, A. L. Gray and R. S. Houk, *Hand Book of Inductively Coupled Plasma Emission Spectroscopy*, Blackie, Classgow and London, 1992.
- D. J. Peters, J. H. Hayes and G.M. Hieftje, *Chemical Separation and Measurements*, Saunders, Philadelphia, 1974.
- A. Welz, *Atomic Absorption Spectrometry*, Verlag, Weinheim, 1985.
- W. Salvin, *Graphite Furnace AAS: A Source Book*, Perkin-Elmer, Norwalk, 1984.
- G. W. Ewing, *Instrumental Methods of Chemical Analysis*, 4th Edn., McGraw Hill, 1978.
- E. Y. Wehry, *Modern Fluorescence Spectroscopy*, Plenum Publishing Company, 1981
- K. Nakamoto, *Infrared and Raman Spectroscopy of Inorganic and Coordination Compounds*, Wiley, 1986.
- H. M. Kingston and L. B. Jassie (Ed), *Introduction to Microwave Sample Preparation: Theory and Practice*, American Chemical Society, Washington DC, 1988.
- S. M. Khopkar, *Basic Concepts of Analytical Chemistry*, New Age International Ltd. Publishers, New Delhi, 1998.
- D. A. Skoog, d. M. West and F. J. Holler, *Fundamentals of Analytical Chemistry*, 7th Edn., Saunders, Philadelphia, 1996.
- R. Kellner, J. M. Mermet, M. Otto and H. M. Widmer (Ed), *Analytical Chemistry*, Wiley-VCH, Weinheim, 1998.
- J. D. Ingel, Jr. and S. R. Crouch, *Spectroscopic Analysis*, Prentice Hall, New Jersey, 1988.

CS 403: Organic Special

Group A

1. Orbital symmetry and pericyclic reactions: (18 lectures)
 Symmetry properties of M.O.'s, orbital symmetry conservation and Woodward-Hoffmann rule in pericyclic reaction; frontier orbital interaction , Fukui-Hoffman theory (qualitative), Dewar theory of aromatic transistion state concept (qualitative); topology of cyclo-additions, periselectivity, regioselectivity, Lewis acid catalysis; higher order cyclo-additions, dipolar additions, electrocyclic reactions, sigmatropic reactions, chelotropic reaction, ene reactions, selection rules
2. Asymmetric synthesis: (09 lectures)
 The chiral pool; chiral auxiliaries, reagents and catalysts; Diels-Alder reaction, Heck reaction; alkylation of chiral enolates; didydroxylation.

Group B

3. Steroids (05 lectures)

Reactions and synthesis of steroids, sources of steroid hormones, diosgenin, hecogenin

4. Nucleic acids: (17 lectures)

Introduction, classification, occurrence, nucleosides: isolation, properties and synthesis of ribosyl and deoxyribosyl nucleosides; biosynthesis of α -D-ribose phosphate, nucleotides: isolation, functions, structures of ribosyl and deoxyribosyl nucleotides; biosynthesis of inosinic acid, adenylic acid, guanylic acid, cytidylic acid and uridylic acid; translation and transcription (general idea), RNA and DNA (structural composition), codon, anticodon, genetic code, protein synthesis

5. Heterocyclic Chemistry: (05 lectures)

Structure, synthesis and reactivity of 5,6-membered rings containing two heteroatoms, pyrimidines and purines

Tentative List of Recommended Books/Journals

- T.L.Gilchrist and R.C. Storr, *Organic Reactions and Orbital Symmetry*, 2nd Edn., Cambridge University Press, 1979.
 R.B. Woodward and R. Hoffman, *The Conservation of Orbital Symmetry*, Verlag Chemie GmbH, 1970.
 R. Streitwieser, *Molecular Orbital Theory of Organic Chemists*, John Wiley, 1961.
 E.R. Lehr and A.P. Merchand, *Orbital Symmetry and Cyclo-addition*, Academic Press, 1972.
 G. B. Gills and M. R. Willis, *Pericyclic Reactions*, Chapman and Hall, 1974.
 T.H. Lowry and K.C. Richardson, *Mechanism and Theory in Organic Chemistry*, 3rd Edn., Harper and Row, 1998.
 I. Fleming, *Frontier Orbitals and Organic Chemical Reactions*, John Wiley, 1980.
 F.A. Carey and R.J. Sundberg, *Advanced Organic Chemistry, Parts A and B*, 4th Edn., Plenum Press, 2001.
 R. Noyori, *Asymmetric Catalysis in Organic Synthesis*, John Wiley, 1994.
 R.E. Ireland, *Organic Synthesis*, Prentice-Hall, 1969.
 R.O.C. Norman and J.M. Coxon, *Principles of Organic Synthesis*, 3rd Edn., ELBS, 2003..
 W. Caruthers, *Modern Methods of Organic Synthesis*, 3rd Edn., Low Price Edition, Cambridge University Press, 1996.
 A. H. Depuy and O.H. Chapman, *Molecular Reaction and Organic Photochemistry*, Prentice-Hall, 1975.
 J.S. Bindra and R. Bindra, *Prostaglandin Synthesis*, Academic Press, 1983.
 L.F. Fieser and M. Fieser, *Steroids*, Reinhold, 1967.

- L.J. Goad and T. Akisha, *Analysis of Sterols*, Blackie Academic and Professional, 1997.
 G. Thomas, *Medicinal Chemistry – An Introduction*, John Wiley, 2001.
 R. L. Pecsok, L. D. Shields, T. Cairns and Ian G. McWilliam, *Modern Methods of Chemical Analysis*, 2nd Edn., 1996.
 A. Mazur and B. Harrow, *Text Book of Biochemistry*, 10th Edn., W.B. Saunders Co., 1971.
 P.W. Kuchel and G.B. Ralston, *Theory and Problems in Biochemistry*, International Edition, McGraw-Hill, 1988.
 D.L. Nelson and M.M. Cox, *Lehninger: Principle of Biochemistry*, 4th Edn., W.H. Freeman Co., 2005.
 T. M. Devlin, *Text Book of Biochemistry*, 2nd Edn., John Wiley, 1986.
 J.M. Berg, J.L. Tymoczko & L. Stryer, *Biochemistry*, 5th Edn., W.H. Freeman Co., 2002.
 R. M. Acheson, *Introduction of Chemistry of Heterocyclic Compounds*, 2nd Edn., Interscience Publisher, 1967.

CS 403: Physical Special

Group A

1. Principles of quantum mechanics: (27 lectures)

Analysis of the postulates — pictures and representations; Ehrenfest's theorem; uncertainty principle; properties of sets of functions, Schmidt orthonormalisation; Fourier transformation, delta function with examples, free particle normalization; matrix formulation, tunneling, bound states, the Virial theorem

Group B

2. Approximate methods in quantum mechanics: (12 lectures)

Time dependent perturbation theory, semiclassical treatment of radiation-matter interaction, transition probability and rates, Einstein's A and B coefficients, selection rules; principles of linear and non-linear variation methods, stationary perturbation theory for non-degenerate and degenerate states — applications to rotator, Stark effect, the He-atom

3. Quantum chemistry: (15 lectures)

Antisymmetry of many electron wave function, spin and spatial orbitals, Slater determinant; closed-shell and open-shell electron configurations; multi-electron pure-spin state wave functions — examples with 2- and 3-electron systems, formulation of a multi-electron closed-shell electron configuration energy, introduction of core, Coulomb and exchange integrals with their properties — example of He atom, independent particle model, multi-electron atomic Hartree Hamiltonian and related SCF equations solution,

vertical ionization potential and Koopman's theorem; variational solution of the closed-shell wave function — formulation of the Hartree-Fock equations, properties of Hartree-Fock operator and wave functions, discussion of electron correlation

Tentative List of Recommended Books/Journals

- H. Eyring, J. Walter and G. F. Kimball, *Quantum Chemistry*, Wiley, New York, 1944.
 A. K. Chandra, *Introductory Quantum Chemistry*, Tata McGraw-Hill Publishing Co, New Delhi, 1989.
 F. L. Pilar, *Elementary Quantum Chemistry*, Tata McGraw-Hill, 1990.
 P. W. Atkins, *Molecular Quantum Mechanics*, Clarendon Press, Oxford, 1980.
 E. Merzbacher, *Quantum Mechanics*, John Wiley and Sons, 1970.
 L. I. Schiff, *Quantum Mechanics*, McGraw-Hill, 1985.
 L. Pauling and E. B. Wilson, *Introduction to Quantum Mechanics*, McGraw-Hill, 1939.
 S P. C. W. Davies, *Quantum Mechanics*, ELBS, 1985.
 J. L. Powell and B. Crasemann, *Quantum Mechanics*, Addison-Wesley, 1961.
 D. Bohm, *Quantum Theory*, Asia Pub. House, 1960.
 R. McWeeny, *Methods of Molecular Quantum Mechanics*, Academic Press, London, 1989.
 D. A. McQuarrie, *Quantum Chemistry*, Viva Books Pvt. Ltd., New Delhi, 2003
 G. C. Schatz and M. A. Ratner, *Quantum Mechanics in Chemistry*, Dover Publication, Inc, New York, 2002.
 H. L. Strauss, *Quantum Mechanics*, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., New Delhi.

Practical

CSP 404: Inorganic Special

1. Preparation of inorganic and coordination compounds and their characterization
 - a. Bi-, tri-, and polydentate ligands
 - b. Complexation and purification
 - c. Growing of single crystals
 - d. Elemental analyses (C, H, N and AAS)
 - e. Spectral, thermal, electrochemical and magnetic studies
2. Kinetic and mechanistic studies of some selected reactions (substitution and redox)

CSP 404: Nuclear-Analytical Special

1. Experiments with GM detector
2. Use of γ -ray spectrophotometer
3. Some radioanalytical experiments

CSP 404: Organic Special

1. Preparation of organic compounds involving multiple step reactions
2. Characterization of organic compounds using spectrophotometric methods

CSP 404: Physical Special

1. Instrumental methods of studying hydrolysis, solubility and kinetics; elementary computer-based numerical methods
2. Methods of determination of molecular weights of solids and liquids

CCA 405: Computer Application in Chemistry**A. Theoretical (30 lectures)****1. Introduction to computers:**

Scope for computers, present-day position, computer overview and organization; hardware: CPU, memory – volatile and non-volatile, I/O devices and controllers; software: concept of stored programmes, information storage and retrieval, control instructions and data, idea of operating system, driver and controller programmes, utility packages, user programmes and code

2. Number system:

Decimal, binary, octal and hexadecimal representations, negative numbers and floating point numbers, character sets (ASCII, EBCDIC), fixed and floating point arithmetic

3. Introduction to DOS and WINDOWS

Concept of file, record, data, bit, byte, block; track, sector on storage media; use of file editors — EDIT, NORTON, word Processors etc.

4. Introduction to DOS and WINDOWS:

Data types, arithmetic operations and expressions, relational expressions, library functions, I/O and format statements, control statements, nesting of loops, block IF, subroutines and function subprograms, subscribed variables, dimension and common, parameter passing between programme modules, file handling (OPEN, CLOSE, INQUIRE, REWIND, BACKSPACE, ENDFILE)

5. Numerical techniques and chemical applications:

Algorithms, logical analysis of problems, flow-chart, programmes, data fitting by least square, interpolation techniques, iterative methods, solution of simultaneous equations

B. Practical (20 lab hours)

On-hand practical training with computers on selected chemical problems

Tentative List of Recommended Books/Journals

- S. Lipschutz, A. Poe, Programming with FORTAN (Schaum Series), Mc-Graw-Hill International Edition, Singapore, 1982.
 V. Rajaraman, Computer programming in FORTAN IV, PHI, New Delhi, 1982.
 B. W. Kernighan, D. M. Ritchie, The C programming Language, PHI, Eastern Economy Edition, New Delhi, 1996.
 V. Rajaraman, Computer programming in C, PHI, New Delhi, 1996.
 R. S. Salaria, Numerical Methods, B. P. B. Publications, New Delhi, 1996.
 S. D. Conte and C. de Boor, Elementary Numerical Analysis, McGraw-Hill International, New Delhi, 1986.
 E. G. Lewars, Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics, Springer (India) Pvt. Ltd., 2007.

CTP 406: Term paper

Topic selection in consultation with the teacher; literature search from different reference books and using internet search; typed write-up with proper tables, structures, figures and literature to be submitted; seminar lecture on this topic to be delivered in presence of all the teachers.

**SYLLABUS FOR
MASTER OF COMMERCE
Course**

(w.e.f. 2020-21 Academic Session)



**DEPARTMENT OF COMMERCE
THE UNIVERSITY OF BURDWAN**

Structure of M. Com Curriculum
M. Com (1st SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM 101	Organizational Behaviour and Human Resource Management (OBHRM)	Core Course	(5-0-0)	5	50
COM 102	Corporate Governance and Sustainability (CGS)	Core Course	(5-0-0)	5	50
COM 103	Managerial Economics (ME)	Core Course	(5-0-0)	5	50
COM 104	Statistics for Business Decisions (SBD)	Core Course	(5-0-0)	5	50
COM 105	Accounting for Managerial Decisions (AMD)	Core Course	(5-0-0)	5	50

M. Com (2nd SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM201	Financial Reporting and Financial Statement Analysis (FRFSA)	Core Course	(5-0-0)	5	50
COM 202	Operations Research (OR)	Core Course	(5-0-0)	5	50
COM 203	International Business (IB)	Core Course	(5-0-0)	5	50
COM 204	Advanced Financial Management (AFM)	Core Course	(5-0-0)	5	50
COM 205	Marketing Management and Strategic Management (MMSM)	Core Course	(5-0-0)	5	50

M. Com (3rd SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM301	Direct and Indirect Taxes (DIT)	Core Course	(5-0-0)	5	50
COM302	Computer Applications in Business – I (CAB I)	Core Course	(3-0-2)	5	50
Any one course from the following major electives					
COM303A	Strategic Financial Management (SFM)	Major Elective	(5-0-0)	5	50
COM 303B	Principles & Practices of Banking (PPB)	Major Elective	(5-0-0)	5	50
COM 303C	Advanced Auditing and Assurance (AAA)	Major Elective	(5-0-0)	5	50

Any one course from the following major electives					
COM304A	Security Analysis and Portfolio Management (SAPM)	Major Elective	(5-0-0)	5	50
COM 304B	Principles & Practice of Insurance (PPI)	Major Elective	(5-0-0)	5	50
COM 304C	International Accounting (IA)	Major Elective	(5-0-0)	5	50
In this semester, 5 credit points are to be earned by way of perusing <i>minor elective paper offered other department of this University or may be in the form of Course from SWAYAM platform</i> , subject to the prior approval of the appropriate University authorities.					
COM 305A	Basic Accounting and Finance (AF)	Minor Elective for extra-departmental students	(4-0-0)	4	50
COM 305B	Personal Finance (PF)	Minor Elective for extra-departmental students	(4-0-0)	4	50

M. Com (4th SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM 400	Social Outreach (SO)	Compulsory	(0-0-2)	2	20
COM 401	Strategic Cost Management (SCM)	Core Course	(5-0-0)	5	50
COM 402	Computer Applications in Business – II (CAB II)	Core Course	(3-0-2)	5	50
Any one course from the following major electives					
COM 403A	Business Valuation (BV)	Major Elective	(5-0-0)	5	50
COM 403B	Management of Commercial Banks & Insurance (MCBI)	Major Elective	(5-0-0)	5	50
COM 403C	Corporate Reporting I (CR I)	Major Elective	(5-0-0)	5	50
Any one course from the following major electives					
COM 404A	Financial Institutions and Financial Derivatives (FIFD)	Major Elective	(5-0-0)	5	50
COM 404B	Management of Risk in Banking & Insurance (MRBI)	Major Elective	(5-0-0)	5	50
COM 404C	Corporate Reporting II (CR II)	Major Elective	(5-0-0)	5	50
COM 405	Project Work	Core Course	(0-0-5)	5	50

SYLLABUS FOR MASTER OF COMMERCE Course

(w.e.f. 2014-15 Academic Session)



**DEPARTMENT OF COMMERCE
THE UNIVERSITY OF BURDWAN**

Structure of M. Com Curriculum
Name of the PG Programme: M.COM

M. Com (1st SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM 101	Macro Business Environment and Strategic Management (MBESM)	Core Paper	(4-0-0)	4	50
COM 102	Organizational Behaviour and Human Resource Management (OBHRM)	Core Paper	(4-0-0)	4	50
COM 103	Managerial Economics (ME)	Core Paper	(4-0-0)	4	50
COM 104	Statistics for Business Decisions (SBD)	Core Paper	(4-0-0)	4	50
COM 105	Marketing Management (MM)	Core Paper	(4-0-0)	4	50
COM 106	Accounting for Managerial Decisions (AMD)	Core Paper	(4-0-0)	4	50

[Note: All the papers in first semester are core papers and compulsory]

M. Com (2nd SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM 201	Corporate Social Responsibility (CSR)	Core Paper	(4-0-0)	4	50
*COM 202	Operations Research (OR)	Departmental Elective	(4-0-0)	4	50
*COM 203	International Finance (IF)	Departmental Elective	(4-0-0)	4	50
COM 204	Advanced Financial Accounting & Auditing (AFAA)	Core Paper	(4-0-0)	4	50
COM 205	Financial Statement Analysis (FSA)	Core Paper	(4-0-0)	4	50
COM 206	Financial Management (FM)	Core Paper	(4-0-0)	4	50

[Note: In this semester papers COM 201, COM 204, COM 205 and COM 206 are core papers and compulsory. Papers COM 202 and COM 203 are departmental electives. They can be taken up by the students or the students can take up any papers of equivalent credits from sister departments (Mathematics, Statistics, Business Administration, Economics) subject to prior approval of the Departmental Committee and the University Authorities].

M. Com (3rd SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM 301	Computer Applications in Business I (CAB I)	Departmental Elective	(2-0-2)	4	50
COM 302	Direct Taxes (DT)	Core Paper	(4-0-0)	4	50
COM 303	Corporate Reporting – I (CR-I)	Core Paper	(4-0-0)	4	50
COM 304	International Accounting (IA)	Departmental Elective	(4-0-0)	4	50
COM 305 F	Financial Institutions and Markets(FIM)	Special Paper	(4-0-0)	4	50
COM 305M	Advertising and Sales Promotion (ASP)	Special Paper	(4-0-0)	4	50
COM 305ED	Fundamentals of Entrepreneurship (FE)	Special Paper	(4-0-0)	4	50
COM 305BI	Principles & Practices of Banking (PPB)	Special Paper	(4-0-0)	4	50
COM 305TP	Advanced Corporate Taxation (ACT)	Special Paper	(4-0-0)	4	50
COM 306 F	Security Analysis and Portfolio Management (SAPM)	Special Paper	(4-0-0)	4	50
COM 306 M	Consumer Behaviour and Marketing Research (CBMR)	Special Paper	(4-0-0)	4	50
COM 306ED	Project Planning & Control (PPC)	Special Paper	(4-0-0)	4	50
COM 306 BI	Principles & Practice of Insurance (PPI)	Special Paper	(4-0-0)	4	50
COM 306TP	Tax Practice and Procedures (TTP)	Special Paper	(4-0-0)	4	50
COM 307	Basic Accounting, Costing and Finance (AFC)	Minor Elective	(4-0-0)	4	50

[Note: In this semester papers COM 301 and COM 302 are core and compulsory papers. Papers COM 303 COM 304 are meant for the Accounting special which will be offered to all students. For each of the papers 305 and 306 (Special Papers) five options are available. A student may opt for any one from these five options. Students will be required to retain the same option for specialization in the forth semester also.].

M. Com (4th SEMESTER)

Course Code	Course Title	Course Type	(L-T-P)	Credit	Marks
COM 401	Computer Applications in Business II (CAB II)	Core Paper	(2-0-2)	4	50
COM 402	Indirect Taxes (IDT)	Core Paper	(4-0-0)	4	50
COM 403	Strategic Cost Management (SCM)	Core Paper	(4-0-0)	4	50
COM 404	Corporate Reporting – II (CR-II)	Core Paper	(4-0-0)	4	50
COM 405F	Business Valuation and Risk Management (BVRM)	Special Paper	(4-0-0)	4	50
COM 405M	Marketing of Services (MS)	Special Paper	(4-0-0)	4	50
COM 405ED	Entrepreneurial Finance & Management (EFM)	Special Paper	(4-0-0)	4	50
COM 405BI	Management of Commercial Banks & Insurance (MCBI)	Special Paper	(4-0-0)	4	50
COM 405TP	Tax Assessment Procedures and Process (TAPP)	Special Paper	(4-0-0)	4	50
COM 406F	Advanced Financial Management (AFM)	Special Paper	(4-0-0)	4	50
COM 406M	Sales and Distribution Management (SDM)	Special Paper	(4-0-0)	4	50
COM 406ED	Entrepreneurial Performance Monitoring (EPM)	Special Paper	(4-0-0)	4	50
COM 406BI	Management of Risk in Banking & Insurance (MRBI)	Special Paper	(4-0-0)	4	50
COM 406TP	Indirect Tax Procedures (ITP)	Special Paper	(4-0-0)	4	50
COM 407	Project Work (PW)	Core Paper	(0-2-0)	2	50
COM 408	Project Presentation, Viva and Social Outreach (PPVSO)	Core Paper	(0-0-2)	2	50

[Note: In this semester papers COM 401 and COM 402 are core papers and compulsory. Papers COM 403 and COM 404 are special papers in Accounting which will be offered to all students. Papers COM 405 and COM 406 are special papers. A student will be required to continue with the same specialization which was opted by him/her in Semester 3.

THE UNIVERSITY OF BURDWAN
DEPARTMENT OF COMPUTER SCIENCE
SYLLABUS FOR M. Sc. (COMPUTER SCIENCE) COURSE

- 1) Duration** : Two Years (Four Semesters)
- 2) Total Marks** : 1200 (300 + 300 + 300 +300)
- 3) Total Credit Points** : 96 (24 + 24 + 24 + 24)
- 4) Number of Papers** : Total Twenty Five, out of which, fourteen are Theoretical, eight Practical, One Term Paper, One Project Work and One Social Outreach Programm.
- 5) Distribution of Marks** : All Theoretical and Practical papers are of full marks 50, out of which, 40 marks for University Exam. & 10 marks for Sessional. Sessional marks of theoretical papers will come from two mid – term examinations of 10 marks each. For Term Paper 50 marks will be of University Exam. For Project Work paper full marks is 50, out of which, 25 (20 for University Exam and 5 for for Sessional marks) marks for social outreach program will be of University exam.
- 6) Duration of Univ. Exam** : Two Hours for Theoretical Papers and three Hours for Practical Papers.
- 7) Instruction Period** : In L-T-P pattern, ‘L’ lectures, ‘T’ tutorials, and, ‘2xP’ practical hours per week are needed for each paper. Unless otherwise specified, credit point of a paper will be: L + T + P. At least 50 hours are needed for each theory and practical paper. Two hours per week will be given for remedial purpose.
- 8) Semester Duration** : 16 Weeks.
-

M.Sc. (Computer Science) 2020-2021 Batch

Semester – I

Courses	(L-T-P) Credits	
MSCS- 101: Advanced Algorithm Design	(3-1-0)	4
MSCS -102: Advanced Computer Architecture	(3-1-0)	4
MSCS -103: Advanced Software Engineering	(4-0-0)	4
MSCS -104: Numerical & Statistical Computing	(4-0-0)	4
MSCS –105: Lab I (Advanced Algorithm Design)	(0-0-4)	4
MSCS -106: Lab II (Advanced Software Engineering and Numerical & Statistical Computing)	(0-0-4)	4
Semester Credits	24	

Semester – II

Courses	(L-T-P) Credits	
MSCS- 201: Advanced Operating Systems	(4-0-0)	4
MSCS- 202: Advanced Computer Networks	(3-1-0)	4
MSCS-203: AI & Applications	(3-1-0)	4
MSCS- 204: Advanced DBMS	(4-0-0)	4
MSCS- 205: Lab III (Advanced Operating Systems and Advanced Computer Networks)	(0-0-4)	4
MSCS-206: Lab IV (AI & Applications and Advanced DBMS)	(0-0-4)	4
Semester Credits	24	

Semester – III

Courses	(L-T-P)	Credits
MSCS-301: Compiler Design	(4-0-0)	4
MSCS-302: Discipline-centric Elective (E1)	(3-1-0)	4
MSCS-303: Term Paper: Minor Project	(4-0-0)	4
MSCS -304: Generic Elective (GE) Or MSWM-304	(2-0-0)	2
MSCS-305: Lab V (Compiler Design)	(0-0-4)	4
MSCS-306: Lab VI (Discipline-centric Elective : E1)	(0-0-4)	4
MSCS-307: Community Engagement Activities	(0-0-0)	2
Semester Credits	24	

MSCS-302-Discipline-centric Elective (E1)

- A: Machine Learning
- B: Cryptography and Network Security
- C: Software Project Management
- D: Data Mining
- E: Object Technology using JAVA
- F: Soft Computing
- G: Theory of Computing
- H: May be opted from SWAYAM

MSCS-304-Generic Elective

- A: Internet and E-Commerce
- B: Web Security
- C: Introduction to Artificial Intelligence
- D: Cryptography
- E: Introduction to Programming
- Or
- F: MSWM-304 - May be opted from SWAYAM

Semester – IV

Courses	(L-T-P)	Credits
MSCS-401: Discipline-centric Elective (E2)	(4-0-0)	4
MSCS-402: Discipline-centric Elective (E3)	(4-0-0)	4
MSCS-403: Major Project	(4-0-0)	4
MSCS-404: Seminar and Grand Viva	(0-0-4)	4
MSCS-405: DE Lab VII(E2)	(0-0-4)	4
MSCS-406: DE Lab VIII(E3)	(0-0-4)	4
Semester Credits	24	
Cumulative Credits	96	

Discipline-centric Elective (E2)

A: Operation Research and Optimization

B: Model Checking

C: Bioinformatics

D: Internet of Things

E: Data Science

F: Deep Learning and NLP

Discipline-centric Elective (E3)

A: Mobile Computing

B: Computer Graphics & Multimedia

C: Real time system

D: Image Processing

E: Block Chain Technology

F: Web Technology

DEPARTMENT OF ECONOMICS



UNIVERSITY OF BURDWAN

PG Syllabus – 2020-21 Session onwards

Syllabus at a Glance

Semester	Courses	Remarks
I	• Microeconomics-I (ECN 101)* • Macroeconomics-I (ECN 102)* • Development Economics-I (ECN 103)* • Mathematical Economics & Statistics (ECN104)* • Econometrics-I (ECN 105)*	<i>All papers are Departmental Core Courses and Compulsory</i>
II	• Microeconomics-II (ECN 201)* • Macroeconomics-II (ECN 202)* • Development Economics-II (ECN 203)* • Basic Environmental Economics (ECN 204)* • Basin Financial Economics (ECN 205)*	<i>All papers are Departmental Core Courses and Compulsory</i>
III	• Select Features of Indian Economy (ECN 301)* • International Economics (ECN 302)* • <u>Major Elective-I (ECN 303 A/B/C/D)#</u> • <u>Major Elective-II (ECN 304 A/B/C/D)#</u> • <u>One minor elective of at least 4 credits from other departments</u> • <i>Interdisciplinary Electives for Extra-departmental students[^]</i> ▪ ECN 305A-Environment & Economy ▪ ECN 305B - Demography ▪ ECN 305C – Basic Econometrics ▪ ECN 305D – Indian Economy ▪ ECN 305E – Banking, Insurance & Finance	<u>Major Elective-I</u> • 303A: ~~Advanced Econometrics-I~~ • 303B: Agricultural Economics-I • 303C: Industrial Organisation • 303D: Spatial Econometrics <u>Major Elective-II</u> • 304A: Applied Econometrics-I • 304B: Agricultural Economics-II • 304C: Behavioural Economics • 304D: Data Analysis for Social Sciences
IV	• <u>Community Engagement Course of 2 credits (ECN 400)</u> • Growth & Planning (ECN 401)* • Public Economics (ECN 402)* • <u>Major Elective-III (ECN 403A/B/C/D)#</u> • <u>Major Elective-IV (ECN 404A/B/C/D)#</u> • Computer Applications & Project (ECN 405)*	<u>Major Elective-III</u> • 403A: Advanced Financial Economics • 403B: Resource Economics & Sustainable Development • 403C: Law & Economics • 403D: Rural Development <u>Major Elective-IV</u> • 404A: Applied Econometrics-II • 404B: Economics of Climate Change & Energy • 404C: Economics of Social Capital • 404D: Game Theory & Information

* marked courses are Core courses and Compulsory;

marked courses are Major Electives and students have to choose from available options;

[^] marked courses are •Interdisciplinary Electives for Extra-departmental Students and departmental students will not be offered these courses;

Framework of the Syllabus

Name of Paper	Type	Credit	Pattern		
			L	T	P
First Semester <i>[All papers are Departmental Core Courses and Compulsory]</i>					
• Microeconomics-I (ECN 101)*	Core	5 credits	5	0	0
• Macroeconomics-I (ECN 102)*	Core	5 credits	5	0	0
• Development Economics-I (ECN 103)*	Core	5 credits	5	0	0
• Mathematical Economics & Statistics (ECN 104)*	Core	5 credits	5	0	0
• Econometrics (ECN 105)*	Core	5 credits	5	0	0
Second Semester <i>[All papers are Departmental Core Courses and Compulsory]</i>					
• Microeconomics-II (ECN 201)*	Core	5 credits	5	0	0
• Macroeconomics-II (ECN 202)*	Core	5 credits	5	0	0
• Development Economics-II (ECN 203)*	Core	5 credits	5	0	0
• Basic Environmental Economics (ECN 204)*	Core	5 credits	5	0	0
• Basic Financial Economics (ECN 205)*	Core	5 credits	5	0	0
Third Semester <i>[Students have to choose 2 Core Courses, 2 Major Electives and 1 Interdisciplinary Elective from other departments; however, students may opt for a 4credit course from SWAYAM Platform and can avail the option of credit transfer in lieu of Interdisciplinary Elective]</i>					
• Select Features of Indian Economy (ECN 301)*	Core	5 credits	5	0	0
• International Economics (ECN 302)*	Core	5 credits	5	0	0
• <u>Advanced Econometrics (ECN 303A)#</u>	Major Elective	5 credits	5	0	0
• <u>Agricultural Economics-I (ECN 303B)#</u>	Major Elective	5 credits	5	0	0
• <u>Industrial Organisation (ECN 303C)#</u>	Major Elective	5 credits	5	0	0
• <u>Spatial Econometrics (ECN 303D)#</u>	Major Elective	5 credits	4	0	1
• <u>Applied Econometrics-I (ECN 304A)#</u>	Major Elective	5 credits	5	0	0
• <u>Agricultural Economics-II (ECN 304B)#</u>	Major Elective	5 credits	5	0	0
• <u>Behavioural Economics (ECN 304C)#</u>	Major Elective	5 credits	5	0	0
• <u>Data Analysis for Social Sciences (ECN 304D)#</u>	Major Elective	5 credits	3	0	2
• <u>Environment & Economy (ECN 305A)^</u>	Interdisciplinary Elective for Extra dept students	4 credits	4	0	0
• <u>Demography (ECN 305B)^</u>		4 credits	4	0	0
• <u>Basic Econometrics (ECN 305C)^</u>		4 credits	4	0	0
• <u>Indian Economy (ECN 305D)^</u>		4 credits	4	0	0
• <u>Banking, Insurance & Finance (ECN 305E)^</u>		4 credits	4	0	0
# Candidates have to select ONE from 303A/B/C/D and ONE from 304A/B/C/D					
^ Interdisciplinary Electives for Extra-departmental Students and candidates can select any one					
Continued.....					

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Name of Paper	Type	Credit	Pattern		
			L	T	P
Fourth Semester [Students have to choose 3 core courses and 2 Major Electives]					
• Community Engagement Course (ECN 400) (30 hours of involvement with at least 50 percent field work)	Compulsory	2 Credits	0	0	2
• Growth & Planning (ECN 401)*	Core	5 credits	5	0	0
• Public Economics (ECN 402)*	Core	5 credits	5	0	0
• <u>Advanced Financial Economics -I (ECN 403A)#</u>	Major Elective	5 credits	5	0	0
• <u>Resource Environment & Sustainable Development(ECN 403B)#</u>	Major Elective	5 credits	5	0	0
• <u>Law & Economics (ECN 403C)#</u>	Major Elective	5 credits	5	0	0
• <u>Rural Development(ECN 403D)#</u>	Major Elective	5 credits	5	0	0
• <u>Applied Econometrics–II (ECN 404A)#</u>	Major Elective	5 credits	5	0	0
• <u>Economics of Climate Change & Energy(ECN 404B)#</u>	Major Elective	5 credits	5	0	0
• <u>Economics of Social Capital (ECN 404C)#</u>	Major Elective	5 credits	5	0	0
• <u>Game Theory & Information (ECN 404D)#</u>	Major Elective	5 credits	5	0	0
• Computer Applications & Project (ECN 405)*	Core	5 credits	0	0	5
# Candidates have to select ONE from 403A/B/C/D and ONE from 404A/B/C/D					

DEPARTMENT OF ECONOMICS



UNIVERSITY OF BURDWAN

PG Syllabus – 2014-15 session onwards

Syllabus at a Glance

Seme ster	Courses	Remarks
I	• Microeconomics-I (ECN 101)* • Macroeconomics-I (ECN 102)* • Development Economics-I (ECN 103)* • Mathematical Economics (ECN 104)* • Econometrics-I (ECN 105)*	<i>All papers are Departmental Core Courses and Compulsory</i>
II	• Microeconomics-II (ECN 201)* • Macroeconomics-II (ECN 202)* • Development Economics-II (ECN 203)* • International Economics (ECN 204)* • Econometrics-II (ECN 205)*	<i>All papers are Departmental Core Courses and Compulsory</i>
III	• Indian Economic Scenario (ECN 301)* • <u>Basic Financial Economics (ECN 302)@</u> • <u>Environmental Economics (ECN 303)@</u> • Major Elective-I (ECN 304)# • Major Elective-II (ECN 305)# • <i>Minor Elective for Extra-departmental students-I ECN 391^</i> • <i>Minor Elective for Extra-departmental students-I ECN 392^</i> • <i>Minor Elective for Extra-departmental students-I ECN 393^</i>	<u>Major Electives are offered in pairs–</u> • Advanced Econometrics-I & II (ECN 304A & ECN 305A) OR • Advanced Economic Theory-I & II (ECN 304B & ECN 305B) OR • Agricultural Economics-I & II (ECN 304C & ECN 305C) <u>Minor Electives for Extra-departmental students–</u> • Environment & Economy (ECN 391) • Demography (ECN 392) • Basic Econometrics (ECN 393) • Indian Economy (ECN 394)
IV	• Growth & Planning (ECN 401)* • Computer Applications & Project (ECN 402)* • Public Economics (ECN 403)* • Major Elective-II (ECN 404)# • Major Elective-II (ECN 405)# • <i>Minor Elective for Extra-departmental students-III ECN 491^</i>	<u>Major Electives are offered in pairs –</u> • Financial Economics-I & II (ECN 404A & ECN 405A) OR • Resource Environment & Energy-I & II (ECN 404B & ECN 405B) OR • Rural Development -I & II (ECN 404C & ECN 405C)

*** marked courses are Core courses and Compulsory;**

marked courses are Major Electives and students have to choose from available options;

@ marked courses are Minor Electives and students have the option of taking these or courses from other departments as per extant university regulations;

^ marked courses are Minor Electives for Extra-departmental Students and departmental students will not be offered these courses;

Framework of the Syllabus

Framework of the Syllabus					
Name of Paper	Type	Credit	Pattern		
			L	T	P
<u>First Semester</u> [All papers are Departmental Core Courses and Compulsory]					
• Microeconomics-I (ECN 101)*	Core	5 credit	5	0	0
• Macroeconomics-I (ECN 102)*	Core	5 credit	5	0	0
• Development Economics-I (ECN 103)*	Core	5 credit	5	0	0
• Mathematical Economics (ECN 104)*	Core	5 credit	5	0	0
• Econometrics-I (ECN 105)*	Core	5 credit	5	0	0
<u>Second Semester</u> [All papers are Departmental Core Courses and Compulsory]					
• Microeconomics-II (ECN 201)*	Core	5 credit	5	0	0
• Macroeconomics-II (ECN 202)*	Core	5 credit	5	0	0
• Development Economics-II (ECN 203)*	Core	5 credit	5	0	0
• International Economics (ECN 204)*	Core	5 credit	5	0	0
• Econometrics-II (ECN 205)*	Core	5 credit	5	0	0
<u>Third Semester</u> [Students have to choose 2 core courses, 1 Minor Elective and 2 Major Electives]					
• Indian Economic Scenario (ECN 301)*	Core	5 credit	5	0	0
• Basic Financial Economics (ECN 302)@	Minor Elective	5 credit	5	0	0
• Environmental Economics (ECN 303)@	Minor Elective	5 credit	5	0	0
• <u>Advanced Econometrics-I (ECN 304A)#</u>	Major Elective	5 credit	5	0	0
• <u>Advanced Economic Theory-I (ECN 304B) #</u>	Major Elective	5 credit	5	0	0
• <u>Agricultural Economics-I (ECN 304C)#</u>	Major Elective	5 credit	5	0	0
• <u>Advanced Econometrics-II (ECN 305A)#</u>	Major Elective	5 credit	5	0	0
• <u>Advanced Economic Theory-II (ECN 305B) #</u>	Major Elective	5 credit	5	0	0
• <u>Agricultural Economics-II (ECN 305C)#</u>	Major Elective	5 credit	5	0	0
• <u>Environment & Economy (ECN 391)^</u>	Minor Elective for Extra dept students	4 credit	4	0	0
• <u>Demography (ECN 392)^</u>		4 credit	4	0	0
• <u>Basic Econometrics (ECN 393)^</u>		4 credit	4	0	0
• <u>Indian Economy (ECN 394)^</u>		4 credit	4	0	0
@ Students may opt for Non-departmental Minor Elective in lieu of ECN 302/ ECN 303 subject to prior approval of departmental committee.					
# Students opting for ECN 304A have to select ECN 305A as well, similarly ECN 304B and ECN 305B shall be offered in pair and ECN 304C and ECN 305C shall be offered in pair.					
^ marked courses are Minor Electives for Extra-departmental Students and departmental students will not be offered these courses;					
Continued.....					

Name of Paper	Type	Credit	Pattern		
			L	T	P
<u>Fourth Semester</u> [Students have to choose 2 core courses, 1 Minor Elective and 2 Major Electives]					
• Growth & Planning (ECN 401)*	Core	5 credit	5	0	0
• Computer Applications & Project (ECN 402)* <i>(including 1 credit for Social Outreach)</i>	Core	5 credit	0	0	5
• Public Economics (ECN 403)*	Core	5 credit	5	0	0
• <u>Financial Economics -I (ECN 404A)#</u>	Major Elective	5 credit	5	0	0
• <u>Resource Environment & Energy Economics-I (ECN 404B)#</u>	Major Elective	5 credit	5	0	0
• <u>Rural Development -I (ECN 404C)#</u>	Major Elective	5 credit	5	0	0
• <u>Financial Economics –II (ECN 405A)#</u>	Major Elective	5 credit	5	0	0
• <u>Resource Environment & Energy Economics-II (ECN 405B)#</u>	Major Elective	5 credit	5	0	0
• <u>Rural Development -II (ECN 405C)#</u>	Major Elective	5 credit	5	0	0
# Students opting for ECN 404A have to select ECN 405A as well, similarly ECN 404B and ECN 405B shall be offered in pair and ECN 404C and ECN 405C shall be offered in pair.					
^ marked courses are Minor Electives for Extra-departmental Students and departmental students will not be offered these courses;					

**SYLLABUS OF
M. A. IN
EDUCATION
(CBCS)**

**DEPARTMENT OF EDUCATION
THE UNIVERSITY OF BURDWAN
BURDWAN**

YEAR 2020

M.A. in Education (2 Years) Structure Template

Semester	Course Code	Course Type	Course Status	Marks Distribution(End Sem. + Int. Asst)	Credit Value of the Course
I	EDN-101	Theory	Philosophical Foundations of Education	40+10=50	5
	EDN-102	Theory	Psychological Foundations of Education	40+10=50	5
	EDN-103	Theory	Sociological Foundations of Education	40+10=50	5
	EDN-104	Theory	Historical, Political and Economic Foundations of Education	40+10=50	5
	EDN-105	Theory	Theoretical Foundations of Research	40+10=50	5
	Sem. - Total			250	25
II	EDN-201	Theory	Assessment in Education	40+10=50	5
	EDN-202	Theory	Pedagogy and Andragogy in Education	40+10=50	5
	EDN-203	Theory	Inclusive Education	40+10=50	5
	EDN-204	Theory	Teacher Education	40+10=50	5
	EDN-205	Theory	Applied Educational Research	40+10=50	5
	Sem. - Total			250	25
III	EDN-301	Theory	Educational Technology	40+10=50	5
	EDN-302	Theory	Dissertation – I	40+10=50	5
	EDN-303	Theory	Education for Sustainable Development –I / Comparative Education - I / Value and Human Rights Education– I / Guidance and Counseling in Education-I	40+10=50	5
	EDN-304	Theory	Yoga and Health Education -I/ Life-Skill Education-I/ ICT in Education – I/ Lifelong Education–I	40+10=50	5
	EDN-305	Theory	Inter-disciplinary Elective / SWAYAM	40+10=50	4

	Sem. - Total			250	24
IV	EDN-400	Practical	Community Outreach Activity	10+10=20	2
	EDN-401	Theory	Curriculum Studies	40+10=50	5
	EDN-402	Theory	Management and Leadership in Education	40+10=50	5
	EDN-403	Theory	Education for Sustainable Development –II/ Comparative Education - II/ Value and Human Rights Education– II / Guidance and Counseling in Education-II	40+10=50	5
	EDN-404	Theory	Yoga and Health Education -II/ Life-skill Education-II/ICT in Education – II/ Life- Long Education–II	40+10=50	5
	EDN-405	Practical	Dissertation -II	40+10=50	5
	Sem. - Total			270	27
Program Total			1020	101	

CURRICULUM AND SYLLABI
FOR
MASTER OF ARTS IN EDUCATION
(M.A. in EDUCATION)

w.e.f 2014-2015

Two- years Course

(Semester System)

Curriculum and Syllabus of M.A./M.Sc. in Education w.e.f 2014-15

i)	Semester I	200	20 credits
ii)	Semester II	200	20 credits
iii)	Semester III	200	20 credits
iv)	Semester IV	200	20 credits

Duration of each semester is six months

Total Marks 800

Total Credit 80

Semester – I

COURSE – I (EDN 101) (Part one)	Marks – 50 (5 credits)
COURSE – II (EDN 102) (Part one)	Marks – 50 (5 credits)
COURSE – III (EDN 103) (Part one)	Marks – 50 (5 credits)
COURSE – IV (EDN 104) (Part one)	Marks – 50 (5 credits)

Semester – II

COURSE – V (EDN 201) (Part two)	Marks – 50 (5 credits)
COURSE – VI (EDN 202) (Part two)	Marks – 50 (5 credits)
COURSE – VII (EDN 203) (Part two)	Marks – 50 (5 credits)
COURSE – VIII (EDN 204) (Part two)	Marks – 50 (5 credits)

Semester – III

COURSE –IX (EDN 301) (Part one)	Marks – 50 (5 credits)
COURSE- X (EDN 302) (Part one)	Marks – 50 (5 credits)
COURSE XI (EDN 303) (Part one)	Marks – 50 (5 credits)
COURSE XII (EDN 304) (Part one)	Marks – 50 (5 credits)

Semester – IV

COURSE –XIII (EDN 401) (Part two)	Marks – 50 (5 credits)
COURSE –XIV (EDN 402) (Part two)	Marks – 50 (5 credits)
COURSE – XV (EDN 403) (Part two)	Marks – 50 (5 credits)
COURSE – XVI (EDN 404) (Part two)	Marks – 50 (5 credits)

N.B.

- A theoretical paper of 50 marks shall generally be covered by 50 lecture periods.
- In Semester III and IV Students may opt for non-departmental Elective for Course XI (EDN 303) (Part one) and Course XII (EDN 403) (Part one)

BURDWAN UNIVERSITY, BURDWAN
DEPARTMENT OF EDUCATION
SYLLABUS OF M.A. IN EDUCATION
Two- year Course
(Semester System)

Semester – I : Duration six months

Total credit 5 x 4 = 20

COURSE I (EDN 101)- Philosophical Foundations of Education (Part one)	5 credit
COURSE II (EDN 102)-Psychological Foundations of Education (Part one)	5 credit
COURSE III (EDN 103) - Sociological Foundations of Education (Part one)	5 credit
COURSE IV (EDN 104)- Comparative Education (Part one)	5 credit

Semester – II : Duration six months

Total credit 5 x 4 = 20

COURSE V (EDN 201) -Philosophical Foundation of Education (Part two)	5 credit
COURSE VI (EDN 202)- Psychological Foundations of Education (Part two)	5 credit
COURSE VII (EDN 203)- Sociological Foundations of Education (Part two)	5 credit
COURSE VIII (EDN 204)-Comparative Education (Part two)	5 credit

Semester –III : Duration six months

Total credit 5 x 4 = 20

COURSE IX (EDN 301) - Methodology of Educational Research (Part one)	5 credit
COURSE X (EDN 302) - Educational Technology & Educational Management (ET - Part one)	5 credit
COURSE XI (EDN 303) - Special Paper I (Part one) / Elective Paper (Part one)	5 credit
COURSE XII (EDN 304) – Practical based on Educational Psychology (Part one)	5 credit

Semester –IV : Duration six months

Total credit 5 x 4 = 20

COURSE XIII (EDN 401) - Methodology Educational Research (Part two)	5 credit
COURSE XIV 4(EDN 02) - Educational Technology & Educational Management (EM - Part two)	5 credit
COURSE XV (EDN 403) - One Special Paper (Part two) / Elective Paper (Part two)	5 credit
COURSE XVI (EDN 404) - Project /Dissertation/Presentation of Seminar Papers/ term paper (on Spl. Paper)(to be decided by the D.C.) (Part two)	5 credit

For Evaluation of Course XVI

Development of Seminar Paper	10
Presentation of Seminar Paper	15
Total -	<u>25</u>

Course Outline

Semester I						
Course No.	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
EDN101	Core	Philosophical Foundation of Education (Part I)	5	4	1	
EDN102	Core	Psychological Foundation of Education (Part I)	5	4	1	
EDN103	Core	Sociological Foundation of Education (Part I)	5	4	1	
EDN104	Core	Comparative Education (Part I)	5	4	1	
Total Credit			20			

Semester II						
Course No.	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
EDN201	Core	Philosophical Foundation of Education (Part II)	5	4	1	
EDN202	Core	Psychological Foundation of Education (Part II)	5	4	1	
EDN203	Core	Sociological Foundation of Education (Part II)	5	4	1	
EDN204	Core	Comparative Education	5	4	1	
Total Credit			20			

Semester III						
Course No.	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
EDN301	Core	Methodology of Educational Research (Part I)	5	4	1	
EDN302	Core	Educational Technology & Educational Management (Part I- ET)	5	4	1	
EDN303	Special Paper	Special Paper I (Part I)	5	4	1	
EDN304	Practical	Practical based on Educational Psychology (Part I)	5	2		3
Total Credit			20			

Semester IV						
Course No.	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
EDN401	Core	Methodology of Educational Research (Part II)	5	4	1	
EDN402	Core	Educational Technology & Educational Management (Part II- EM)	5	4	1	
EDN403	Special Paper	Special Paper I (Part II)	5	4	1	
EDN404	Practical	Project/ Dissertation/ Presentation of Seminar paper/ Term Paper (on Spl. Paper)	5	2		3
Total Credit			20			
All Total Credit			80			

**CURRICULUM STRUCTURE FOR
TWO-YEAR M.Ed. PROGRAMME
IN WEST BENGAL
FOLLOWING
NCTE REGULATIONS, 2014**

PDFill PDF Editor with Free Writer and Tools

**Prepared by the Curriculum Committee
Constituted by the**

**Higher Education Department
Government of West Bengal
BikashBhavan, Salt Lake, Kolkata – 700091**



CURRICULUM STRUCTURE FOR 2 YEAR M.Ed. PROGRAMME IN WEST BENGAL FOLLOWING NCTE
REGULATIONS, 2014

COURSE & CODE	COURSE NAME	MARKS		MarksCredit)	Class Teaching Hour
		Theory	Practicum		
SEMESTER-I					
MED 101	Educational Studies	80	20	80+20 3+1	48+32
MED 102	Historical ,Political and Economic Perspectives of Education	80	20	80+20 3+1	48+32
MED 103	Psychology of Learning and Development	80	20	80+20 3+1	48+32
MED 104	Pre- service and In- service Teacher Education	80	20	80+20 3+1	48+32
MED 105	Communication and Expository Writing		50	25+25 1+1	32
MED 106	Self Development through Yoga Education		50	25+25 1+1	32
TOTAL		320	180		
Full Marks: 500 Credit : 20					
SEMESTER-II					
MED 201	Philosophical Perspective of Education	80	20	80+20 3+1	48+32
MED 202	Sociological Perspectives of Education	80	20	80+20 3+1	48+32
MED 203	Introduction to Research Methodology	80	20	80+20 3+1	48+32
MED 204	Inclusive Education and gender Issues in Education	80	20	80+20 3+1	48+32
MED 205	Curriculum Studies	40	10	40+10 2	48
MED 206	Internship in Teacher Education Institutions		50	500+2	0+32
TOTAL		360	140		
Full Marks: 500 Credit : 20					
SEMESTER-III					
MED 301	Specialization Courses in Elementary Or Secondary Education	160	40	140+60 5+3	80+96
	a Institutions, Systems and Structures	40	10	40+10 2	16+32
	b Stage Specific Status Issues and Concerns	40	10	40+10 2	16+32
	c Policy and Practice Relating to Curriculum, Pedagogy and Assessment	80	20	80+20 3+1	48+32
MED 302	Advance Research MethodsIncluding Statistical Techniques	40	10	40+10 2	16+32
MED 303	Internship		100	100 0+4	128
MED 304	ICT in Education	40	10	40+10 2	16+32
MED 305	Dissertation Related Work		50	50 0+2	0+32
MED 306	Academic Writing		50	50 0+2	0+32
Interdisciplinary elective / SWAYAM	As per student’s choice	40	10	50 4	
TOTAL		280	270		
Full Marks: 550 Credit : 24					
SEMESTER-IV					
MED 400	Community Outreach Activity	20	5	25 2	
MED 401	Perspectives and Issues and Research in Teacher Education	80	20	80+20 3+1	48+32
MED 402	Specialization Any One	240	60	240+60 9+3	144+96
2.4.2 E OR 2.4.2 S	Educational Policy, Economics of Education and Educational Planning in the context of Elementary Education OR	80 80 80	20 20 20	240+60 9+3	144+96



	Secondary Education				
	Educational Planning , Educational Administration and	80	20	240+60	144+96



**CURRICULUM STRUCTURE FOR 2 YEAR M.Ed. PROGRAMME IN WEST BENGAL FOLLOWING NCTE
REGULATIONS, 2014**

COURSE & CODE	COURSE NAME	MARKS		MarksCredit)	Class Teaching Hour
		Theory	Practicum		
SEMESTER-I					
MED 101	Educational Studies	80	20	80+20 3+1	48+32
MED 102	Historical ,Political and Economic Perspectives of Education	80	20	80+20 3+1	48+32
MED 103	Psychology of Learning and Development	80	20	80+20 3+1	48+32
MED 104	Pre- service and In- service Teacher Education	80	20	80+20 3+1	48+32
MED 105	Communication and Expository Writing		50	25+25 1+1	32
MED 106	Self Development through Yoga Education		50	25+25 1+1	32
TOTAL		320	180		
Full Marks: 500 Credit : 20					
SEMESTER-II					
MED 201	Philosophical Perspective of Education	80	20	80+20 3+1	48+32
MED 202	Sociological Perspectives of Education	80	20	80+20 3+1	48+32
MED 203	Introduction to Research Methodology	80	20	80+20 3+1	48+32
MED 204	Inclusive Education and gender Issues in Education	80	20	80+20 3+1	48+32
MED 205	Curriculum Studies	40	10	40+10 2	48
MED 206	Internship in Teacher Education Institutions		50	500+2	0+32
TOTAL		360	140		
Full Marks: 500 Credit : 20					
SEMESTER-III					
MED 301	Specialization Courses in Elementary Or Secondary Education	160	40	140+60 5+3	80+96
	a Institutions, Systems and Structures	40	10	40+10 2	16+32
	b Stage Specific Status Issues and Concerns	40	10	40+10 2	16+32
	c Policy and Practice Relating to Curriculum, Pedagogy and Assessment	80	20	80+20 3+1	48+32
MED 302	Advance Research MethodsIncluding Statistical Techniques	40	10	40+10 2	16+32
MED 303	Internship		100	100 0+4	128
MED 304	ICT in Education	40	10	40+10 2	16+32
MED 305	Dissertation Related Work		50	50 0+2	0+32
MED 306	Academic Writing		50	50 0+2	0+32
TOTAL		240	260		
Full Marks: 500 Credit : 20					
SEMESTER-IV					
MED 401	Perspectives and Issues and Research in Teacher Education	80	20	80+20 3+1	48+32
MED 402	Specialization Any One	240	60	240+60 9+3	144+96
2.4.2 E OR 2.4.2 S	Educational Policy, Economics of Education and Educational Planning in the context of Elementary Education OR Secondary Education	80 80 80	20 20 20	240+60 9+3	144+96
	Educational Planning , Educational Administration and	80	20	240+60	144+96

2.4.3 E OR 2.4.3. S	Management, Leadership in the Context of Elementary Education OR Secondary Educatio	80 80	20 20	9+3	
2.4.4 E OR 2.4.4 S	Educational Technology and ICT in Elementary / Secondary Education	80 80 80	20 20 20	210+90 9+3	144+96
MED 403	Dissertation and Social Outreach Programme		100	100 0+4	128
	TOTAL	320	180		
Full Marks: 500 Credit : 20					
Total Marks: 2000 (Credit : 80					

Note:
b *Optional Courses can be from among the following -Vocational/Work Education, Health and Physical Education, Peace Education, Guidance and Counselling, and Environmental and Population Education, Yoga Education.
c Course codes are abbreviated in the following manner:
1st Digit –Course
2nd Digit – Semester
3rd Digit/ Digits – Course No.
Example: 1.4.11 – 1B.Ed.4 4th Semester). 11Course No. XI).

- Semester means effective teaching work of 16 weeks excluding admission and semester end examination period.
- One credit of teaching activities means one hour effective teaching of theory course in each week for 16 weeks: Total 16 hours teaching per credit.
- One credit for Practicum / Field work / Internship means two hour effective work in each week for 16 weeks. Total 32 hours of practicum per credit.

Course Structure

SEMESTER -WISE DETAILS CURRICULUM AND ASSESSMENT PATTERN

Semester I (July to December

Semester-Wise Courses and Credits (M.Ed.)

SEMESTER- I (24 Credits) July to December

Course	Paper Title	Core/ Spl Core /Sec Core;EleSpcl/ Sec Spcl	Credit s/ Hours	Class Teaching	Practicum/ Hands on Experiences/Students Activity/Seminar/ Workshop etc	Internship	Project	Internal Assessment Minimum Weightage in %	External Exam if any Maximum Weightage in %
101	Educational Studies	Core	4	348Hrs	132 Hrs	0	0	20	80
102	Historical ,Political and Economic Perspectives of Education	Core	4	348Hrs	132 Hrs	0	0	20	80
103	Psychology of Learning and Development	Core	4	348Hrs	132 Hrs	0	0	20	80
104	Pre-service and In-service Teacher Education	Core	4	348Hrs	132 Hrs	0	0	20	80
105	Communication and Expository Writing	Tool Subject	2	0	132 Hrs	0	0	50	0
106	Self Development Through Yoga	Tool Subject	2	0	132 Hrs	0	0	50	0
Total			20					180	
								500	

Semester II (January toJune 20 Credits

WITH EFFECT FROM 2021-2023 ACADEMIC SESSION

SYLLABUS FOR

M. Sc. In

Electronics and Communication



**DEPARTMENT OF
ELECTRONICS AND COMMUNICATION**

**THE UNIVERSITY OF BURDWAN
BURDWAN**

THE UNIVERSITY OF BURDWAN
SYLLABUS FOR M. Sc. IN
Electronics and Communication



Course Structure in Electronics and Communication

PROGRAM OUTCOME:

TO PRODUCE SKILLED MANPOWER FOR

1. RESEARCH AND DEVELOPMENT SECTORS AND INDUSTRIES RELATED TO ELECTRONICS
2. ACADEMIC INSTITUTIONS AND ORGANIZATIONS
3. ENTREPRENEURSHIP, START UP PROGRAMS AND CONSULTANCY

1 credit = 1 hour/week for theory; 2 hours/week for practical

Duration of examination for a course of 4 credits will be 2 hr. for theory papers and 4 hrs. for practical papers.

SEMESTER – I (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A.	E.T	Total	
MSEC101	Core	T	Mathematical Methods and Numerical Analysis	10	40	50	4
MSEC102	Core	T	Electromagnetic Theory and Transmission lines	10	40	50	2 2
MSEC103	Core	T	Network Analysis	10	40	50	4
MSEC104	Core	T	Physics of Semiconductor Devices	10	40	50	4
MSEC105	Core	P	Practical (Electrical and Electronics)	10	40	50	4
MSEC106	Core	P	Computational Lab (C/C++)	10	40	50	4
				Total credit			24

I.A.: Internal Assessment, E.T.: End Term

SEMESTER – II (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A.	E.T	Total	
MSEC201	Core	T	Analog and Digital Integrated Circuits	10	40	50	4
MSEC202	Core	T	Analog communication Systems	10	40	50	4
MSEC203	Core	T	Digital Signal Processing	10	40	50	4
MSEC204	Core	T	Microprocessor and microcontroller	10	40	50	4
MSEC205	Core	P	Practical	10	40	50	4
MSEC206	Core	P	Computational lab (using Python and Scilab)	10	40	50	4
				Total credit			24

SEMESTER – III (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A.	E.T	Total	
MSEC301	Core	T	Digital Communication Systems	10	40	50	4
MSEC302	Core	T	Microwave devices and circuits	5	20	25	2
				5	20	25	2
MSEC303	Core	P	Advanced General Practical	10	40	50	4
MSEC304	GE	T	MSEC304: Electronic Science	5	20	25	2
MSEC305	DE	T	MSEC305-1: VLSI Technology MSEC305-2: Medical Electronics	10	40	50	4
MSEC306	DE	T	MSEC306-1: Satellite and Mobile Communications MSEC306-2: Nano Electronics MSEC306-3: May be opted from SWAYAM	10	40	50	4
MSEC307	CE	N.A.	N.A.	5	20	25	2
				Total credit			24

CE: Community Engagement Activities; DE: Discipline-centric Elective; GE: Generic elective

The Discipline-centric Elective (DE) course in Semester III may also be opted from SWAYAM

SEMESTER – IV (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A.	E.T	Total	
MSEC401	Core	T	Optical Fiber communication	10	40	50	4
MSEC402	Core	T	MSEC402-A: Power Electronics	5	20	25	2
			MSEC402B: Control systems	5	20	25	2
MSEC403	Float-ing/Core	P	Advanced General Practical	10	40	50	4
MSEC404	DE	T	MSEC404-1: Photonics MSEC404-2: Digital Image Processing	10	40	50	4

MSEC405	DE	T	MSEC405-1: Radar, Remote Sensing and Navigational Systems MSEC405-2: Antenna Design	10	40	50	4
MSEC406	Project/ Term paper	NA	N.A.	---	50	50	4
				Total credit			24

SEMESTER – I

Paper: MSEC101

Mathematical Methods

Course outcome:

- To provide analytical skill to solve problems in electronics and communication
- To learn numerical analysis for solving problems

1. (a) Functions of a complex variable. Brief review of the topics included in the honours syllabus: analytic functions, Cauchy-Riemann equations, integration in the Complex plane, Cauchy's theorem, Cauchy's integral formula.

(b) Proof of Taylor and Laurent expansions. Singular Points and their classification. Branch point and branch cut. Riemann sheets. Application of residue theorem to the evaluation of definite integrals and the summation of infinite series. Integrals involving branch point singularity.

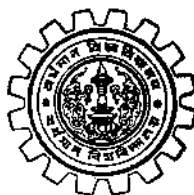
2. Fourier and Laplace transforms. Inverse transforms. Convolution theorem. Solution of ordinary and partial differential equations by transform methods.

3. Introduction to Z transform Region of convergence, properties of the Z transform, Inverse transform using counter integration, complex convolution theorem, Parseval's relation. Unilateral Z transform and its application to difference equation with non zero initial condition.

4. Linear vector spaces. Subspaces. Bases and dimension. Linear independence and orthogonality of vectors. Gram-Schmidt orthogonalisation procedure. Matrix representation. The algebra of matrices. Special matrices. Rank of a matrix. Elementary transformations. Elementary matrices. Equivalent matrices. Solution of linear equations. Linear transformations. Change of Basis. Eigenvalues and eigenvectors of matrices. The Cayley-Hamilton theorem. Diagonalisation of matrices. Bilinear and Quadratic forms.

**M Tech
in
Electronics and Communication
Engineering (Microwaves)**

SYLLABUS



**Department of Physics
The University of Burdwan
Golapbag, Burdwan-713104, West Bengal
Website: <http://www.buruniv.ac.in>
Email: mtece@buruniv.ac.in**

Detailed Course Structure

Semester I

Paper Code	Paper	Credit	Marks			Total Marks
			Continuous Assessment		Univ. Exam	
			Theory	Practice		
MW 101	Advanced Electromagnetic Engineering (L=2, T=1, P=1)	03	05	05	50	60
MW 102	Microwave & mm Wave Circuits (L=2, T=1, P=1)	03	05	05	50	60
MW 103	Microwave & mm Wave Vacuum and Solid State Devices (L=2, T=1, P=1)	03	05	05	50	60
MW 104	Antenna and Radio Wave Propagation (L=2, T=1, P=1)	03	05	05	50	60
MW 105	Digital Signal Processing (L=2, T=1, P=1)	03	05	05	50	60
MW 106	Communication Theory (L=2, T=1, P=1)	03	05	05	50	60
MW 107	Seminar-I (L=0, T=0, P=2)	02	10	30	-	40
MW 108	Comprehensive Viva Voce on Practical's-I	02	-	-	50	50
TOTAL		22	40	60	350	450

Semester II

Paper Code	Paper	Credit	Marks			Total Marks
			Continuous Assessment		Univ. Exam	
			Theory	Practice		
MW 201	Computational Electromagnetics (L=2, T=1, P=1)	03	05	05	50	60
MW 202	Microwave & mm Wave Measurements (L=2, T=1, P=1)	03	05	05	50	60
MW 203	Microwave & mm Wave Communication Systems (L=2, T=1, P=1)	03	05	05	50	60
MW 204	Radar, Remote Sensing and Navigational Technique (L=2, T=1, P=1)	03	05	05	50	60
(ANY ONE)	Optional Elective-I (L=2, T=1, P=1)	03	05	05	50	60
MW 2051/ MW 2052/ MW 2053	Microwave & mm Wave Device, Circuit and System Modeling/ Advanced Antenna Engineering/ Gyrotron Technology					
(ANY ONE)	Optional Elective-II (L=2, T=1, P=1)					
MW 2061/ MW 2062	Light Wave Technology/ Microwave Photonics	03	05	05	50	60
MW 207	Seminar-II (L=0, T=0, P=2)	02	10	30	-	40
MW 208	Comprehensive Viva Voce on Practical's-II	02	-	-	50	50
TOTAL		22	40	60	350	450

Seminar (MW 107 and MW 207):

Each student in Semesters I and II is required to deliver one seminar per week on any of the topics suggested by the department having 15 minutes for presentation and 5 minutes for discussion. The internal teachers of the course will evaluate the performance of the students. Such evaluations will be termed as “Continuous Assessment”.

Course Outcome for MW 107 and MW 207:

- To become able to design and prepare a presentation on assorted technical topics
- To gain the communication skill and confidence to present a topic before the audience
- To gain the skill on technical report writing

Comprehensive Viva Voce on Practical's (MW 108 and MW 208):

Students will be examined by a board of examiners on the practical training performed and the laboratory report during each of the semesters I and II.

Course Outcome for MW 108 and MW 208:

The skill and knowledge gained through practical training (includes design, simulation, fabrication and T&M) would be estimated.

Semester III

Paper Code	Paper	Credit	Marks	
			Univ. Exam	Total
MW 301	Project I	16	200	200
MW 302	Term Paper/ Minor Elective from AICTE Approved Departments	02	50	50
MW 303	Research Methodology and IPR <i>May be opted from SWAYAM (https://swayam.gov.in/)</i>	02	50	50
TOTAL		20	300	300

Semester IV

Paper Code	Paper	Credit	Marks	
			Univ. Exam	Total
MW 401	Project II	18	300	300
MW 402	Grand Viva-Voce	04	100	100
TOTAL		22	400	400

MW 301 and MW 302: Project I and Term Paper/ Minor Elective from AICTE Approved Departments:

The entire third and fourth semesters of one year duration are assigned for the project works at different institutions and laboratories of repute within the country including Burdwan University.

SYLLABUS

For

**M TECH IN ELECTRONICS AND
COMMUNICATION ENGG (MICROWAVES)**



**THE UNIVERSITY OF BURDWAN
DEPARTMENT OF PHYSICS
RAJBATI, BURDWAN 713 104
WEST BENGAL, INDIA**

Detailed Course Structure

SEMESTER I

Paper	Credit	Marks			Univ Exam Total
		Continuous Assessment	Theory	Practice	
MW-101 Microwave and mm-Wave Devices	3	10	10	50	70
MW-102 Microwave and mm-Wave Circuits	4	10	15	50	75
MW-103 mm-Wave Device and Circuit Modelling	3	10	10	50	70
MW-104 Microwave and mm-Wave Communication Systems	4	10	10	50	70
MW-105 Advanced Electromagnetic Engineering	3	10	-	50	60
MW-106 Digital Signal Processing	3	10	05	50	65
MW-107 SEMINAR	2	10	30	-	40
MW-108 Comprehensive Viva Voce on Practicals	2	-	-	50	50
Total	24	70	80	350	500

SEMESTER II

Paper	Credit	Marks			Univ Exam Total
		Continuous Assessment	Theory	Practice	
MW-201 Microwave and mm-Wave Measurements	4	10	10	50	70
MW-202 Advanced Communication Technology	3	10	10	50	70
MW-203 Satellite and Mobile Communication	3	10	10	50	70
MW-204 Computational Electromagnetics	3	10	05	50	65
MW-205 Lightwave Technology	3	10	10	50	70
MW-206 Microwave Antenna, Propagation and Applications	4	10	05	50	65
MW-207 SEMINAR	2	10	30	-	40
MW-208 Comprehensive Viva Voce on Practicals	2	-	-	50	50
Total	24	70	80	350	500

Seminar (MW-107 and MW-207) : Each student in Semesters I and II is required to deliver one seminar per week on any of the topics suggested by the department leaving 15 minutes for presentation and 5 minutes for discussion. The internal teachers of the course will evaluate the performance of the students. Such evaluations will be termed as "Continuous Assessment".

Comprehensive Viva-Voce on Practicals (MW-108 and MW-208) :

Students will be examined by a board of examiners on the practical training performed and the laboratory report during each of the Semesters I and II.

Class load for Semester I and II

	Theory	Practical	Seminar	Tutorial
Class Hours/ week	12	12	05	01
(2 classes/paper/week)				

SEMESTER III

Paper	Credit	Univ Exam	Marks Total
MW - 301 Project Viva Voce I	04	50	50
MW - 302 Mid-Term Report on Project Work	04	50	50
MW - 303 General Seminar	06	100	100
Total	14	200	200

Project Work of one-year duration (MW-301; MW-401), Mid-term

Project Report (MW-302) and Final Dissertation (MW-402) :

Entire third and fourth semesters each of six months' duration are assigned to project work.

In Semester III examination, a student has to submit a mid-term project report containing (i) Aim and objective (ii) Literature Survey (iii) Progress of the work done and (iv) Present status of the project work. He/ she also has to present a talk on the project work.

General Seminar (MW-303) :

A student has to submit a report on the General Seminar topic allotted by the department at the end of Semester II and has to deliver a lecture on the topic during the Semester III examination. The duration will be 20 minutes presentation followed by 10 minutes discussion.

SEMESTER IV

Paper	Credit	Univ Exam	Marks Total
MW - 401 Project Viva Voce-II	06	100	100
MW - 402 Final Dissertation on Project Work	12	200	200
MW - 403 Grand Viva Voce	06	100	100
Total	24	400	400

In Semester IV examination a student has to submit a final dissertation based on the total project work carried out along with a presentation and viva-voce examination on the project work.

Grand Viva Voce (MW-403) : At the Semester IV Examination, a student has to appear before a board of examiners for a Grand Viva Voce Examination covering the entire course curriculum.

RULES RELATING TO EXAMINATIONS OF M. TECH. COURSE IN ELECTRONICS & COMMUNICATION ENGINEERING (MICROWAVES)

1. A student of the course, is required to attend at least 75% of the lectures delivered and tutorial and practical classes held in each paper of Semesters I and II to earn full credit for appearing at the relevant Semester examination. However, the Faculty Council concerned may, for sufficient reasons and on the recommendation of the concerned Head of the Department and on payment of suitable fees, condone any shortage in such percentage of attendance up to a limit of 60%.

2. A student with less than 60% attendance in any paper will be debarred from appearing at the corresponding Semester examination and will be considered as a drop-out from the course.

However, he/she may apply to the concerned Faculty Council for readmission in the subsequent year and may be permitted to take readmission subject to the favourable recommendation by the concerned Head of the Department and payment of usual course fees in this regard. In the case of a student doing the Semester-II course of studies, his/her SEM-IV of Semester I will be sent forward in the

Department of English and Culture Studies
The University of Burdwan
Syllabus for M.A. in English
(Effective from the 2020-2021 session)

A Brief Introduction

The syllabus for the MA programme in English offers training in canonical English literatures as well as emergent interdisciplinary fields to postgraduate students of literature. The course is designed to lend competence in English language skills, through a close reading of literature. At the same time, the course hones research skills, making students aware of the cultural contexts and of literary studies. The syllabus also exposes students to the complex operations of English in India, sensitizes them in the process to social concerns, and to literature's task of making our existence meaningful in the contemporary world.

M.A. Programme: Course Structure and Credits

The M.A. programme has four semesters and is spread over a period of two years.

Semester	Course Code	Course Type	Course Status	Marks Distribution (End Sem. + Int. Asst.)	Credit Value of the Course
I	MA ENG 101	Theory	Core Course	40+10=50	5
	MA ENG 102	Theory	Core Course	40+10=50	5
	MA ENG 103	Theory	Core Course	40+10=50	5
	MA ENG 104	Theory	Core Course	40+10=50	5
	MA ENG 105	Theory	Core Course	40+10=50	5
	Sem-I Total			250	25
II	MA ENG 201	Theory	Core Course	40+10=50	5
	MA ENG 202	Theory	Core Course	40+10=50	5
	MA ENG 203	Theory	Core Course	40+10=50	5
	MA ENG 204	Theory	Core Course	40+10=50	5
	MA ENG 205	Theory	Core Course	40+10=50	5
	Sem-II Total			250	25
III	MA ENG 301	Theory	Core Course	40+10=50	5
	MA ENG 302	Theory	Core Course	40+10=50	5
	MA ENG 303(A/B/C/D)	Theory	Major Elective	40+10=50	5
	MA ENG 304(A/B/C/D)	Theory	Major Elective	40+10=50	5
	MA ENG 305(A/B/C/D)	Theory	Inter-disciplinary Elective	40+10=50	4
	For MA ENG 305(A/B/C/D), students may opt for a 4 credit course from SAYAAM Platform and can avail the option of credit transfer.				
	Sem-III Total			250	24

IV	MA ENG 400	Practical/ Field work	Community Engagement Course	20+5=25	2
	MA ENG 401	Theory	Core Course	40+10=50	5
	MA ENG 402	Theory	Core Course	40+10=50	5
	MA ENG 403(A/B/C/D)	Theory	Major Elective	40+10=50	5
	MA ENG 404(A/B/C/D)	Theory	Major Elective	40+10=50	5
	MA ENG 405	Term paper	Core Course	40+10=50	5
	Sem-IV Total			270	27
	MA Programme Total			1025	101

Evaluation and Pattern of Questions:

In each paper of 50 marks (5 credits/4 credits) the End-Semester Examination shall be of 40 marks and the Mid-Semester Examination/Continuous Assessment based on class test, assignment, seminar, etc., the details of which are to be decided and notified to the students at the beginning of the semester, shall be of 10 marks. In the End-semester Examination, there shall be two groups in each paper. Each group shall have 4 questions of 10 marks each. Candidates are to answer a total of 4 questions, taking 2 from each group. The allotted time for each paper in the End-semester Examination shall be 2 hours.

SEMESTER I

MA ENG 101: The Cultural History of English in India

The course is a new step towards understanding the operations of English in India in terms of administrative decisions, impact on education system, emergence of generic forms, material cultures, modern Indian vernaculars and literatures in them.

Unit I

(‘History of English in India’ and a minimum of two authors will be taught)

- History of English in India.
 - The Education Notes, Hints and Minutes of Charles Grant, Thomas B. Macaulay, Charles Trevelyan, Charles Wood, and abolition of Persian as official language in India in 1837. (All selections from Great Indian Education Debate: The Anglicist Orientalist Debates edited by Lynn Zastoupil and Martin Moir edited Psychology Press, 1999).
 - Birth of modern Indian vernaculars and new expressive forms
 - Serampore Mission Press
 - Calcutta Schoolbook Society
 - Bilinguality and biculturality in the Bengal Presidency

THE UNIVERSITY OF BURDWAN
DEPARTMENT OF ENGLISH & CULTURE STUDIES
Syllabus for M.A. in English
(Effective from 2014-16 Session)

The new MA course in English offers training in canonical English literatures as well as emergent interdisciplinary fields, to postgraduate students of literature. The course is designed to lend competence in English language skills, through a close reading of literature. At the same time, the course hones research skills, making students aware of the cultural contexts of literary studies. The project writing component (that encourages field work) ensures the research-intensive nature of the course.

The new MA course exposes students to the complex operations of English in India today; sensitizes them in the process to social concerns, and to literature's task of making our existence meaningful in the contemporary world. The course is socially inclusive in intent and the outreach component of project papers is testimony to the same.

Credits and Evaluation: The course has four semesters and is spread over a period of two years. Students will be required to take fifteen compulsory or 'core' (of 75 credit points), four major elective (of 20 credit points) **and one minor elective (of a minimum of 2 credit points, offered by other departments)** courses. **The minor elective courses offered in this syllabus are meant for the students of other departments.** Each paper of 5 credits shall have 5 hour session of lectures per week over a period of one semester of 16 weeks for teaching-learning process. Evaluation will be based on end semester examination and internal assessment. For end semester examination, each paper will carry 40 marks and will be of two hours' duration. Project paper will carry 50 marks (of which 10 marks will be for social outreach and 10 for viva-voce).

Course Structure

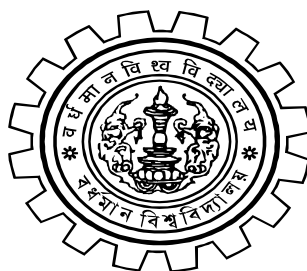
Course Code	Course Title	Credits	Marks
	First Semester		
PG/ENG/101 (CORE)	Medieval and Renaissance English Literature I	5	50
PG/ENG/102 (CORE)	Medieval and Renaissance English Literature I	5	50
PG/ENG/103 (CORE)	Shakespeare I (Plays & Poems)	5	50
PG/ENG/104 (CORE)	Shakespeare II (Background, Reception and Translation)	5	50
PG/ENG/105	Classical Literature & Criticism	5	50

(CORE)			
	Second Semester		
PG/ENG/201 (CORE)	Eighteenth Century English Literature I	5	50
PG/ENG/202 (CORE)	Eighteenth Century English Literature II	5	50
PG/ENG/203 (CORE)	Nineteenth Century English Literature I	5	50
PG/ENG/204 (CORE)	Nineteenth Century English Literature II	5	50
PG/ENG/205 (CORE)	Literary Criticism: Renaissance to Modern	5	50
	Third Semester		
PG/ENG/301 (CORE)	Modern English Literature till 1950	5	50
PG/ENG/302 (CORE)	Post 1950s English Literature	5	50
PG/ENG/303 (CORE)	Literary Theory and Contemporary Thoughts I	5	50
PG/ENG/304 (CORE)	Literary Theory and Contemporary Thoughts II	5	50
PG/ENG/305 (MINOR ELECTIVE)	Popular Culture /Indian Literatures in English Translation*	5	50
	Fourth Semester		
PG/ENG/401 (MAJOR ELECTIVE)	Indian English Literature / American Literature/Australian Literature /*	5	50
PG/ENG/402 (MAJOR ELECTIVE)	Translation Studies / Literature & Films/ African Literature*	5	50
PG/ENG/403 (MAJOR ELECTIVE)	Literature of South Asian Diaspora / Folklore Studies /Trauma & Literature*	5	50
PG/ENG/404 (MAJOR ELECTIVE)	Gender and Literature / Race & Caste Studies / Environment & Literature*	5	50

PG/ENG/405 (CORE)	Project	5	50

* Students are to take 1 (one) out of three optional papers.

**ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN**



**M. Sc. SYLLABUS SEMESTER SYSTEM
[CHOICE BASED CREDIT SYSTEM]**

[w. e. f. 2020- '21]

**DEPARTMENT OF ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN
BURDWAN-713104**

SEMESTER- III (TOTAL MARKS: 300)

Course				Lect. h/week	Dur. of Exam (in h)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSES301	Core	T	Biodiversity Conservation & Sustainable Development	4	2	10	40	50	4
MSES302	Core	T	Emerging Environmental Problems, Health Hazards & Genetic Engineering	4	2	10	40	50	4
MSES303	Core	T	Remote Sensing & GIS	4	2	10	40	50	4
MSES304	GE	T	Environmental Perspectives or MSWM: May be opted from SWYAM	2	2	05	20	25	2
MSES305-1	DE	P	Practical on RS & GIS, EIA & Diseases	8	4	10	40	50	4
MSES305-2	DE	T	Ecological Modelling and GIS for Environmental Applications	4	2	10	40	50	4
MSES305-3	DE	T	Ecotoxicology & Industrial Microbiology	4	2	10	40	50	4
MSES306-1	DE	T	May be opted from SWYAM	4	2	10	40	50	4
MSES306-2	DE	T	Forest Ecology and Oceanography	4	2	10	40	50	4
MSES307	Core	P	Community Engagement Activities	4	2	05	20	25	2
								Total Credit	24

GE: Generic Elective; DE: Discipline-centric Elective

SEMESTER- IV (TOTAL MARKS: 300)

Course				Lect. h/week	Dur. of Exam (in h)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSES401	Core	T	Environmental Impact Assessment & Environmental Laws	4	2	10	40	50	4
MSES402	Core	T	Environmental Toxicology & Hazardous Wastes	4	2	10	40	50	4
MSES403	Core	T	Environmental Biotechnology	4	2	10	40	50	4
MSES404-1	DE	T	Environmental Issues, Economics & Environmental Management	4	2	10	40	50	4
MSES404-2	DE	T	Environmental Engineering and Science	4	2	10	40	50	4
MSES405-1	DE	P	Practical of Toxicological Testing	8	4	10	40	50	4
MSES405-2	DE	P	Practical of Spatial Data Analysis and Ecological Modelling	8	4	10	40	50	4
MSES406	Core	P	Dissertation Work	4	4	10	40	50	4
							Total Credit		24

**ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN
M. Sc. SYLLABUS 2007
SEMESTER SYSTEM**

The course will be divided into four semesters each being of six months duration. Each semester contains six papers of total 300 marks all together twenty-four modules. 10% of the total theoretical marks (800) will be treated as internal assessment, i.e., 80.

Duration of Theoretical Examination Time: 3 Hours

Duration of Practical Examination Time: Minimum 4 Hours & Maximum 5 Hours

Distribution of Marks: Total Theoretical Marks 45

Two long questions of 10 marks out of 4 questions

Three questions of 5 marks out of 8 questions

Five questions of 2 marks out of 8 questions

SEMESTER – I

General Theoretical Papers	Marks: 180
General Practical	Marks: 100
Internal Assessment	Marks: 20

ENVIRON – 101: Basic Ideas on Environment	Marks: 45
ENVIRON – 102: Physical Environment	Marks: 45
ENVIRON – 103: Environmental Biology	Marks: 45
ENVIRON – 104: Environmental Microbiology	Marks: 45
ENVIRON – 105: General Practical	Marks: 50
ENVIRON – 106: General Practical	Marks: 50

SEMESTER – II

General Theoretical Papers	Marks: 180
General Practical	Marks: 100
Internal Assessment	Marks: 20

ENVIRON – 201: life Processes & Ecotoxicology	Marks: 45
ENVIRON – 202: Environmental Geoscience	Marks: 45
ENVIRON – 203: Soil Science, Energy Resource, & Environmental Statistics	Marks: 45
ENVIRON – 204: Environmental Pollution & Degradation	Marks: 45
ENVIRON – 205: General Practical	Marks: 50
ENVIRON – 206: General Practical	Marks: 50

SEMESTER – III

General Theoretical Papers	Marks: 135
Special Theoretical Paper	Marks: 45
Special Practical	Marks: 50
General Practical	Marks: 50
Internal Assessment	Marks: 20

ENVIRON – 301: Environmental Impact Assessment & Environmental Laws
Marks: 45

ENVIRON –302: Environmental Economics & Environmental Management
Marks: 45

ENVIRON – 303: Emerging Environmental Problems, Health Hazards & Genetic Engineering
Marks: 45

ENVIRON – 304: Remote Sensing & GIS (Special Paper)
Marks: 45

ENVIRON – 305: General Practical Paper
Marks: 50

ENVIRON – 306: Special Practical Paper
Marks: 50

SEMESTER – IV

General Theoretical Paper	Marks: 45
Special: Theoretical Paper	Marks: 90
General Practical	Marks: 50
Special Practical	Marks: 50
Seminar Presentation	Marks: 50
Internal Assessment	Marks: 15

ENVIRON – 401: Biodiversity Conservation & Sustainable Development
Marks: 45

ENVIRON – 402: Special Paper: Environmental Toxicology (Special paper)
Marks: 45

ENVIRON – 403: Special Paper: Environmental Biotechnology (Special paper)
Marks: 45

ENVIRON – 404: General Practical Paper
Marks: 50

ENVIRON – 405: Special Practical Paper
Marks: 50

ENVIRON – 406: Seminar Presentation Paper
(Dissertation/ Term Paper 40+ Viva-voce 10)
Marks: 50

NB. Internal Assessment will be made through class test/ class work performance, etc.

FIRST SEMESTER

. ENVIRON – 101
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

BASIC IDEAS ON ENVIRONMENT

- I Environmental awareness:** Definition, principles scope , and objectives of environmental science; concept on environment; World Environment Day and National Earth Day and their relevance; environmental awareness and education. Environmental movements in India (Narmada Dam, Tehri Dam) [5]
- II Components of environment:** Lithosphere, hydrosphere, atmosphere and biosphere; physical and biological environments; [5]
- III Introduction to ecology:** Definition, principles, and scope of ecology, ecosystem ecology; concepts of Gaia Hypothesis; limiting factors, combined concept on limiting factors [5]
- IV Principles and concepts of ecosystem:** Concept of ecosystem; homeostasis of the ecosystem structure and functional aspects of ecosystem; ecological energetics; ecological interactions [5]
- V Life Processes and characteristics:** Basic ideas with respects to growth,metabolism and developmental processes [5]
- VI Biomes:** Meaning of biomes, biome type, tropical evergreen rainforest biome, Monsoon deciduous forest biome, Savana biome, Mediterranean biome, Temperate grassland biome, Tundra biome, Marine biome [5]
- VII Man, society and environment:** Human civilization processes (anthropological perspectives), society, class, gender; human settlements [5]

Suggested Readings

1. *Environmental Science* — S. C. Santra, New Central Book Agency.
2. *Environmental Science; Cunningham & Saigo WCB McGraw Hill*, 1999-5th Den.
3. *Environmental Science-Enger & Smith. 7th Den*, McGraw Hill .
4. *Fundamental of Ecology*, E.P. Odum, W.B. Sauders Company, USA.
5. *Concept of Ecology*, E. J. Kormondy, Prentice Hall of India Pvt. Ltd.
6. *Environmental Biology*, Biswarup Mukherjee, Tata McGraw Hill Co. Ltd., New Delhi.
7. *Ecology a bridge between science & society*, by E. P. Odum, Sinauer associates.

FIRST SEMESTER

ENVIRON – 102
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

PHYSICAL ENVIRONMENT

- I Fundamentals of Earth processes:** Origin of Earth; Geological time scale; internal structure of earth; Geotectonics; Continental drift and mountain building with reference to plate tectonics;
External geomorphic processes: weathering and erosion; Soil formation; Landforms developed due to water, wind and glacier; sediments and sedimentation [8]
- II Fundamentals of climatology:** Scale of meteorology; elements of climate -- pressure, temperature, precipitation, humidity, radiation and wind equation of motion for atmosphere; tropical motion systems
Climate of India: Spatial and temporal patterns of climatic parameters in India, Indian monsoon, climatic regions of India [6]
- III Environmental chemistry:** Atoms, elements, compounds, chemical bonds and chemical reactions; geospheric element transformation and behaviour; organic compounds – hydrocarbons and polymer chemistry; biological chemistry – chemistry of carbohydrate, protein, fat, nucleic acids, pigments, phenol etc; green chemistry – concept, green catalyst; material life cycle and application of green chemistry [12]
- IV Principles of analytical methods:** Design of sampling techniques (air, soil, biological matters), Chromatography, gas chromatography, HPLC, GC-MS, Atomic absorption spectroscopy, Flame photometry; some microbial methods [8]

Suggested Readings

1. *Environmental Geology*, Edward A. Keller, Prentice Hall, New Jersey.
2. *Physical Chemistry*, P.C. Rakshit, Sarat Book House, Calcutta.
3. *Environmental Chemistry*, A. K. De, New Age (p.) Ltd.
4. *Fundamentals of Environmental Chemistry*, Manban, S.E., Lewis Publishers.
5. *Elements of Bioinorganic Chemistry*, G. N. Mukherjee, Arabinda Das, U. N. Dhar & Sons Pvt. Ltd.
6. *Atmospheric Chemistry & Physics*, Sainfeld, John Wiley & Sons. Inc.
7. *Chemistry for Environmental Engineering*, Sway, Mearthy & Parkin; Tata Mc. Graw-Hill.

FIRST SEMESTER

ENVIRON – 103
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

ENVIRONMENTAL BIOLOGY

- I Evolution:** Fundamentals of evolutionary processes; origin of life; role of natural selection, genetic drift, evolutionary divergence – races, species and isolating mechanism, patterns of speciation, population genetics, [7]
- II Biological diversity:** A brief accounts of microbes, plants and animals and microbes; principles of taxonomy – nomenclature, an outline of classification and identification (plants, animals) [8]
- III Population and environment:** Population characteristics; population dynamics; human population growth, natality, mortality, age structure, dispersal and distribution, immigration, emigration [6]
- IV Community ecology:** Biotic community concept and structure and classification; species diversity in communities, pattern in communities; ecological succession – causes, trends, of succession, basic types of succession, general process of succession, successional changes in community, model of succession, - relay floristic model, initial floristic composition model, tolerance and inhibition model; climax concept; structural and functional changes in hydrosere, xerosere [8]
- V Habitat ecology:** Freshwater ecology, marine ecology, estuarine ecology and terrestrial ecology [4]
- VI Forest and wildlife:** Classification and distribution of forests, ecological and economic value of forest, forest degradation and deforestation, impact of deforestation on the environment; current strategies of forest management, agroforestry, social forestry, farm forestry, green belt development, principles and strategies of protected area network, sanctuary, national park, biosphere reserve, wild life tourism [6]

Suggested readings

1. *Principles of Systematic Zoology*, E. Mayr and Peter D Ashlock, McGRAW-HILL, INC
2. *Principles of Animal Taxonomy*, G G Simpson, Columbia University Press

FIRST SEMESTER

ENVIRON – 104
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

ENVIRONMENTAL MICROBIOLOGY

- I General microbiology:** Microbiology of air, water and soil; general idea about bacterial morphology -- shape, size; structure chemistry and function of capsule, pilus, membrane, cell wall, plasmid and chromose, replication of bacterial nucleus; fungal morphology [6]
- II Microbial culture techniques:** Isolation and characterization, microbial growth analysis; preservation of microorganisms [6]
- III Food Microbiology:** Contamination and microbial spoilage of fresh food and its preservation; food adulteration; fermented food; food poisoning; microbiology of milk, milk sources, types of microorganisms used, pasteurization [4]
- IV Microbes of different environment:** Thermophiles, psychrophiles, halophiles, acidophiles and alkaliphiles [6]
- V Microbial transformations of pesticides:** Fundamental reactions of pesticide metabolism, B-oxidation, oxidative dealkylation, thioether oxidation, decarboxylation, epoxidation, aromatic hydroxylation, aromatic heterocyclic and non-heterocyclic ring cleave; hydrolysis, halogen reactions, nitro reactions, miscellaneous reactions [6]
- VI Microbial transformations of heavy metals:** microbes in metal containing habitat, metal-microbes interactions, microbial immobilization and transformation of metals, microbial application of metal removal [6]
- VII Microbial properties:** Distinctive properties of virus, types of viral nucleic acids, replication of viral DNA and RNA, lysogeny, induction, lysogenic conversion significance of lysogeny, Viroids and prions. [6]

Suggested readings

1. *Microbiology*, Pelzer, M. J. Chan, E.C.S. and Kreig, N. R. McGraw-Hill Publishing Company.
2. *Wastewater Microbiology*, Bitton, G., John Wiley, NY.

FIRST SEMESTER

ENVIRON – 105
Time of Examination: 4hrs

Marks: 50

GENERAL PRACTICAL PAPER

1. Measurement and preparation of Oxygen Profile in aquatic ecosystem
2. macroscopic and microscopic identification of igneous, sedimentary and metamorphic rocks, common minerals; Study of fossils with reference to paleoenvironment
3. Study of pond biota – phytoplankton, zooplankton and macrophytes
4. Physico-chemical analysis of water and and soil parameters
 - a) Meteorological parameters: Temperature, moisture, humidity, light
 - b) Soil parameters: pH, organic matter, N, P, K
 - c) Water parameters: DO, free and combined CO₂, salinity, conductivity, turbidity (Secchi Disc method), sulfate, phosphate, nitrate-nitrogen, ammonical-nitrogen, residual chlorine, sodium and potassium
5. Laboratory Note book and *Viva-voce*:

15 marks

FIRST SEMESTER

ENVIRON – 106
Time of Examination: 4hrs

Marks: 50

GENERAL PRACTICAL PAPER

1. Analysis of vegetation: Frequency, density, abundance, cover and basal area, dominance, Importance Value Index (IVI) and phytograph
2. Determination of species diversity by diversity indices in plant community
3. Lay out of experimental design (RBD; split-plot etc.); Sampling techniques and statistical analysis of experimental design
4. Study of bioenergetics – Plants and animal tissues by calorimetric methods
5. Estimation of biomass by crop growth analysis
6. Laboratory Note book and *Viva-voce*:

15 marks

SECOND SEMESTER

ENVIRON – 201

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

LIFE PROCESSES & ECOTOXICOLOGY

- I Toxicology:** Principles of toxicology; elements and areas of toxicology; acute and chronic toxicology; dose-response relationship; statistical concept of LD₅₀ and LC₅₀; chemical and biological factors and their influences, bioassay methods, routes of entry of toxicants; interaction of toxicants with organism
Microbial toxins - algal, fungal and bacterial toxins [8]
- II Biochemical aspects of heavy metals:** Sources, distribution, mechanism of action, effects and remedial measures of some heavy metals like arsenic, cadmium, lead, mercury, aluminium, chromium [8]
- III Biochemical aspects of some specific industrial toxicants:** Sources, distribution, mechanism of action, effects and remedial measures of some specific toxicants like PAN, MIC [8]
- IV Immunology and immunotoxicity:** Properties of immune response; innate and acquired immunity; cells and organs of immune system; concepts of antigens; concept of antibodies with special reference to structure, function, classification; antigen antibody interaction, major histocompatibility complex; cell mediated and humoral immunity [8]
- V Stress Physiology:** Environmental stress -concept and stress agents-water, temperature, salinity, radiation, air pollutants and metals on plants and animal systems. [8]

Suggested Readings

1. *Toxicants in the aquatic ecosystem*, T. R. Crompton, John Wiley & Sons, NY.
2. *Casarett & Doull's Toxicology, The basic Science of poisons*, 2nd Den, Editors, J. Doull, C.D. Klaassen, M.O. Amdur, Macmillan Publishing Co. Inc., NY.
3. *Statistics for environmental Biology and Toxicology*, W. W. Piegorsh & A. J. Bailer.

SECOND SEMESTER

ENVIRON –202

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

ENVIRONMENTAL GEOSCIENCE

- I. Land resources & management:** Land resources, land degradation cycle, land-use pattern, land reform, land use plan, soil surveys in relation to land use planning; methods of site selection and evaluation [6]
- II. Water resources management and its environment:** World water balance, hydrogeology and geochemistry of surface and groundwater; water quality, use of water, conservation of water resources, climate change impacts on water resource management [6]
- III. Mineral resources and environment:** Mineral resources in relation to plate tectonics and geology, geology of mineral resources, distribution of mineral resources in India, environmental impact of mineral development, recycling of mineral resources [8]
- IV. Geological hazards:** Earthquakes, Landslides, Cyclones and Floods Indian context [6]
- V. Environmental meteorology:** Atmospheric stability, adiabatic character; Turbulence and diffusion, Application of meteorology to air pollution study [6]
- VI. Environmental climatology:** Climatic change in of recent times; identification and characteristics of bio-climatic and agro-climatic regions of India; urban climatology; climate and human comfort [8]

Suggested Readings

1. *Environmental Geology*, Edward A. Keller, Prentice Hall, New Jersey.
2. *Geology Environment Society*, K.S. Valdiya, University press
3. *Environmental meteorology*, B. Padmanabha Murthy, I.K. International
4. *Atmosphere, Weather and Climate*, Roger G. Barry Richard J. Charley, Routledge (Taylor & Francis group)
5. *Coping with natural hazards; Indian Context*, K.S. Valdiya, Orient Longman .
6. *Environmental Geology*, C.W. Montgomery, Mc. Graw Hill International.

SECOND SEMESTER

ENVIRON – 203
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

SOIL SCIENCE, ENERGY RESOUCES & ENVIRONMENTAL STATISTICS

- I Soil Science:** Origin, nature and classification of parent material for soil formation, soil profile, physical properties of soil, soil air, soil water, soil temperature, soil colloids, soil pH, mineral nutrition in plants; Soil erosion and conservation [8]
- II Energy:** Energy budget of the earth; earth's thermal environment and seasons; sun as a source of energy, solar radiation and its spectral characteristics. Conventional and non-conventional energy sources, fossil fuels; nuclear energy-fission and fusion; energy from biogas and biomass [6]
- III Energy and environment:** Principles of generation of Solar, hydropower wind, geothermal and ocean energy, energy use patterns in different parts of the world and India and its impact on the environment; [8]
- IV Energy management:** Energy consumption; energy conservation, increased efficiency, and cogeneration, energy policy, integrated energy management, management of nuclear energy wastes, some conservation factors, research and development on renewable energy [8]
- V Environmental statistics:** Basic elements and tools of statistical data analysis, bivariate and multivariate data; statistical measures --mean, median, standard error and deviation; testing of hypothesis: Null and alternative hypothesis, level of significance, degree of freedom, t-test [10]

Suggested Readings

1. *Environmental Statistics and data analysis*, Ott, W. R., Lewis Publishers, New Jersey.
2. *Statistical Methods*, G. W. Snedecor & W. G. Cochran.
3. *Statistics for environmental Biology and Toxicology*, W. W. Piegorsh & A. J. Bailer.
4. *Soils – their properties & management*, Peter E. V. Charman, Oxford Univ. Press.
5. *Introductory Soil Science*, D.K.Das, Kalyani Publishers.

SECOND SEMESTER

ENVIRON – 204
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

ENVIRONMENTAL POLLUTION & DEGRADATION

- I Air Pollution:** Natural and anthropogenic sources of pollution; inorganic pollutants, ozone, SPM, photochemical smog, acid rain; organic pollutants, biopollutants; effects of air pollutants on human, plants, materials and climate; status of air pollution in Indian cities; different control measures and air quality standard
- II Water pollution:** Sources, types and consequences; inorganic and organic pollutants; concept of eutrophication, DO, BOD, COD; sewage and groundwater pollution; water quality, standard and health; physico-chemical analysis of water; effects of water pollution on biological system; status of water pollution in different water bodies with reference to Indian context; thermal pollution
- III Noise pollution:** Sources of noise, types of noise; noise and health; sonic boom; sound pressure and intensity level; decibels; noise exposure levels and standard; noise measurement; control of noise pollution; noise mapping
- IV Radiation pollution:** Radioactivity in the environment; biological effects of radiations; pollution from nuclear weapons' explosions; pollution from electric power generation plant and nuclear reactors,
- V Soil pollution:** Sources, effect of soil pollution on biota, surface water and groundwater regimes; fate and behavior of soil pollutants; impact of different pesticides (herbicides, insecticides, fungicides, nematocides, rodenticides etc.) on soil; different kinds of synthetic fertilizer (NP&K) and their interactions with different components of soil; management of agricultural pollution in India.
- VI Environmental degradation:** Wetlands, wastelands, and desertification; genesis of wasteland and wetland – problems and prospects; different conventions on wetland

Suggested Readings

1. *Environmental Noise Pollution and Its Control*, Chhatwal, Mehra Katyal, Satake Katyal, Nagahiro, Anmol Publications (Pvt.) Ltd., New Delhi.
2. *Environmental radiation and thermal pollution and their control*, G. R. Chhatwal *et al.*, Anmol Publications (Pvt.) Ltd., New Delhi.
3. *Elements of the nature & properties of soils*, Nyle C Bardy, Prentice Hall, New Jersey.
4. *Understanding environmental pollution*, Marquita K. Hill, Cambridge University Press, 1997.
5. *Air pollution and climate change*, Alan Wellburn-2nd Edn., Longman, 1998.

SECOND SEMESTER

ENVIRON – 205
Time of Examination: 4hrs

Marks: 50

GENERAL PRACTICAL

1. Collection, isolation and population study of microorganism in air, water and soil
2. Handling of meteorological data recording equipment
3. Air pollution sampling, monitoring and analysis by High Volume Sampler
4. Measurement of noise level
5. Laboratory Note book and *Viva-voce*:

15 marks

SECOND SEMESTER

ENVIRON –206
Time of Examination: 4hrs

Marks: 50

GENERAL PRACTICAL

1. Impact of agrochemicals on hydrophytes, xerophytes and mesophytes
2. Effect of pesticides on opening and closing of stomata of different crops
3. Effect of pesticides on total sugar content of different crops
4. Effect of pesticides and heavy metals on total protein content of different crops and aquatic vertebrates
6. Laboratory Note book and *Viva-voce*:

15 marks

THIRD SEMESTER

[General Paper]

ENVIRON –301

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL LAWS

- I Environmental Impact Assessment:** Concept and evolution/ origin of EIA; principle and characteristics of different EIA processes and their relationship; Environmental Impact Statement (EIS); environmental accounts, evaluation, audit and assessment; EIA and sustainable development; EIA guidelines 1994; Notification of GoI; Revised notification, Sept. 2006.
- II EIA techniques and methods:** Evaluation of methodologies, different methods -- Ad Hoc, Checklist, Overlay, Matrix, use of Computers & expert system; EIA and planning and management; global scale and transboundary IA; prediction and assessment of impacts on the air, surface water, soil, and noise environment; Strategic Environmental Impact Assessment System-an overview; Environmental Audit System.
- III Environmental modeling methods and future development of EIA Process**
- IV Environmental protection** – issues and problems; International and National efforts for Environment Protection; Provisions in constitution of India regarding Environment (Article 48A and 58A); Environmental Policy Resolution, Legislation and Public Policy Strategies in Pollution Control; Wildlife Protection Act, 1972 amended 1991; Forest Conservation Act, 1980, Indian Forest Act, (revised) 1982; Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and Control of Pollution) Act, 1974 as amended up to 1988; The Environment (Protection) Act, 1986 and Rules 1986; Scheme of labeling of environmental friendly products (Ecomark); Public Liability Insurance Act, 1991 and Rules 1991; Role of Supreme Court and Green Bench of High Court on environment protection in India; Role of NGOs in environmental protection in India; Acts and rules-CRZ & CMZ; 1991

Suggested readings

1. *Environmental and social impact assessment and introduction*, C. J. Barrow.
2. *Environment & Pollution Law Manual*, S. K. Mohanty, Universal Law Publisher Ltd. New Delhi.

THIRD SEMESTER

[General Paper]

ENVIRON – 302

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

ENVIRONMENTAL ECONOMICS & ENVIRONMENTAL MANAGEMENT

- I. Environmental Economics:** Concept of ecological economics; environmental economics and principles; cost-benefits analysis; the economics of environmental quality; measuring environmental values; Polluter pays Principles; precautionary principle and compensation principle; trade and environment; externalities
- II. Resource Conservation and Management:** Concept of resources; resource taxonomy; exhaustive resources and renewable and recyclable resources; resource management and conservation principle and ways; conservation strategies
- III. Environmental Management System:** Environmental system principles, tools and management strategies; different Environmental management systems; perspectives of environmental management policy in India, ISO Systems & certification procedure
- IV. Natural disaster management:** IDNDR viewpoint; disaster studies – Indian scenario; role of information science and technology for natural disaster reduction; natural disaster mitigation *vis-à-vis* risk and vulnerability
- V. Waste management:** Types, sources and generation of wastes, their characterization, chemical composition; methods of disposal and management of wastes (Municipal, Bio-medical, and Hazardous e-waste); recycling of waste materials

Suggested readings

1. Uberoi, N K 1999 Environmental Management, New Delhi Publ. Excel Books
2. The Earthscan reader in Environmental economics, Markandya, A. 1992
3. Coping with Natural Hazards : Indian Content , K.S. Valdiya, Orient Longman.

THIRD SEMESTER

[General Paper]

ENVIRON – 303
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

EMERGING ENVIRONMENTAL PROBLEMS, HEALTH HAZARDS & GENETIC ENGINEERING

I Emerging Environmental Problems: Environmental problems in developing countries – High-rise buildings, urban slum. sanitation problems
Green house gases and global warming, carbon trading and sequestration; ozone depletion and its impact on global climate; temperature inversion; nuclear winter-concept and prediction.

II Environmental health and health hazards: Concept of health and disease; principles of epidemiology; epidemiology of communicable diseases viz., Leprosy, Cancer, Malaria, Tuberculosis, AIDS etc; communication for health education; health planning and management

III Principle of genetic engineering: Concept, cell cycles, gene cloning; genetics responses of microorganisms with reference to pollutants; GMO and its merits and demerits; conservation of gene resources; recombinant DNA technology and its applications and limitations; Nif gene and biological nitrogen fixation; intellectual property rights and intellectual property protection

IV Environmental mutagenic and genetic disorders; Mutagenesis mechanism: UV-induced (cyclobutane type pyrimidine dimmers), single strand DNA breaks, chemical induced DNA alkylation, adduct formation, intra and inter-strand cross-linking; enzyme mediated photorepair and excision repair

Suggested Readings

1. **Global Environmental Governance** By James Gustave Speth and Peter M. Haas
Washington, DC: Island Press, 2006. 179pp. ISBN: 1-59726-081-9, \$40

2. **The Environment in Asia Pacific Harbours** Eric Wolanski, ed. New York: Springer, 2007. 498 pp. ISBN: 978-1-4020-6566-8, \$99

3. **Human Genetic Engineering: A Guide for Activists, Skeptics, and the Very Perplexed**, by Shanks, Peter Nation Books, 06/2005, Paperback, \$16.95

4. **Genetic Engineering, Food and our Environment** Luke Anderson, Chelsea Green, 1999, \$7.95

THIRD SEMESTER

[Special Paper]

ENVIRONS – 304

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

GIS & REMOTE SENSING

- I Concept of map, coordinate and projection:** Classification of map; map scale; spatial referencing system; map projections; commonly used map projections; grid systems
- II Basic principles of remote sensing-:** Electromagnetic remote sensing process; physics of radiant energy ; energy source sources and radiation principles; energy interactions in the atmosphere; energy interaction with earth surface materials; an ideal remote sensing system
- III Remote sensing platforms and sensors:** Satellite system parameters; resolutions; imaging sensor systems- active and passive; different types of satellite with special emphasis on Indian remote sensing satellites
- IV Digital image processing:** Basic character of digital image; image classification- supervised and unsupervised
- V Fundamentals of GPS and GIS and Integration of Remote Sensing and GIS**
- VI Environmental Application of Remote sensing and GIS:** Land use/land cover mapping; agricultural, water resource , disaster management and forestry application

Suggested Reading:

1. *Remote sensing of urban environment*, B. S. Sokhi, S. M. Rashid, Manak Publication (pvt.) Ltd.
2. *Remote sensing and image interpretation*, Lilles and Kiefer, 3rd Edition, John Wiley & Son Inc., NY.
3. *Text book of Remote Sensing and Geographical Information System* , M. Anji Reddy , BS publications
4. *Remote Sensing principles and Applications*, Dr. B. C. Panda. Viva Books pvt. Ltd.

THIRD SEMESTER

ENVIRON – 305
Time of Examination: 4hrs

Marks: 50

[GENERAL PRACTICAL]

- I Analysis of environmental data and their computer handling
- II Characterization of wastes and waste water: MLSS;MLVSS
- III Identification(with characters) of some parasitic and other pathogenic diseases.
- IV Preparation of report (case studies on EIA)
- V Bacterial transformation experiments
- VI Study of chromosome-Allium and Drosophila

THIRD SEMESTER

ENVIRON – 306
Time of Examination: 4hrs

Marks: 50

[SPECIAL PRACTICAL]

- I. Digital image processing: Raw image data reading; image enhancement technique; histogram equalization technique ;FCC and spectral signature of earth features
- II. Georeferencing and mosaicking of image
- III. Image subset and export
- IV. Classification of image- supervised and unsupervised
- V. Digitization and different types of vector layer generation
- VI. Cartographic representation

FOURTH SEMESTER

[General Paper]

ENVIRON – 401

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

BIODIVERSITY CONSERVATION & SUSTAINABLE DEVELOPMENT

- I Biodiversity:** α β , γ biodiversity; genetic species and ecosystem diversity; Biological diversity and biogeography; biological productivity – succession and restoration; ‘Hotspots’ of biodiversity; strategies for biodiversity conservation and Agenda-21; ex-situ and in-situ conservation; Biodiversity acts of India; National biodiversity authority; Indian board on Wildlife; convention on biodiversity; value of biodiversity; Phytogeographical and Zoogeographical regions of India.; IPR and IPP in biodiversity.
- II Sustainable development :** overview, sustainable management practices in agriculture, forestry, aquaculture, industrial development, urban development
- III Bioremediation:** Concept. Practices and applications; microbial process of bioremediation; phytoremediation factors influencing bioremediation; ex- situ bioremediation of contaminated soil; microbial removal of nitrogen and phosphorus; The water hyacinth pond; The algae fish pond, The duckweed pond and the reed beds.

Suggested readings

1. *Bioremediation*, Baker, H., and Herson, D. S., McGraw-Hill Publishing Company.
2. *Bioremediation principles*, Eweis, J. B. Ergas, S. J., Chang, D. P.Y. and Schroeder, E. D., McGraw-Hill Publishing Company.

FOURTH SEMESTER
[Special Paper]

. ENVIRON – 402
No. of Lectures: 40

Marks: 45
Time of Examination: 3hrs

ENVIRONMENTAL TOXICOLOGY

- I. Toxic responses:** General toxic responses of cell, organs, nervous system, gastrointestinal tract, liver, kidney, blood, and reproductive system; mechanism of cellular injury; bioaccumulation and biomagnifications of toxicants in ecosystem; toxic responses to different types of plant systems

- II. Toxic agents:** Phytotoxins; animal toxins; Microbial toxin and xenobiotic and their impact.

- III Genetic toxicology:** Types, classes, mode of action, metabolism of chemical carcinogens; mutagenicity, genetic diseases; teratogenicity

- IV Impacts of industrial effluents:** General impacts of some effluents discharged from paper and pulp industry, sugar, distillery, tannery, mining, sponge-iron on ecosystem with special reference to occurrence, environmental sources, biochemical effects, and remedial measures

- V Bioactive substances:** Bioactive substances and their significance in the ecosystem; food additives; synthetic dyes etc

- VI Applied toxicology:** Forensic toxicology, clinical toxicology ; occupational toxicology

Suggested Readings

1. *Toxicants in the aquatic ecosystem*, T. R. Crompton, John Wiley & Sons, NY.
- 2.. *Casarett & Doull's Toxicology, The basic Science of poisons*, 2nd Den, Editors, J. Doull, C.D. Klaassen, M.O. Amdur, Macmillan Publishing Co. Inc., NY.
3. *Statistics for environmental Biology and Toxicology*, W. W. Piegorsh & A. J. Bailer.

FOURTH SEMESTER

[Special Paper]

ENVIRON – 403

No. of Lectures: 40

Marks: 45

Time of Examination: 3hrs

ENVIRONMENTAL BIOTECHNOLOGY

- I Microbes in relation to environment:** virus, bacteria, fungi, algae, lichen, protozoa microbial groups
- II Practical utility of viruses-**Bioinsecticides, phase topping
- III Bacteriology of water and sewage**, Methods for differentiating faecal from Sewage organisms and their characters.
- IV Biotechnological methods:** Pollution detection and abatement
- V Molecular biology in Environmental monitoring** –an overview.
- VI Biosensor in environmental analysis** : Enzyme electrode, immobilized cell biosensor, optical biosensor, ISFET based devices, H₂O₂ biosensor, microbial biosensor, gas phase biosensor, nanobiosensor, amphoteric biosensor,, environmental application of biosensor
- VII Agricultural biotechnology** : Biofertilizer-types and application in agriculture; biopesticides; biocomposting; integrated pest management-concept, technology involved in agriculture and forestry

Suggested readings:

1. Environmental Biotechnology, Eastern book Corporation, Hemant Rawat.2008
2. Environmental Biotechnology, Indian Book.Co.in S.K. Agarwal, 1998
3. Environmental Biotechnology : Principles and Application Springer (India0 Pvt. Ltd., A. M. Chakraborty, M. Moo-Young and W. A. Anderson (Ed) 2007.
4. Environmental Biotechnology (2nd edition) A. K. Chatterjee, Prentice Hall Of India Pvt. Ltd. New Delhi-110001
5. Environmental Microbiology Biotechnology by New Age International Publishers, 2004 D. P. Singh & S. K. Dwivedi
6. Text Book of Environmental Biotechnology . I. K. International Publishing House Pvt. Ltd. Pradipta Kumar Mahapatra.2006.

FOURTH SEMESTER

ENVIRON – 404
Time of Examination: 4hrs

Marks: 50

[GENERAL PRACTICAL]

1. Studies on specific physicochemical characteristics of wetlands, wasteland, crop land of your locality
2. Changes in bacterial population in effluents coming from industry
3. Studies on bioassay of wastewater by using lemna
4. Studies on relative water content of leaves under mesophytic, xerophytic and hydrophytic conditions
5. Excursion (Educational tour –Submission of Field Report and field samples)

FOURTH SEMESTER

ENVIRON – 405
Time of Examination: 4hrs

Marks: 50

[SPECIAL PRACTICAL]

1. Identification of microbes and higher plants involved in Environmental Biotechnology
2. Collection and Identification of floral diversity from crop field
3. Isolation and characterization of nitrogen fixing bacteria from crop field
4. Isolation of root nodules and Quantification of leg- hemoglobin
5. Quantitative estimation of indole acetic acid from plant material.
6. Measurement of ascorbic acid , chlorophyll and phenol in plants
7. Isolation and measurement of DNA and RNA.
8. Assay of toxicity by algal specimens
9. Microbial assessment of water quality
10. Studies on heavy metal toxicity by seed germination and seedling growth test
11. Screening of resistant varieties of crop under drought stress .

FOURTH SEMESTER

ENVIRON – 405
Time of Examination: 4hrs

Marks: 50

[SPECIAL PRACTICAL]

- 1.Measurement of LC_{50}/LD_{50} and safe concentration of toxicants
- 2.Quantitative estimation of residual heavy metals in the tissue of aquatic vertebrates with special reference to fish by Atomic Absorption Spectrophotometer
- 3.Study on chronic toxicity
- 4.Study on toxicological lesions viz. histopathological, histochemical
- 5.Study on toxicological response through biochemical tests viz. amylase activity, protease activity etc.
- 6.Study on histochemical localization of heavy metals

FOURTH SEMESTER

ENVIRON – 406

Marks: 50

SEMINAR PRESENTATION PAPER

[Dissertation/ Term Paper]

Submission of Dissertation paper	40
Viva-Voce:	10

**ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN**

**M. Sc. SYLLABUS
SEMESTER SYSTEM**

Prepared by:-
**Department of Environmental
Science
The University of Burdwan
Burdwan
713 104**

SYLLABUS FOR

M.A./M.Sc. PROGRAMME IN GEOGRAPHY

With effect from session 2020-22

CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF GEOGRAPHY
THE UNIVERSITY OF BURDWAN
PURBA BARDHAMAN– 713104
WEST BENGAL, INDIA

DEPARTMENT OF GEOGRAPHY
M.A./M.Sc. PROGRAMME IN GEOGRAPHY
Division of Courses and Credits

SEMESTER I

Course				Lecture hour /Week	Duration of Examination (in hrs.)			Marks			Credit
Course code	Type	T/P	Name					I.A.	E.A.	Total	
				L	T	P					
MSGG 101	Core	T	Geographical Thought	4	-	-	2	10	40	50	4
MSGG 102	Core	T	Geotectonics and Geomorphology	4	-	-	2	10	40	50	4
MSGG 103	Core	T	Soil and Biogeography	4	-	-	2	10	40	50	4
MSGG 104	Core	T	Resources and Economic Activities	4	-	-	2	10	40	50	4
MSGG 105	Core	P	Quantitative Techniques in Geography	-	-	8	2	10	40	50	4
MSGG 106	Core	P	Instrumental Survey and Map Projection	-	-	8	2	10	40	50	4
Total Credit										24	

Abbreviation used: T/P → Theory/Practical; L/T/P → Lecture/Tutorial/Practical; I.A. → Internal Assessment; E.A.→ End Term Assessment

SEMESTER II

Course				Lecture hour /Week			Duration of Examination (in hrs.)	Marks			Credit
Course code	Type	T/P	Name	L	T	P		I.A.	E.A.	Total	
MSGG 201	Core	T	Recent Trend in Geography	4	-	-	2	10	40	50	4
MSGG 202	Core	T	Climatology & Hydrology	4	-	-	2	10	40	50	4
MSGG 203	Core	T	Region & Regional Planning	4	-	-	2	10	40	50	4
MSGG 204	Core	T	Population and Settlement Geography	4	-	-	2	10	40	50	4
MSGG 205	Core	P	Thematic Mapping	-	-	8	2	10	40	50	4
MSGG 206	Core	P	Remote Sensing and Geographical Information System	-	-	8	2	10	40	50	4
Total Credit										24	

Abbreviation used: T/P → Theory/Practical; L/T/P → Lecture/Tutorial/Practical; I.A. → Internal Assessment; E.A.→ End Term Assessment

SEMESTER III

Course				Lecture hour /Week			Duration of Examination (in hrs.)	Marks			Credit
Course code	Type	T/P	Name	L	T	P		I.A.	E.A.	Total	
MSGG 301	Core	T	Social and Cultural Geography	4	-	-	2	10	40	50	4
MSGG 302	Core	T	Contemporary Geographical Issues in India	4	-	-	2	10	40	50	4
MSGG 303	Core	P	Statistical Techniques in Geographical Analysis	-	-	8	2	10	40	50	4
MSGG 304	GE	T	Geoinformatics/ Environmental Geography	2	-	-	1	5	20	25	2
MSGG 305	DE	T	Discipline centric Elective Theory	4	-	-	2	10	40	50	4
MSGG 306	DE	P	Discipline centric Elective Practical	-	-	8	2	10	40	50	4
MSGG 307	CE	P	Community Engagement Activities	-	-	4	2	5	20	25	2
Total Credit											24

Abbreviation used: T/P → Theory/Practical; L/T/P → Lecture/Tutorial/Practical; I.A. → Internal Assessment; E.A.→ End Term Assessment; GE → Generic elective; DE → Discipline-centric Elective; CE → Community Engagement Activities

SEMESTER IV

Course				Lecture hour /Week			Duration of Examination (in hrs.)	Marks			Credit
Course code	Type	T/P	Name	L	T	P		I.A.	E.T.	Total	
MSGG 401	Core	T	Geography of Development & Political Geography	4	-	-	2	10	40	50	4
MSGG 402	Core	T	Research Methodology	4	-	-	2	10	40	50	4
MSGG 403	Review of Literature on a topic based on DE	P	Review of Literature based on Discipline Centric Elective Course	-	-	8	2	10	40	50	4
MSGG 404	DE	T	Discipline centric Elective Theory	4	-	-	2	10	40	50	4
MSGG 405	DE	P	Discipline centric Elective Practical	-	-	8	2	10	40	50	4
MSGG 406	Dissertation	P	Dissertation	-	-	8	2	10	40	50	4
Total Credit											24

Abbreviation used: T/P → Theory/Practical; L/T/P → Lecture/Tutorial/Practical; I.A. → Internal Assessment; E.A.→ End Term Assessment; DE → Discipline-centric Elective

SYLLABUS

for
M.A. / M. Sc. IN GEOGRAPHY

(Choice Based Credit System (CBCS))

**Revised in PGBoS Meetings held on 06.09.2018
To be effective from Academic Session 2016-18**



**THE UNIVERSITY OF BURDWAN
RAJBATI, BURDWAN – 713104
WEST BENGAL, INDIA
www.buruniv.ac.in**

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SYLLABUS

For

M.Sc. IN GEOSPATIAL SCIENCE

Choice Based Credit System (CBCS)

Revised in PGBS Meeting held on 16.10.2020

To be effective from Academic Session 2020-22



**THE UNIVERSITY OF BURDWAN
RAJBATI, BURDWAN – 713104
WEST BENGAL, INDIA
www.buruniv.ac.in**

DEPARTMENT OF GEOGRAPHY**MSc in Geospatial Science****Division of Courses and Credits****SEMESTER I**

Course				Lect. Hr /week	Dur. of Exam. (in H)	Marks			Credit
Course code	Type	T/P	Name			Internal Assessment	End Term Assessment	Total	
MSGS 101	Core	T	Generic Concepts in Geography	4	2	10	40	50	4
MSGS 102	Core	T	Fundamentals of Map making & Data Representation	4	2	10	40	50	4
MSGS 103	Core	T	Geodesy and Map Projection	4	2	10	40	50	4
MSGS 104	Core	T	Fundamentals of Remote Sensing, GIS and GNSS	4	2	10	40	50	4
MSGS 105	Core	P	Probability and Statistics	8	4	10	40	50	4
MSGS 106	Core	P	Cartography and Surveying	8	4	10	40	50	4
Total credit									24

SEMESTER II

Course				Lect . Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			Internal Assessment	End Term Assessment	Total	
MSGS 201	Core	T	Principles of Photogrammetry	4	2	10	40	50	4
MSGS 202	Core	T	Digital Image Processing (DIP)	4	2	10	40	50	4
MSGS 203	Core	T	Microwave, Thermal and Hyperspectral Remote Sensing	4	2	10	40	50	4
MSGS 204	Core	P	Digital Image Processing (DIP): Practical	8	4	10	40	50	4
MSGS 205	Core	P	Practical in GIS and Change Detection	8	4	10	40	50	4
MSGS 206	Core	P	Multivariate Statistics in Geospatial Science	8	4	10	40	50	4
Total credit									24

SEMESTER III

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			Internal Assessment	End Term Assessment	Total	
MSGS 301	Core	T	Techniques of Geospatial Analysis	4	2	10	40	50	4
MSGS 302	Core	T	Spatial Decision Support Systems and Modelling	4	2	10	40	50	4
MSGS 303	Core	P	Elementary Mathematics and Programming	8	4	10	40	50	4
MSGS 304	GE	T	Geospatial Science	2	1	5	20	25	2
MSGS 305	DE	T	Discipline centric Elective Theory	4	2	10	40	50	4
MSGS 306	DE	P	Discipline centric Elective Practical	4	8	10	40	50	4
MSGS 307	CE	N.A	N.A.	N.A.	N.A.	5	20	25	2
Total credit									24

SEMESTER IV

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSGS 401	Core	T	Web GIS	4	2	10	40	50	4
MSGS 402	Core	T	Database Management System (DBMS)	4	2	10	40	50	4
MSGS 403	Review of Literature on a topic based on DE	P	Literature Review	4	4	10	40	50	4
MSGS 404	DE	T	Discipline centric Elective Theory	4	2	10	40	50	4
MSGS 405	DE	P	Discipline centric Elective Practical	8	4	10	40	50	4
MSGS 406	Dissertation/ Project	N.A.	N.A.	4	4	10	40	50	4
Total credit									24

Choice Based Credit System (CBCS) Syllabus
for
Post Graduate Course
on
Geospatial Science
With effective from the Academic Session – 2015-17



The University of Burdwan
Golapbag,
Burdwan
West Bengal - 713104

Syllabus for Post Graduate Course on Geospatial Science

Summary of the Course and Credits

Division of Course and Credits

SEMESTER - I

Course	Code	Course Title	T	P	Credit	Marks	Examination Time (Hrs.)
GST	101	Principles of Earth System and Geospatial Science	√	×	4	50	2
GST	102	Cartography and Surveying Technology	√	×	4	50	2
GST	103	Geodesy and GPS	√	×	4	50	2
GST	104	Fundamentals of Remote Sensing and GIS	×	×	4	50	2
GSP	105	Computer Programming, Remote Sensing and GIS Practical	×	√	4	50	4
GSP	106	Surveying and Thematic Mapping	×	√	4	50	4
		Total			24	300	

SEMESTER - II

Course	Code	Course Title	T	P	Credit	Marks	
GST	201	Principles of Photogrammetry	√	×	4	50	2
GST	202	Digital Image Processing (DIP)	√	×	4	50	2
GST	203	Microwave, Thermal and Hyper Spectral Remote Sensing and Applications	√	×	4	50	2
GST	204	Geographical Information System (GIS)	√	×	4	50	2
GSP	205	Digital Image Processing	×	√	4	50	4
GSP	206	Statistical Methods	×	√	4	50	4
GSP	207	Field Work and Seminar	×	√	2	25	
		Total			26	325	

SEMESTER - III

Course	Code	Course Title	T	P	Credit	Marks	
GST	301	Spatial Data Analysis and Modelling	√	×	4	50	2
GST	302	Digital Photogrammetry, LIDAR, SONAR	√	×	4	50	2
GST	303	Database Management System	√	×	4	50	2
GST	304	Major Elective	√	×	4	50	2
GSMT	304A	Earth System Science	√	×			
GSMT	304B	Forestry and Ecology	√	×			
GSMT	304C	Urban Development and Planning	√	×			
GSMT	304D	Environment and Public Health	√	×			

GSMP	305	Major Elective	×	√	4	50	3
GSMP	305A	Earth System Science	×	√			
GSMP	305B	Forestry and Ecology	×	√			
GSMP	305C	Urban Development and Planning	×	√			
GSMP	305D	Environment and Public Health	×	√			
GSMIE	306	Minor Elective: Geospatial Science and Applications	√	×	2	25	2
GSSOP	307	Community Outreach Programme	×	√	2	25	2
		Total			24	300	
SEMESTER - IV							
Course	Code	Course Title	T	P	Credit	Marks	
GSGV	401	Grand Viva	√	×	4	50	3
GSSM	402	Seminar	√	×	2	25	3
GSDS	403	Dissertation	√	×	10	125	3
GSVI	404	Viva- Voce on Project	√	×	6	75	3
		Total			22	275	
Grand Total					96	1200	

हिंदी विभाग
वर्द्धमान विश्वविद्यालय
DEPARTMENT OF HINDI
THE UNIVERSITY OF BURDWAN



SYLLABUS

M.A. IN HINDI

To be effective from the Examination 2020

एम० ए० पाठ्यक्रम
शिक्षा वर्ष 2020 से प्रारंभ

Department of Hindi
The University of Burdwan
Proposed Post Graduate (M.A.) Syllabus for the Examination 2020

M.A. in Hindi							
Course No	Course Status and Type	Course Title	Credit	Pattern of Teaching learning (hours per week)			Marks
				L	T	P	
First Semester [All courses are Departmental Core Courses and Compulsory]							
HIN-101	Core /TH	हिन्दी साहित्य का इतिहास : आदिकाल और मध्यकाल (Hindi Sahitya ka itihās : Aadikaal aur madhyakaal)	5	5	0	0	40+10=50
HIN-102	Core /TH	हिन्दी साहित्य का इतिहास : आधुनिक काल (Hindi Sahitya ka itihaas : Aadhunik kaal)	5	5	0	0	40+10=50
HIN-103	Core /TH	भाषा विज्ञान और हिन्दी भाषा का विकास (Bhasha vigyan aur Hindi bhasha ka vikas)	5	5	0	0	40+10=50
HIN-104	Core/ TH	हिन्दी गद्य की विविध विधाएँ (Hindi gadya ki vividh vidhayen)	5	5	0	0	40+10=50
HIN-105	Core/ TH	हिन्दी पत्रकारिता (Hindi patrakarita)	5	5	0	0	40+10=50
		Semester I Total	25				250
Second Semester [All courses are Departmental Core Courses and Compulsory]							

HIN 201	Core/ TH	भारतीय और पाश्चात्य काव्य- सिद्धांत (Bhartiya aur pashchatya kavya siddhanta)	5	5	0	0	40+10=50
HIN 202	Core/ TH	हिंदी आलोचना (Hindi aalochana)	5	5	0	0	40+10=50
HIN 203	Core/ TH	अनुवाद विज्ञान (Anuvaad vigyaan)	5	5	0	0	40+10=50
HIN 204	Core/ TH	नाटक और रंगमंच (Natak aur Rangmanch)	5	5	0	0	40+10=50
HIN 205	Core/ TH	मध्यकालीन काव्य (Madhyakalin kavya)	5	5	0	0	40+10=50
		Semester II Total	25				250
Third Semester [Students have to take 2 Compulsory Core Courses, 2 Major Electives (HIN 303A/B/C/D and HIN 304 A/B/C/D) and 1 Interdisciplinary Elective from other Departments/ SWAYAM Platform]							
HIN301	Core/TH	आधुनिक काव्य –I (Aadhunik kavya- I)	5	5	0	0	40+10=50
HIN302	Core/TH	आधुनिक काव्य – II (Aadhunik kavya – II)	5	5	0	0	40+10=50
HIN303 A	Major Elective/ TH	जयशंकर प्रसाद (Jay Shankar Prasad)	5	5	0	0	40+10=50
HIN303 B		सुमित्रानंदन पंत (Sumitra Nandan Pant)	5	5	0	0	40+10=50
HIN303 C		महादेवी वर्मा	5	5	0	0	40+10=50

		(Mahadevi Verma)					
HIN303 D		सूर्यकांत त्रिपाठी निराला (Suryakant tripathi Nirala)	5	5	0	0	40+10=50
HIN304 A	Major Elective/ TH	भारतेन्दु हरिश्चन्द्र (Bhartendu Harischandra)	5	5	0	0	40+10=50
HIN304 B		प्रेमचन्द (Premchand)	5	5	0	0	40+10=50
HIN304 C		राहुल सांकृत्यायन (Rahul Sankrityayan)	5	5	0	0	40+10=50
HIN304 D		फणीश्वर नाथ रेणु (Fanishwar Nath Renu)	5	5	0	0	40+10=50
HIN305 A	Inter disciplinary Elective/TH	(हिन्दी साहित्य अ) (Hindi Sahitya A)	4	4	0	0	40+10=50
HIN305 B		हिन्दी साहित्य ब (Hindi Sahitya B)	4	4	0	0	40+10=50
HIN305 C		(हिन्दी साहित्य स) (Hindi Sahitya C)	4	4	0	0	40+10=50
HIN305 D		हिन्दी साहित्य द (Hindi Sahitya D)	4	4	0	0	40+10=50
		Semester III Total	24				250
Fourth Semester [Students have to take 3 Compulsory Core Courses (HIN-401, HIN-402, HIN-405), 2 Major Electives courses {Either HIN- 403A /B/C /D and in case of HIN-404 any one from either A / B/C/ or D} and 1 Compulsory Community Engagement course (HIN-400)]							
HIN400	Communiy Engagemen t Course /	Community Engagement Course/ Educational/ Litrary Tour	2	0	0	2	20+5=25

	PRACTICAL	सामाजिक कार्य /शैक्षणिक /साहित्यिक यात्रा					
HIN401	Core/TH	हिन्दी उपन्यास : पृष्ठभूमि और पाठ (Hindi upanyas: Pristhabhumi aur path)	5	5	0	0	40+10=50
HIN402	Core/TH	हिन्दी कहानी : पृष्ठभूमि और पाठ (Hindi kahaani: Pristhabhumi aur path)	5	5	0	0	40+10=50
HIN403 A	Major Elective/TH	समकालीन महिला कहानीकार Samkaaleen Mahila Kahanikaar	5	5	0	0	40+10=50
HIN403 B		समकालीन कविता (Samkaaleen kavita)	5	5	0	0	40+10=50
HIN403 C		आदिवासी विमर्श (Adivasi Vimarsh)	5	5	0	0	40+10=50
HIN403 D		समकालीन उपन्यास (Samkaaleen Upanyaas)	5	5	0	0	40+10=50
HIN404 A	Major Elective/ PR	अज्ञेय (AJNEYA)	5	0	0	5	40+10=50
HIN404 B		जैनैन्द्र (Jainendra)	5	0	0	5	40+10=50
HIN404 C		यशपाल (Yashpal)	5	0	0	5	40+10=50
HIN404 D		शिवप्रसाद सिंह (Shivprasad Singh)	5	0	0	5	40+10=50
HIN405	Core/ PRACTICAL	परियोजना कार्य (Project Work Dessertation)	5	2	0	3	40+10=50
		Semester IV Total	27				275
Grand Total (For 4 Semesters)			101				1025

हिंदी विभाग
वर्धमान विश्वविद्यालय
DEPARTMENT OF HINDI
THE UNIVERSITY OF BURDWAN



SYLLABUS
M.A. IN HINDI
TO BE INTRODUCED FROM THE SESSION 2015-2016
एम०ए०पाठ्यक्रम
शिक्षा वर्ष 2015 – 2016 से प्रारंभ

COURSE STRUCTURE

FIRST SEMESTER

Paper No.	Type	Title	Credit	L - T - P
HIN 101	Core	हिन्दी साहित्य का इतिहास : आदिकाल और मध्यकाल (Hindi Sahitya ka itihas : Aadikaal aur madhyakaal)	5	4 - 1 - 0
HIN 102	Core	हिन्दी साहित्य का इतिहास : आधुनिक काल (Hindi Sahitya ka itihaas : Aadhunik kaal)	5	4 - 1 - 0
HIN 103	Core	भाषा विज्ञान और हिन्दी भाषा का विकास (Bhasha vigyan aur hindi bhasha ka vikas)	5	4 - 1 - 0
HIN 104	Core	हिन्दी गद्य की विविध विधायें (Hindi gadya ki vividh vidhayen)	5	4 - 1 - 0
		Total	20	16 -4- 0

L : Learning Mode

T : Tutorial Mode

P : Practical Mode

SECOND SEMESTER

Paper No.	Type	Title	Credit	L - T - P
HIN 201	Core	भारतीय और पाश्चात्य काव्य सिद्धांत (Bhartiya aur pashchatya kavya siddhanta)	5	4 - 1 - 0
HIN 202	Core	हिंदी आलोचना (Hindi aalochana)	5	4 - 1 - 0
HIN 203	Core	हिंदी पत्रकारिता (Hindi patrakarita)	5	4 - 1 - 0
HIN 204	Core	अनुवाद विज्ञान (Anuvaad vigyaan)	5	4 - 1 - 0
		Total	20	16 -4- 0

L : Learning Mode

T : Tutorial Mode

P : Practical Mode

THIRD SEMESTER

Paper No.	Type	Title	Credit	L - T - P
HIN 301	Core	मध्यकालीन काव्य (Madhya kalin kavya)	5	4 - 1 - 0
HIN 302	Core	आधुनिक काव्य –I (Aadhunik kavya- I)	5	4 - 1 - 0
HIN 303	Core	आधुनिक काव्य – II (Aadhunik kavya – II)	5	4 - 1 - 0
HIN 304 A	Major Optional/Elective	जयशंकर प्रसाद (Jay Shankar Prasad)	5	4 - 1 - 0
HIN 304 B	Major Optional/Elective	निराला(Nirala)	5	4 - 1 - 0
HIN 305	Minor Elective	हिन्दी साहित्य	4	3-1-0
		Total	24	19 -5- 0

L : Learning Mode

T : Tutorial Mode

P : Practical Mode

FOURTH SEMESTER

Paper No.	Type	Title	Credit	L - T - P
HIN 401	Core	हिन्दी उपन्यास : पृष्ठभूमि और पाठ (Hindi upanyas : Pristhabhumi aur path)	5	4 - 1 - 0
HIN 402	Core	हिन्दी कहानी : पृष्ठभूमि और पाठ (Hindi kahaani : Pristhabhumi aur path)	5	4 - 1 - 0
HIN 403 A	Major Optional/Elective	प्रेमचंद (Premchand)	5	4 - 1 - 0
HIN 403 B	Major Optional/Elective	फणीश्वरनाथ रेणु (Fanishwarnath Renu)	5	4 - 1 - 0
HIN 403 C	Major Optional/Elective	राहुल सांकृत्यायन (Rahul Sankrityayan)	5	4 - 1 - 0
HIN 404	Core	Project Work	10	0 - 2 - 8
HIN 405	Social outreach	सामाजिक /शैक्षणिक / साहित्यिक यात्रा	01	12-5-9
		Total	26	12 - 5 - 9

L : Learning Mode

T : Tutorial Mode

P : Practical Mode

TOTAL CREDIT: 90

Learning Mode : 63

L : Learning Mode

Department of History
The University of Burdwan
Restructuring of PG Syllabus (History) - 2020

Preamble

The Department of History has undertaken the initiative to restructure the syllabus at the Post-Graduate level as per the guidelines set by the Syllabus Committee, Arts Faculty, the University of Burdwan. The purpose is to introduce a common pattern of syllabus in all subjects under the UGC prescribed CBCS system and to infuse uniformity in the syllabi across the disciplines.

The PG syllabus of History shall have a total of 1020 marks divided into 20 courses of 50 marks each and an additional 25 marks for Community Engagement Course.

Keeping in tune with the decision to offer various types of courses there are altogether four types of courses on offer in the department of History. 1. Core Course, 2. Major Elective Course, 3. Inter-disciplinary Elective, and 4. Community Engagement Course. The Project Paper is being bracketed under the category of Core course.

Each course of 50 marks shall be of 5 credits each except the Inter-disciplinary Elective course which shall be of 4 credits and the Community Engagement Course with 2 credits. **A Candidate has to earn at least 101 credits to get a PG degree**

First & Second Semesters

The first & second semesters shall have five courses each, comprising of all the core courses, the marks and credit value of each semester being 250 and 25 respectively. In the 1st and 2nd Semesters neither options in Core courses nor any major elective and interdisciplinary elective courses are made available to students.

Third & Fourth Semesters

In the third semester major elective and interdisciplinary elective courses are introduced. Of the total five papers in Semester – III there are two core courses (301 & 302), two major elective courses (303 & 304) and one Inter-disciplinary course (305). Major Elective Courses are again have three options each, such as,

303A, 303B & 303C and 304A, 304B & 304C respectively. An Interdisciplinary course offered in this semester has four options, such as, 305A, 305B, 305C & 305D to be chosen one among these five by students. **However, students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer, subject to prior approval of the departmental committee and University Authorities and uniformity of academic calendar**

In this semester, though the total marks value of five courses remain unchanged i.e., 250, a slight change in the total credit value (from 25 in earlier two semesters to 24 in Semester-III) results from the introduction of Inter-disciplinary Elective course in this semester with 4 credits.

In the Fourth Semester, two core courses (401 & 402), two major elective courses (403 & 404), and a project paper(405)categorized as a core course, are available. Here again three options are available in each major elective course, such as 403A, 403B & 403C and 404A, 404B &404C respectively. In addition to these, a new course on Community Engagement is introduced in this semester to extend the teaching learning process beyond the four walls of classroom and to connect it with the society at large. Since this course carry 25 marks and 2 credits, the total marks and credit value of this semester register an increase in comparison to other semesters, being 275 and 27 respectively.

Assessment Pattern

The performance of a candidate in a theoretical course (paper) will be assessed for a maximum of 50 marks as explained below except for the Community Engagement Course (400) and Project (405)

- 40 marks as end-semester examination
- 10 marks as Internal Assessment based on class test, assignment, seminar etc.

	Course Code	Course Type	Name of the Course /Title of the Paper	Course Status	Marks Distribution (End Sem + Int. Asst.	Credit Value of the Course

The Core Course on Project will be assessed on total of 50 marks with divisions, such as, 40 marks for project writing and 10 marks for presentation or viva-voce examination. The project work may be based on field investigations to be carried out by students of 4th Semester only.

The Course on Community Engagement, meant only for 4th Semester students, will have thrust areas, such as a. Appreciation of Rural Society, b. Understanding of Rural Society, c. Rural Institutions, d. Rural Development etc. Assessment of this course will be carried out on 25 marks to be divided into 20 marks for report writing and another 5 marks for presentation and viva-voce to be held in the presence of external experts from other departments of the Home University.

**** Each course of 5 credits shall have 5 Lectures of one hour duration per week over a period of one semester of 16 weeks for teaching-learning process. Departments will have the liberty to allocate hours in lecture hours/Tutorial/Practical (Keeping in mind that two tutorials are equivalent to one Lecture hour)**

	MA HIST 101	TH	Interrogating Indian Historiography	Core Course	40+10 = 50	5
	MA HIST 102	TH	Nineteenth Century Bengal: Life and Culture	Core Course	40+10 = 50	5
	MA HIST 103	TH	Institutional Politics in India: Pre-Gandhian Phase	Core Course	40+10 = 50	5
	MA HIST 104	TH	Burma, Indo-China and Thailand: Society, Economy and Politics	Core Course	40+10 = 50	5
	MA HIST 105	TH	History of Ideas: 19 th & 20 th Century India	Core Course	40+10 = 50	5
	Semester Total				250	25
	Course Code	Course Type	Name of the Course /Title of the Paper	Course Status	Marks Distribution (End Sem + Int. Asst.)	Credit Value of the Course
	MA HIST 201	TH	Historiography and Methodology: Western Tradition	Core Course	40+10 = 50	5
	MA HIST 202	TH	Twentieth Century Bengal: Life and Culture	Core Course	40+10 = 50	5
	MA HIST 203	TH	Institutional Politics in India: Gandhian Phase	Core Course	40+10 = 50	5
	MA HIST 204	TH	Indonesia and Malay: Society, Economy and Politics	Core Course	40+10 = 50	5
	MA	TH	Western Political	Core	40+10 = 50	5

	HIST 205		Ideas: Machiavelli to Marx	Course		
			Semester Total		250	25

Semester - III	Course Code	Course Type	Name of the Course /Title of the Paper	Course Status	Marks Distribution (End Sem + Int. Asst.	Credit Value of the Course
	MA HIST 301	TH	The Rahr in the Nineteenth Century	Core Course	40+10 = 50	5
	MA HIST 302	TH	Economy in Transition: Pre- colonial India	Core Course	40+10 = 50	5
	MA HIST 303A	TH	Science & Society in Pre-colonial India	Major Elective	40+10 = 50	5
	MA HIST 303B	TH	State and Society in Colonial India	Major Elective	40+10 = 50	5
	MA HIST 303C	TH	History of the USA (I776-1900)	Major Elective	40+10 = 50	5
	MA HIST 304A	TH	State and Society in Ancient India	Major Elective	40+10 = 50	5
	MA HIST 304B	TH	Science & Society in Colonial & Post -Colonial India	Major Elective	40+10 = 50	5
	MA HIST 304C	TH	History of the USA (1900-1945)	Major Elective	40+10 = 50	5
	MA HIST 305A	TH	History of Women: Emerging Perspectives	Interdisciplinary Elective	40+10 = 50	4
	MA HIST 305B	TH	Emergence of Industrial Societies in Europe	Interdisciplinary Elective	40+10 = 50	4

	MA HIST 305C	TH	A Cultural History of Europe: Renaissance and Reformation	Interdisciplinary Elective	40+10 = 50	4
	MA HIST 305D	TH	Indian Foreign Policy: 1952-2014	Interdisciplinary Elective	40+10 = 50	4
	Semester Total				250	24
Semester - IV	Course Code	Course Type	Name of the Course /Title of the Paper	Course Status	Marks Distribution (End Sem + Int. Asst.	Credit Value of the Course
	MA HIST 400	PR	Community Engagement Course	Community Engagement	20+5 = 25	2
	MA HIST 401	TH	The Rahr in the Twentieth Century: 1900-1947	Core Course	40+10 = 50	5
	MA HIST 402	TH	Economy in Transition: Colonial India	Core Course	40+10 = 50	5
	MA HIST 403A	TH	State & Society in Medieval India	Major Elective	40+10 = 50	5
	MA HIST 403B	TH	India Since Independence: 1947-2007	Major Elective	40+10 = 50	5
	MA HIST 403C	TH	History of the USA: 1945-1991	Major Elective	40+10 = 50	5
	MA HIST 404A	TH	Indian Women Through the Ages	Major Elective	40+10 = 50	5
	MA HIST 404B	TH	Bi-Polarism to Unipolarism: International Relations (1945-1991)	Major Elective	40+10 = 50	5
	MA HIST 404C	TH	Europe in the Age of Enlightenment	Major Elective	40+10 = 50	5
	MA HIST 405	PR	Project Paper	Core Course	40+10 = 50	5
	Semester Total				275	27
	Programme Total					1020

Department of History
The University of Burdwan

Syllabus for the Degree of M A in History to be effective from the academic session 2014-16

Preamble:

The entire syllabus shall be of 90 credits carrying 900 marks, of which 10 credits carrying 100 marks shall be allotted to Project Work. The syllabus is divided into 17 courses of which 16 courses are of 50 marks each and one course, i.e., project work is of 100 marks. Each course of 50 marks is of 5 credits (1 credit = 1 lecture of 1 hour per week x 16). A candidate has to earn total 90 credits to earn PG degree in History. Each course of 5 credits shall have 5 hour session of Lectures per week over a period of one semester of 16 weeks for teaching-learning process.

The 90 credits carrying 900 marks shall be divided into four Semesters. Each of the first three Semesters shall be of four courses carrying 20 credits (5 credits for each course) and 200 marks (160 marks for End Semester Examination and 40 marks for Continuous Assessment). Fourth Semester shall be of five courses carrying 30 credits (20 credits from four courses and 10 credits from project work) and 300 marks (160 marks for End Semester Examination, 40 for Continuous Assessment and 100 marks for Project Work).

The syllabus contains mainly two types of courses ----- Core and Elective. A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course. The Core courses are compulsory for the students. Generally a course which can be chosen from a pool of courses and which may be very specific / specialized / advanced to the subject of study or which provides extended scope or enables exposure to some other disciplines / subjects / domains will be called an Elective Course. Elective Courses (known as Departmental Elective Courses) are to be offered to the students of the department and students from sister / related disciplines may also be offered one or two such courses in the 4th semester on the basis of availability of seats and teachers.

Students shall have to earn 70 credits from Departmental Core Courses and 20 credits from Elective courses. A maximum of 10 credits may be earned in the 4th semester from non-departmental Elective Courses to be offered by sister/related disciplines in lieu of Departmental Electives. Students may opt for Non-departmental Elective in lieu of MAHIST 403 and MAHIST 404, subject to prior approval of departmental committee. A student may opt entirely for

Departmental Elective Courses. Departmental Elective courses will be offered in 3rd and 4th Semester of study. For selecting non-departmental elective courses by any student prior approval of the departmental committee and the University authorities will be required and uniformity in academic calendar across departments should be maintained.

The performance of a candidate in each course will be assessed for a maximum of 50 marks out of which 40 marks shall be allotted to end-semester examination of two hours duration. Students are required to answer *four* question (out of *eight* alternatives), carrying 10 marks each. The remaining 10 marks shall be allotted to Continuous Assessment through Class Tests or Viva voce.

The Project Work, carrying 10 credits (100 marks) is compulsory for the students and therefore shall be treated as Core Course. The students shall be required to do project in the 4th semester. It may be done on any course related to Indian history. Of the 100 marks entrusted to Project Work, 60 marks shall be allotted to Project writing, 20 for seminar presentation, 10 for Viva-voce and 10 marks to Social Outreach Programme.

In the first and second semester all the courses to be offered are Course Courses and compulsory for the students. In the Third Semester there shall be two Core Courses which are compulsory and two Elective Courses (MAHIST303 and MAHIST304) with options. Students have to opt for two Elective Courses, one each from MAHIST 303 (A/B/C/D) and MAHIST 304 (A/B/C/D). The Fourth Semester is of two Core Courses (compulsory for the students) and two Elective Courses (MAHIST 403 and MAHIST 404) with options and a Project Work. Students are required to choose one course under MAHIST 403 (A/B/C/D) and one under MAHIST 404 (A/B/C/D).

**MA in History
Course Outline**

First Semester						
Course No	Course Type	Course Title	Credit	Credit Distribution (L, T & P)		
MAHIS T 101	Core	Interrogating Indian Historiography	5	4	1	0
MAHIS T 102	Core	Nineteenth- and Twentieth- Century Bengal: Life and Culture	5	4	1	0
MAHIS T103	Core	Mainland Southeast Asia: Burma, Indo-China and Thailand	5	4	1	0
MAHIS T 104	Core	History of Ideas: Nineteenth and Twentieth Century India	5	4	1	0
		Total Credit	20	16	4	0
Second Semester						
Course No	Course Type	Course Title	Credit	Credit Distribution		
MAHIST 201	Core	Historiography and Methodology: The Western Tradition	5	4	1	0
MAHIST 202	Core	Making of the Indian Nation-State	5	4	1	0
MAHIST 203	Core	Island Southeast Asia: Indonesia and Malaysia	5	4	1	0
MAHIST 204	Core	Western Political Ideas: Machiavelli to Marx	5	4	1	0
		Total Credit	20	16	4	0

Third Semester						
			Credit	Credit Distribution		
MAHIST 301	Core	The Rahr in the Nineteenth Century	5	4	1	0
MAHIST 302	Core	Economy in Transition: Pre-colonial India	5	4	1	0
MAHIST 303A	Elective	State and Society in Ancient India	5	4	1	0
MAHIST 303B	Elective	Science and Society in Pre-colonial India	5	4	1	0
MAHIST 303C	Elective	History of Women: Issues and Trends	5	4	1	0
MAHIST 303D	Elective	History of the USA: 1776-1850	5	4	1	0
MAHIST 304A	Elective	State and Society in Medieval India	5	4	1	0
MAHIST 304B	Elective	Science and Society in Colonial and Post-colonial India	5	4	1	0
MAHIST 304C	Elective	Indian Women through the Ages	5	4	1	0
MAHIST 304D	Elective	History of the USA: 1850-1900	5	4	1	0
		Total Credit	20	16	4	0
Fourth Semester						
Course No	Course Type	Course Title	Credit	Credit Distribution		

MAHIST 401	Core	The Rahr in the Twentieth Century: 1900-1947	5	4	1	0
MAHIST 402	Core	Economy in Transition: Colonial India	5	4	1	0
MAHIST 403A	Elective	State and Society in Colonial India	5	4	1	0
MAHIST 403B	Elective	A Cultural History of Europe: Renaissance and Reformation	5	4	1	0
MAHIST 403C	Elective	Emergence of Industrial Societies:The Conceptual Framework	5	4	1	0
MAHIST 403D	Elective	History of the USA: 1900-1945	5	4	1	0
MAHIST 404A	Elective	State and Society in India since Independence	5	4	1	0
MAHIST 404B	Elective	Europe in the Age of Enlightenment	5	4	1	0
MAHIST 404C	Elective	Emergence of Industrial Societies:The Classical Case and the Late-Starters	5	4	1	0
MAHIST 404D	Elective	History of the USA: 1945-1991	5	4	1	0
MAHIST 405	Core	Project Work & Extension Outreach*	10	0	2	8
Total Credit			30	16	6	8
All Total Credit			90	64	18	8

*Credits in the Lecture (L) mode shall be decided through end-semester written test. Credits in the Tutorial (T) mode shall be decided by internal tests. Finally, credits in the Practical (P) mode will be decided by the extent and quality of field work/extension outreach report.

1. Title and Commencement

The programme shall be called the full-time Integrated Master of Library and Information Science (M.Lib.I.Sc.) programme under the Faculty of Arts, Commerce, etc.

This syllabus shall come into force from the academic session 2020-2021.

2. Objectives

The primary objective is to train the students in the basics of professional skills for information / knowledge management, so that they serve the society through an institution of library or information centre.

To give the students an understanding of the basic principles of Library and Information Science and to enable them to understand, appreciate and develop professionalism to work in contemporary “Information Age”.

To acquaint the students with the development of the Universe of Knowledge and methods of its organization in a library/information system.

To train students in the techniques of Information Management and equip them with skills for applying Information Communication Technologies (ICT) in libraries and information centres.

To make students fully aware of various sources of information and train them in techniques of dissemination of information in the context of different user groups.

3. Duration and Semester System

The duration of the programme leading to the Degree of Master of Library and Information Science (M.Lib.I.Sc.) shall be two academic years. A student must complete the programme within four years from the date of admission to the programme..

Each academic year shall be divided into two semesters. The first and third semesters shall ordinarily commence in the month of July of the first and second academic years and the second and the fourth semesters in the month of January of the first and second academic years or on such dates as may be fixed by the University. There shall be a minimum of 16 weeks of teaching in a semester.

3. Academic Calendar

Academic Calendar will be as approved by the University.

4. Eligibility & Admission

Admission to the Integrated Master of Library and Information Science programme leading to Master of Library and Information Science degree shall be made through Entrance Test conducted by the University. The minimum qualification for appearing in the Entrance Test will be:

Bachelor degree with Honours/Major (in any discipline) following 10+2+3 pattern from the University, or any other university, accepted as equivalent thereto by the Statutory Bodies of the University/norms prescribed by the Regulatory Bodies as applicable subject to such conditions as may be prescribed thereof.

Reservation rules shall be as prescribed by the State Government and notified by the authorities concerned from time to time.

Foreign nationals either residing in India or abroad or Indian nationals residing abroad may be admitted to Integrated Master of Library and Information Science programme according to the policy guidelines laid down by the Government of India/University Executive Council from time to time.

5. Intake: Thirty Four (34).

6. Programme Outcomes (PO)

- Students understand the role, important and usefulness of this programme.
- Libraries and information centers are described as a social institution and it plays a vital role for education and culture.
- Students are learned about organizing, storing and disseminating library resources and providing various types of services to the patrons.
- The programme makes the students as professionals to serve in libraries and information centres.
- Beyond libraries and information centres, students are being experts in the other field like museums, archive centres, and documentation centres.
- The programme includes the applications of computer in libraries and information centres. The students are well equipped with computers tools and technologies that are being applicable in libraries and information centres.
- The students are well learned about library management software, digital library software to provide the services in digital environment.

7. Course Specific Outcomes(CSO)

- The programme includes the course ‘Knowledge Organization’. The students are learned ‘Knowledge Organization’ to organize documents, information and knowledge systematically in library.
- The course ‘Resource Description’ enables students to describe the various resources in different format like AACR2, CC, ISBD.
- The course ‘Content Designation and Metadata Encoding’ enables students to describe the various content designator and metadata schema like MARC21, Dublin Core metadata schema etc.
- The course ‘Neoteric Library Technology’ provides learning about advanced library and information technologies that includes automated library system, digital library system, semantic web technologies etc.
- The Course ‘Guided Research Project’ is about a dissertation work that helps students becoming a library professional in traditional and digital library environment.

8. Programme Structure

M.Lib.I.Sc. (Int.) curricula consist of 101 credits distributed in 21 courses in 2 academic years divided into 4 semesters.

Each credit requires 16 contact hours of teaching for theory or 32 contact hours of teaching for tutorial in a semester.

A minimum of 75 credits shall have to be earned from Departmental **Core Courses** and shall be Compulsory.

A minimum of 20 credits shall have to be earned from Departmental **Major Electives**.

A minimum of 4 credits shall have to be earned from **Inter-disciplinary Electives** offered by other departments/SWAYAM platform as stipulated by the university regulations.

A minimum of 2 credits shall have to be earned from **Library Community Development Programme (Community Engagement Course)**.

4 credits are assigned to Open Courses (**Interdisciplinary Elective**) (coded as MLIS305/A/B/C/D). Students of M.Lib.I.Sc. course are to opt for one **Interdisciplinary Elective** Open Course in third semester from open courses offered by any other department of the University. **However, students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer.**

Students from other departments of this University may opt for the **Interdisciplinary Elective** Open Courses offered by this Department.

In Semester-III a student shall opt for **Interdisciplinary Electives** of at least 4 credits from the sister departments/ SWAYAM, subject to prior approval of the departmental committee and University Authorities and uniformity of academic calendar.

In semester IV, one course **MLIS405** entitled '**Guided Research Project**' shall be dealing with applied part of the subject/field survey/Literature survey/Report writing etc (with 50 marks/5 credit). It is a core compulsory course.

A minimum of 2 credits shall have to be earned from MLIS400 entitled '**Library Community Development Programme**'. In semester IV each student shall have to participate in Community Engagement Course compulsorily from the specified programmes in the syllabus subject to the approval of the DC/PGBS.

Each course of 5 credits shall have 5-hour session of Lectures per week over a period of one semester of at least 16 weeks for teaching-learning process.

M.Lib.I.Sc. (Int.) course has a total 1020 marks (50 x 19 Core Courses + 50 x 1 Interdisciplinary Elective Courses + 20 x 1 Community Engagement Course).

In each course of 50 marks (5 credits/4 credits) the End-semester examination shall be of 40 marks (10 marks Mid-sem examination/Continuous Assessment based on class test, assignment, seminar etc modalities for which are to be decided by the concerned course-in-charge and to be notified to the students at the beginning of the semester). In End-semester, there shall be 8 questions of 10 marks each from which 4 questions are to be answered by the candidates (Time 2 hours).

In each course of 50 marks (5 credits/4 credits) which has two groups within it the End-semester examination shall be of 40 marks. There shall be 4 questions of 10 marks from each group. Candidates are to answer 4 questions taking 2 from each group. (Time 2 hours).

9. Community Engagement Course (MLIS400: Library Community Development Programme)

The Community Engagement Course entitled '**Library Community Development Programme**' is 2 **credit course** for Two Years Integrated M.Lib.I.Sc Programme.

10. Guidelines for Evaluation Pattern:

The performance of a candidate in a theoretical course (paper) will be assessed for a maximum of 50 marks as explained below (except the courses MLIS400 and MLIS405 which are discussed below):

- 40 marks as end-semester examination
- 10 marks as Continuous Assessment based on class test, assignment, seminar etc, modalities for which are to be decided by the concerned course-in-charge and notified to the students at the beginning of the semester.

MLIS405 (Guided Research Project): Based on Survey Report, Assignment, Presentation and Viva-Voce.

- Field survey and project Writing: 40 marks
- Presentation and Viva-Voce (in the presence of external experts from other Universities/Institutions): 10 marks.

MLIS400 (Library Community Development Programme): Students have to participate in the Library Community Engagement programmes/ activities of the department for the concerned year and follow it up with a written Report & Presentation and Viva-Voce. The main objectives are to develop an appreciation of rural culture, lifestyle and wisdoms among students, to learn about the states of various agricultural and rural development programmes, to understand causes for rural distress and poverty and explore solutions for the same and to apply class room knowledge of courses to field realities. Evaluation pattern would be as follows:

- Report writing: 10 marks
- Presentation and viva-voce: 10 marks (in the presence of external expert(s) from other Departments of the Home University)

11. Question Pattern

Courses with 5

credits

MLIS 101, MLIS 102, MLIS 103, MLIS 104, MLIS 105 ; MLIS 201, MLIS 202, MLIS 203, MLIS 204, MLIS 205 ; MLIS 301, MLIS 302, MLIS 303A, MLIS 303B, MLIS 303C, MLIS 303D, MLIS 304A, MLIS304B, MLIS 304C, MLIS 304D, MLIS 401, MLIS 402, MLIS 403A, MLIS 403B, MLIS 403C, MLIS 403D, MLIS 404A, MLIS 404B, MLIS 404C, MLIS 404D

Courses with 4 credits : MLIS 305A, MLIS 305B, MLIS 305C, MLIS 305D ; or course through SWAYAM.

Course with 2 credits : MLIS400

A. In each course of 50 marks (5 credits/4 credits) the End-semester examination shall be of 40 marks (10 marks Mid-sem examination/Continuous Assessment based on class test, assignment, seminar etc modalities for which are to be decided by the concerned course-in-charge and to be notified to the students at the beginning of the semester). In End-semester, there shall be 8 questions of 10 marks each from which 4 questions are to be answered by the candidates (Time 2 hours).

B. In each course of 50 marks (5 credits/4 credits) which has two groups within it the End-semester examination shall be of 40 marks. There shall be 4 questions of 10 marks from each group. Candidates are to answer 4 questions taking 2 from each group. (Time 2 hours).

12. Scope of Employability : This syllabus emphasizes the practical contents for job opportunities in favour of passed out students. The important courses of job opportunities are as follows:

MLIS102 : Knowledge Organization ; MLIS103 : Resource Description; MLIS104 : Library Information Technology; MLIS201: Library System Management; MLIS202: Document Classification; MLIS203:Document Cataloguing; MLIS204:Content Designation and Metadata Encoding; MLIS302: Information Retrieval; MLIS303:Automated Library System; MLIS304:Digital Resource Management; MLIS401:Digital Library System;MLIS405:Guided Research Project; MLIS400 : Library Community Development Programme

13. Credit pattern

explanation L T P

4	2	0	pattern: (4 X 16 wks) = 64 hrs = 4 credits + (2 X 16 wks) = 32 hrs = 1 credit + 0 > Altogether 5 credits
2	0	4	pattern: (2 X 16 wks) = 32 hrs = 2 credits + 0 + (4 X 16 wks) = 64 hrs = 2 credits > Altogether 5 credits
2	2	2	pattern: (2 X 16 wks) = 32 hrs = 2 credits + (2 X 16 wks) = 32 hrs = 1 credit + (2 X 16 wks) = 32 hrs = 1 credit > Altogether 5 credits
0	2	4	pattern: 0 + (2 X 16 wks) = 32 hrs = 2 credits + (4 X 16 wks) = 64 hrs = 4 credits > Altogether 5 credits
0	10	0	pattern: 0 + (10 X 16 wks) = 160 hrs = 5 credits + 0 = Altogether 5 credits
0	0	2	pattern: 0 + 0 + (2 X 16 wks) = 32 hrs = 2 credits = Altogether 2 credits

Note: L for Lecture, T for tutorial, P for Practical

Each course of 5 credits shall have 5 Lectures of one hour duration per week over a period of one semester of 16 weeks for teaching-learning process. Department will liberty to allocate hours in lecture hours/Tutorial/Practical (Keeping in mind that two tutorials are equivalent to one Lecture hour)

Candidates have to select ONE from 303A/B/C/D and ONE from 304A/B/C/D

For Interdisciplinary Elective course for the students of other departments, candidates have to select ONE from 305A/B/C/D. However, students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer.

Candidates have to select ONE from 403A/B/C/D and ONE from 404A/B/C/D.

[ME: Major Elective ; IE: Interdisciplinary Elective ; CS: Compulsory]

Course Structure Template of M.Lib.I.Sc

Semester	Course Code	Course Type	Course Status	Marks Distribution (End Sem +Int.Asst)	Credit Value of the Course
I	MLIS101	TH	Core Course	40+10=50	5
	MLIS102	TH	Core Course	40+10=50	5
	MLIS103	TH	Core Course	40+10=50	5
	MLIS104	TH	Core Course	40+10=50	5
	MLIS105	TH	Core Course	40+10=50	5
	Sem-I Total			250	25
II	MLIS201	TH	Core Course	40+10=50	5
	MLIS202	TH	Core Course	40+10=50	5
	MLIS203	TH	Core Course	40+10=50	5
	MLIS204	TH	Core Course	40+10=50	5
	MLIS205	TH	Core Course	40+10=50	5

	Sem-II Total			250	25
III	MLIS301	TH	Core Course	40+10=50	5
	MLIS302	TH	Core Course	40+10=50	5
	MLIS303 (A/B/C/D)	TH	Major Elective	40+10=50	5
	MLIS304 (A/B/C/D)	TH	Major Elective	40+10=50	5
	MLIS305 (A/B/C/D)	TH	Interdisciplinary Elective	40+10=50	4
	MLIS305 (A/B/C/D)	However, students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer.			
	Sem-III Total			250	24
IV	MLIS400	PR	Library Community Development Programme (Community Engagement Course)	20+5=25	2
	MLIS401	TH	Core Course	40+10=50	5
	MLIS402	TH	Core Course	40+10=50	5
	MLIS403 (A/B/C/D)	TH	Major Elective	40+10=50	5
	MLIS404 (A/B/C/D)	TH	Major Elective	40+10=50	5
	MLIS405	PR/Project	Core Course	40+10=50	5
	Sem-IV Total			275	27
Program Total				1025	101

In the syllabus 'Paper' shall be designated as 'course'.

The PG syllabus shall have 1020 marks divided into 20 courses of 50 marks each and an additional 20 marks for Library Community Development Programme (Community Engagement Course).

Each course of 50 marks shall be of 5 credits each except the Inter-disciplinary Elective course which shall be of 4 credits and Library Community Development Programme (Community Engagement Course) shall be of 2 credits.

In LIS 305(A/B/C/D), students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer. A candidate has to earn at least 101 credits to earn PG degree.

The credits to be earned in various semesters are as follows:

	First Semester	Second Semester	Third Semester	Fourth Semester
Core Courses (Compulsory)	25	25	10	15
				(Including the course on Project)
Major Elective Courses (Departmental)			10	10
Interdisciplinary Elective (Extra-departmental/SWAYAM Platform)			4	
Community Engagement Course (Compulsory)				2
Total	25	25	24	27
Grand Total	101			

Detailed Structure of Syllabus:

Semester	Courses		Remarks
I	MLIS101	Library and Society	All courses are Departmental Core Courses and Compulsory
	MLIS102	Knowledge Organization	
	MLIS103	Resource Description	

	MLIS104	Library Information Technology	
	MLIS105	Information Sources and Services	
II	MLIS201	Library System Management	All courses are Departmental Core Courses and Compulsory
	MLIS202	Document Classification	
	MLIS203	Document Cataloguing	
	MLIS204	Content Designation and Metadata Encoding	
	MLIS205	Information Systems and Users	
III	MLIS301	Information Communication and Management	Core Course
	MLIS302	Information Retrieval	Core Course
	Major Elective -I		Major Elective -I
	MLIS303A	Automated Library System	Select One
	MLIS303B	Digital Resource Management	
	MLIS303C	Technical Writing	
	MLIS303D	Digital Preservation	
	Major Elective -II		Major Elective -II
	MLIS304A	Neoteric Library Technology	Select One
	MLIS304B	Content Management and Web Products	
	MLIS304C	Library Networking	
	MLIS304D	Learning Content Management System	
	Interdisciplinary Elective		Interdisciplinary Elective
	MLIS305A	Current Trends in LIS	

	MLIS305B	Medical Information Systems and Services	Select One
	MLIS305C	Agricultural Information Systems and Services	
	MLIS305D	LIS Education	
	MLIS400	Library Community Development Programme <i>(30 hours of involvement with at least 50 per cent field work)</i>	Compulsory (Community Engagement Course)
IV	MLIS401	Digital Library System	Core Course
	MLIS402	Research Methodology	Core Course
	Major Elective -III		Major Elective -III
	MLIS403A	Community Information System	Select One
	MLIS403B	Academic Library System	
	MLIS403C	Informetrics	
	MLIS403D	Web Scale Library Discovery Services	
	Major Elective -IV		Major Elective -IV
	MLIS404A	Semantic Digital Repository	Select One
	MLIS404B	Open Access System	
	MLIS404C	Library and Information Profession and Related Agencies	
	MLIS404D	Library Functions and Operations	
	Project		
	MLIS405	Guided Research Project	

Framework of Teaching-learning Process

Name of courses		Type	Credit	Pattern of Teaching-learning (hours per week)		
				L	T	P
First Semester [All courses are Departmental Core Courses and Compulsory]						
MLIS101	Library and Society	Core	5 Credit	5	0	0
MLIS102	Knowledge Organization	Core	5 Credit	5	0	0
MLIS103	Resource Description	Core	5 Credit	5	0	0
MLIS104	Library Information Technology	Core	5 Credit	5	0	0
MLIS105	Information Sources and Services	Core	5 Credit	5	0	0
Second Semester [All courses are Departmental Core Courses and Compulsory]						
MLIS201	Library System Management	Core	5 Credit	5	0	0
MLIS202	Document Classification	Core	5 Credit	5	0	0
MLIS203	Document Cataloguing	Core	5 Credit	5	0	0
MLIS204	Content Designation and Metadata Encoding	Core	5 Credit	5	0	0
MLIS205	Information Systems and Users	Core	5 Credit	5	0	0
Third Semester [Students have to take 2 compulsory core courses , 2 Major Electives and 1 Interdisciplinary Elective from other departments/SWAYAM Platform]						
MLIS301	Information Communication and Management	Core	5 Credit	5	0	0
MLIS302	Information Retrieval	Core	5 Credit	5	0	0

MLIS303A	Automated Library System	Select One	Major Elective	5 Credit	5	0	0
MLIS303B	Digital Resource Management		Major Elective	5 Credit	5	0	0
MLIS303C	Technical Writing		Major Elective	5 Credit	5	0	0
MLIS303D	Digital Preservation		Major Elective	5 Credit	5	0	0
MLIS304A	Neoteric Library Technology	Select One	Major Elective	5 Credit	5	0	0
MLIS304B	Content Management and Web products		Major Elective	5 Credit	5	0	0
MLIS304C	Library Networking		Major Elective	5 Credit	5	0	0
MLIS304D	Learning Content Management System		Major Elective	5 Credit	5	0	0
MLIS305A	Current Trends in LIS		Interdisciplin ary Elective	4 Credit	5	0	0
MLIS305B	Medical Information Systems and Services		Interdisciplin ary Elective	4 Credit	5	0	0
MLIS305C	Agricultural Information Systems and Services		Interdisciplin ary Elective	4 Credit	5	0	0
MLIS305D	LIS Education		Interdisciplin ary Elective	4 Credit	5	0	0
However, for DEPT 305(A/B/C/D) students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer							

Fourth Semester [Students have to take 3 compulsory core courses and 2 Major Electives and one compulsory Community Engagement course]							
MLIS400	Library Community Development Programme (30 hours of involvement with at least 50 per cent field work)		Compulsory (Community Engagement course)	2 Credit	0	0	5
MLIS401	Digital Library System		Core	5 Credit	0	0	5
MLIS402	Research Methodology		Core	5 Credit	5	0	0
MLIS403A	Community Information System	Select One	Major Elective	5 Credit	5	0	0
MLIS403B	Academic Library System		Major Elective	5 Credit	5	0	0
MLIS403C	Informetrics		Major Elective	5 Credit	5	0	0
MLIS403D	Web Scale Library Discovery Services		Major Elective	5 Credit	5	0	0
MLIS404A	Semantic Digital Repository	Select One	Major Elective	5 Credit	5	0	0
MLIS404B	Open Access System		Major Elective	5 Credit	5	0	0
MLIS404C	Library and Information Profession and Related Agencies		Major Elective	5 Credit	5	0	0
MLIS404D	Library Functions and Operations		Major Elective	5 Credit	5	0	0
Project							
MLIS405	Guided Research Project		Core	5 Credit	0	0	5

Programme Credit Structure										
Sem	Course Code	Course Title	Type	Credit Pattern Pattern of Teaching-learning (hours per week)			Credit Value	Marks Distribution		
				Lecture (L)	Tutorial (T)	Practice (P)		Semester Examination	Internal Assessment	Total Marks
S E M I	First Semester [All courses are Departmental Core Courses and Compulsory]									
	MLIS101	Library and Society	Core	4	2	0	5	40	10	50
	MLIS102	Knowledge Organization	Core	3	1	2	5	40	10	50
	MLIS103	Resource Description	Core	4	2	0	5	40	10	50
	MLIS104	Library Information Technology	Core	2	0	4	5	40	10	50
	MLIS105	Information Sources and Services	Core	3	1	2	5	40	10	50
S E M II	Second Semester [All courses are Departmental Core Courses and Compulsory]									
	MLIS201	Library System Management	Core	4	2	0	5	40	10	50
	MLIS202	Document Classification	Core	0	2	4	5	40	10	50
	MLIS203	Document Cataloguing	Core	0	2	4	5	40	10	50
	MLIS204	Content Designation and Metadata Encoding	Core	3	1	2	5	40	10	50
	MLIS205	Information Systems and Users	Core	4	2	0	5	40	10	50
S	Third Semester [Students have to take 2 compulsory core courses , 2 Major Electives and 1 Interdisciplinary Elective from other departments/SWAYAM Platform]									
	MLIS301	Information Communication and Management	Core	4	2	0	5	40	10	50
E M	MLIS302	Information Retrieval	Core	4	2	0	5	40	10	50
	Major Elective (Any One)									

III	MLIS303A	Automated Library System	Select One	ME	4	2	0	5	40	10	50
	MLIS303B	Digital Resource Management		ME	4	2	0	5	40	10	50
	MLIS303C	Technical Writing		ME	4	2	0	5	40	10	50
	MLIS303D	Digital Preservation		ME	4	2	0	5	40	10	50
	Major Elective (Any One)										
	MLIS304A	Neoteric Library Technology	Select One	ME	4	2	0	5	40	10	50
	MLIS304B	Content Management and Web products		ME	4	2	0	5	40	10	50
	MLIS304C	Library Networking		ME	4	2	0	5	40	10	50
	MLIS304D	Learning Content Management System		ME	4	2	0	5	40	10	50
	Interdisciplinary Elective (Any One)										
	MLIS305A	Current Trends in LIS		IE	4	2	0	4	40	10	50
	MLIS305B	Medical Information Systems and Services		IE	4	2	0	4	40	10	50
	MLIS305C	Agricultural Information Systems and Services		IE	4	2	0	4	40	10	50
	MLIS305D	LIS Education		IE	4	2	0	4	40	10	50
	However, for MLIS305(A/B/C/D) students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer										
	Fourth Semester [Students have to take 3 compulsory core courses and 2 Major Electives and one compulsory Community Engagement course]										

S E M	MLIS400	Library Community Development Programme (30 hours of involvement with at least 50 per cent field work)	CS	0	0	5	2	20 Report writing	5 Viva-voce/ Presentation	25

IV	MLIS401	Digital Library System	Core	2	0	5	5	40	10	50	
	MLIS402	Research Methodology	Core	4	2	0	5	40	10	50	
	Major Elective (Any One)										
	MLIS403A	Community Information System		ME	4	2	0	5	40	10	50
	MLIS403B	Academic Library System		ME	4	2	0	5	40	10	50
	MLIS403C	Informetrics		ME	4	2	0	5	40	10	50
	MLIS403D	Web Scale Library Discovery Services		ME	4	2	0	5	40	10	50
	Major Elective (Any One)										
	MLIS404A	Semantic Digital Repository	Select One	ME	4	2	0	5	40	10	50
	MLIS404B	Open Access System		ME	4	2	0	5	40	10	50
	MLIS404C	Library and Information Profession and Related Agencies		ME	4	2	0	5	40	10	50
	MLIS404D	Library Functions and Operations		ME	4	2	0	5	40	10	50
	MLIS405	Guided Research Project	Core	0	0	5	5	40 [Survey Report, Assignment, Presentation]	10 [Viva-voce / Presentation]	50	

Grand Total								101	810	210	1020



The University of Burdwan
Department of Library and Information Science
Burdwan – 713 104, West Bengal

MASTER OF LIBRARY AND INFORMATION SCIENCE (M.Lib.I.Sc.)

SYLLABUS
(Choice Based Credit System)

With effect from 2014-2016 academic session

Approved in the PGBS meeting held on 02.07.2014

Approved in the Joint Meeting of the FCs held on 28.07.2014

Approved in the EC meeting held on 26.09.2014

Modification Approved in PGBS meeting held on 26.05.2015

Modification Approved in the PGBS meeting held on 04.01.2016

Master of Library and Information Science (M.Lib.I.Sc.)
Integrated Two Academic Year Four Semester Programme – Choice Based Credit System
(With effect from 2014-2016 academic session)

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- This syllabus shall come into force from the academic session 2014-2016.

2. Objectives

- The primary objective is to train the students in the basics of professional skills for information / knowledge management, so that they serve the society through an institution of library or information centre.
- To give the students an understanding of the basic principles of Library and Information Science and to enable them to understand, appreciate and develop professionalism to work in contemporary “Information Age”.
- To acquaint the students with the development of the Universe of Knowledge and methods of its organization in a library/information system.
- To train students in the techniques of Information Management and equip them with skills for applying Information Communication Technologies (ICT) in libraries and information centres.
- To make students fully aware of various sources of information and train them in techniques of dissemination of information in the context of different user groups.

3. Duration and Semester System

- The duration of the programme leading to the Degree of Master of Library and Information Science (M.Lib.I.Sc.) shall be two academic years. A student must complete the programme within four years from the date of admission to the programme..
- Each academic year shall be divided into two semesters. The first and third semesters shall ordinarily commence in the month of July of the first and second academic years and the second and the fourth semesters in the month of January of the first and second academic years or on such dates as may be fixed by the University. There shall be a minimum of 90 days of teaching in a semester.

3. Academic Calendar

Academic Calendar will be as approved by the University.

4. Eligibility & Admission

- Admission to the Integrated Master of Library and Information Science programme leading to Master of Library and Information Science degree shall be made through Entrance Test conducted by the University. The minimum qualification for appearing in the Entrance Test will be:

Bachelor degree with Honours/Major (in any discipline) following 10+2+3 pattern from the University, or any other university, accepted as equivalent thereto by the Statutory Bodies of the University/norms prescribed by the Regulatory Bodies as applicable subject to such conditions as may be prescribed thereof.

- Reservation rules shall be as prescribed by the State Government and notified by the authorities concerned from time to time.
- Foreign nationals either residing in India or abroad or Indian nationals residing abroad may be admitted to Integrated Master of Library and Information Science programme according to the policy guidelines laid down by the Government of India/University Executive Council from time to time.

5. Intake: Twenty seven (27).

6. Programme Structure

- M.Lib.I.Sc. (Int.) curricula consist of 82 credits distributed in 21 courses in 2 academic years divided into 4 semesters.
- Each credit requires 12 contact hours of teaching for theory or 26 contact hours of teaching for practical in a semester.
- 78 credits are meant for Core Courses/ Major Elective (coded as ML-CC-XXX) and required to be completed/earned by each student.
- 4 credits are assigned to Open Courses (Minor Elective) (coded as ML-OC-XXX). Students of M.Lib.I.Sc. course are to opt for one Minor Elective Open Course in third semester from open courses offered by any other department of the University.
- Students from other departments of this University may opt for the Minor Elective Open Courses offered by this Department.
- M.Lib.I.Sc. (Int.) course has a total 2000 marks (100 x 19 Core Courses + 50 x 1 Core Course + 50 x 1 Minor Elective Courses)
- Internal Assessment marks of a course are either through Continuous Evaluation (CE) or Practical (PRC) or Project (PRJ) or a combination of these elements as decided by the Course Teacher concerned.
- If internal assessment is based on CE, then it will be a combination of Test and/or Term paper and/or Seminar presentation.

7. Credit pattern explanation

L	T	P	
3	1	0	pattern: (3 X 12 wks) = 36 hrs = 3 credits + (1 X 12 wks) = 12 hrs = 1 credit + 0 > Altogether 4 credits
2	0	4	pattern: (2 X 12 wks) = 24 hrs = 2 credits + 0 + (4 X 12 wks) = 48 hrs = 2 credits > Altogether 4 credits
2	1	2	pattern: (2 X 12 wks) = 24 hrs = 2 credits + (1 X 12 wks) = 12 hrs = 1 credit + (2 X 12 wks) = 24 hrs = 1 credit > Altogether 4 credits
0	2	4	pattern: 0 + (2 X 12 wks) = 24 hrs = 2 credits + (4 X 12 wks) = 48 hrs = 2 credits > Altogether 4 credits
0	4	0	pattern: 0 + (4 X 12 wks) = 48 hrs = 4 credits + 0 > Altogether 4 credits
0	0	2	pattern: 0 + 0 + (2 X 12 wks) = 24 hrs = 2 credits > Altogether 2 credits

Programme Credit Structure

Sem	Course Code	Course Title	Credit Pattern			Credit Value	Marks Distribution		
			Lecture (L)	Tutorial (T)	Practice (P)		Semester Examination	Internal Assessment	Total Marks
S E M I	LS-CC-101	Library and Society	3	1	0	4	80	20	100
	LS-CC-102	Knowledge Organization	2	1	2	4	80	20	100
	LS-CC-103	Resource Description	3	1	0	4	80	20	100
	LS-CC-104	Library Information Technology	2	0	4	4	80	20	100
	LS-CC-105	Information Sources and Services	2	1	2	4	80	20	100
S E M II	LS-CC-201	Library System Management	3	1	0	4	80	20	100
	LS-CC-202	Document Classification	0	2	4	4	80	20	100
	LS-CC-203	Document Cataloguing	0	2	4	4	80	20	100
	LS-CC-204	Content Designation and Metadata Encoding	2	1	2	4	80	20	100
	LS-CC-205	Information Systems and Users	3	1	0	4	80	20	100
S E M III	LS-CC-301	Information Communication and Management	3	1	0	4	80	20	100
	LS-CC-302	Information Retrieval	3	1	0	4	80	20	100
	LS-CC-303	Automated Library System	2	0	4	4	80	20	100
	LS-CC-304	Digital Resource Management	2	0	4	4	80	20	100
	LS-OC-305	Open Knowledge System [Minor Elective Course: For the students of other Departments]	3	1	0	4	40	10	50
S E M IV	LS-CC-401	Research Methodology	3	1	0	4	80	20	100
	LS-CC-402	Digital Library System	2	0	4	4	80	20	100
	LS-CC-403	Major Elective (any one) LS-CC-403 A: Community Information System LS-CC-403 B: Academic Library System	3	1	0	4	80	20	100
	LS-CC-404	Guided Research Project	0	4	0	4	80 (Text)	20 (Viva/ Presentation)	100



DEPARTMENT OF LAW
THE UNIVERSITY OF BURDWAN

LL.M. (CBCS) SYLLABUS
SESSION: 2020 onwards

SYLLABUS STRUCTURE

SEMESTER-I

Course Code	Course Title	Credit			Marks			
		L	P	T	ESE	IA	Class Teaching	Total
LMCT 101	Jurisprudence	3	1	1	80	10	10	100
LMCT 102	Indian Constitutional Law: New Challenges	3	1	1	80	10	10	100
LMCT 103	Law and Social Transformation	3	1	1	80	10	10	100
LMMJ (A) 104	Principles of Corporate Law	3	1	1	80	10	10	100

SEMESTER-II

Course Code	Course Title	Credit			Marks			
		L	P	T	ESE	IA	Class Teaching	Total
LMCT 201	Judicial Process	3	1	1	80	10	10	100
LMCT 202	Human Rights and Contemporary Challenges	3	1	1	80	10	10	100
LMMJ (A) 203	Competition and Consumer Law	3	1	1	80	10	10	100
LMMJ (A)204	Capital Market and foreign investment	3	1	1	80	10	10	100

SEMESTER III

Course Code	Course Title	Credit			Marks			
		L	P	T	ESE	IA(1)	Class teaching	Total
LMCT 301 (Core)	Environment And Legal Order	3	1	1	80	10	10	100
LMCT 302 (Core)	Constitutionalism, Administration and Access to Information	3	1	1	80	10	10	100
LMCT 303 (Minor)	Basics of Law *	2	0	2	40	10	0	50
LMMJ (A) 304(Major)	Economic enterprise and Legal Regulation	3	1	1	80	10	10	100
LMMJ (A) 305 (Major)	Law and Credit	3	1	1	80	10	10	100

*However, students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer

SEMESTER IV

Course Code	Course Title	Credit			Marks			
		L	P	T	ESE/ viva	IA	Class teaching	
LMCT 401 (Core)	Research Methodology	3	1	1	80	10	10	100
LMCT 402	Community Engagement Course ➤ The Supervisor of the dissertation shall be the final authority in every	0	2	0	40	10	-	50

	matter (including assessment and awarding of marks) concerning the course ‘Community Engagement Course’ of the students undertaking dissertation under the respective supervisors.							
LMCT 403	Dissertation and Presentation (along with Viva Voce) Note: ➤ Evaluation of Dissertation by Respective Supervisor (internal) and external expert. ➤ Presentation (along with Viva voce) to be evaluated by a panel comprising of the external expert and all the supervisors. Each panel member should evaluate the candidate independently and an average of all should be considered for final calculation. ➤ Marks should be submitted in the 80%- 20% format (i.e.160 and 40)	0	5	5	160	40	-	160+ 40
LMCT 404	Research Methodology II (Practical)		2		40	10		50

DETAILED SYLLABUS OF
2 YEAR LL.M COURSE
w.e.f. 2014-2016 Session

SEMESTER I

PAPER LM 1.1 (COMPULSORY)

MARKS 100

JURISPRUDENCE

1. Definition, Nature, Scope and Importance of study of Jurisprudence
2. Positivism and Analytical Theories of Law
 - a. Jeremy Bentham's Utilitarianism and Analytical Positivism
 - b. Austin's Theory of Law
 - c. Analytical Positivism and Indian Legal System
 - d. Kelson's Pure theory of Law
3. Natural Law Theories
 - a. Historical development in Ancient, Medieval and Renaissance Period
 - b. Twentieth Century Natural Law Revival
 - c. Hart on Natural Law
 - d. Fuller and Morality of Law
4. Sociological Jurisprudence
 - a. Roscoe Pound's Theory of Social Engineering and Theory of Interest
 - b. Theories of Duguit and Ihering
5. Historical and Anthropological Theories
 - a. The German Historical School- Savigny's Volksgeist Theory
 - b. The English Historical School- Sir Henry Maine
6. American Realism
7. Law and Morality- Relationship and Enforcement of Morality by Law- Hart- Devlin Debate
8. Feminist Jurisprudence – Liberal, Socialist and Radical Feminism
9. The critical Legal Studies Movement – Post- Modernist Jurisprudence
10. The Concept of Justice, Basis of Justice and relation between Law and Justice, Problem of Power

Books Recommended :

1. Friedman – Legal Theory
2. Dias – Jurisprudence
3. Bodenheimer – Jurisprudence : The Philosophy and Method of Law
4. Salmond – Jurisprudence
5. G.W.Paton – Jurisprudence
6. S.N. Dhyani – Fundamentals of Jurisprudence
7. V.D.Mahajan – Jurisprudence
8. Dr S K Tiwari – Jurisprudence : Legal Theory and elements of Law
9. B N Mani Tripathi – Jurisprudence and Legal theory

GROUP A (CORPORATE LAW)

PAPER LM 1.2

MARKS 100

LAW OF CORPORATE MANAGEMENT AND GOVERNANCE

I. Corporate Incorporation and Management

1. (i) Certificate of Incorporation
(ii) Memorandum and Articles of Association
(iii) Doctrine of Ultra Vires
(iv) Doctrine of Indoor Management
- 2.(i) Directors: Appointment, Removal, Position, Powers and Duties of Directors.
(ii) Audit Committee: Its Role.
(iii) Company Secretary: Qualification, Appointment and Duties
(iv) Officer who is in default: Definition of Officer who is in default
(v) Liability of independent directors.
- 3 (i) Types of Meetings
(ii) Procedure of calling meeting
(iii) Company's resolutions and its kinds

II: Oppression & Mismanagement and Investigation

1. (i) Rule in Foss v. Harbottle
(ii) Prevention of Oppression
(iii) Prevention of Mismanagement
(iv) Role & Powers of the Company Law Board
(v) Role & Powers of Central Government
2. (i) Company Investigation

III: Corporate Liquidation

1. (i). Winding up of Companies
(ii). Mode of winding up of the companies
(iii). Compulsory Winding up under the Order of the Tribunal
(iv). Voluntary winding up
(v). Contributories
(vi). Payment of liabilities

IV: Corporate Governance and Social Responsibility

1. (i) Importance of Corporate Governance
(ii) Different system of Corporate Governance
(iii) Impact of Legal Traditions and the Rule of Law on Corporate Governance
(iv) Legal Reforms of Corporate Governance in India
(v) Reports of the various Committees on Corporate Governance
(vi) Emerging Trend based on the recommendation of the Committees in the Companies Act 1956 and the Listing Agreement with Special reference to Clause 49.
2. (i) Corporate Social and Environmental Responsibility

Books Recommended :

1. Smith and Keenan's, *Company Law* (2002)
2. Andrew Lidbetter, *Company Investigations ad Public Law* (1999)
3. Saleem Sheikh & William Rees, *Corporate Governance & Corporate Control* (2002).
4. Avtar Singh, *Company Law*, 2007 Eastern Book Company, Lucknow.
5. Gower's *Principles of Company Law* 8th Edition 2008, R. Cambray & Co. Pvt. Ltd.
6. Smith and Keenan's *Company Law*.
7. S. K. Verma & Suman Gupta, *Corporate Governance and Corporate Law Reform in India*. (2005).
8. Companies Act, 1956
9. Suman Gupta: *Shareholder's Democracy: Fact or Fiction*. (1992)

COMPETITION AND CONSUMER PROTECTION LAWS

UNIT - I

- 1. Competition: An Introduction**
 - Definition of Competition
 - Definition of Competition Law
 - Objectives of Competition Law
- 2. History of Competition Law**

(USA, UK, Europe) Relevant provisions of Sherman's Act

 - Indian scenario with an overview of MRTP Act, 1969
 - *Raghavan* Committee Report
- 3. International co-operation for competition**
 - WTO agreements and the Act

UNIT - II

- 1. Anti-competitive Agreement**
 - Appreciable adverse effect
 - Horizontal and Vertical agreements
 - Effects doctrine
- 2. Prohibition of anti-competitive agreements**
 - Concerted practices and parallel behaviour
 - Cartel and Cartelisation
 - Bid rigging and collusive bidding
 - Tie-in-arrangements
 - Exclusive supply agreement
 - Resale price maintenance agreement
- 3. Abuse of Dominant Position**
 - Relevant market
 - Predatory behaviour
 - Predatory pricing
 - Discriminatory practices
 - Relevant market

UNIT - III

- 1. Combination**
 - Value of Assets
 - Turnover
 - Acquisition
 - Conglomeration
 - Joint Venture
 - Merger and Amalgamation
 - Notification

2. Competition Commission of India

- Establishment and composition
- Duties
- Procedure for inquiry
- Powers
- Competition fund

3. Competition Advocacy

- Competition Policy

UNIT - IV

Consumer Protection Act, 1986 and its applicability to Competition Law

- Definition of Consumer
- Definition of Service
- Deficiency in Service
- Unfair Trade Practices
- Overlapping areas

Books Recommended:

1. Mittal D.P., Taxmann's *Competition Law* (2007)
2. *Universal Guide to Competition Law in India-2003*, Universal Law Publishing Company, New Delhi.
3. Ramappa. T., *Competition Law in India- Policy, Issues and Development* (2006) Oxford University Press.
4. Nahar. S. Mahala, *Law, Practice and Procedure (2006)*, Commercial Law Publishers.
5. Dhall .Vinod, *Competition Law Today*, (ed.) 2007, Oxford University Press
6. Bangia R.K., *A Handbook of Consumer Protection Laws and Procedure*, 2004, Allahabad Law Agency.
7. Singh Avtar, *Law of Consumer Protection; Principles and Practice*, 2005, Eastern Book Company.
8. Verma S.K. & M.Afzal Wani, *A Treatise on Consumer Protection Laws*, (ed.) 2004, Indian Law Institute.
9. Anoop K. Kaushal, *Universal's Practical Guide to Consumer Protection Law*, 2006, Universal law Publishing Company, New Delhi.
10. Pavleen, *Consumer Decision- Making*, 2006, Deep & Deep Publication.
11. Aggarwal, Prof. V. K., *Consumer and Protection Law and Practice*, 6th Ed. (2008).

GROUP – B (INTERNATIONAL LAW)

PAPER LM 1.2

MARKS 100

PUBLIC INTERNATIONAL LAW

- 1) Historical Background and Theoretical Foundation of International Law
- 2) Codification and Progressive Development of International Law
- 3) Relationship between International Law and Municipal Law – Indian Practice
- 4) Nature and Functions of State under International Law, State Responsibility, State Succession
- 5) Diplomatic and Consular Relations – The Vienna Convention on Diplomatic Relations, 1961
- 6) Law Relating to Outer Space
- 7) Law of Seas
- 8) War Crimes, Crimes against Peace and Humanity, Role of the ICC
- 9) Law of Neutrality
- 10) India and International Law – A Review

Books Recommended :

- 1) O. Connel, D.P. – International Law, Vol. I & II
- 2) S.K. Agarwal (Ed.) – Essays on the Law of Treaties (1972)
- 3) Roselyn Higgins – The Development of International Law through the Political Organs of the UN (1963)
- 4) D.J. Harris – Cases and Materials on International Law (Third Ed. 1983)
- 5) Francis M. Sekandi (Ed.) – New Horizons in International Law (Second Revised Edition)
- 6) George Schwarzenberger – International Law
- 7) Brownlie – Principles of Public International Law, 4th Edn. 1990
- 8) Rebecca, M. Wallace : International Law
- 9) Melcolm N. Shaw : International Law
- 10) Martin Dixon and Robert : Cases and Material on International Law Mc. Corquodale
- 11) Shabled Rosemat – Developments in the Law of Treaties
- 12) H. Lanterpacht (Ed.) – Oppenheim : International Law, Vol. I & II, 7th Edn.(1952)
- 13) Schwarzenberger – The Law of Armed Conflicts, Vol. I & II
- 14) J.G. Starke – Introduction to International Law
- 15) John F. Murphy – The Evolving Dimensions of International Law (Cambridge, 2010)

PRIVATE INTERNATIONAL LAW

- 1) Scope and Nature of Private International Law
- 2) Theories of Private International Law
- 3) Jurisdiction
- 4) Exclusion of Foreign Law and Sovereign Immunity
- 5) Family Law
- 6) Law of Property
- 7) Law of Obligations
- 8) India And Private International Law – The Practices

Books Recommended :

- 1) Dicey – Conflict of Laws
- 2) Cheshire – Private International Law
- 3) Paras Diwan – Private International Law, Indian and English
- 4) Lakshmi Jambholkar (Ed.) – Select Essays on Private International Law (2011)

GROUP C (INTELLECTUAL PROPERTY LAWS)

PAPER LM 1.2

MARKS 100

IPR : JURISPRUDENTIAL DEVELOPMENT

1. Origin and Genesis of IPR
2. Theories of IPR- Locke's, Hegel and Marxian
3. IPR in Ethical, Moral and Human Rights perspective ,
4. Nature and Concept of IPR (Individual & Collective)
5. Importance of IPR in knowledge based Market Economy
6. Different forms of IPRs ; Comparative study with physical property.

IPR : INTERNATIONAL PERSPECTIVE

1. Internationalisation & Protection of Intellectual Property
2. Paris Convention, Berne Convention, WIPO, GATT, WTO, TRIPS & TRIMS
3. Benefit Sharing- International treaty on Plant, Genetic resources for food and Agriculture
4. Development of WIPO on traditional knowledge and cultural expression
5. Intellectual Property, Competition Issues and FDI
6. Patentability of Biotechnology – Global Development
7. Protection of Geographical Indication – Global Perspective
8. On-line Copyright Infringement and Liability of ISP
9. Convention on Biological Diversity, Protection of Traditional Knowledge, Rights of Indigenous people, transfer of technology, Multinational ownership.

Books Recommended :

- 1) Melville B. Nimmer - Copyright and other Aspects of literary , musical and Artistic Works, 2nd Edn.
- 2) Baxi, U. The Law of Intellectual Property : Copyright law in India (1989)
- 3) P. Narayanan - Copyright and Industrial Design, 2nd Edn. 1995.
- 4) P. Narayanan - Trademark, Trade name and Passing off Cases 2nd Edn. Vol. I & II, 1997.
- 5) Thairani, K- Copyright : The Indian Experience (1987).
- 6) Lal's Copyright Act, 3rd Edn. 1995 Law Publications .

GROUP – D (ENVIRONMENTAL LAW)

PAPER LM 1.2

MARKS 100

INTERNATIONAL ENVIRONMENTAL LAW – I

Unit – 1 : Reasons for growth of environmental law internationally.

- I) International Environmental Campaigns

Unit – 2 : World Summit in 20th century

- I) The United Nations Conference on Human Environment, 1972 (Stockholm Conference)
 - a) Framework of the Conference
 - b) Aims and Objectives
 - c) United Nations Declaration on the Human Environment, 1972
- II) The United Nations Conference on Environment and Development, (UNCED) (Earth Summit, 1992).
 - a) Framework of the Conference
 - b) Aims and Objectives
 - c) Earth Charter or Rio Declaration
 - d) Agenda 21 : Blue Print for action in 21st century
 - e) Earth Summit Plus Five

INTERNATIONAL ENVIRONMENTAL LAW – II

Unit – 1 : Sustainable Development and International Legal Order in 21st Century

- a) Johannesburg Declaration (2001)
- b) Rio + 20 (2012)

Unit – 2 : Major International Environmental Agreements on –

- a) Global warming
- b) Radioactive pollution
- c) Wetland conservation
- d) Climate change
- e) Conservation of Biosphere

Unit – 3 : World Charter for Nature 1982; Our Common Future (Report of WCED)

Unit – 4 : UNEP; Characteristics; Role; Functions, IPCC

Unit – 5 : Environmental Obligations

- a) International Financing Policy
 - i. Global Environment Facility
 - ii. World Environment Fund
 - iii. Global Environmental Monitoring System (GEMS)
- b) Millennium Development Goals 2000
- c) The Future We Want

Unit – 6 : Global Environmental Issues and their Legal Order

- a) Climate Change
- b) Oil Pollution
- c) Ozone Layer Depletion
- d) Transboundary Pollution
- e) Pollution of Sea and Marine Resources
- f) Food Pollution

GROUP E (CRIMINAL LAW)

PAPER LM 1.2

Marks 100

CRIMINAL JUSTICE SYSTEM

I A) Crime

- a) Concept, Nature, Definition and Characteristics of Crime.
- b) Development of Criminal Law and Criminal Justice System during British period and post independent period.
- c) Theories of Crime
- d) Sociology of Crimes.

B) Criminology

- a) Definition of Criminology - Social, Psychological and Legal approaches
- b) Nature and scope of Criminology

C) Principles of Criminal Jurisprudence

- a) Adversarial (Accusatorial) and Inquisitorial System
- b) Recommendations of Malimath Committee Report- Shift from Co-ordination in Criminal Justice system, from 'justice model' to crime control model'.
- c) How the burden of proof shifts as per the nature of crime?

II Crime trends and Crime Prevention

Social Change, Deviance and Disorganization

- a) Who is a Criminal
- b) Crimes against person
- c) Crimes against property
- d) Crime, Social Control and Crime Prevention
- e) Community and Crime Prevention
- f) Crimes under Special Law and its jurisdictional aspect (Dowry Prohibition Act, Prevention of Atrocities Act, Electricity Act, 2003).

III Criminal Liability: Precepts and Principles

- a) Evolution of civil and criminal Liability from common liability for 'Wrongs'
- b) Elements of Criminal Liability of the crime, contemplation, preparations, attempt and commission.
- c) Mensrea - (intention) recklessness, malice, negligence, inchoate offences.
- d) Mensrea under the IPC
- e) Exemptions from criminal liability
- f) Strict Liability.
- g) Principles of Group or Joint Liability:
- h) Vicarious and Corporate Liability

IV Victimology

- a) The concept of victimology
- b) Rights of Victims. Protection to Victims under Criminal Law
- c) Victim- offender Relationship
- d) Victim Perception
- e) Withdrawal of Prosecution Role of Victim

Compensation under various Laws:

- i. Section 357. CRPC
 - ii. Motor Vehicles Act
 - iii. sexual harassment and assaults.
 - iv. medical negligence
 - v. State liability to pay compensation for police Atrocities
- f) Compensation and Restitution to the victim- Justice To Victims, (Principle of compensatory jurisprudence)

V. Procedural Mechanism in the Criminal Justice Syste

(viz. Police, Prosecutor and Judicial system)

- a) Role of police in modern societies
- b) Police Reforms and role played by Supreme Court
- c) Meaning, purpose and need of independent prosecution system
- d) Relationship of Police and Prosecution
- e) Effective Judicial Control on Criminal Justice system

Books Recommended :

- 1) Dutta K.K., Some Aspects of Criminal Law, Law Research Institute, Edition 1997, APH, Publishing House, Darya Ganj, New Delhi -02.
- 2) Dr. Mrinmaya Chaudhari, Languishing for Justice, A Critical Survey of the Criminal Justice System, DATTSONS, J. Nehru Marg, Sadar, Nagpur.
- 3) Malik P.L., Criminal Court Hand Book, 18th Edition, Eastern Book Company, 32, Lalbagh, Lucknow -01.
- 4) Manjula Batra, Protection of Human Rights in Criminal Justice Administration, Deep and Deep Publication, New Delhi.
- 5) Parvesh K Atri, Readings in Criminal and Criminology, 1st edition 1998,
- 6) Anmol Publication Pvt. Limited, New Delhi -2
- 7) Ahmed Siddiqui, Criminology, Problems and Perspectives, 4th edition 1997, Eastern Book Company, Lucknow -01
- 8) Clive Coleman and Clive Norris , Introducing Criminology, Edition 2000, Lawman (India) Pvt Limited, Lajpat Nagar, New Delhi-24
- 9) Bharat B Das, Victims in the Criminal Justice System, 1st Edition 1997, APH Publication Corporation, New Delhi 2.

CRIME AND SOCIAL LEGISLATIONS

I Meaning and Purpose of Social Legislation

- a) Concept of Social Justice
- b) Historical Evolution of the concept of Social Justice from British Rule onwards
- c) Social Legislations interpreted by Courts in India
- d) Impact of social legislation on the Criminal Law in India
- e) Need for Reform in Social Legislations in the Indian context.

II Protection of rights in Criminal Justice System

- a) Protection of Civil Right Act 1995.
- b) Meaning, Nature and scope of the Act.
- c) Need for reforms in the existing Civil Right Act,
- d) Nature of Offences.

III. Dowry Prohibitions Act 1961

- a) Meaning and Purpose
- b) Merits and Demerits
- c) Negative Impact of the Act in certain exceptional cases
- d) Need for modification in the existing provisions
- e) Complementary provisions Sec 498A, Sec 304A & B of I P C
- f) Powers of Police Officers
- g) Nature of Offences.

IV A) The Immoral Traffic (Prevention) Act, 1956

- a) Definition and objectives of Act
- b) Regulatory Framework
- c) Scope of the Act and its applicability

B) Pre-conception and Pre-Natal Diagnostic Techniques (Prohibition of Sex Selection) Act, 1995

- a) Purpose and Object of the act
- b) Merits and Demerits

V Prevention of Corruption Act, 1988 : Its impact on Society

- a) Nature, Meaning and Scope
- b) Social reasons for the increase in the crimes of Corruptions
- c) Prosecution - Sanctions and Regulations under the Act
- d) Investigation Procedure and Powers under the Act.

VI Prevention of Atrocities Act 1989

- a) Meaning, Nature and Scope of the Act
- b) Relevance of the Act in the present day scenario
- c) Merits and Demerits

Books Recommended :

- 1) Krishnamurthy S. 1987, Impact of Social Legislations, on the Criminal Law in India, R.R. Publishers, Bangalore
- 2) Bare Acts
 - * I.T. Act, 2003
 - * Evidence Act, 2003 and 2005
 - * CR.P.C. 1999, 2003 & 2004
 - * I.P.C. 1999, 2003 & 2004
 - * Dowry Prohibition Act (1961), Dowry Prohibition (Amendment) Act (1961)
 - * The Immoral Traffic (Prevention) Act, 1956
 - * Prevention of Corruption Act, 1988.
- 3) Roger Glenn Lamphear, Freedom from Crime. Ed, 1979, Nellen Publishing Company, New York, 100016.
- 4) P.S. Narayana, The Scheduled Caste and Scheduled Tribes (Prevention of Atrocities Act 1989 and Protection of Civil Rights Act 1955.,)Gogra Law Agency, Hyderabad, AP-2.
- 5) Chakrabharti N.K. Social Defense, in the administration of Criminal justice Ed 1999, Deep and Deep Publications Pvt. Ltd, New Delhi-
- 6) Dewan V K, Law Relating to Offences against Women, 1st Edition 1996, Oriental Law House, New Delhi-24.

SEMESTER II

PAPER LM 2.1 (COMPULSORY)

MARKS100

INDIAN CONSTITUTIONAL LAW : THE NEW CHALLENGES

1. Federalism
 - a) Creation of new states.
 - b) Allocation and share of resources - distribution of grants-in-aid.
 - c) Centre's responsibility and internal disturbance within States.
 - d) Directions of the Centre to the State under Article 356 and 365.
 - e) Special status of certain States.

2. "State": Need for widening the definition in the wake of liberalization, globalization and privatization.

3. Right to Equality
 - Privatization and its impact on affirmative action.

4. Freedom of Press and challenges of new scientific development
 - a) Freedom of speech and expression
 - i) Right to broadcast and telecast.
 - ii) Convergent Media: Prasar Bharti
 - iii) Impact of Information Technology Act, 2000
 - b) Right to strikes, *hartal* and *bandh*

5. Emerging regime of new rights and remedies.
Reading Directive Principles and Fundamental Duties into Fundamental rights.
 - i) Compensation jurisprudence.
 - ii) Right to education.
 - iii) Commercialisation of Education and its impact.

6. Right of minorities to establish and administer educational institutions and state control:
Critical Analysis of Pai Foundation & its aftermath.

7. Separation of powers: stresses and strains.
 - a) Judicial activism and judicial restraint.
 - b) PIL : implementation.
 - c) Judicial independence.
 - i) Appointment, transfer and removal of judges.
 - d) Accountability: Executive and judiciary.

8. Democratic process.

- a) Nexus of politics with criminals and the business.
- b) Election: Jurisprudence of Representation; Role of Election Commission.
- c) Electoral Reforms: Contribution of Judiciary.
- d) Coalition government, 'stability, durability, corrupt practice'

Books Recommended:

No specific bibliography is suggested for this course since the course materials obviously depends upon the latest developments. These developments in the areas specified in the course can be gathered from the recent materials such as case law, changes and amendments of laws, critical comments, studies and reports, articles and research papers and lastly contemporary emerging ethos impacting on constitutional values.

GROUP A (CORPORATE LAW)

PAPER LM 2.2

MARKS 100

Regulation of Capital Market and Foreign Investment

- I. Trends in regulation of capital markets
- II. (1) Corporatization of stock exchanges
(2) Role of SEBI and RBI
- III. Policy framework for regulation of FDI
- IV. Bilateral and multilateral investment agreements

BANKING AND INSURANCE LAWS**I The Evaluation of Banking Services and its History in India**

1. History of Banking in India.
2. Bank nationalization and social control over banking.
3. Various types of Banks and their functions.
4. Contract between banker and customer: their rights and duties.
5. Role and functions of Banking Institutions

II Lending by Banks and Recent Trends of Banking System in India

1. Advances, Loans and Securities.
2. Direct, collateral and miscellaneous Securities.
3. Default and recovery.
4. Bank Debt Recovery Tribunals.
5. The Securitization and Reconstruction of Financial Assets and Enforcements of Security Interest Act, 2002 (Definitions, Section 13 – Enforcement of security interest, Section 17 - Right to appeal.)

III General Principles of Law of Insurance

1. Definition, nature and history.
2. Contract of insurance and principles.
3. The Risk – commencement, attachment, assignment.
4. Types of insurances.
5. Policy and its Legal Status.

IV Recent Trends in Insurance

1. Insurance against third party risks (relevant provisions from Motor Vehicles Act, 1988.)
2. Liability Insurance.
3. Consumer Protection and Banking and Insurance Services.
4. The Insurance Act, 1938 and the Insurance Regulatory & Development Authority Act, (IRDA), 2000.
5. Miscellaneous Insurance Schemes: New Dimensions (Group Life Insurance, Mediclaim, Sickness).

Books Recommended:

- 1) Tannan, M.L., *Tannan's Banking Law and Practice in India*, 2008, Wadhwa and Co.
- 2) Tannan, M.L., *Tannan's Banking Law and Practice in India*, 2004, India Law House.
- 3) Tannan: *Banking Law and Practice in India* (in 3 vols.), 22nd Ed., R. Cambray & Co. Pvt. Ltd.
- 4) Gupta, S. N., *The Banking Law in Theory and Practice* (in three volumes), 2006, Universal Law Publishing Co.
- 5) Sharma, B.R. and Nainta, R.P., *Principles of Banking Law and Negotiable Instruments Act 2004*, Allahabad Law Agency
- 6) Nainta, R.P., *Baking System, Frauds and Legal Control*, 2005, Deep and Deep Publications.
- 7) Murthy, K.S.N., and Sarma, K.V.S., *Modern Law of Insurance in India*, 2002, Lexis Nexis Butterworth
- 8) Birds, John, *Modern Insurance Law*, 2003, Universal Publishing Co.
- 9) Shah, M. B., *Landmark Judgments on Insurance*, 2004, Universal Publishing Co.
- 10) Mishra, M.N., *Law of Insurance Principles and Practice*, 2008, Radhakrishnan Prakashan
- 11) Rangarajan, C., *Handbook of Insurance and Allied Laws*.

GROUP – B (INTERNATIONAL LAW)

PAPER LM 2.2

MARKS 100

LAW OF INTERNATIONAL ORGANISATIONS

- 1) Evolution and Growth of International Organisations
- 2) Nature and Scope of International Organization
 - a. Nature and Legal Personality : Public and Private
 - b. Types of International Organisations : Private International Organisations
- 3) Universal International Organisation
 - a. League of Nations
 - b. United Nations
 - i. Principles and Purposes of United Nations
 - ii. Structure, Composition and Functions of the Organs of United Nations
 - iii. Law Making Process in the United Nations Resolutions
 - iv. UN Peace Keeping Function
 - v. Need for Structural Changes in United Nations Organisation
- 4) Executive Powers and Functions of the Secretary General of the UN
- 5) Specialised Agencies of the United Nations and their functions
- 6) Regional International Organisations : Council of Europe, OAS, OAU, NATO, SAARC, Arab League
- 7) Judicial Institutions
 - a. Historical Evolution
 - b. Permanent Court of Arbitration
 - c. Permanent Court of International Justice
 - d. International Court of Justice – Composition, Jurisdiction and Functions
- 8) India and the United Nations

Books Recommended :

- 1) S.S. Goodspeed – The Nature and Function of International Organization.
- 2) Edward Yewin – Legislative Powers in the UN and Specialized Agencies (1969)
- 3) Ingrid Detter – Law Making by International Organization
- 4) Higgins – The Development of International Law through the Political Organs of the United Nations (1963)
- 5) D.W. Rowett – The Law International Institution
- 6) Buth Russell – A History of UN Charter
- 7) A CASES (Ed.) – United Nations Peace Keeping Legal Essay (1978)
- 8) Meurice Rertrend – The Third General World Organisation (1989)
- 9) M. Moskowitz – The Roots and Readhes of United Nations – Action and Decisions (1980)
- 10) Dr. J.N. Saxena (Ed.) – United Nations for a Better World, Lancers Book, P.B. 4236 New Delhi – 110048
- 11) Dr. Rahmatullah Khan – Implied Powers of the United Nations
- 12) Sir Gerald Fitz Maurice – The Law and Procedure of the International Court of Justice, 1986
- 13) Sabltai Rosenne – The World Court, What it is and how it works ? 1995
- 14) Felice Morgen Stern – Legal Problems of International Organisation, 1986
- 15) Dr. S.K. Kapoor – International Law and Human Rights, Fourteenth edition (2002)

INTERNATIONAL HUMAN RIGHTS AND HUMANITARIAN LAW

PART – A : INTERNATIONAL HUMAN RIGHTS LAW

- 1) Human Rights and The United Nations Charter : Role of the United Nations.
- 2) International Bill of Human Rights – UDHR, ICCPR and ICESCR
- 3) Regional Instruments
 - a. European Convention on Human Rights
 - b. American Convention on Human Rights
 - c. African Convention on Human Rights
 - d. Asia and Human Rights
- 4) Human Rights of Vulnerable Groups : Women, Children, Minorities, Refugees, Tribal etc.

PART – B : INTERNATIONAL HUMANITARIAN LAW

- 1) Origin and Development and IHL
- 2) Source of IHL
- 3) ICRC – its Role and Function
- 4) International Measures for Implementation of IHL – the Mechanism

Books Recommended :

- 1) Y.S.R. Murty – Human Rights Hand Book
- 2) Ian Brownlie – Basic Documents on International Law, Oxford, 2012
- 3) Rhona K.M. Smith – International Human Rights, Oxford, 2012
- 4) Balchandran-Vearghese – Introduction to International Humanitarian Law
- 5) B.S. Chimni – International Refugee Law
- 6) S. Rajkhowa and Manik Chakraborty – Indigenous Peoples and Human Rights (2010)
- 7) Manik Chakraborty – Human Rights and Refugees
- 8) Manik Chakraborty (Ed.) – Human Rights in Twenty First Century : An Anthology (2014)
- 9) Upendra Baxi – Human Rights in the Administration of Criminal Justice
- 10) E. Lanterpacht – International Law and Human Rights
- 11) Upendra Baxi (Ed.) – The Right to be Human
- 12) Indian Society of International Law – Year Book on IHL and Refugee Law

GROUP C (INTELLECTUAL PROPERTY LAWS)

PAPER LM 2.2

MARKS 100

IPR : PATENT LAW

- 1) Basic concepts of Patent, Meaning, Nature and Kind of patent, Patent specification
- 2) Procedure for Registration of Patent, Patent Agent
- 3) Rights and obligation of Patentee; Assignment and surrender of Patent; Licensing
- 4) Enforcement of Patent, Government use of invention, Grounds of granting Patent on revocation for non-working, Revocation of Patent
- 5) Infringement of Patent, Remedies for infringement, Threat of infringement
- 6) Software and Patent; Micro- organism and Patent
- 7) Patent in International Scenario – A Comparative study

Books Recommended :

- 1) Cornish, W.R.- Intellectual Property (1981) , Second Indian Reprint, 1993, Universal Book Traders, Delhi.
- 2) Vashishtha - Law and Practice of Intellectual Property in India, 1999.
- 3) P. Narayanan- Intellectual Property (2nd Edn.) 1999.
- 4) Sangal P.S. and Kishore Singh - Indian Patent System and Paris Convention : Legal Perspectives (1987).
- 5) Pearson and Miller- Commercial Exploitation of Intellectual Property 1st Edition, 1990.
- 6) Gopalkrishnan, N.S.- Intellectual Property and Criminal Law , 1st Edn, 1994, National Law School of India University, Bangalore.
- 7) T.A. Blanco white - Patents for Inventions, 5th Edn, 1983. Stevens and Sons.
- 8) P. Ganguli - Clearing up for Patents - Indian Scenario, Universal Press.

IPR : COPYRIGHT LAW

- I. Meaning, Nature and Development of Copyright
- II. Subject matter of Copyright
- III. Ownership, Assignment, Registration and Licensing of Copyright
- IV. Rights of Copyright owner and Licensee
- V. Infringement of Copyright and Remedies
- VI. Neighbouring Rights; Performers Rights and Broadcasting Rights including Satellite and Cable distribution
- VII. Software Piracy and Copyright Protection
- VIII. On Line Piracy and Copyright Protection

Books Recommended :

- 1) Cornish, W.R.- Intellectual Property (1981) , Second Indian Reprint, 1993, Universal Book Traders, Delhi.
- 2) Vashishtha - Law and Practice of Intellectual Property in India, 1999.
- 3) P. Narayanan- Intellectual Property (2nd Edn.) 1999.
- 4) Sangal P.S. and Kishore Singh - Indian Patent System and Paris Convention : Legal Perspectives (1987).
- 5) Pearson and Miller- Commercial Exploitation of Intellectual Property 1st Edition, 1990.
- 6) Gopalkrishnan, N.S.- Intellectual Property and Criminal Law , 1st Edn, 1994, National Law School of India University, Bangalore.
- 7) T.A. Blanco white - Patents for Inventions, 5th Edn, 1983. Stevens and Sons.
- 8) P. Ganguli - Clearing up for Patents - Indian Scenario, Universal Press.

GROUP – D (ENVIRONMENTAL LAW)

PAPER LM 2.2

MARKS 100

ENVIRONMENTALISM AND INDIAN SOCIETY

Unit – 1 : Concept of “Environment”

- 1) Definition, Meaning and Scope of the term ‘Environment’ and ‘Pollution’.
- 2) Human Population and Environment – Population Growth, Human Health, Environmental Education.
- 3) Concept of Ecology and Ecosystem; Types, Biomes and Classification, Food Chains.
- 4) Natural and Biological Sciences Interactions : Biogeochemical Cycles
- 5) Ecological Pyramids

Unit – 2 : Relationship between Population, Environment and Development

- 1) Population vs. Development
- 2) Development vs. Environment
- 3) Corporate Environmental Responsibility
- 4) Concept of ‘Common Property’ and ‘State Property’.
- 5) Notion of Doctrine of Public Trust

Unit – 3 : Environment and Social Issues

- 1) Water Conservation, Rain Water Harvesting, Wetland Conservation, Forest Conservation
- 2) Environmental Disaster; Environmentally Displaced Persons
- 3) Environmental Social Movements
- 4) Religious Texts and Environment

Unit – 4 : Early Legislations Dealing with Environment before 1947 (Relevant Sections only)

- 1) Shore Nuisance (Bombay and Colaba) Act, 1853
- 2) Indian Penal Code, 1860
- 3) The Police Act, 1861
- 4) The Sarais Act, 1867
- 5) Northern India Canal and Drainage Act, 1873
- 6) Obstruction in Fairways Act, 1881
- 7) Indian Easement Act, 1882
- 8) Orient Gas Company Act, 1887
- 9) The Indian Fisheries Act, 1897
- 10) Indian Ports Act, 1908
- 11) Indian Forest Act, 1927
- 12) Motor Vehicles Act, 1958
- 13) Merchant Shipping Act, 1958
- 14) Bengal Smoke Nuisance Act, 1905

ENVIRONMENTAL POLLUTION AND LEGAL CONTROL IN INDIA

Unit – 1 : Environmental Pollution,
Sources, Causes, Effects of Water, Air, Land and Noise Pollution

Unit – 2 :

- 1) Constitutional Mandate and Environmental Protection
- 2) Role of Judiciary for Environmental Protection and Sustainable Development
- 3) Principles Evolved
 - a. Absolute Liability
 - b. Precautionary Principle
 - c. Polluter Pays Principle
 - d. Intra and Inter Generational Equity
 - e. Public Trust Doctrine

Unit – 3 : Statutory Control of Environmental Pollution

- 1) Water (Prevention and Control of Pollution) Act, 1974
- 2) Air (Prevention and Control of Pollution) Act, 1981
- 3) Environment (Protection) Act, 1986 and Rules to Control Various Pollutions
- 4) National Green Tribunal Act, 2010
- 5) Wastes Management
 - a. Solid Waste
 - b. Hazardous Waste
 - c. Bio Medical Waste
 - d. e-Waste

Unit – 4 : Remedies under Traditional Laws (Relevant Portion only)

- 1) Criminal Procedure Code, 1973
- 2) Code of Civil Procedure, 1908
- 3) Indian Penal Code, 1860
- 4) Law of Torts : Vicarious Liability
- 5) Protection of Human Rights Act, 1993
- 6) Class Action : Order 1 Rule 8 of C.P.C. 1908
- 7) West Bengal Land Reforms Act, 1955
- 8) Public Liability Insurance Act, 1991
- 9) Remedies under Local Laws

GROUP E (CRIMINAL LAW)

PAPER LM 2.2

Marks 100

CRIMINAL JUSTICE : CONCEPTS AND PROCEDURE

I Classification of Offences

- a) Cognizable and Non-cognizable offences.
- b) Bailable and Non-Bailable offences.
- c) Compoundable and Non-Compoundable offences
- d) Investigation, Prosecution and Trial
- e) Warrant cases and Summons cases
- f) Summary Trials

II Constitutional Provisions

- a) Art. 20 Protection against Ex-Post Facto Laws, Protection against Double Jeopardy and Protection against Self Incrimination
- b) Art. 21 Impact of expansive interpretation on criminal jurisprudence
Meaning of terms :
 - Life and Personal liberty
 - Fair Procedure
 - Due Process of Law
- c) Right of Accused
 - Arrest, Hand Cuffing Bail, Speedy Trial
 - Torture Custodial Violence
 - Compensation
 - Public Interest Litigation : Direct access to Courts in case of violation of Fundamental Right and other implicit rights
- d) Death Penalty in Light of Art. 21
- e) Art. 22 Protection to Accused in case of punitive detention
Protection against Preventive Detention

III (A) Procedural Criminal Law – Initiation of Proceeding

- 1) FIR – rights of complainant,
- 2) Duties of Police Officers under Sec 154
- 3) Delay in lodging FIR.
- 4) Complaint Proceedings
- 5) Jurisdiction of Courts.
- 6) Quashing of Proceedings Sec. 482 CrPC & Article 227 of Constitution
- 7) Extent and Nature of interference by Superior Courts

(B) Procedural Criminal Law (Trial Procedures).

- 1) Arrest and questioning of accused (Sec. 41,42,46, 65, 57 . CrPC
- 2) Guidelines of Supreme Court in
 - i) D.K Basu v Union of India
- 3) Rights of the Accused

- i) Pre arrest and Post arrest Bail, Remand
- ii) Right to Legal Aid
- iii) Search and Seizure, Surveillance (Sec- 91,94, 97, 103, 165. CRPC)
- iv) Charge Sheet- powers and duties of Police at the time of investigation
- v) Extent of interference by court in investigation

IV Admissibility of Evidence.

- 1) Relevancy and admissibility, of facts
- 2) Relevancy of confessions and dying declarations
- 3) Appreciating expert evidence in court
- 4) Relevancy and Admissibility of evidence collected through Forensic and other modern tools and techniques
- 5) Admissibility of evidence in Cyber Crime
- 6) Role of the Court in drawing inference from evidence
- 7) Protection of Witnesses
- 8) Hostile witnesses

Books Recommended:

- 1) Dutta K.K., Some Aspects of Criminal Law, Law Research Institute, Edition 1997, APH, Publishing House, Darya Ganj, New Delhi -02.
- 2) Malik P.L., Criminal Court Hand Book, 18th Edition, Eastern Book Company, 32, Lalbagh, Lucknow -01.
- 3) Justice Chandrachud Y V and Manohar V R, Ratanlal and Dhirajlal's The Indian Penal Code. 28th Edition 199, Wadhwa and Company New Delhi.
- 4) Manjari Rajendra, First Information Report, Edition 2001, Asia Law House, Hyderabad-2
- 5) Mahendra Kumar Sharma, minimum Sentencing for Offences in India, Law and Policy, Edition 1996, Deep and Deep publications, Rajori Garden, New Delhi-64
- 6) Handbook of Criminal Procedure Code
- 7) Jadhav N.K. Is Capital Punishment Necessary, 1st Edition 1973, Anmol Publications, Bombay-52

CRIMINOLOGY AND PENOLOGY

- 1) Criminology- Definition, Nature, Scope and utility
- 2) Methods of Criminological Studies
- 3) Schools of Criminology: Classical, Biological Cartographic, Sociological and Socialist.
- 4) Theorising Criminal aetiology : Lombroro and Neo- Lombrosian, Psycho-analysis, Differential Association, Anomie Tradition; Critical Criminology with reference to Labeling, Interactionism and Conflict Theory
- 5) A brief discussion on Modern Trends in Criminology: Phenomenology, Postmodernism and Feminism Crime and Feminism.
- 6) Punishment: Concept and Theories
- 7) Death Sentence
- 8) Treatment of offenders: Prison, Probation and Parole
- 9) Victimology.

Books Recommended:

1. Saxena R.N. The Immoral Traffic (Prevention) Act, 1956, 5th Edition 1996, The Law Book Pvt. Ltd, Allahabad-01
2. Dr. Mehanathan M C, Law of Control on NARCOTIC DRUGS AND PSYCHOTROPIC SUBSTANCES in India, Edition 2002, Capital Law House, Delhi-32
3. Ramchandran S. Commentaries on The prevention of Food Adulteration Act 1954, 6th Edition 1997, S. Gogia and Company, Hyderabad
4. Peter Barrie, Compensation for Personal Injuries, Edition 2000, Oxford University Press, New Delhi.

SEMESTER III

PAPER LM 3.1 (COMPULSORY)

MARKS 100

LAW AND SOCIAL TRANSFORMATION IN INDIA

I: Law and Social Change

1. Law as an instrument of social change
2. Law as a product of traditions and culture
3. Introduction of common law system and institutions in India and the impact of received law on the Indian Social and Legal Order.
4. Limits of Law in bringing out social change.

II : Religion, Community and the Law

1. Indian Secularism: Constitutional Provisions and Judicial Responses
2. Constitutional Protections to Religious and Linguistic minorities.
3. Affirmative Action (Reservation)

III: Women and the Law

1. Gender Injustice and its various forms
2. Empowerment of Women: Constitutional and Statutory Provisions; Women's Commission.
3. Crimes Against Women: legislative and judicial initiatives.

IV: Children and the Law

1. Child Labour
2. Sexual Exploitation of Children
3. Adoption and Related Problems
4. Children and Education.

V: Language and the Law.

1. Language as a divisive factor.
2. Constitutional Recognition of Linguistic Pluralism: formation of linguistic states.
Constitutional Recognition of Linguistic Pluralism: formation of linguistic states.
3. Constitutional guarantees to linguistic minorities.
4. Language policy and the Constitution: Official languages (Arts 343-351)
5. Non-discrimination on the ground of language.

VI. Community and the law

1. Caste as a divisive factor.
2. Non-discrimination on the ground of caste.
3. Acceptance of caste as a factor to undo past injustices.
4. Protective discrimination: Scheduled castes, tribes and backward classes.
5. Affirmative Action: Reservation; Statutory Commission, Statutory provisions.

VII. Modernisation and the Law

1. Modernisation as a value: Constitutional perspectives reflected in the fundamental duties.
2. Modernisation of social institutions through law.
 - Agrarian reform: Industrialization of agriculture.

- Industrial reform: Free enterprise v. State regulation
 - Industrialization v. environmental protection.
3. Criminal law: Inquisitorial System; Plea bargaining; Compounding and Payment of Compensation to victims: Witness Protection schemes: Prison Reforms:
 4. Civil Law: Confrontation v. Consensus.
ADRS - Mediation and Conciliation; *Lok adalats*.
 5. Democratic decentralization and local self-government.

Books Recommended :

1. Marc Galanter (ed). *Law and Society in Modern India*. (1997). Oxford, New Delhi.
2. Baxi, Upendra, . *The Crisis of Indian Legal System*. (1982). Vikas Publication.
3. Baxi, Upendra (ed). *Law and Poverty: Critical Essays*. (1988). Tripathi, Bombay.
4. Manushi, A Journal About Women and Society.
5. Duncan Derret. *The State, Religion and Law in India*. (1999). Oxford. New Delhi.
6. M.P.Singh, *Constitution of India* (2008). 11th Ed. Eastern Book Co., Lucknow.
7. Sunil Deshta and Kiran Deshta. *Law and Menace of Child Labour*. (2000). Anmol Publications, New Delhi.
8. Savitri Gunasekhare. *Children, Law and Justice* (1997) Sage Publications.
9. Indian Law Institute, *Law and Social Change: Indo-American Reflections*. Tripathi, (1988).
10. M. P.Jain. *Outlines of Indian Legal History*. (1993). Tripathi, Bombay.
11. Agnes Flavia, *Law and Gender Inequality: The Politics of Women's Rights in India* (1999) Oxford, New Delhi.
12. Ved Kumari, *Offences Against Women in Kamala Sankaran and Ujjwal Kumar Singh* (ed) Towards Legal Literacy An Introduction to Law in India PP.78-94 (2008) Oxford, New Delhi.
13. Virendra Kumar: *Dynamics of Reservation Policy: Towards a More Inclusive Social Order* 50, Journal of the Indian Law Institute PP 478-517 (2007).
14. Virendra Kumar, '*Minorities' Right to Run Educational Institutions*: T.M.A Pai Foundation in Perspective 45, Journal of the Indian Law Institute PP 200-238 (2003)

GROUP A (CORPORATE LAW)

PAPER LM 3.2

MARKS 100

THE LAW OF CORPORATE FINANCE AND SECURITIES REGULATIONS

- I: (1). Public Issue of Shares
- (i) Prospectus
 - (ii) Remedies for misrepresentation
 - (iii) SEBI and Stock Exchange guidelines
- (2). Share Capital
- (i) Nature and Kind of Shares
 - (ii) Transfer, Transmission, Surrender and forfeiture of Shares
 - (iii) Purchase by Company of its own shares
 - (iv) Issue of shares at premium and discount
 - (v) SEBI Guidelines
- II: (1) Shareholders' Rights (Various rights of shareholders and variation of shareholders rights.
- (2) Debentures; Difference between Share and Debentures; Kinds of Debenture; Remedies of Debenture Holder; Company Charges.
- III: (1) Insider Trading; SEBI's Guidelines on Insider Trading
- (2) Securities and Exchange Board of India (SEBI): Constitution, Powers and Functions
- IV: (1) Reconstruction, Amalgamation and Take Over: Provisions in Company Law and SEBI Guidelines
- (2) Auditors :
- (i) Appointment, powers, duties and removal of auditors
 - (ii) Special Audit
 - (iii) Director Responsibility statement in Board Report
 - (iv) National Advisory Committee on Accounting Standards

Books Recommended :

1. Gower's *Principles of Company Law*, Sweet & Maxwell Thomson, 2006
2. Smith and Keenon's *Company Law*, Pearson Education Ltd., 2009
3. Suman Gupta: *Shareholder's Democracy: Fact or Fiction*, Publication Division, University of Delhi, 1992
4. Companies Act, 2013
5. Verma J.C., *Corporate Mergers, Amalgamations & Takeovers*, Bharat Law House, 2008
6. Journals - Journal of Indian Law Institute ,
7. Corporate Law Cases, Chartered Secretary, Law and Contemporary Problems.
8. Statutory Materials - Companies Act

PROJECT AND SEMINAR

I. Project on Specialisation Paper	:	50 Marks
II. Seminar presentation on Specialisation Paper	:	50 Marks

GROUP B (INTERNATIONAL LAW)

PAPER LM 3.2

MARKS 100

INTERNATIONAL TRADE LAW

- 1) Introduction, Objects and Importance of International Trade Law
- 2) Unification of International Law Relating to Trade
- 3) Sources of International Trade Law
- 4) International Financial Institutions – its Functions, Role and Achievements – A Critical Study
- 5) Legal Regime in International Trade – (GATT, WTO, UNCTAD, UNCITRAL)
- 6) International Law on Sale of Goods
- 7) International Law on Carriage of Goods by Sea, Air and Land
- 8) International Insurance Contracts – Laws and Practices
- 9) Dispute Settlement Mechanisms in International Trade

Books Recommended :

- 1) John S. Chipman – The Theory of International Trade, Vol. I & II
- 2) Lorand Bartels (Ed.) – Regional Trade Agreements and the WTO Legal System (Oxford, 2006)
- 3) Michael J. Trebilcock – The Regulation of International Trade (Routledge, London, 2005)
- 4) Nicholas Kouladis – Principles of Law Relating to International Trade (2006)
- 5) Simone Schnitzer – Understanding International Trade Law (Universal Publishing, Delhi, 2007)
- 6) Leo D’Arcy, Carole Murray and Barbara Cleane – The Law and Practice of International Trade (Sweet & Maxwell, 2000)
- 7) Kumar Ratnesh – WTO – Structure, Functions, Tasks and Challenges (2002).

GROUP C (INTELLECTUAL PROPERTY LAWS)

PAPER LM 3.2

MARKS 100

IPR : TRADEMARK, DESIGN, G.I AND FARMERS' RIGHTS

I. Trade Mark :

- a) Meaning and nature, Registration of Trade Mark, Procedure of registration, limitation, , Foreign trade mark
- b) Assignment of Trade Mark; rights of owner, rights of license, Passing off & infringement; remedies for infringement.

II. Designs Act :

- a) Meaning and Nature, concept, functional designs ; inventor of designs and the rights
- b) Registration : procedure and benefits, registration authorities, their power and functions.
- c) Design of Copyright: term of design, Licensing ; Assignment.
- d) Infringement of design, remedies against infringement.

III. Geographical Indication :

- a) Meaning and concept of G.I goods ;
- b) Protection under G.I of Goods Act,1999

IV. Sui Generis and Protection of Plant Varieties :

- a) Meaning, Concept, Sui Generis Protection,
- b) Plant Varieties and Farmers Rights ; Rights of Farmers

Books Recommended :

- 1) Melville B. Nimmer - Copyright and other Aspects of literary , musical and Artistic Works, 2nd Edn.
- 2) Baxi, U.The Law of Intellectual Property : Copyright law in India (1989)
- 3) P. Narayanan - Copyright and Industrial Design, 2nd Edn. 1995.
- 4) P. Narayanan - Trademark, Trade name and Passing off Cases 2nd Edn. Vol. I & II,1997.
- 5) Thairani, K- Copyright : The Indian Experience (1987).
- 6) Lal's Copyright Act, 3rd Edn. 1995 Law Publications .

GROUP D (ENVIRONMENTAL LAW)

PAPER LM 3.2

MARKS 100

LAWS FOR CONSERVATION OF BIOSPHERE AND POLICIES IN INDIA

Unit – 1 : Biodiversity and Law

- 1) Definitions
- 2) Meaning and Importance
- 3) Role of Flora and Fauna in Maintaining Biodiversity
- 4) Threats to Biodiversity
- 5) Need for Protection of Biodiversity
- 6) Biodiversity and Economic Valuation
- 7) Convention on Biological Diversity, 1992
- 8) The Biological Diversity Act, 2002
- 9) Protection of Plant Varieties and Farmers Right Act, 2001 (relevant portion only)
- 10) The Geographical Indications (Regulation and Protection) Act, 1999 (relevant portion only)

Unit – 2 : Wild and Law

- 1) The Wild Life (Protection) Act, 1972
- 2) The Forest Conservation Act, 1980
- 3) Concept of Reserve Forest

Unit – 3 : Planning and Environment

- 1) Pre Independence Period
- 2) Post Independence Period
- 3) Five Year Plans

Unit – 4 : Policies

- 1) National Environmental Policy
- 2) National Forest Policy
- 3) National Water Policy
- 4) Environmental Impact Assessment act CRZ Notifications.

Books Recommended :

GROUP E (CRIMINAL LAW)

**ORGANISED CRIME, TERRORISM AND INTERNATIONAL
CRIME: NEW CHALLENGES**

- I Organized Crime
 - 1) Definition and Scope
 - 2) Characteristics of organized crime
 - 3) Types of organized crime
 - 4) Causes of organized crime
- II Classification of Organized Crimes
 - A) International Perspective
 - 1) Transnational organized crime
 - 2) Illicit Firearms trafficking
 - 3) Drug trafficking
 - 4) Money laundering scams and frauds
 - B) Indian Perspective
 - 1) Smuggling, Money Laundering and Hawala
 - 2) Terrorism
 - 3) Counterfeiting of Currency
 - 4) Drug trafficking: NDPS Act penal provisions
 - 5) Cyber Crimes and penal provisions in IT Act, 2000 (Sec.65, 66 & 67)
 - 6) Trafficking of women and children
 - 7) Trafficking of Human Organs (penal provisions)
- III Profiles of Criminal Gang / Investigation and Prosecution
 - 1) Criminal Intent and mensrea in such crimes
 - 2) Modus operandi of organized crime
 - 3) Role of Police in Investigation of organized crime
 - 4) Role of Judiciary, Trial and Sentencing in organized crime
- IV Legislative Provisions in India
 - 1) Maharashtra Control of Organized Crime Act, 1999
 - 2) Relevant Provisions under IPC and Indian Evidence Act
 - 3) Prevention, control and correctional strategies
- V Laws relating to Transnational Organised Crime
 - 1) Organised crime and United Nations
 - 2) Naples Declaration and Global Action Plan 24 Dec. 1994 (Salient features)
 - 3) United Nations Conventions Against Organized Crime 15th Dec. 2000 (Salient features)
 - 4) Extradition Treaty: Extradition Act 1962 (Relevant Provisions)

- VI International Crimes
- 1) Emerging Crimes of International Nature
 - 2) Objectives of International Criminal Law
 - 3) Salient features of International Criminal Court.

Books Recommended :

Bare Acts:

1. Narcotic Drugs and Psychotropic Substances Amendment (Act) 2001
2. Immoral Traffic (Prevention) Act, 1956
3. Maharashtra Control of Organised Crimes Act 1999
4. Naples Declaration and Global Action Plan, 1994
5. Extradition Treaty & Extradition Act, 1962

Books:

1. Mathur K.M., Crime, Human Rights and National Securities, Gian Publishing House, New Delhi -02
2. Nadan Kamat, Computer and Information Technology Law
3. Attra Chand, Terrorism Political Violence Security of Nation, Gian Publishing House, New Delhi -02.
4. William A Schabas, International Criminal Court, 1st Edition 2001, Cambridge University Press.

SEMESTER IV

PAPER LM 4.1 (COMPULSORY)

MARKS 100

LEGAL EDUCATION & RESEARCH METHODOLOGY

PART A : LEGAL EDUCATION : MARKS 20

I. Objective of Legal Education

II. Method of Teaching

- Lecture Method
- The Problem Method
- Discussion Method
- The Seminar Method

III. Examination System and problems in evaluation – external and internal assessment.

IV. Clinical Legal Education – legal aid, legal literacy, legal survey and law reform.

PART B : RESEARCH METHODOLOGY : MARKS 80

I: Precepts

1. Nature
2. Objectives
3. Types: Doctrinal and Non-Doctrinal

II: Necessary Steps

1. Identification and Formulation of Research Problem
2. Hypothesis and Research Design (Characteristics and contents)
3. Processing the Plan of Research: Data Collection, Analysis and use of Internet, Legislative material, Indian & foreign court decision and juristic writings.

III: Techniques

1. **Methodology:** Tool and Techniques for collection of data, collection of case materials and juristic literature, use of historical and comparative research material and use of questionnaire and interview.
2. Census and Survey
3. Sampling: Types, Merits and Demerits
4. Report Writing

IV: Conduct of Research

1. Supervision
2. Guidelines for researchers

Books Recommended :

- 1) S.K. Verma and M. Afzal Wani (Eds.) *Legal Research and Methodology*, Indian Law Institute (2001) 2nd Edition.
- 2) Baxi, Upendra, '*Socio-Legal Research in India – A Program Schriff*', ICSSR, Occasional Monograph, 1975.
- 3) Cohen, Morris L., '*Legal Research*', Minnesota, West Publishing Co. 1985.
- 4) Ghosh, B.N., '*Scientific Method and Social Research*', New Delhi, Sterling Publishers Pvt. Ltd., 1984.
- 5) Goode and Hatt, '*Methods in Social Research*', Singapore, Mc. Graw Hill Book Co., 1985 (reprint).
- 6) Johari J.C. (ed), '*Introduction to the Method of Social Sciences*', New Delhi, Sterling Publishers Pvt. Ltd. 1988.
- 7) Kothari C.K., '*Research Methodology: Method and Techniques*', New Delhi, Wiley Eastern Ltd., 1980.
- 8) Stone, Julius, '*Legal System and Lawyer's Reasoning*', Sydney, Maitland Publications, 1968.

PAPER LM 4.2 (Compulsory)

MARKS 100

DISSERTATION

PAPER LM 4.3 (Compulsory)

MARKS 100

SEMINAR, VIVA-VOCE AND TEACHING ASSIGNMENT

I. Seminar on Dissertation Topic	:	50 Marks
II. Viva-Voce	:	40 Marks
III. Teaching Assignment	:	10 Marks

Department of Mass Communication
The University of Burdwan
Proposed Post Graduate (M.A.) Syllabus for session 2020-2022 onwards

M.A. in Mass Communication							
Course No	Course Status and Type	Course Title	Credit	Pattern of Teaching learning (hours per week)			Marks
				L	T	P	
First Semester [All courses are Departmental Core Courses and Compulsory]							
MC101	Core /TH	Introduction to Communication	5	4	1	0	40+10=50
MC102	Core /TH	Development of Media and Media Law	5	4	1	0	40+10=50
MC103	Core /TH	Advertising and Marketing Communication	5	4	1	0	40+10=50
MC104	Core/ TH	Public Relations & Corporate Communication	5	4	1	0	40+10=50
MC105	Core/ PR	Computer Application in Media	5	0	0	5	40+10=50
		Semester I Total	25				250
Second Semester [All courses are Departmental Core Courses and Compulsory]							
MC201	Core/ TH	International Communication and Globalization	5	4	1	0	40+10=50
MC202	Core/ TH	Reporting and Writing	5	4	1	0	40+10=50
MC203	Core/ TH	Editing and Designing	5	4	1	0	40+10=50
MC204	Core/ TH	Media Management and Economics	5	4	1	0	40+10=50
MC205	Core/ TH	Online Media	5	4	1	0	40+10=50
		Semester II Total	25				250
Third Semester [Students have to take 2 Compulsory Core Courses, 2 Major Electives (MC303A or B and MC304 A or B) and 1 Interdisciplinary Elective from other Departments/SWAYAM Platform]							
MC301	Core/TH	Communication Research	5	4	1	0	40+10=50
MC302	Core/TH	Development Communication	5	4	1	0	40+10=50
MC303A	Major Elective/ TH	Health Communication	5	4	1	0	40+10=50
MC303B		NGO and Advocacy Communication	5	4	1	0	40+10=50
MC304A	Major Elective/ TH	Women and Media	5	4	1	0	40+10=50
MC304B		Photo Journalism	5	4	1	0	40+10=50
MC305	Inter disciplinary Elective/TH	Media Culture and Society (For Students from other departments)[Students may opt for a 4 Credit course from SWAYAM Platform and can avail the option of credit transfer]	4	3	1	0	40+10=50
		Semester III Total	24				250

Fourth Semester [Students have to take 3 Compulsory Core Courses (MC-401, MC402, MC405), 2 Major Electives courses {Either MC- 403A or 403B and in case of MC- 404 any one from either A or B or C or D} and 1 Compulsory Community Engagement course (MC400)]							
MC400	Community Engagement Course /PR	Social Outreach Programme	2	0	0	2	10+10=20
MC401	Core/TH	Radio	5	4	1	0	40+10=50
MC402	Core/TH	Television	5	4	1	0	40+10=50
MC403A	Major Elective/TH	Film Studies: Indian Cinema	5	4	1	0	40+10=50
MC403B		Film Studies: World Cinema	5	4	1	0	40+10=50
MC404A	Major Elective/ PR	Radio Production	5	0	0	5	40+10=50
MC404B		Television Production	5	0	0	5	40+10=50
MC404C		Film Production	5	0	0	5	40+10=50
MC404D		Documentary Production	5	0	0	5	40+10=50
MC405	Core/PR	Dissertation	5	0	0	5	40+10=50
		Semester IV Total	27				270
Grand Total (For 4 Semesters)			101				1020

**Department of Mass
Communication**

University of Burdwan

**Syllabus of Two Years MA
(CBCS System)**

**Academic Year 2015
onwards**

Course Outline

Semester I						
Course No	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
MC101	Core	Mass Communication	5	4	1	0
MC102	Core	Development of Media and Media Law	5	4	1	0
MC103	Core	Advertising	5	3	1	1
MC104	Core	Public Relations	5	3	1	1
MC105	Core	Computer Application in Media- Stage I	5	1	0	4
		Total Credit	25			
Semester II						
Course No	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
MC201	Core	International Communication	5	4	1	0
MC202	Core	Reporting and Writing	5	2	1	2
MC203	Core	Editing & Designing	5	3	2	
MC204	Core	Media Management	5	3	1	1
MC205	Core	Computer Application in Media- Stage II	5	1	1	3
		Total Credit	25			

Semester III							
Course No	Course Type		Course Title	Credit	Credit Distribution		
					L	T	P
MC301	Core		Communication Research	4	3	1	0
MC302	Core		Development Communication	4	2	1	1
MC303	Core		Rural Communication	4	2	1	1
MC304	Major Elective	A1	Corporate Social Responsibility	2	2	0	
		A2	Women and Media	2	2	0	0
		B1	Health Communication	2	1	0	1
		B2	Online Media	2	1	0	1
Either A1 A2 or B1 B2							
MC305	Minor elective	Media Culture & Society	4	3	1	0	
Students from other departments							
MC 306	Core	Dissertation	5	1	0	4	
		Total Credit	25				
Semester IV							
Course No	Course Type		Course Title	Credit	Credit Distribution		
					L	T	P
MC401	Core		Radio	5	2	1	2
MC402	Core		Television	5	2	1	2
MC403	Core		Film	5	2	1	2
MC404			Media for Community Outreach	5	1	0	4
MC405	Core		Audio-Visual Project	5	1	0	4
			Total Credit	25			
All Total Credit (for 4 semester)				100			

SYLLABUS FOR M.A./M.SC.INMATHEMATICS

Under Choice Based Credit System (CBCS)

Effective from 2020-2021



**The University of Burdwan
Burdwan-713104
West Bengal**

Preamble

The M.A./M.Sc. in Mathematics is a two-year, four-semester programme under Choice Based Credit System (CBCS). Total 96 credits are equally distributed in four semesters (24 credits in each semester). 74, 16, 4, 2 and 2 credits are given for 18 core courses, 4 discipline-centric Elective courses, project, 1 Generic elective course and Community Engagement Activities respectively. The programme is divided into two streams, namely Applied and Pure after 2nd semester. Discipline-centric Elective courses can be chosen from the baskets which contain a variety of courses. The courses in 1st and 2nd semester are designed on considering the syllabi of various eligibility tests at the national level.

Objectives

- Impart teaching so that the students could develop critical thinking ability about the fundamental aspects of mathematics.
- Make the students capable of pursuing research work in various emerging fields of mathematics and its applications.
- Train the students with mathematical knowledge and computational techniques so that they can deal with the problems faced by the industries.
- Make the students aware of their responsibility to meet the societal needs.

Pre-requisite

The students should possess the knowledge on the courses taught in the B.A./B.Sc. with Mathematics Honours.

Programme Outcomes

- Development of critical thinking for carrying out scientific investigations.
- Skills to analyze problems, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- Ability to pursue research or build careers in industry in mathematical sciences and allied fields.

- Development of the effective scientific and technical communications in both oral and written forms.
- Awareness for becoming a responsible citizen with commitment to deliver one's responsibilities within the scope of bestowed rights and privileges.

Programme Specific Outcomes

- Understanding about the fundamental axioms in mathematics and capability of developing ideas based on them.
- Development of mathematical reasoning and an understanding of the underlying unifying structures of mathematics (i.e., sets, relations and functions, logical structure) and the relationships among them.
- Motivation for research studies in mathematics and related fields with real life applications.
- Knowledge in a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.
- Advanced knowledge in mathematical sciences.
- Nurturing problem solving skills, thinking, creativity through assignments, project work.
- Preparing for competitive examinations, like NET, SET, GATE, etc.

PROFILE

Semester I

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMG101	Core	T	Real Analysis	4	2	10	40	50	4
MSMG102	Core	T	Complex Analysis	4	2	10	40	50	4
MSMG103	Core	T	Foundation of Topology	4	2	10	40	50	4
MSMG104	Core	T	Integral Transforms and Integral Equations	4	2	10	40	50	4
MSMG105	Core	T	Classical Mechanics	4	2	10	40	50	4
MSMG106	Core	T	Numerical Analysis	4	2	10	40	50	4
					Total credit				24

Abbreviation used: T/P → Theory/Practical; I.A. → Internal Assessment; E.T. → Term-end examination

Semester II

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMG201	Core	T	Algebra	4	2	10	40	50	4
MSMG202	Core	T	Elements of Functional Analysis and Multivariate Calculus	4	2	10	40	50	4
MSMG203	Core	T	Geometry of Curves and Surfaces	4	2	10	40	50	4
MSMG204	Core	T	Differential Equations	4	2	10	40	50	4
MSMG205	Core	T	Operations Research	4	2	10	40	50	4
MSMG206	Core	P	Computer-aided Numerical practical	8	4	10	40	50	4
					Total credit				24

Semester III (Applied Stream)

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMA301	Core	T	Methods of Applied Mathematics	4	2	10	40	50	4
MSMA302	Core	T	Continuum Mechanics	4	2	10	40	50	4
MSMA303	Core	T	Theory of Electromagnetic fields and Special Theory of Relativity	4	2	10	40	50	4
MSMA304	GE	T	*	2	1	5	20	25	2
MSMA305	DE	T	Vide Appendix I	4	2	10	40	50	4
MSMA306	DE	T	Vide Appendix II	4	2	10	40	50	4
MSMA307	CE	N.A.	N.A.	N.A.	N.A.	5	20	25	2
					Total credit				24

Abbreviation used: CE → Community Engagement Activities; DE → Discipline-centric Elective (One Discipline-centric Elective course in Semester III may be opted from SWAYAM); GE → Generic elective (Generic elective course may be opted from SWAYAM).

*: MSMA304-1: Introduction to Operations Research; MSMA304; MSWM304: Course opted from SWAYAM.

Appendix I

Basket of courses for DE (Only one course has to be chosen from the basket)

MSMA305-1: Boundary Layer Theory and Magneto-hydrodynamics-I

MSMA305-2: Turbulent Flows-I

MSMA305-3: Space Sciences-I

MSMA305-4: Course opted from SWAYAM

Appendix II:

Basket of courses for DE (Only one course has to be chosen from the basket)

MSMA306-1: Advanced Optimization-I

MSMA306-2: Advanced Operations Research-I

MSMA306-3: Quantum Mechanics-I

MSMA306-4: Fuzzy Mathematics and Applications-I

MSMA306-5: Course opted from SWAYAM

Semester III (Pure Stream)

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMP301	Core	T	Abstract Algebra	4	2	10	40	50	4
MSMP302	Core	T	Analysis I	4	2	10	40	50	4
MSMP303	Core	T	Geometry of Manifolds	4	2	10	40	50	4
MSMP304	GE	T	*	2	1	5	20	25	2
MSMP305	DE	T	Vide Appendix III	4	2	10	40	50	4
MSMP306	DE	T	Vide Appendix IV	4	2	10	40	50	4
MSMP307	CE	N.A.	N.A.	N.A.	N.A.	5	20	25	2
					Total credit				24

Abbreviation used: CE → Community Engagement Activities; DE → Discipline-centric Elective (One Discipline-centric Elective course in Semester III may be opted from SWAYAM); GE → Generic elective (Generic elective course may be opted from SWAYAM).

*: MSMP304-1: Introduction to Graph Theory, MSWM304: Course opted from SWAYAM.

Appendix III

Basket of courses for DE (Only one course has to be chosen from the basket)

MSMP305-1: Advanced Functional Analysis-I

MSMP305-2: Advanced Differential Geometry – I

MSMP305-3: Advanced Complex Analysis-I

MSMP305-4: Measure and Integration-I

MSMP305-5: Course opted from SWAYAM

Appendix IV

Basket of courses for DE (Only one course has to be chosen from the basket)

MSMP306-1: Euclidean and non – Euclidean Geometries-I

MSMP306-2: Commutative Algebra-I

MSMP306-3: Advanced Operator Theory –I

MSMP306-4: Ergodic Theory-I

MSMP306-5: Algebraic Topology-I

MSMP306-6: Course opted from SWAYAM

Semester IV (Applied Stream):

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMA401	Core	T	Dynamical Systems, Chaos and Fractals	4	2T/4P	10	40	50	4
MSMA402	Core	T	Fluid Mechanics	4	2T/4P	10	40	50	4
MSMA403	Core	T	Introduction to Quantum Mechanics and Wavelet Analysis	4	2T/4H	10	40	50	4
MSMA404	DE	T	Vide Appendix V	4	2T/4H	10	40	50	4
MSMA405	DE	T	Vide Appendix VI	4	2T/4H	10	40	50	4
MSMA406	Project	N.A.	N.A.	4	---	---	50	50	4
				Total credit					24

Appendix V**Basket of courses for DE (Only one course has to be chosen from the basket)**

MSMA404-1: Boundary Layer Theory and Magneto-hydrodynamics-II

MSMA404-2: Turbulent Flows-II

MSMA404-3: Space Sciences-II

Appendix VI**Basket of courses for DE (Only one course has to be chosen from the basket)**

MSMA405-1: Advanced Optimization-II

MSMA405-2: Advanced Operations Research-II

MSMA405-3: Quantum Mechanics-II

MSMA405-4: Fuzzy Mathematics and Applications-II

Semester IV (Pure Stream):

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMP401	Core	T	Graph Theory, Set Theory and Logic	4	2T/4P	10	40	50	4
MSMP402	Core	T	Analysis II	4	2T/4P	10	40	50	4
MSMP403	Core	T	Topology	4	2T/4H	10	40	50	4
MSMP404	DE	T	Vide Appendix VII	4	2T/4H	10	40	50	4
MSMP405	DE	T	Vide Appendix VIII	4	2T/4H	10	40	50	4
MSMP406	Project	N.A.	N.A.	4	---	---	50	50	4
				Total credit					24

Appendix VII**Basket of courses for DE (Only one course has to be chosen from the basket)**

MSMP404-1: Advanced Functional Analysis-II

MSMP404-2: Advanced Differential Geometry – II

MSMP404-3: Advanced Complex Analysis-II

MSMP404-4: Measure and Integration-II

Appendix VIII**Basket of courses for DE (Only one course has to be chosen from the basket)**

MSMP405-1: Euclidean and non – Euclidean Geometries-II

MSMP405-2: Commutative Algebra-II

MSMP405-3: Advanced Operator Theory –II

MSMP405-4: Ergodic Theory-II

MSMP405-5: Algebraic Topology-II

COURSE STRUCTURE
SEMESTER STRUCTURE OF M.A./M.SC. SYLLABUS IN MATHEMATICS
(SEMESTER-I, II, III, IV)

SEMESTER-I

Duration: 6 Months

Total Marks: 250

Total No. of Lectures: 50 Hours per paper

Each Theoretical Paper Containing 45 Marks and 5 Marks for Internal Assessment

Paper		Marks
MCG101:	Functional Analysis-I (27+3)	30
	Real Analysis-I (18+2)	20
MCG102:	Linear Algebra-I (27+3)	30
	Modern Algebra-I (18+2)	20
MCG103:	Elements of General Topology (27+3)	30
	Complex Analysis-I (18+2)	20
MCG104:	Ordinary Differential Equations & Special Functions (27+3)	30
	Operations Research-I (18+2)	20
MCG105:	Principle of Mechanics-I (27+3)	30
	Numerical Analysis (18+2)	20

SEMESTER-II

Duration: 6 Months

Total Marks: 250

Total No. of Lectures: 50 Hours per paper

Each Theoretical Paper Containing 45 Marks and 5 Marks for Internal Assessment

Paper		Marks
MCG201:	Complex Analysis-II (27+3)	30
	Real Analysis-II (18+2)	20
MCG202:	Partial Differential Equations (27+3)	30
	Differential Geometry (18+2)	20
MCG203:	Operations Research-II (27+3)	30
	Principle of Mechanics-II (18+2)	20
MCG204:	Computer Programming (27+3)	30
	Continuum Mechanics-I (18+2)	20
MCG205:	Computer Aided Numerical Practical	50

Semester III & IV Separated for Pure and Applied Stream

SEMESTER-III: Pure Stream

Duration: 6 Months

Total Marks: 250

Total No. of Lectures: 50 Hours per paper

Each Theoretical Paper Containing 45 Marks and 5 Marks for Internal Assessment

Paper		Marks
MPG301:	Modern Algebra-II (27+3)	30
	General Topology-I (18+2)	20
MPG302:	Graph Theory (36+4)	40
	Set Theory-I (9+1)	10
MPG303:	Set Theory –II & Mathematical Logic (27+3)	30
	Functional Analysis-II (18+2)	20
MPS304:	Special Paper-I (45+5)	50
MPS305:	Special Paper-II (45+5)	50

SEMESTER-IV: Pure Stream

Duration: 6 Months

Total Marks: 250

Total No. of Lectures: 50 Hours per paper

Each Theoretical Paper Containing 45 Marks and 5 Marks for Internal Assessment

Paper		Marks
MPG401:	Modern Algebra-III (45+5)	50
MPG402:	General Topology-II (27+3)	30
	Functional Analysis-III (18+2)	20
MPS403:	Special Paper-III (45+5)	50
MPS404:	Special Paper-IV (45+5)	50
MPT405:	Term Paper (30+15+5)	50

Term Paper MPT405 is related with the Special papers and the Marks distribution is 30 Marks for written submission and 15 Marks for Seminar Presentation and 5 Marks for Viva-Voce.

SEMESTER-III: Applied Stream

Duration: 6 Months

Total Marks: 300

Total No. of Lectures: 50 Hours per paper

Each Theoretical Paper Containing 45 Marks and 5 Marks for Internal Assessment

Paper		Marks
MAG301:	Methods of Applied Mathematics -I (45+5)	50
MAG302:	Methods of Applied Mathematics -II (27+3)	30
	Theory of Electro Magnetic Fields (18+2)	20
MAG303:	Continuum Mechanics-II (27+3)	30
	Dynamical Systems (18+2)	20
MAS304:	Special Paper-I (45+5)	50
MAS305:	Special Paper-II (45+5)	50

SEMESTER-IV: Applied Stream

Duration: 6 Months

Total Marks: 250

Total No. of Lectures: 50 Hours per paper

Each Theoretical Paper Containing 45 Marks and 5 Marks for Internal Assessment

Paper		Marks
MAG401:	Continuum Mechanics-III (45+5)	50
MAG402:	Elements of Quantum Mechanics (27+3)	30
	Chaos and Fractals (18+2)	20
MAS403:	Special Paper-III (45+5)	50
MAS404:	Special Paper-IV (45+5)	50
MAT405:	Term Paper (30+15+5)	50

Term Paper MAT405 is related with the Special papers and the Marks distribution is 30 Marks for written submission and 15 Marks for Seminar Presentation and 5 Marks for Viva-Voce.

Cluster of Special Paper-I & III For Semester-III & IV respectively each of 50 marks

(Pure Stream):

- A** Differential Geometry of Manifolds-I & II
- B** Advanced Real Analysis-I & II
- C** Advanced Functional Analysis-I & II
- D** Rings of Continuous Function-I & II
- E** Theory of Rings and Algebra-I & II
- F** Non-linear Optimization in Banach Spaces-I & II
- G** Harmonic Analysis-I & II
- H** Applied Functional Analysis-I & II

Cluster of Special Paper-II & IV For Semester-III & IV respectively each of 50 marks

(Pure Stream):

- A** Measure and Integration- I & II
- B** Operator Theory and Applications- I & II
- C** Algebraic Topology- I & II
- D** Lattice Theory-I & II
- E** Advanced Operations Research- I & II
- F** Geometric Functional Analysis- I & II
- G** Proximities, Nearnesses and Extensions of Topological Spaces- I & II
- H** Advanced Complex Analysis- I & II

Cluster of Special Paper-I & III For Semester-III & IV respectively each of 50 marks

(Applied Stream):

- A** Viscous Flows, Boundary Layer Theory and Magneto Hydrodynamics-I & II
- B** Elasticity-I & II
- C** Elasticity and Theoretical Seismology-I & II
- D** Applied Functional Analysis -I & II

Cluster of Special Paper-II & IV For Semester-II & IV respectively each of 50 marks

(Applied Stream) :

- A** Quantum Mechanics- I & II
- B** Advanced Operations Research- I & II
- C** Inviscid Compressible Flows and Turbulence- I & II

**MASTER OF BUSINESS
ADMINISTRATION (MBA)
CURRICULUM**

With

Choice Based Credit System (CBCS)

(With Effect From Session 2020-21)



**DEPARTMENT OF BUSINESS ADMINISTRATION
THE UNIVERSITY OF BURDWAN**

SEMESTER-WISE DISTRIBUTION OF CORE & ELECTIVE COURSES

MBA SEMESTER – I

Sl. No.	Course Code	Course Name	Credit Particulars
CORE COURSES			
1.	MBA-1101	Management Process & Organisation Theory (MPOT)	7 nos. core courses at serial nos. (1-7) @ 3 credits per course, i.e. a total of 21 credits will be offered.
2.	MBA-1102	Managerial Economics (ME)	
3.	MBA-1203	Organisational Behaviour (OB)	
4.	MBA-1405	Fundamentals of Marketing Management (FMM)	
5.	MBA-1504	Accounting For Managers (AFM)	
6.	MBA-1606	Fundamentals of Human Resource Management (FHRM)	
7.	MBA-1707	Fundamentals of Production & Operations Management (FPOM)	
NON-SPECIALIZATION ELECTIVE COURSES			
8.	MBAE-1108	Indian Ethos and Business Ethics (IEBE)	1 no. elective course to be selected from the list at serial nos. (8-10) @ 3 credit per course, i.e. 3 credits will be offered.
9.	MBAE-1210	Corporate Success Behaviour (CSB)	
10.	MBAE-1311	Corporate Governance (CG)	
Credits to Be Offered in Semester-I From Core Courses			21 Credits
Credits to Be Offered in Semester-I From Non-Specialization Elective Courses			03 Credits
Total Credits to Be Offered in Semester-I From Core & Elective Courses			24 Credits

MBA SEMESTER – II

Sl. No.	Course Code	Course Name						Credit Particulars
CORE COURSES								
1.	MBA-2101	Research Methodology (RM)						5 nos. core courses at serial nos. (1-5) @3 credits per course, i.e. a total of 15 credits will be offered.
2.	MBA-2102	Business Environment and Legislation (BEL)						
3.	MBA-2103	Managerial Communication and Skill Development (MCSD)						
4.	MBA-2704	Fundamentals of Computer Applications and Management Information System (FCAMIS)						
5.	MBA-2705	Quantitative Techniques in Management (QTM)						
NON-SPECIALIZATION ELECTIVE COURSES								
6.	MBAE-2206	Organisational Change and Development (OCD)						1 no. elective course to be selected from non-specialization area; the list at serial nos. (6-8) @ 3 credit per course, i.e. 3 credits will be offered.
7.	MBAE-2207	Leadership (LDP)						
8.	MBAE-2308	Corporate Social Responsibility and Sustainability (CSRS)						
SPECIALIZATION ELECTIVE COURSES								
Marketing Management		Financial Management		Human Resource Mgmt.		Systems, Operations & Decision Sciences		For each of the four specialization areas, three nos. elective courses to be selected from the list of five courses @3 credits per course, i.e. a total of 9 credits will be offered.
MBAE-2409	Consumer Behaviour (CB)	MBAE-2509	Corporate Financial Reporting and Analysis (CFRA)	MBAE-2609	Human Resource Planning and Development (HRPD)	MBAE-2709	Logistics and Supply Chain Management (LSCM)	
MBAE-2410	Sales and Distribution Management (SDM)	MBAE-2510	Security Analysis and Portfolio Management (SAPM)	MBAE-2610	Compensation and Benefits Management (CBM)	MBAE-2710	Purchasing and Materials Management (PMM)	
MBAE-2411	Rural Marketing Management (RMM)	MBAE-2511	Project Finance and Management (PFM)	MBAE-2611	Training and Development (T&D)	MBAE-2711	Production Planning and Control (PPC)	
MBAE-2412	Industrial Marketing (INDM)	MBAE-2512	Strategic Cost Management (SCM)	MBAE-2612	Counselling Skills for Managers (CSM)	MBAE-2712	Business Process Reengineering (BPR)	
MBAE-2413	Public Relations and Marketing (PRM)	MBAE-2513	Working Capital Management (WCM)	MBAE-2613	Understanding Self: Indian Perspective (USIP)	MBAE-2713	Managing E-Business (MEB)	
Credits to be Offered in Semester-II from Core Courses								15 Credits
Credits to be Offered in Semester-II from Elective Courses under Non-Specialization Area								03 Credits
Credits to be Offered in Semester-II from Elective Courses under Specialization Area								09 Credits
Total Credits to be Offered in Semester-II from Core & Elective Courses								27 Credits

MBA SEMESTER – III

Sl. No.	Course Code	Course Name	Credit Particulars					
CORE COURSES			5 nos. core courses at serial nos. (1-5) @ 3 credits per course, i.e. a total of 15 credits will be offered.					
1.	MBA-3301	Introductory Strategic Management (ISM)						
2.	MBA-3502	Corporate Finance (CF)						
3.	MBA-3703	Operations Research (OR)						
4.	MBA-3704	Business Analytics (BA)						
5.	MBA-3105	Summer Project and Viva (SPV)						
NON-SPECIALIZATION ELECTIVE COURSES			1 no. non-specialization elective course (sl. 6 or 7) @ 3 credits will be offered.					
6.	MBAE-3206	Team Dynamics at Work (TDW)						
7.	MBAE-3307	Knowledge Management and Business Excellence (KMBE)						
MINOR ELECTIVE COURSES			1 no. minor elective course (sl. 8 or 9) @ 4 credits will be offered.					
8.	MBAME-3108	Management Principles and Practices (MPP)						
9.	MBAME-3209	Group and Team Effectiveness (GTE)						
SPECIALIZATION ELECTIVE COURSES								
Marketing Management		Financial Management	Human Resource Management	Systems, Operations & Decision Sciences	For each of the four specialization areas, three nos. elective courses to be selected from the list of five courses @ 3 credits per course, i.e. a total of 9 credits will be offered.			
MBAE-3410	Integrated Marketing Communication (IMC)	MBAE-3510	Corporate Taxation (CT)	MBAE-3610		Performance Management (PM)	MBAE-3710	Decision Support System (DSS)
MBAE-3411	Voluntary Sector Marketing (VSM)	MBAE-3511	Behavioural Finance (BF)	MBAE-3611		Labour Legislation (LL)	MBAE-3711	Internet of Things (IoT)
MBAE-3412	Service Marketing (SVM)	MBAE-3512	Financial Econometrics (FE)	MBAE-3612		Employee Relations (ER)	MBAE-3712	Systems Analysis and Design (SAD)
MBAE-3413	Strategic Marketing Management (SMM)	MBAE-3513	Financial Derivatives (FD)	MBAE-3613		HRD: Strategies and Systems (HRDSS)	MBAE-3713	Project Management (PROM)
MBAE-3414	Global Marketing Management (GMM)	MBAE-3514	Financial Markets (FM)	MBAE-3614	Human Resource Information System (HRIS)			
Credits to be Offered in Semester-III from Core Courses					15 Credits			
Credits to be Offered in Semester-III from Elective Courses under Non-Specialization Area					03 Credits			
Credits to be Offered in Semester-III from Elective Courses under Specialization Areas					09 Credits			
Credits to be Offered in Semester-III from Minor Elective Courses					04 Credits			
Total Credits to be Offered in Semester-III from Core & Elective Courses					31 Credits			

MBA SEMESTER – IV

Sl. No.	Course Code	Course Name						Credit Particulars
CORE COURSES								
1.	MBA-4301	Entrepreneurship Development (ED)						3 nos. core courses at serial nos. (1-3) @3 credits per course, i.e. a total of 9 credits will be offered.
2.	MBA-4302	International Business (IB)						
3.	MBA-4103	Comprehensive Report (CR)						
4.	MBA-4104	Community Engagement Course						1 no. core course at serial no. 4 @ 2 credits will be offered.
SPECIALIZATION ELECTIVE COURSES								
Marketing Management		Financial Management		Human Resource Mgmt.		Systems, Operations & Decision Sciences		For each of the four specialization areas, 3 nos. elective courses to be selected from the list of 5 courses @3 credits per course, i.e. a total of 9 credits will be offered.
MBAE-4409	Retail Marketing (RTM)	MBAE-4509	Management of Financial Services (MFS)	MBAE-4609	Strategic Human Resource Management (SHRM)	MBAE-4709	Advanced Operations Research (AOR)	
MBAE-4410	Brand Management (BM)	MBAE-4510	Management Accounting for Business Decisions (MABD)	MBAE-4610	Human Capital Management (HCM)	MBAE-4710	Total Quality Management (TQM)	
MBAE-4411	Tourism Marketing (TM)	MBAE-4511	Merger, Acquisition and Corporate Restructuring (MACR)	MBAE-4611	Contemporary Interventions in Human Resource Management (CIHRM)	MBAE-4711	Database Management System (DBMS)	
MBAE-4412	Advertising and Sales Promotion Mgmt. (ASPM)	MBAE-4512	Entrepreneurial Finance and Valuation (EFV)	MBAE-4612	Global Human Resource Management (GHRM)	MBAE-4712	Decision Models and Optimization (DMO)	
MBAE-4413	Small Business Marketing (SBM)	MBAE-4513	Multinational Finance (MF)	MBAE-4613	Employer Branding (EB)	MBAE-4713	Smart Manufacturing (SMFG)	
Credits to be Offered in Semester-IV from Core Courses								09 Credits
Credits to be Offered in Semester-IV from Elective Courses under Specialization Areas								09 Credits
Credits to be Offered in Semester-IV from Community Engagement Course (Core)								02 Credits
Total Credits to be Offered in Semester-IV from Core and Elective Courses								20 Credits

MBA PROGRAMME DESIGN & REQUIREMENTS

Department of Business Administration The University of Burdwan



THE PROGRAMME

The Master of Business Administration (MBA) is a two-year full time programme offered by the Department of Business Administration, The University of Burdwan. This programme was introduced by the University with the approval of the University Grants Commission (UGC) long back in the year 1983. Necessary technical approval for the programme has been obtained by the University from All India Council for Technical Education (AICTE) from time to time.

PROGRAMME OBJECTIVES

The Programme is designed to turn out a cadre of future managers thoroughly conversant with general principles of management along with tools and techniques pertinent thereto. The programme is also aimed to churn out future managers with specializations in the areas of Marketing, Finance, Human Resource Management and Systems, Operations & Decision Sciences.

PROGRAMME STRUCTURE

The courses for the MBA programme are offered in the following areas:

- Area – I: General Management*
- Area – II: Organisational Behaviour*
- Area – III: Economics*
- Area – IV: Strategic Management*
- Area – V: Marketing Management*
- Area – VI: Financial Management*
- Area – VII: Human Resource Management*
- Area – VIII: Systems, Operations & Decision Sciences*

PROGRAMME STRUCTURE

AREA	CORE COURSES		ELECTIVE COURSES	
	COURSE CODE	COURSE NAME	COURSE CODE	COURSE NAME
AREA-1: GENERAL MANAGEMENT	MBA 1101	Management Process & Organisation Theory (MPOT)	MBAE 1108	Corporate Governance (CG)
	MBA 2101	Business Environment (BE)		
	MBA 2103	Managerial Communication and Skill Development (MCSD)		
	MBA 3101	Research Methodology (RM)		
	MBA 2102	Corporate Social Responsibility and Business Ethics (CSR & BE)		
	MBA 3106	Summer Project & Viva (SPV)		
	MBA 4104	Comprehensive Report (CR)		
AREA-2: ORGANI- SATIONAL BEHAVIOUR	MBA 1202	Understanding Individual Employee Behaviour (UIEB)	MBAE 2207	Ergonomics
	MBA 2204	Managing Interpersonal and Group Processes (MIGP)	MBAE 1209	Corporate Success Behaviour (CSB)
	MBA 4201	Organisational Change and Development (OCD)	MBAE 2208	Employee Non-Cognitive Behaviour (ENB)
			MBAME 3214	Group and Team Effectiveness (GTE) – Minor Elective
3. Economics	MBA 1303	Managerial Economics (ME)	MBAE 2306	Economics of Human Resources (EHR)
	MBA 4302	Entrepreneurship Development (ED)	MBAE 1311	Development Economics (DE)
	MBA 3304	International Business (IB)	MBAE 1306	Social Entrepreneurship (SE)
			MBAE 1310	Indian Economic Environment (IEE)
			MBAE 4808	Advanced Project Management (PM)
4. Strategic Management	MBA 3402	Introductory Strategic Management (SM)	MBAE 3407	Corporate Creativity and Strategic Innovation (CCSI)
			MBAE 3409	Competitive Strategies (CS)
			MBAE 3408	Strategic Management of Non-Profit Organisations (SMNPO)
5. Marketing Management	MBA 1504	Fundamentals of Marketing Management (FMM)	MBAE 2509	Consumer Behaviour (CB)
			MBAE 2510	Sales and Distribution Management (SDM)
			MBAE 4505	Brand Management (BM)
			MBAE 4506	Retail Marketing (RTM)
			MBAE 2512	Advertising (ADV)
			MBAE 2511	Rural Marketing (RMM)

AREA	CORE COURSES		ELECTIVE COURSES	
	COURSE CODE	COURSE NAME	COURSE CODE	COURSE NAME
			MBAE 3511	Service Marketing (SVM)
			MBAE 4507	Strategic Marketing (SM)
			MBAE 3510	Voluntary Sector Marketing (VSM)
			MBAE 4509	Events Marketing Management (EMM)
			MBAE 4508	Industrial Marketing (INDM)
			MBAE 3512	Integrated Marketing Communication (IMC)
6. Financial Management	MBA 1605	Accounting for Managers (AFM)	MBAE 2609	Financial Markets and Financial Mathematics (FMFM)
	MBA 3605	Corporate Finance (CF)	MBAE 2610	Corporate Reporting (CR)
			MBAE 4605	Financial Engineering(FE)
			MBAE 2612	Working Capital Management (WCM)
			MBAE 2611	Security Analysis & Portfolio Management (SAPM)
			MBAE 3611	Advanced Corporate Finance (ACF)
			MBAE 4606	International Financial Management (IFM)
			MBAE 3610	Corporate Taxation (CT)
			MBAE 4607	Merger and Acquisition (M&A)
			MBAE 4608	Financial Time Series Analysis (FTSA)
			MBAE 4609	Commodity Derivative Market (CDM)
			MBAE 3612	Business Valuation (BV)
7. Human Resource Management	MBA 1706	Fundamentals of Human Resource Management (FHRM)	MBAE 2709	Human Resource Planning (HRP)
			MBAE 2710	Compensation and Reward Management (CRM)
			MBAE 2711	Employment Relations (ER)
			MBAE 3710	Labour Laws (LL)
			MBAE 4705	Strategic Human Resource Management (SHRM)
			MBAE 3712	Performance Management & Employee Development (PM & ED)
			MBAE 2712	Managerial Counselling & Negotiation Skills (MCNS)

AREA	CORE COURSES		ELECTIVE COURSES	
	COURSE CODE	COURSE NAME	COURSE CODE	COURSE NAME
			MBAE 4708	International Human Resource Management (IHRM)
			MBAE 4706	Contemporary Interventions in Human Resource Management (CIHRM)
			MBAE 3711	Training & Development (T & D)
			MBAE 4707	Human Capital Management (HCM)
			MBAME 3713	Employer Branding (EB)-Minor elective
8. Systems, Operations & Decision Sciences	MBA 2805	Quantitative Techniques in Management (QTM)	MBAE 4805	Total Quality Management (TQM)
	MBA 1807	Fundamentals of Production & Operations Management (FPOM)	MBAE 4806	Database Management System (DBMS)
	MBA 3803	Management Information System (MIS)	MBAE 2811	Production Planning & Control (PPC)
	MBA 4803	Operations Research (OR)	MBAE 2809	Business Process Reengineering (BPR)
			MBAE 2812	Purchasing & Materials Management (PMM)
			MBAE 2810	Logistics & Supply Chain Management (LSCM)
			MBAE 3811	Systems Analysis & Design (SAD)
			MBAE 4807	Knowledge Management & Business Excellence (KMBE)
			MBAE 3810	Decision Support System (DSS)
			MBAE 4808	Project Management (PM)
			MBAE 4809	E-Business (EB)
			MBAE 3812	Applied Operations Research (AOR)

MBA (HR) PROGRAMME DESIGN UNDER CHOICE BASED CREDIT SYSTEM
DEPARTMENT OF BUSINESS ADMINISTRATION (HUMAN RESOURCE)
THE UNIVERSITY OF BURDWAN

THE PROGRAMME

The Master of Business Administration (Human Resource) i.e. MBA (HR) programme is a full-time, post graduate programme in Human Resource Management offered by the Department of Business Administration (Human Resource), The University of Burdwan. The programme is designed to enable students to comprehend the wide range of contemporary concepts, techniques and practices in the field of human resource management and understand the underpinning imperatives that influence the field.

PROGRAMME OBJECTIVES

- To turn out a repertoire of budding executives thoroughly conversant with the general principles of management along with the tools and techniques pertinent thereto and have specialized in-depth knowledge and expertise in management of human resources of an organisation
- To nurture socially responsive and ethically grounded HR professionals equipped with analytical, technological and strategic capabilities to address complex workforce challenges in both global and local contexts.

PROGRAMME OUTCOMES (POs)

PO1: Core Managerial and Human Resource Competence

Develop a strong foundation in management principles and specialized HR knowledge, enabling students to design and implement HR systems and practices aligned with contextual factors and organizational goals.

PO2: Analytical Thinking and Strategic Decision-Making

Equip students with analytical and problem-solving skills to evaluate business and HR issues in diverse contexts.

PO3: Ethical Leadership and Governance Orientation

Instill ethical conduct, corporate governance and social responsibility for sustainable leadership.

PO4: Technology, Innovation, and Global Readiness

Prepare students for digital and global HR landscapes with tools like HR analytics and understanding of international labour standards.

PO5: Contextual Relevance and Social Engagement

Foster engagement with regional socio-economic realities and indigenous perspectives through fieldwork, Indian Knowledge Systems, and applied research, nurturing a socially responsive and culturally rooted HR mindset.

PROGRAMME STRUCTURE

The courses for the MBA (HR) programme are offered in the following areas:

1. ***Foundations of Management***
2. ***Human Resource Management***
3. ***Organisational Behaviour***
4. ***Strategic Management***
5. ***Marketing Management***
6. ***Accounting & Finance***

7. Systems, Operations & Decision Sciences
8. Emerging Areas

There shall be two types of courses viz. Core Courses and Elective Courses. A student is compulsorily required to take the core courses as part of the core requirement of the MBA (HR) programme. Elective courses can be chosen from a pool of courses offered by the parent department or other departments. Students can choose the electives from the courses which facilitate improved understanding of the subject or provide exposure to other disciplines/subjects. An elective course offered by the parent department would be considered as Major Elective/Discipline Centric Elective. An Elective course offered by other departments/disciplines would be referred to as Generic Elective/Interdisciplinary Elective. Students from other departments can choose the Generic Elective/ Interdisciplinary Elective course(s) from the options available in the curriculum. A course code has been denoted with an alpha-numeric symbol signifying the programme name, semester, area and the serial no. of the course under the particular semester. Major Elective/Discipline Centric Elective courses and Generic Elective/Interdisciplinary Elective courses have been prefixed with the letters E and ME respectively before the numeric digits in the course code.

AREA-WISE DISTRIBUTION OF COURSES				
AREA	CORE COURSES		ELECTIVES	
	COURSE CODE	CORE COURSE	COURSE CODE	ELECTIVE COURSE
1. Foundations of Management	MBAHR1101	Management Process and Organisation Theory (MPOT)	MBAHRE1109	Indian Ethos and Business Ethics (IEBE)
	MBAHR1102	Managerial Economics (ME)	MBAHRE1110	Indian Economy and Policy (IEP)
			MBAHRE1111	Development Economics (DE)
	MBAHR2101	Research Methodology (RM)	MBAHRE1112	Business Laws (BL)
	MBAHR2103	Managerial Communication and Skill Development (MCSD)	MBAHRE 2113	Business Environment (BE)
2. Human Resource Management	MBAHR1206	Fundamentals of Human Resource Management (FHRM)	MBAHRE2208	Managerial Counselling and Negotiation Skills (MCNS)
	MBAHR2202	Human Resource Planning and Development (HRPD)	MBAHRE2209	Trade Unionism and Collective Bargaining (TUCB)
	MBAHR2204	Compensation & Benefits Management (CBM)	MBAHRE2210	Understanding Self: Indian Perspective (USIP)
	MBAHR2205	Training and Development (T&D)	MBAHRE3205	Economics of Human Resources (EHR)

	MBAHR3202	Performance Management and Competency Mapping (PMCM)	MBAHRE3206	Human Resource Management in Service Sector (HRMSS)
	MBAHR3203	Fundamentals of Industrial Relations (FIR)	MBAHRE3207	Stress Management and Employee Well-being (SMEW)
	MBAHR3204	Labour Laws-I (LL-I)	MBAHRE3208	Employee Empowerment and Engagement (EEE)
	MBAHR4201	Labour Laws-II (LL-II)	MBAHRME3220	Human Resource Development (HRD) (<i>Generic Elective/ Interdisciplinary Elective course</i>)*
	MBAHR4202	Strategic Human Resource Management (SHRM)	MBAHRE4205	International Human Resource Management (IHRM)
	MBAHR2206	Summer Internship Project (SIP)	MBAHRE4206	Human Capital Management and HR Audit (HCM&HRA)
	MBAHR4203	Dissertation and Field Work (D&FW)	MBAHRE4207	Contemporary Employment Relations (CER)
	MBAHR4204	Community Engagement (CE)	MBAHRE4208	Human Resource Information System (HRIS)
			MBAHRE4213	Cross Cultural and Diversity Management (CCDM)
			MBAHRE4214	HR Analytics (HRA)
			MBAHRE4215	International Labour Organisation and International Labour Laws (ILO&ILL)
3. Organisational Behaviour	MBAHR1303	Organisational Behaviour (OB)	MBAHRE 2311	Organisational Change and Development (OCD)
			MBAHRE3309	Team Dynamics at Work (TDW)
			MBAHRE3310	Leadership (LSP)
			MBAHRE3311	Ergonomics (ERG)
4. Strategic Management	MBAHR3401	Introductory Strategic Management (ISM)	MBAHRE1408	Corporate Governance (CG)
			MBAHRE2407	Corporate Social Responsibility and Sustainability (CSRS)
			MBAHRE3413	Corporate Creativity and Strategic Innovation (CCSI)
			MBAHRME3419	Industrial Organisation and Competitive Strategies (IOCS) (<i>Generic Elective/ Interdisciplinary Elective course</i>)*
			MBAHRE4409	Entrepreneurship Development (ED)
			MBAHRE4410	Knowledge Management and Business Excellence (KMBE)
			MBAHRE4411	Innovation Management (IM)
			MBAHRE4416	Strategic Management of Non-Profit Organisations (SMNPO)

5. Marketing Management	MBAHR1504	Fundamentals of Marketing Management (FMM)	MBAHRE4517	Employer Branding (EB)
6. Accounting & Finance	MBAHR1605	Basic Accounting and Finance (BAF)	MBAHRE2614	Corporate Finance (CF)
			MBAHRE2615	Financial Statement Analysis (FSA)
			MBAHRE2616	Corporate Reporting (CR)
			MBAHRE3617	Financial Institutions and Markets (FIM)
			MBAHRE3618	Business Valuation (BV)
7. Systems, Operations & Decision Sciences	MBAHR1707	Fundamentals of Production and Operations Management (FPOM)	MBAHRE2712	Quantitative Techniques for Human Resource Management (QTHRM)
			MBAHRE3712	Management Information System (MIS)
			MBAHRE4712	Total Quality Management (TQM)
8. Emerging Areas			MBAHRE3814	Infrastructure Management (IM)
			MBAHRE3815	Health Care Management (HM)
			MBAHRE3816	Social Enterprise Management (SEM)
			MBAHRE4818	Management of Rural Business (MRB)
			MBAHRE4819	Sports Management (SM)
			MBAHRE4820	Educational Institutions Management (EIM)
* Generic Elective/ Interdisciplinary Elective course(s) will be offered to the students of allied/other departments.				

PROGRAMME ADMINISTRATION

In order to complete the MBA (HR) programme, a student is required to obtain **102 credits**. Each of the courses in the identified areas carries 3 credits (excluding Generic Elective/Interdisciplinary Elective course offered by other departments/SWAYAM platform, Summer Internship Project, Dissertation and Field Work and Community Engagement). The credit distribution for the programme is as follows:

- **54 credits from 18 core courses** (excluding Summer Internship Project and Dissertation and Field Work)
- **6 credits** from Summer Internship Project (3 credits) and Dissertation and Field Work (3 credit)
- **2 credits** shall have to be earned from a Community Engagement Course.
- **40 credits from elective courses as follows:**
 - **24 credits** from 8 elective courses in the Human Resource Management Area.
 - **12 credits** from 4 elective courses from the areas excluding Human Resource Management Area.

- o **4 credits** from one Generic Elective/Interdisciplinary Elective course offered by other departments/ a course through SWAYAM platform subject to the provisions and stipulations of the extant UNIVERSITY REGULATION RELATING TO ALL POST GRADUATE PROGRAMME OF STUDIES AND EXAMINATIONS.

The other details relating to the programme based on Choice Based Credit system are as follows:

- Theoretical courses of 3 and 4 credits would, in general, entail 30 and 40 lecture hours respectively including tutorials.
- A semester-assessment shall be divided into 2 discrete components, identified as E1 and E2. E1 stands for the Internal Assessment and E2 stands for the Semester-end Examination. The first component (E1) of assessment will comprise 20% of the total marks in each course of the semester. This will be based on attendance, class test, assignment, seminar etc. Each course carries 100 marks (excluding Generic Elective/Interdisciplinary Elective course and Community Engagement course) of which 20% will be reserved for internal assessment (E1) and the remaining 80% will be for written examination/evaluation.
- The marks distribution for Generic Elective/Interdisciplinary Elective course and Community Engagement course would be 50 marks (40 marks for written exam and 10 marks will be reserved for internal assessment) and 25 marks (Report: 20 marks & 5 marks for internal assessment) respectively, unless otherwise specified in the relevant regulation of the university.
- Emphasis will be given on case study-based teaching in the relevant courses of the programme.
- For Summer Internship Project (MBAHR2206), students will be required to undergo summer training of 4-6 weeks duration in an industrial, business or service organisation by taking up a project study. The report will have to be submitted as per the notification of the department/university.
- Course MBAHR4203 Dissertation and Field Work, will be segregated into two components: Dissertation and Field Work. Dissertation will be based on Contemporary Issues in Human Resource Management. Field Work will be based on industry visit(s) to be organised by the department/ a study signifying macro level Human Resource Development. The choice of Dissertation and Field Work and the components thereof will be decided by the Department/PGBS.
- In semester IV, each student shall have to compulsorily undergo a Community Engagement Course (MBAHR4204) subject to the approval of the Department/PGBS. Community Engagement activities will be based on components like involvement in activities aimed at the excluded class/deprived children, identification of socio-economic issues on rural livelihood/rural society, understanding rural institutions, participation in rural development programmes, serving the interests of informal workers, activities aimed at environment protection, career counseling for the students of the excluded group, participation in literacy camps and other types of activities as specified and approved by the department.
- A single report comprising three separate sections on Dissertation, Field Work and Community Engagement Course will have to be submitted within the deadline set by the department/university. Unless otherwise specified, MBAHR2206, MBAHR4203 and MBAHR4204 will ordinarily be considered as Practical courses.

- The list of electives to be offered in a particular semester would be decided by the department.
- Students from other departments can opt for the Generic Elective/Interdisciplinary Elective course(s) courses from the different areas by obtaining necessary permission from their concerned departments.
- The Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) shall be calculated as per extant university regulations.
- Issues relating to admission, attendance, examination, programme administration, etc. will be governed by the relevant policies, rules and regulations of the university.

SEMESTER-WISE DISTRIBUTION OF COURSES			
CORE COURSES		ELECTIVE COURSES	
SEMESTER-I			
MBAHR1101	Management Process and Organisation Theory (MPOT)	MBAHRE1408	Corporate Governance (CG)
MBAHR1102	Managerial Economics (ME)	MBAHRE1109	Indian Ethos and Business Ethics (IEBE)
MBAHR1303	Organisational Behaviour (OB)	MBAHRE1110	Indian Economy and Policy (IE&P)
MBAHR1504	Fundamentals of Marketing Management (FMM)	MBAHRE1111	Development Economics (DE)
MBAHR1605	Basic Accounting and Finance (BAF)	MBAHRE1112	Business Laws (BL)
MBAHR1206	Fundamentals of Human Resource Management (FHRM)		
MBAHR1707	Fundamentals of Production and Operations Management (FPOM)		
SEMESTER-II			
MBAHR2101	Research Methodology (RM)	MBAHRE2407	Corporate Social Responsibility and Sustainability (CSRS)
MBAHR2202	Human Resource Planning and Development (HRPD)	MBAHRE2208	Managerial Counselling and Negotiation Skills (MCNS)
MBAHR2103	Managerial Communication and Skill Development (MCSD)	MBAHRE2209	Trade Unionism and Collective Bargaining (TUCB)
MBAHR 2204	Compensation and Benefits Management (CBM)	MBAHRE2210	Understanding Self: Indian Perspective (USIP)

MBAHR2205	Training and Development (T&D)	MBAHRE 2311	Organisational Change and Development (OCD)
MBAHR2206	Summer Internship Project (SIP)	MBAHRE2712	Quantitative Techniques for Human Resource Management (QTHRM)
		MBAHRE2113	Business Environment (BE)
		MBAHRE2614	Corporate Finance (CF)
		MBAHRE2615	Financial Statement Analysis (FSA)
		MBAHRE2616	Corporate Reporting (CR)
SEMESTER—III			
MBAHR3401	Introductory Strategic Management (ISM)	MBAHRE3205	Economics of Human Resources (EHR)
MBAHR3202	Performance Management and Competency Mapping (PMCM)	MBAHRE3206	Human Resource Management in Service Sector (HRMSS)
MBAHR3203	Fundamentals of Industrial Relations (FIR)	MBAHRE3207	Stress Management and Employee Well-being (SMEW)
MBAHR3204	Labour Laws-I (LL-I)	MBAHRE3208	Employee Empowerment and Engagement (EEE)
		MBAHRE3309	Team Dynamics at Work (TDW)
		MBAHRE3310	Leadership (LSP)
		MBAHRE3311	Ergonomics (ERG)
		MBAHRE3712	Management Information System (MIS)
		MBAHRE3413	Corporate Creativity and Strategic Innovation (CCSI)
		MBAHRE3814	Infrastructure Management (IM)
		MBAHRE3815	Health Care Management (HCM)
		MBAHRE3816	Social Enterprise Management (SEM)
		MBAHRE3617	Financial Institutions and Markets (FIM)
		MBAHRE3618	Business Valuation (BV)
		MBAHRME3419	Industrial Organisation and Competitive Strategies (IOCS) (Generic Elective/ Interdepartmental Elective)
		MBAHRME3220	Human Resource Development (HRD) (Generic Elective/Interdepartmental Elective)
		Generic Elective/ Interdisciplinary Elective course(s) will be offered to the students of allied/other departments.	
SEMESTER—IV			
MBAHR4201	Labour Laws-II (LL—II)	MBAHRE4205	International Human Resource Management (IHRM)
MBAHR4202	Strategic Human Resource Management (SHRM)	MBAHRE4206	Human Capital Management and HR Audit (HCMA)
MBAHR4203	Dissertation and Field Work (D&FW)	MBAHRE4207	Contemporary Employment Relations (CER)
MBAHR4204	Community Engagement (CE)	MBAHRE4208	Human Resource Information System (HRIS)
		MBAHRE4409	Entrepreneurship Development (ED)

	MBAHRE4410	Knowledge Management and Business Excellence (KMBE)
	MBAHRE4411	Innovation Management (IM)
	MBAHRE4712	Total Quality Management (TQM)
	MBAHRE4213	Cross Cultural and Diversity Management (CCDM)
	MBAHRE4214	HR Analytics (HRA)
	MBAHRE 4215	International Labour Organisation and International Labour Laws (ILO&ILL)
	MBAHRE4416	Strategic Management of Non-Profit Organisations (SMNPO)
	MBAHRE4517	Employer Branding (EB)
	MBAHRE4818	Management of Rural Business (MRB)
	MBAHRE4819	Sports Management (SM)
	MBAHRE4820	Educational Institutions Management (EIM)

1. FOUNDATIONS OF MANAGEMENT

CORE COURSES

MBAHR1101 MANAGEMENT PROCESS AND ORGANISATION THEORY (MPOT) [3 credits]

COURSE OUTCOME

At the end of the course, the students shall be able to

- *understand, analyze and apply core management functions to improve organizational effectiveness in dynamic business environments.*
- *critically evaluate major organization theories and their relevance to contemporary management practices, enabling effective decision-making and strategic leadership.*

Unit I: Understanding an Organisation—Organisational Adaptation, Survival and Growth—Nature, Purpose and Importance of Management in Organisations— The Management Process—Kinds of Managers—Basic Managerial Skills and Roles, Changing Nature of Managerial Work—Management: Science or Art—Management as a Profession. Evolution of Management Thought: Classical Management Approaches, Behavioural Management Approaches, Quantitative Management Approaches, Modern Management Approaches, Contemporary Management Issues and Challenges—Global Dimensions of Management.

Unit II: Planning & Decision-Making—Planning: Concept, Importance, Types or Elements of Plan, Levels of Planning, Steps in Planning, Benefits and Limitations of Planning—Making Planning Effective— Management by Objectives. Decision Making—Types of decisions, Nature of decision making, Rational Perspectives and Behavioural Aspects of decision making

Unit III: Organising: Concept, Nature, Importance and Process of Organising—Organisation Structure and

DEPARTMENT OF BUSINESS ADMINISTRATION (HUMAN RESOURCE)
THE UNIVERSITY OF BURDWAN
GOLAPBAG, BURDWAN



Information Brochure

Mission:

“Achieving excellence in human resource management education and research and satisfying the needs of the industry and the academia, by nurturing and developing talents; all aimed towards the holistic development of the society”

DEPARTMENT OF BUSINESS ADMINISTRATION (HUMAN RESOURCE): A PRELUDE

The Department of Business Administration (Human Resource) is one of the youngest departments of the university. In 1979, a one-year full time Post Graduate Diploma Course in Industrial Relations and Personnel Management was introduced in the Department of Commerce with financial assistance from the University Grants Commission. This one-year P.G. Diploma Course was subsequently upgraded to a 2-year full-time post graduate course in Human Resource Management leading to the MBA (HR) Degree from the year 2000. This course has been approved by the All India Council for Technical Education (AICTE). Since its inception, the MBA (HR) programme was a part of the Department of Commerce of this university. Subsequently, in the year 2009, the Department of Business Administration (Human Resource) was formed. The department has a dedicated group of faculty members having expertise in different areas of human resources and general management.

ABOUT THE MBA (HR) PROGRAMME

The specific-objective of MBA (HR) course is to turn out a cadre of professionals with the requisite insight and expertise to manage human resources of an organization as asset and ensure their best contribution to the achievement of organizational goals. The course curriculum is regularly revised and updated in order to cater to the needs of the society in general and the industry in particular. The course curriculum has been revised and updated in 2014. The latest course structure and programme administration of the MBA (HR) are as follows:

COURSE STRUCTURE

MBA (HR) 1st SEMESTER

Paper Code

HR-101: Management Process & Organisation Theory (MPOT)

HR-102: Individual Behaviour in Organisation (IBO)

HR-103: Managerial Economics (ME)

HR-104: Accounting and Finance (A&F)

HR-105: Business Environment (BE)

HR-106: Human Resource Management (HRM)

HR-107: Managerial Communication and Skill Development (MCSD)

HR-108: Quantitative Techniques in Human Resource Management (QT)

MBA (HR) 2nd SEMESTER

HR-201: Research Methodology (RM)
HR-202: Corporate Social Responsibility and Business Ethics (CSR & BE)
HR-203: Marketing Management (MM)
HR-204: Production and Operations Management (POM)
HR-205: Economics of Human Resources (EHR)
HR-206: Managing Interpersonal and Group Processes (MIGP)
HR-207: Fundamentals of Industrial Relations (FIR)
HR-208: Summer Project

MBA (HR) 3rd SEMESTER

HR-301: Strategic Management (SM)
HR-302: Entrepreneurship Development (ED)
HR-303: Human Resource Information System (HRIS)
HR-304: Human Resource Planning and Development (HRPD)
HR-305: Training and Development (TD)
HR-306: Performance Management and Competency Mapping (PMCM)
HR-307: Compensation and Reward Management (CRM)
HR-308: Labour Laws-I (LL-I)

MBA (HR) 4th SEMESTER

HR-401: Organisational Change and Development (OCD)
HR-402: Strategic Human Resource Management (SHRM)
HR-403: Contemporary Employment Relations (CER)
HR-404: Human Capital Management & HR Audit (HCM&HRA)
HR-405: Labour Laws-II (LL-II)
HR-406: Cross Cultural and International Human Resource Management (CC IHRM)
HR-407: Dissertation/ Industrial Training on Contemporary Issues in Human Resource Management (70 marks) & Field Study (30 marks)
HR-408: Grand Viva

PROGRAMME ADMINISTRATION:

- Each semester will be of six months duration including the semester-wise exam.
- Total marks for the entire programme: 3200 marks
- Each paper carries 100 marks of which 20 % will be reserved for internal assessment for all theoretical papers and the remaining 80 % will be for written examination. Internal Assessment will be made during the semester on the basis of attendance (25%) and assignment/class test/viva (75%).
- Emphasis will be give on case study-based teaching in the relevant papers of the course curriculum.
- For paper HR-208 (Summer Project), students will be required to undergo summer training of 4-6 weeks duration in an industrial, business or service organisation by taking up a project study. Each student will be required to submit

MBA (TOURISM) Syllabus

The Programme of study for the MBA (Tourism) shall normally extend over a period of two academic years, each academic year comprising of two semesters, and each semester comprising of sixteen weeks of class work. No student shall normally be permitted to obtain Degree earlier than four semesters.

Medium of Instruction:

The medium of instruction shall be English for all subjects.

Credit details:

- A. There shall be three categories of Papers viz., Compulsory Papers, Specialization Papers, and Open Elective Papers.
- B. Dual Specialization will be offered to the students out of “Tour Packaging & Operation Management”, “Event Management”, “Hotel Management”. The combinations of Dual specializations to be offered to the students will be decided every year by the Departmental Committee after making a trade off between Market Demand & class load of the faculty. In each specialization a student will have to undertake a total of 3 papers under dual specialization, two papers in 3rd and one paper in 4th semester.
- C. Department will offer Open Elective Papers in 2nd and 3rd semester to the students. Students are required to undertake one paper each in both 2nd and 3rd semester. The open elective paper to be offered to the students will be decided every year by the Departmental Committee.
- D. The students shall compulsorily undertake the Practical Tourism during the 2nd semester classes (the exact period of the commencement of practical tourism will be announced by the department every year). The project report in 4th Semester will lead to a dissertation on the basis of 6 weeks training undertaken in a Travel & Tourism organization.
- E. Total credits of MBA (Tourism) Programme is 100

MBA (TOURISM) CREDIT DISTRIBUTION					
Category	Minimum Credit to be covered				Total Credit to be earned
	Semester I	Semester II	Semester III	Semester IV	
CORE PAPERS	28	20	08	08	64
SPECIALIZATION PAPERS	--	--	16	08	24
OPEN ELECTIVE PAPER	--	--	04	--	04
PROJECT REPORT Including Community Engagement Program	--	04	--	02	06
				+ 02	02
TOTAL	28	26	26	20	100

Evaluation:

- A. Each paper would have two components- the first being Internal Assessment Marks and the second being the Semester End Examination Marks. The Internal Assessment marks are based on continuous internal assessment. The total marks for the Internal Assessment would be based on the total credit awarded to the paper. Out of the total marks of 100 (4 Credit) for such a course, 20 marks shall be earmarked for continuous Internal Assessment and remaining 80 marks for the semester end examination. However, in case of project based papers, the distribution of marks will be 80 marks for Project Report and 20 marks for viva-voice. This paper in the 4th Semester will include Social Outreach Program carrying 02 credits.

FIRST SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 101	Management Process & Organizational Behaviour	20	80	100	4	4
MBT- 102	Tourism Economics	20	80	100	4	4
MBT- 103	Tourism Concept & Impacts	20	80	100	4	4
MBT- 104	Indian History Art, Culture & Architecture	20	80	100	4	4
MBT- 105	Geography and International Tourism	20	80	100	4	4
MBT- 106	Transport in Travel & Tourism	20	80	100	4	4
MBT- 107	Communication Skill Development	10	40	50	2	2
MBT- 108	Tourism Resources of West Bengal	10	40	50	2	2

SECOND SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 201	Tourism Products of India	20	80	100	4	4
MBT- 202	Travel Agency & Tour Operations Management	20	80	100	4	4
MBT- 203	Tourism Marketing	20	80	100	4	4
MBT- 204	Information Technology & Tourism	20	80	100	4	4

MBT- 205	Managerial Communication Skill Development	10	40	50	2	2
MBT- 206	Hotel Management	10	40	50	2	2

PROJECT

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 207	PRACTICAL TOURISM	20	80	100	4	4

THIRD SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 301	Air Fares & Ticketing	20	80	100	4	4
MBT-302	Sustainable & Eco Tourism	20	80	100	4	4

OPEN ELECTIVE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 303	Computerized Reservation System	10	40	50	2	2
MBT- 304	Tour Guiding and Visitor Interpretation	10	40	50	2	2

SPECIALIZATION

Tour Packaging & Operation Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3101	INTRODUCTION TO TOUR PACKAGE OPERATION	20	80	100	4	4
MBT-3102	PLANNING FOR TOUR PACKAGING	20	80	100	4	4

Event Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3201	UNDERSTANDING EVENT	20	80	100	4	4
MBT-3202	MANAGING EVENT	20	80	100	4	4

Hotel Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3301	FRONT OFFICE & HOUSE KEEPING MANAGEMENT	20	80	100	4	4
MBT-3302	HOTEL OPERATION	20	80	100	4	4

Minor Elective Paper

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3501	Adventure Tourism	10	40	50	2	2
MBT-3502	Tourism Entrepreneurship	10	40	50	2	2

FOURTH SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 401	Research Methodology	20	80	100	4	4
MBT- 402	Tourism Policy, Planning & Development	20	80	100	4	4

PROJECT

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 403	Project report & Grand Viva including Social Outreach Program	20	80	100	4	4

SPECIALIZATION

Tour Packaging & Operation Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 4101	MANAGING TOUR PACKAGE OPERATION	20	80	100	4	4

Event Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 4201	DESTINATION MARKETING	20	80	100	4	4

Hotel Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 4301	RESORT PLANNING & DEVELOPMENT	20	80	100	4	4

MBA (TOURISM) Syllabus

The Programme of study for the MBA (Tourism) shall normally extend over a period of two academic years, each academic year comprising of two semesters, and each semester comprising of sixteen week of class work. No student shall normally be permitted to obtain Degree earlier than four semesters.

Medium of Instruction:

The medium of instruction shall be English for all subjects.

Credit details:

a. There shall be three categories of Papers viz., Compulsory Papers, Specialization Papers, and Open Elective Papers.

b. Dual Specialisation will be offered to the students out of "Tour Packaging & Operation Management", "Event Management", "Hotel Management". The combinations of Dual specializations to be offered to the students will be decided every year by the Departmental Committee after making a tradeoff between Market Demand & class load of the faculty. In each specialization a student will have to undertake a total of 3 papers under dual specialization, two papers in 3rd and one paper in 4th semester.

c. Department will offer Open Elective Papers in 2nd and 3rd semester to the students. Students are required to undertake one paper each in both 2nd and 3rd semester. The open elective paper to be offered to the students will be decided every year by the Departmental Committee.

d. The students shall compulsorily undertake the Practical Tourism during the 2nd semester classes (the exact period of the commencement of practical tourism will be announced by the department every year). The project report in 4th Semester will lead to a dissertation on the basis of 6 weeks training undertaken in a Travel & Tourism organization.

e. Total credits of MBA (Tourism) Programme is 100

MBA (TOURISM) CREDIT DISTRIBUTION					
Category	Minimum Credit to be covered				Total Credit to be earned
	Semester I	Semester II	Semester III	Semester IV	
CORE PAPERS	28	20	08	08	64
SPECIALIZATION PAPERS	--	--	16	08	24
OPEN ELECTIVE PAPER	--	02	02	--	04
PROJECT REPORT	--	04	--	04	08
TOTAL	28	26	26	20	100

Evaluation:

a. Each paper would have two components- the first being Internal Assessment Marks and the second being the Semester End Examination Marks. The Internal Assessment marks are based on continuous internal assessment. The total marks for the Internal Assessment would be based on the total credit awarded to the paper. Out of the total marks of 100 (4 Credit) for such a course, 20 marks shall be earmarked for continuous Internal Assessment and remaining 80 marks for the semester end examination. However, in case of project based papers, the distribution of marks will be 80 marks for Project Report and 20 marks for viva-voce. MBT303 (Computerized Reservation System) paper has computer based laboratory work content and hence the students would be evaluated on their progress during the course by the internal faculty member and there will not be separate end semester examinations.

FIRST SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 101	Management Process & Organizational Behaviour	20	80	100	4	4
MBT- 102	Tourism Economics	20	80	100	4	4
MBT- 103	Tourism Concept & Impacts	20	80	100	4	4
MBT- 104	Indian History Art, Culture & Architecture	20	80	100	4	4
MBT- 105	Geography and International Tourism	20	80	100	4	4
MBT- 106	Transport in Travel & Tourism	20	80	100	4	4
MBT- 107	Communication Skill Development	10	40	50	2	2
MBT- 108	Tourism Resources of West Bengal	10	40	50	2	2

SECOND SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 201	Tourism Products of India	20	80	100	4	4
MBT- 202	Travel Agency & Tour Operations Management	20	80	100	4	4
MBT- 203	Tourism Marketing	20	80	100	4	4
MBT- 204	Information Technology & Tourism	20	80	100	4	4
MBT- 205	Managerial Communication Skill Development	10	40	50	2	2
MBT- 206	Hotel Management	10	40	50	2	2

PROJECT

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 207	PRACTICAL TOURISM	20	80	100	4	4

OPEN ELECTIVE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 208	Adventure Tourism	10	40	50	2	2
MBT- 209	Tourism Entrepreneurship	10	40	50	2	2

THIRD SEMESTER**CORE PAPERS**

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 301	Air Fares & Ticketing	20	80	100	4	4
 MBT- 302	Sustainable & Eco Tourism	20	80	100	4	4

OPEN ELECTIVE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 303	Computerized Reservation System	10	40	50	2	2
MBT- 304	Tour Guiding and Visitor Interpretation	10	40	50	2	2

SPECIALIZATION

Tour Packaging & Operation Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3101	INTRODUCTION TO TOUR PACKAGE OPERATION	20	80	100	4	4
MBT-3102	PLANNING FOR TOUR PACKAGING	20	80	100	4	4

Event Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3201	UNDERSTANDING EVENT	20	80	100	4	4
MBT-3202	MANAGING EVENT	20	80	100	4	4

Hotel Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT-3301	FRONT OFFICE & HOUSE KEEPING MAN AGEMENT	20	80	100	4	4
MBT-3302	HOTEL OPERATION	20	80	100	4	4

FOURTH SEMESTER

CORE PAPERS

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 401	Tourism Policy, Planning & Development	20	80	100	4	4
MBT- 402	Research Methodology	20	80	100	4	4

PROJECT

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 403	Project report & Grand Viva	20	80	100	4	4

SPECIALIZATION

Tour Packaging & Operation Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 4101	MANAGING TOUR PACKAGE OPERATION	20	80	100	4	4

Event Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 4201	DESTINATION MARKETING	20	80	100	4	4

Hotel Management

Paper Code	Name of the Paper	Internal Mark	Semester end Examination Mark	Total Mark	Teaching Hour per Week	Credit
MBT- 4301	RESORT PLANNING & DEVELOPMENT	20	80	100	4	4



The University of Burdwan

Dept. of Microbiology,

New CBCS Syllabus for M.Sc. Microbiology Course: Effective from 2020- 2022 session onwards.

Programme Employability of the M.Sc. Microbiology Syllabus

Modification of curriculum is carried out on a regular basis to cope with the latest development and discoveries in the field of Microbiology and to make the course effective and relevant to the local/ national and global developmental needs.

Microorganisms are omnipresent. The whole biosphere depends on the activities of microorganisms and they influence human society in countless ways. Role of microorganisms is indispensable in the field of medicine, agriculture, food & beverages, leather, space research, bioremediation, biomass production etc. Regular up gradation of the course curriculum is necessary to develop trained personnel to apply modern technologies and knowledge for exploiting microbes for mankind in a more meaningful way and to face the challenges in those fields. Students of this course will acquire knowledge not only on basic principles and techniques of bacteriology, virology, mycology, immunology and parasitology, but also will be familiar with the application of their knowledge to improve crop productivity, to discover novel and effective medicines against newly emerging deadly pathogens, to apply microbes for the development of fuel, for decreasing greenhouse gasses, for the production of cosmetics that protect skin from damaging UV rays and what not. To give them a preliminary idea about research, project work, seminar lecture and review writing are integral part of the curriculum. Social outreach is a compulsory course to make the students familiar with the actual scenario of our society. Through their laboratory courses they will be familiar with laboratory safety rules and will be expert in routine and specialized microbiological skills including accurately reporting statistically valid observations and analysis applicable to clinical, industrial and agricultural research. Hopefully, this course will make students able to communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing, making them eligible for higher

studies, jobs in various sectors and entrepreneurship development in the field of Microbiology.

Program Outcome

On completion of the Post Graduate Degree Programme a student should be able to acquire the following outcome-

Subject knowledge-

Expected to acquire comprehensive knowledge and understanding of the subject studied in the Masters Programme which will make them eligible for higher studies, jobs in various sectors and entrepreneurship development in the field of study.

Research Related Skills

It is expected that the students should be skilled in identifying problems based on review of the progress and development in that particular field and to identify the lacuna. They should be skilled in data searching using various electronic tools available at present. Hopefully they will be able to plan and design the experiment and to explain the obtained data using various statistical and graphical tools.

Communication Skill

A student should be capable of expressing acquired knowledge vividly and briefly, both verbally and in writing and be able to present complex information in a clear and concise manner. They must have the ability to express their thoughts and ideas confidently and convincingly both to the subject experts and to the common people.

Critical Thinking

Students are expected to develop analytical skills and critical thinking to solve real life problems using their acquired knowledge base.

Moral and Ethical awareness

A student should be familiar with the dos and don'ts during use of his knowledge in practical life and should have preliminary ideas about various types of Intellectual property rights related issues.

PSO of the Department of Microbiology, The University of Burdwan

Ability to develop and inculcate basic knowledge and understandings on the origin of life and Prokaryotic microorganisms (both Bacteria & Archaea) and eukaryotic microorganisms (mainly algae, fungi, Protozoa and helminths); of various fundamental metabolic reactions (both anabolic & catabolic), operating among microorganisms with special emphasis to their occurrence, significance and implications; of various fundamental metabolic reactions (both anabolic & catabolic), operating among microorganisms with special emphasis to their occurrence, significance and implications; of laboratory work ethics, safety and experiment designing as well as practical skills related to general microbiology, biochemistry and of microbial metabolism through practical experiments and skill development.

To develop and inculcate basic understanding of concept of information molecule, detail knowledge of central dogma of molecular genetics as well as DNA damage, repair and regulation of gene expression; of cell biology (with special emphasis to cell signaling, host-parasite interaction and cancer biology) and Microbial genetics; of statistics and bioinformatics towards solving biological problems; of fundamental concept on principal and application of various biochemical, microbiological and molecular techniques that are used for studying microorganisms, analytes, metabolites as well as their structural, biochemical and molecular aspects; Practical skills related to molecular biology, microbial genetics, bioinformatics and statistics and their application towards solving biological problems

Ability to develop and inculcate basic understanding of Industrial Microbiology (with special emphasis to bioreactors, fermentation, downstream processing, metabolite production and recovery) and Recombinant DNA technology (concept of RDT with special emphasis to various tools, technique, methods as well as multi omics approaches that are currently involved in RDT); of role of microorganisms and viruses in sustainable agriculture, plant microbe interactions and biology of plant pathogenic microorganisms; of microbial ecology, its functioning; soil, air, water and waste water microbiology; basic practical skills related to experiments that come within the domains of Recombinant DNA technology and Industrial microbiology; of the subject of Microbiology to post graduate students of other Programs who are opting this as choice; of advanced specialized knowledge based skill on experiments related to agriculture & environmental microbiology or microbial genetics and genomics; of food microbiology and concept of intellectual property rights, patents, copyright etc., as well as Biosafety and bioethics or additional skills based on specific knack, choice and interest of the candidate student to be availed from SWAYAM portal; of societal outreach to develop skill, confidence for employment, spreading importance of the subject in the society through teaching learning hands on experimental techniques etc and finally ability to develop interest, knowledge through interaction with scientists/ academicians in greater way to choose livelihood get motivated towards science and take up science/ research as career through educational tour to well known academic and or Research institutes, industries, production plants companies etc.

Ability to develop basic concept of immune system, its components, types, functioning and response; clinical immunology, antigen-antibody interactions; of medical microbiology (with emphasis on microbial infections, pathogenicity, bacterial resistance to host immune system and antibiotics; drug discovery; clinical development of biological and development of novel antimicrobials; of practical skills related to experiments that come within the domains of immunology and medical microbiology; of practical skills that come within the domains of Food Microbiology, IPR and Biosafety or practical skills related to experiments that come within the domains of advanced agriculture Microbiology; of Scientific writing through review write up on recent scientific problems related to microbiology; of advanced knowledge, technical knowhow etc for advanced food microbiology finally, ability to provide training so that each student can develop into independent experimental microbiologist through scientific writing,, hypothesis framing, experiment execution, designing of experiments and deduce result with suitable interpretations, depending upon observed records.

Course outcomes:

Microbiology is the study of microorganisms like bacteria, viruses, fungi, algae and protozoa. Microbes has both beneficial and harmful effect on human civilization. Many of them are extremely useful for the production of medicines, alcoholic beverages, aminoacids, industrial enzymes, various types of fermented food etc. Now a days various types of microbes are used as biofertilizaer, probiotics, bioremediation agent, for extracting metals from ores; in water purification, in space reserach and what not. On the other hand some pathogenic bacteria, fungi and virus causes deadly diseases in humans, animals and plants that sometimes causes havoc. After Covid-19 pandemic, even a layman can understand the devastating power of this invisible enemies. Thus the science of microbiology has an important role to play in health, agriculture, food, environment and many bio-industries. Several discoveries in recent years have put Microbiology on the centre stage of teaching, research and development golbaly. The Choice Based Credit System (CBCS) curriculum for Microbiology has now been developed into a new system called Learning Outcome Curriculum Framework (LOCF) under the recommendations and guidance of University Grants Commission (UGC). It is envisaged that the students trained under this curriculum will have the required attributes of knowledge, skills, temperament and ethics related to the subject of Microbiology. Besides the contents of the curriculum, the teaching learning processes have also been designed to achieve these attributes. A variety of learning assessment tasks such as Preparation of Review and Project, Industrial tour etc. have been included in the curriculum. Besides assessing the knowledge/skills acquired by the students, these tasks would also help to supplement the teaching learning processes. There are 18 core courses which includes all important aspects of the discipline of Microbiology and are all compulsory courses. The choice based General Elective (GE) course is designed to inculcate basic knowledge of Microbiology to the students of other post graduate programmes. The Generic Elective Courses (GEC) are designed to impart comprehensive understanding of Microbiology to students from other disciplines. The Microbiology students will have the choice to select GE courses from other disciplines depending on their interest and passion besides Microbiology. A number of skill based discipline centric Elective (DE) courses are included to develop skills in areas which have direct relevance to employability in food and pharmaceutical industries, diagnostics, health, agriculture and environment-related job opportunities in Microbiology. Online Courses (OLC) which are available on NPTEL or SWAYAM portals under MOOCS being developed by MHRD are included as optional programme to provide opportunity to the most disadvantaged students. The online courses would also inculcate the habit of self-study at their own pace by the students and also acclimatize them to future technologies of learning process.

**Course Specific Outcomes of M.Sc. in Microbiology under The University of Burdwan
Semester-I**

Course Code	Course Title	Outcome
MSMI101	Prokaryotic Microorganisms	- Understanding the origin and evolution of biomolecules and prokaryotic organisms. - Exploration and identification of the microbial diversity including archaea and bacteria. - Learning the microbial cellular organization, microbial physiology and microbial growth and strategies for their exploitation and prevention.
MSMI102	Acellular and eukaryotic microorganisms	- Understanding the identification, structural organization and molecular regulation of viruses, pathogenesis and prevention of viruses, vaccine development against the viruses. - Understanding the pathogenesis and prevention against certain medically important viruses creating worldwide pandemics. - Gathering knowledge about identification and characterization of certain eukaryotic microbes like algae and fungi, along with their ecological and economic significance. - Identification and characterization of the medically-significant protozoa and helminthes.
MSMI103	Biochemistry	- Understanding the structural organization of biological macromolecules including nucleic acid, protein, lipid. - Gathering knowledge about fundamental biochemical reactions and interactions between biomolecules.
MSMI104	Microbial Metabolism	Acquiring knowledge about metabolic pathways, their regulations along with their role in the interaction with surrounding environmental factors.
MSMI105	General Microbiology.	- Identification and characterization of certain prokaryotic and eukaryotic microbes. - Demonstration of key practical skills and expertise in working with microbes for experimental purpose along with learning of good microbiological practices.
MSMI106	Biochemistry & Microbial Metabolism	- Preparative and analytical approaches for working with biological macromolecules. - Development of expertise for biochemical high throughput techniques for experimental purpose and understanding the fundamental biochemical laboratory practices

**Course Specific Outcomes of M.Sc. in Microbiology under The University of Burdwan
Semester-II**

Upon successful completion of the course, students are expected to be able to:

Course Code	Course Title	Outcome
MSMI201	Molecular	Understand the scientific process, in the context of learning the

	Biology	fundamental biological and chemical 'facts' of molecular biology. • Will become knowledgeable regarding the properties of the major classes of molecules found in living organisms, and the relationship between molecular structure and their biological function. • Understand about the organization of prokaryotic, eukaryotic, viral genomes and regulation of genome replication. • Can describe and discuss the molecular mechanism of prokaryotic and eukaryotic DNA replication, Transcription and Translation mechanisms. • Develop concepts on prokaryotic gene expression, control of gene expression, operons, DNA damage- repair mechanisms and cell cycle. • Learn RNA synthesis and function of different types of RNA. • Explain post transcriptional and post translational modifications in eukaryotes; inhibition factors of protein synthesis, genetic code and protein folding.
MSMI202	Cell Biology & Microbial Genetics	• Competently explain importance of plasmid, their types, replication, and copy number control, distribution and plasmid addiction systems in bacteria. • Gain knowledge on transposons present in prokaryotes, their mechanism of transposition, types and role of retrotransposons. • Have detail knowledge on the various methods of genetic recombination in bacteria. • Discuss the molecular mechanisms underlying mutations, detection of mutations, mutation types, rate and frequency; isolation and selection of mutants. • Will understand host-parasitic interactions, behavioural changes of the host due to infection, cell transformation by virus, pathogen induced diseases in plants & animals. • Know different cellular components in cell signalling, communication (bacterial two component system) and quorum sensing. • Comprehend the biology, genetics and therapy of cancer. They will know the mechanisms of apoptosis.
MSMI203	Statistics and Bioinformatics	• Apply the principles of statistics for designing microbiological experiment, statistical analysis, and interpretation of results. • Operate and solve exercise using computation statistics software. • Get acquainted with operating systems and programming language along with their importance (Windows/Unix/Linux); C programming and its applications in sequence analysis. • Develop concepts of biological databases, sequence analysis and

		similarity searching via various online servers, scoring matrices; basics of phylogenetic tree and software used; software for epitope, promoter and gene prediction. Also learn data mining tools with their applications and comparative analysis. • Comprehend methods and software used for protein structure prediction and analysis, and protein visualization tools. • Develop basic idea of bacterial genome sequencing, assembly, annotation and in silico comparative genomics; Preliminary idea about computer aided drug designing and molecular dynamic simulation of proteins.
MSMI204	Principles Microbial techniques	• Develop conceptual knowledge on principle and application of various biochemical, microbiological and molecular biology techniques that are used for studying microorganisms, analytes, metabolites as well as their structural, biochemical and molecular aspects. • Able to explain the standard operating procedure of various laboratory instruments. • Pertain the theory, principles of microscopic, chromatographic, electrophoretic, spectrophotometric and radioisotopic, x-ray crystallographic techniques. • Will gain knowledge regarding PCR, DNA sequencing and protein sequencing methods.
MSMI205	Molecular Biology & Microbial Genetics	• Competent in basic practical skills related to molecular biology and microbial genetics. • Perform experiments to estimate the purity & concentration of DNA, induction of mutation and curing of plasmid. • Acquire Knowledge in preparation of competent bacterial cells and transformation of E. coli. • Collection of metagenome from different samples & its analysis by agarose gel electrophoresis. • Learn Primer designing and amplification of gene by PCR technique.
MSMI206	Statistics and Bioinformatics	• Develop practical skills, working knowledge and applicability of statistics for biological problems. • Exposure to different sequence/structural/genome database through web server, different protein structure visualization tool and different sequence analysis software. • Writing different programmes in C/Perl for sequence handling/manipulation

Course specific outcome (CSO) of Semester-III of M.Sc. Microbiology (CBCS) course curriculum

Course code	Course title	Outcome
Core paper MSMI 301	Industrial Microbiology and Recombinant	• Upon successful completion of the course, the student: • Will be aware of various fermentation protocols for production of microbial biomass and products like amino acids, enzymes, antibiotics, biofuels, steroids, wine etc.

	DNA Technology	• Will have gained insight on industrially important microbes. • Understands the concept of various fermentation methods, principles of batch and continuous processes, learns about the design, types of fermenters and various critical components of bioreactors. • Understand the basic tools and techniques of rDT. • Will gain knowledge on DNA finger-printing and DNA & protein sequencing techniques. • Will be aware of calculations and tools used in rDT.
Core paper MSMI 302	Agriculture Microbiology and Environmental Microbiology	• By the completion of this course, the students will be able to learn: • Basics of ecology, microenvironment and microbial interactions within ecosystems including extremophiles and their environments. • Different types of environments and habitats where microorganisms grow which include details of air, soil and marine microbiology. • The important roles microorganisms play in maintaining healthy environment by degradation of solid/liquid wastes; how these activities of microorganisms are used in sewage treatment plants, production of activated sludge and functioning of septic tanks. • Have understood the significance of BOD/COD and various tests for accessing quality of water. • Know about various interactions between plants & their pathogens, biofertilizers and bioinsecticides.
Core paper (Practical) MSMI-303	Industrial Microbiology & Recombinant DNA Technology	• By the completion of this course, the students will get practical knowledge on various techniques of rDT and microbial techniques like: • Restriction digestion and restriction mapping. • Primer designing, PCR, RFLP, RAPD. • Gene Cloning, southern blotting. • Isolation & analysis of RNA. • Enzyme and whole cell immobilization technique. • Isolation, purification and analysis of polysaccharide. • Wine production.
GE Paper MSMI- 304	Introduction to General & Applied Microbiology	• By the completion of this course, the students will be able to learn: • Microbial diversity and their applications for the benefit of mankind. • Extremophiles, their application and relation with astrobiology. • Metabolomics. • Chromatin remodeling and epigenetics

		• Various web-based tools of bioinformatics and their applications.
DE paper (Practical) MSMI-305-I	Agriculture & Environmental Microbiology	• Isolation and identification of rhizospheric microbial populations and detection of IAA and siderophore, phosphate solubilisation by them. • Study of VAM and lichen. • Bio-sorption of dyes. • Enumeration of microorganisms from air and PPFM from phyllosphere.
DE paper MSMI-305-II	Advance Microbial Genetics	• By the completion of this course, the students will be able to learn: • Prokaryotic and eukaryotic genome organization. • Mutation. • Gene recombination and transfer mechanism. • Plasmids and bacteriophages.
DE paper MSMI-306-I	Food Microbiology and IPR, Biosafety and Bioethics	• By the completion of this course, the students will be able to learn: • History and development of food microbiology and production of various fermented foods. • Food spoilage and food-borne infections. • Patents, bio-safety laws and IPR.
DE paper MSMI-306-II	SWAYAM Course	• These courses from various renowned institutes of India give students an opportunity to learn subjects of their choice from academic leaders.
MSMI-307 Credit compulsory paper	Social Outreach and Educational Tour	• Social outreach program helps students to apply their gained knowledge to different aspects of society, to share their knowledge to younger students. • Educational tour develops an understanding of various recent trends in the scientific world.

Course specific outcome (CSO) of Semester-IV of M.Sc. Microbiology (CBCS) course curriculum

Course code	Course title	Outcome
Core paper MSMI-401	Immunology	• To demonstrate the basic knowledge of immunological processes at a cellular and molecular level • To define central immunological principles and concepts of the key mechanisms and cellular players of innate and adaptive immunity and how they relate • To elucidate the genetic basis for immunological diversity and the generation of adaptive immune responses, mechanisms of inflammation. • To understand the principles governing vaccination and the mechanisms of protection against infectious diseases • To understand and explain the basis of immunological tolerance, autoimmunity, transplantation, allergy and allergic diseases • To understand and explain the immune system in cancer; tumor immunology and principles of immunotherapy. • To have knowledge on Antigen antibody interactions.

Core paper MSMI-402	Medical Microbiology	• Ability to develop and inculcate fundamental concept of step wise process of infection: Crossing physical, chemical and biological barriers, Colonization, Association, Adhesion and Invasion of host tissue and toxigenesis with details account of virulence factors. • To have knowledge on mechanisms of bacterial resistance to host cellular (phagocytosis) and humoral defenses. Antibiotic/Drug resistance-origin, cause and clinical implication. • To have idea on Molecular basis of bacterial pathogenecity and Antibiotic and chemotherapeutic agents. • To have knowledge on drug discovery, Clinical development of biological and Development of antimicrobial agents.
Core paper MSMI-403	Immunology & Medical Microbiology (Practical)	• Ability to develop and inculcate basic practical skills related to experiments that come within the domains of immunology and medical microbiology (including different types of assay and immunological methods, isolation and identification of some clinically important microbes and study of microbial flora of human body parts).
DE paper MSMI404-I	Food Microbiology, IPR and Biosafety (Practical)	• Ability to develop and inculcate basic practical skills related to experiments that come within the domains of the following: • Detection of bacterial load from different food sources, production of biofuels from natural sources, Isolations and identification of microbes in processed foods and mock patent filing.
DE paper MSMI404-II	Advance Agriculture Microbiology	• Ability to develop and inculcate basic skills related to experiments that come within the domains of advanced agriculture Microbiology (Microbes and soil fertility, Biological nitrogen fixation, Plant-microbe interactions, Bio-inoculants, Molecular plant pathology and plant diseases).
DE paper MSMI-405-I	Review	• Ability to develop independent scientific writing skill to find out scientific literature on a particular topic from different databases and make a detailed documentation on it so that it can help in finding new scientific problems which can be addressed through research.
DE paper MSMI-405-II	Advance Food Microbiology	• Ability to develop and inculcate the advanced knowledge, technical knowhow etc for advanced food microbiology through the concept of food spoilage, food preservation, different food-borne infections and fermented food products.
MSMI406	Project	• Ability to develop independent experimental microbiologist through scientific writing,, hypothesis framing, experiment execution, designing of experiments and deduce result with suitable interpretations, depending upon observed records.

THE UNIVERSITY OF BURDWAN

Syllabus for M.Sc. Course in Microbiology

First Semester <u>Theory Papers</u> Paper 101 - 50 marks (45 + 5*) Paper 102 - 50 marks (45 + 5*) Paper 103 - 50 marks (45 + 5*) Paper 104 - 50 marks (45 + 5*) <u>Practical Papers</u> Paper 105 - 50 marks (45 + 5*) Paper 106 - 50 marks (45 + 5*) Total marks – 300	Second Semester <u>Theory Papers</u> Paper 201 - 50 marks (45 + 5*) Paper 202 - 50 marks (45 + 5*) Paper 203 - 50 marks (45 + 5*) Paper 204 - 50 marks (45 + 5*) <u>Practical Papers</u> Paper 205 - 50 marks (45 + 5*) Paper 206 - 50 marks (45 + 5*) Total marks – 300
Third Semester <u>Theory Papers</u> Paper 301 - 50 marks (45 + 5*) Paper 302 - 50 marks (45 + 5*) Paper 303 - 50 marks (45 + 5*) Paper 304 - 50 marks (45 + 5*) <u>Practical Papers</u> Paper 305 - 50 marks (45 + 5*) Paper 306 - 50 marks (45 + 5*) Total marks – 300	Fourth Semester <u>Theory Papers</u> Paper 401 - 50 marks (45 + 5*) Paper 402 - 50 marks (45 + 5*) Paper 403 - 50 marks (45 + 5*) <u>Practical Papers</u> Paper 404 - 50 marks (45 + 5*) Paper 405 - 50 marks (35 marks practical + 15 marks industrial tour report) Paper 406 - Project Work 50 marks Total marks – 300
* indicates 10% marks of each Theory paper will be given on the basis of internal assessment Total marks for Semester I, II, III, IV - 1200	

Syllabus for Semester-I**Theory**

	Total : 300 marks	Total
Paper 101 : : Bacteriology	50 marks (45 + 5*)	50
Paper 102 : Acellular and eukaryotic microorganisms	50 marks (45 + 5*)	50
Paper 103 : Biomolecules, biochemistry and enzymology	50 marks (45 + 5*)	50
Paper 104: Microbial Metabolism ...	50 marks (45 + 5*)	50

Practical

Paper 105: General Microbiology	50 marks
Paper 106 Biochemistry & Bacterial Metabolism	50 marks

* =Internal assessment

Syllabus for Semester-II**Theory**

	Total : 300 marks	Total
Paper 201: Molecular Biology	50 marks (45 + 5*)	50
Paper 202: Microbial Genetics	50 marks (45 + 5*)	50
Paper 203: Biostatistics and Computer Application	50 marks (45 + 5*)	50
Paper 204: Physico-chemical principles & techniques	50 marks (45 + 5*)	50

Practical

Paper 205: Microbial Genetics	50 marks
Paper 206: Molecular Biology	50 marks

* =Internal assessment

Syllabus for Semester-III**Theory**

	Total: 300 marks	Total
Paper-301: Fermentation Technology	50 marks (45 + 5*)	50
Paper 302: Food & Industrial Microbiology	50 marks (45 + 5*)	50
Paper-303: Immunology	50 marks (45 + 5*)	50
Paper-304: Medical Microbiology	50 marks (45 + 5*)	50

Practical

Paper-305: Microbial Biotechnology 50 marks

Paper-306 : Medical Microbiology & Immunology 50 marks

=Internal Assessment*Syllabus for Semester-IV****Total: 300 marks****Theory**

		Total
Paper- 401: Recombinant DNA Technology	50 marks (45 + 5*)	50
Paper - 402: Bioinformatics & Bioethics	50 marks (45 + 5*)	50
Paper- 403: Agricultural & Environmental Microbiology	50 marks (45 + 5*)	50

Practical

Paper- 404: Recombinant DNA Technology & Bioinformatics	50 marks
Paper- 405: Agricultural, Environmental Microbiology	35 marks
& Report on Industrial Visit	15 marks
	(Total – 50 marks)

***=Internal Assessment**

Paper- 406- Project Work - 50 marks (Project Report 35 marks + Viva 15 marks)

SYLLABUS

M. Sc. Course In

MOLECULAR BIOLOGY AND HUMAN GENETICS

(With effect from the session 2021–2023)

[CHOICE BASED CREDIT SYSTEM]



**THE UNIVERSITY OF BURDWAN
BURDWAN, WEST BENGAL
713104, INDIA**

SYLLABUS
M. Sc. Course In
MOLECULAR BIOLOGY AND HUMAN GENETICS
Incorporation as per PSO and CSO

Summary of the course and credits

Semester I [Credits – 24]

Course				Lect. Hr /Week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMHG101	Core	T	Transmission Genetics & Basic Human Genetics	4T	2T	10	40	50	4
MSMHG102	Core	T	Biochemistry & Cell Biology	4T	2T	10	40	50	4
MSMHG103	Core	T	Computational Biology, Biostatistics & Evolutionary Genetics	4T	2T	10	40	50	4
MSMHG104	Core	T	Molecular Biology & Bio techniques	4T	2T	10	40	50	4
MSMHG105	Core	P	Lab work based on courses MSMHG101 & MSMHG102	4P	4P	10	40	50	4
MSMHG106	Core	P	Lab work based on courses MSMHG103 & MSMHG104	4P	4P	10	40	50	4
Total credit									24

T/P: Theory/Practical

Semester II [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMHG201	Core	T	Reproductive Biology & Developmental Genetics	4T	2T	10	40	50	4
MSMHG202	Core	T	Immunology & Immunogenetics	4T	2T	10	40	50	4
MSMHG203	Core	T	Molecular Human Genetics & Human Genome	4T	2T	10	40	50	4
MSMHG204	Core	T	Genetic Engineering Model Genetic Systems	4T	2T	10	40	50	4
MSMHG205	Core	P	Lab work based on courses MSMHG201 & MSMHG202	4P	4P	10	40	50	4
MSMHG206	Core	P	Lab work based on courses MSMHG203 & MSMHG204	4P	4P	10	40	50	4
Total credit									24

T/P: Theory/Practical

Semester III [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMHG301	Core	T	Bioinformatics & Omics	4T	2T	10	40	50	4
MSMHG302	Core	T	Clinical Genetics & Genetic Counselling	4T	2T	10	40	50	4
MSMHG303	Core	P	Lab work based on courses MSMHG301 & MSMHG302	4T	4P	10	40	50	4
MSMHG304	GE	T	Basic Principle of Genetics	2T	1T	5	20	25	2
MSMHG305	DEC	T	Discipline-centric Elective	4T	2T	10	40	50	4
MSMHG306	DEC	P	Lab work based on courses MSMHG305	4T.	4P	10	40	50	4
MSMHG307	CE	NA	Community Engagement Or Clinical Assignments	N.A.	N.A.	5	20	25	2
Total credit									24

T/P: Theory/Practical

CE: Community Engagement Activities; DE: Discipline-centric Elective; GE: Generic elective

*** Discipline-centric Elective (Student need to take any one of these Discipline-centric Elective)**

1. CANCER BIOLOGY (CORSE CODE: MSMHG 305-DE1)
2. INFECTION BIOLOGY (CORSE CODE: MSMHG 305-DE2)
3. MOLECULAR DIAGNOSTICS (CORSE CODE: MSMHG 305-DE3)
4. NANOBIO TECHNOLOGY (CORSE CODE: MSMHG 305-DE4)
5. STEM CELL AND REGENERATIVE MEDICINE (CORSE CODE: MSMHG 305-DE5)
6. One course of 4 credits from SWAYAM may be opted

**Based on the Departmental resource, student may be offered all, some or one DE for the particular session. If more than One DE courses are offered students may opt any of these DE course as per given selection criteria. New discipline-centric elective may be included, as per Departmental resource and appropriate steps. The concerned teachers and Department committee will formulate the detail content and take necessary modality for this purpose at that time.*

**** CORSE CODE: MSMHG 306-DE1, 306-DE2, 306-DE3, 306-DE4, 306-DE5,**

Community Engagement: Based on Discipline-centric Elective

Semester IV [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSMHG401	Core	T	Neurogenetics and Pharmacogenetics	4T	2T	10	40	50	4
MSMHG402	Core	T	Intellectual Property Rights, Biosafety and Bioethics	4P	2P	10	50	50	4
MSMHG403	Core	T	Project Proposal Preparation	2T	1T	10	40	50	4
MSMHG404	DE	T	Journal Club/ Communication Skills and Seminar Presentation	NA	NA	10	40	50	4
MSMHG405	DE	P	Research Lab / Biotech Industry visit and internship	NA	NA	10	40	50	4
MSMHG406	Project/Term paper	NA	Dissertation	NA	NA	0	50	50	4
Total credit									24

Notes on marks distribution:

- In each course, 20% marks is allotted for Internal Assessment (for both theory and practical's), i.e., 10 marks for a paper of 50 marks and 5 marks for a paper of 25 marks.
- Marks distribution for each paper will be as follows:
 - For **40** marks of **NON-UNIT** based paper:
Four questions (out of six) of 2 marks each, four questions (out of six) of 4 marks each and two questions (out of four) of 8 marks each are to be answered
 - For **40** marks of **UNIT** based paper:
UNIT I (Total Marks 20): *Four questions (out of six) of 1 mark each, two questions (out of four) of 4 marks each and one question (out of two) of 8 marks are to be answered*
UNIT II (Total Marks 20): *Four questions (out of six) of 1 mark each, two questions (out of four) of 4 marks each and one question (out of two) of 8 marks are to be answered*
 - For 20 marks of **NON-UNIT** based paper:
Four questions (out of six) of 1 mark each, two questions (out of four) of 4 marks each and one question (out of two) of 8 marks are to be answered

SYLLABUS FOR
M.Sc. COURSE IN NUTRITION AND PUBLIC HEALTH
(With effect from the session 2021–2023)
[CHOICE BASED CREDIT SYSTEM]



DEPARTMENT OF NUTRITION AND PUBLIC HEALTH
THE UNIVERSITY OF BURDWAN
BURDWAN, WEST BENGAL
713104, INDIA

Annexure-I

POST GRADUATE SYLLABUS
Department of NUTRITION AND PUBLIC HEALTH
Summary of the course and credits

Semester I [Credits – 24]

Course				Lect. /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSNP101	Core	T	Concept of Food, Nutrition and Public Health	4T	2h	10	40	50	4
MSNP102	Core	T	Nutritional Biochemistry and Physiology	4T	2h	10	40	50	4
MSNP103	Core	T	Nutrition and Human Development	4T	2h	10	40	50	4
MSNP104	Core	T	Epidemiology and Microbiology	4T	2h	10	40	50	4
MSNP105	Core	P	Nutritional Physiology and Biochemistry	4P	4h	10	40	50	4
MSNP106	Core	P	Microbiology	4P	4h	10	40	50	4
Total credit									24

T/P: Theory/Practical

Semester II [Credits – 24]

Course				Lect. /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSNP 201	Core	T	Pathophysiology and Dietetics	4T	2h	10	40	50	4
MSNP 202	Core	T	Nutritional Assessment and Community Nutrition Management	4T	2h	10	40	50	4
MSNP 203	Core	T	Parasitology and Medical Entomology	4T	2h	10	40	50	4
MSNP 204	Core	T	Public Health and Environment	4T	2h	10	40	50	4
MSNP 205	Core	P	Anthropometry and Diet Therapy	4P	4h	10	40	50	4
MSNP 206	Core	P	Eco-toxicology, Parasitology and Medical Entomology	4P	4h	10	40	50	4
Total credit									24

T/P: Theory/Practical

Semester III [Credits – 24]

Course				Lect. /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSNP 301	Core	T	Food Sanitation and Food Hygiene	4T	2h	10	40	50	4
MSNP 302	Core	T	Food-Commodities and Food Technology	4T	2h	10	40	50	4
MSNP 303	Core	P	Food preparation and Food technology	4P	4h	20	40	50	4
MSNP 304	GE	T	Choice Based	2T	1h	5	20	25	2
MSNP 305*	DE	T	Discipline-centric Elective	4T	2h	10	40	50	4
MSNP 306**	DE	P	Discipline-centric Elective	4P	4h	10	40	50	4
MSNP 307	CE	T/P	Community Engagement ##	N.A.	N.A.	5	20	25	2
Total credit									24

T/P: Theory/Practical

CE: Community Engagement Activities; DE: Discipline-centric Elective; GE: Generic elective

Discipline-centric Elective (Students need to take any one of these Discipline-centric Electives)*1. EPIDEMIOLOGY AND COMMUNITY HEALTH(COURSE CODE: MSNT 305-DE1)****Generic Elective (To be offered for other departments)**

- 1. Communicable diseases and their management**
- 2. Food technology and Food preservation**

****COURSE CODE: MSNP 306-DE1****##Community Engagement:** Based on Discipline-centric Elective**Semester IV [Credits – 24]**

Course				Lect. /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSNP 401	Core	T	Food Toxicology, Food-Preservation and Immunology	4T	2h	10	40	50	4
MSNP 402	Core	T	Biostatistics, Bioinformatics and Nutrigenomics	2T	1h	5	20	25	2
MSNP 403	Core	P	Food Toxicology, Immunology and Bioinformatics	4P	2h	05	20	25	2
MSNP 404#	DE	T	Discipline-centric Elective*	4T	2h	10	40	50	4
MSNP 405##	DE	T	Discipline-centric Elective*	4T	2h	10	40	50	4
MSNP 406###	DE	P	Discipline-centric Elective*	8P	4h	10	40	50	4
MSNP 407	Project	T / P	Dissertation\$\$ (Empirical or Non empirical)	NA	–	–	50	50	4
Total credit									24

*Based on Discipline-centric Elective taken in Semester -III

\$\$Based on Discipline-centric Elective

#DE Course Code: MSNP 404-DE1 ##DE Course Code: MSNP 405-DE1

###DE Course Code: MSNP 406-DE1

Department of Political Science
The University of Burdwan

Syllabus for the M.A. Degree in Political Science

(To be effective from the academic session 2020 – 2022)

Principles / Guidelines/ Rules
One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week. [UGC Guidelines on Adoption of CBCS]
Core Paper 75 credits
Departmental Optional courses / Major Electives 20 Credits
Inter-disciplinary Electives 4 Credits [Offered by other departments/SWAYAM platform as stipulated by the university regulations]
Community Engagement Course 2 Credits [Full Marks: 20+5=25]
Credit requirement for a PG Programme: 101 Credits
This syllabus contains 20 courses of 50 marks each with a total of 1000 marks and for Community Engagement Course there is an additional 20 marks. Total marks of this syllabus is 1020.
Each course has a nomenclature and an alpha-numeric code
Each student will have to take any two major elective courses both in Semester – III and in Semester – IV among three options in each major elective course.
Each student will have to take any one Interdisciplinary Electives in Semester – III mandatorily from other academic departments of the University of Burdwan/ SWAYAM platform.
All Core Courses and Major Elective Courses will have 5 Credits.
All Inter-disciplinary Electives will have 4 Credits.
Students of other departments, while opting for Inter-disciplinary Electives in Political Science, will have to get the approval of the Head of the Department.
As per University guidelines on the Restructuring of M.A. syllabus, "Students have to participate in the Community Engagement programmes/ activities of the department for the concerned year and follow it up with a written Report & Presentation and Viva-Voce. The main objectives are to develop an appreciation of rural culture, lifestyle and wisdoms among students, to learn about the states of various agricultural and rural development programmes, to understand causes for rural distress and poverty and explore solutions for the same and to apply class room knowledge of courses to field realities. Evaluation pattern would be as follows: Report writing: 20 marks + Internal: 05 marks= 25 [Full Marks]

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Name of Courses	Level MA Semester	Course Type	Course Code	Title of the Course	Credit L+T/ Pr
POL 101	I	Core Paper	MAPOL101	Indian Political Thought	4+1
POL 102	I	Core Paper	MAPOL102	Liberal and Post Liberal Political Theory	4+1
POL 103	I	Core Paper	MAPOL103	Comparative Politics: Principles and Approaches	4+1
POL 104	I	Core Paper	MAPOL104	Politics in South Asia	4+1
POL 105	I	Core Paper	MAPOL105	Indian Politics: Institutions and Processes	
POL 201	II	Core Paper	MAPOL201	Modern Western Political Thought	4+1
POL 202	II	Core Paper	MAPOL202	Marxist Political Theory	4+1
POL 203	II	Core Paper	MAPOL203	Theories of Public Administration	4+1
POL 204	II	Core Paper	MAPOL204	Research Methodology	4+1
POL 205	II	Core Paper	MAPOL205	Post Cold War International Relations	4+1
POL 301	III	Core Paper	MAPOL301	Public Policy	4+1
POL 302	III	Core Paper	MAPOL302	Political Sociology: Conceptual issues	4+1
POL 303 A	III	Major Elective	MAPOL303A	Comparative and Development Administration	4+1

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POL 303 B	III	Major Elective	MAPOL303B	Ethnic Politics and Nationhood in India	4+1
POL 303 C	III	Major Elective	MAPOL303C	India and Her Neighbours	4+1

POL 304 A	III	Major Elective	MAPOL304A	Issues of Citizencentric Administration in India	4+1
POL 304 B	III	Major Elective	MAPOL304B	Understanding Indian Politics	4+1
POL 304 C	III	Major Elective	MAPOL304C	India and the World	4+1
POL 305 A	III	Interdisciplinary Elective	MAPOL305A	Issues in Contemporary Political Theory	4 (L)
POL 305 B	III	Interdisciplinary Elective	MAPOL305B	Public Policy in India	4 (L)
POL 305 C	III	Interdisciplinary Elective	MAPOL305C	Politics of Human Rights	4 (L)
POL 400	IV	Core Paper	MAPOL400	Community Engagement	2 (Pr)
POL 401	IV	Core Paper	MAPOL401	State Formation and Political Regime	4+1
POL 402	IV	Core Paper	MAPOL402	Theories of International Relations	4+1
POL 403A	IV	Major Elective	MAPOL403A	Social Welfare Administration	4+1
POL 403 B	IV	Major Elective	MAPOL403B	India's Political Economy	4+1
POL 403 C	IV	Major Elective	MAPOL403C	Peace and Conflict Studies	4+1
POL 404 A	IV	Major Elective	MAPOL404A	Local Governance in India with Special Reference to West Bengal	4+1

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POL 404 B	IV	Major Elective	MAPOL404B	Social and Political Movements in India	4+1
POL 404 C	IV	Major Elective	MAPOL404C	International Law	4+1
POL 405	IV	Core Paper	MAPOL405	Project	4+1

M.A. (Political Science) Syllabus

First Semester

MAPOL101 [Core Paper]

Modern Indian Political Thought

1. Rammohun Roy: Liberal outlook
2. Bankim Chandra Chattopadhyay and Swami Vivekananda: Nationalism and Nation-building
3. Rabindranath Tagore and M.K. Gandhi: critique of western civilization and the state
4. Jawaharlal Nehru and Subhas Chandra Bose: democracy and socialism
5. Jaya Prakash Narayan: Socialist tradition
6. M.A. Jinnah : Two-Nation Theory
7. Savarkar: Hindutva
8. B.R. Ambedkar: Social Justice

MAPOL102 [Core Paper]

Liberal and Post Liberal Political Theory

1. Liberalism: various forms
2. Totalitarianism: Arendt and Talman
3. Liberty and Minimalist state: Hayek, Popper and Nozick
4. Theory of Justice: Rawls and Sen
5. Communitarianism: basic tenets; concept of civic republicanism
6. Multiculturalism: basic tenets; multiculturalism in the non-western world

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Syllabus for the M.A. Degree in Political Science

(To be effective from the academic session 2014 – 2016)

Principles / Guidelines/ Rules
1 Lecture of 1hour per week X 16 (14 – 16) = 1Credit
1 Lecture of 1hour = 2 Tutorial / Remedial Coaching
Core Paper 64 – 72 credit minimum
Credit requirement for a PG Programme: 82 – 96 Crdits
Each course has a nomenclature and an alpha-numeric code
Each student will be allowed to take any one major elective course in Semester – III and in Semester – IV among three options.
Each student will be allowed to take any one minor elective course in Semester – III and in Semester – IV among four options.
Students of other departments, while opting for minor elective course in Political Science, will have to get the approval of the Head of the Department.

Subject	Level	Course No.	Course Type	Course Code	Title of the Course	Credit L+T
Political Science	MA Semester - I	101	Core Paper	MAPOL101	Indian Political Thought	4+1
Political Science	MA Semester	102	Core Paper	MAPOL102	Liberal and Post Liberal Political Theory	4+1
Political Science	MA Semester - I	103	Core Paper	MAPOL103	Comparative Politics: Principles and Approaches	4+1
Political Science	MA Semester - I	104	Core Paper	MAPOL104	Politics in South Asia	4+1
Political Science	MA Semester - II	201	Core Paper	MAPOL201	Modern Western Political Thought	4+1
Political Science	MA Semester - II	202	Core Paper	MAPOL202	Marxist Political Theory	4+1
Political Science	MA Semester - II	203	Core Paper	MAPOL203	State Formation and Political Regime	4+1
Political Science	MA Semester - II	204	Core Paper	MAPOL204	Politics of India since Independence	4+1

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Political Science	MA Semester - III	301	Core Paper	MAPOL301	Theories of Public Administration	4+1
Political Science	MA Semester - III	302	Core Paper	MAPOL302	Conceptual issues in Political Sociology	4+1
Political Science	MA Semester - III	303	Core Paper	MAPOL303	Theories of International Relations	4+1
Political Science	MA Semester - III	304	Major Elective	MAPOL304	Issues of Citizen-centric Administration in India	4+1
Political Science	MA Semester - III	305	Major Elective	MAPOL305	Political Sociology of the States in India	4+1
Political Science	MA Semester - III	306	Major Elective	MAPOL306	Indian Foreign Policy	4+1
Political Science	MA Semester	307	Minor Elective	MAPOL307	Issues in Contemporary Political Theory	4+1
Political Science	MA Semester - III	308	Minor Elective	MAPOL308	Public Policy Studies	4+1
Political Science	MA Semester - III	309	Minor Elective	MAPOL309	Politics of Human Rights	4+1
Political Science	MA Semester - III	310	Minor Elective	MAPOL310	Strategic Studies in International Relations	4+1
Political Science	MA Semester - IV	401	Core Paper	MAPOL401	Local Government in India	4+1
Political Science	MA Semester - IV	402	Core Paper	MAPOL402	Post Cold War International Relations	4+1
Political Science	MA Semester	403	Core Paper	MAPOL403	Local Government in West Bengal	4+1
Political Science	MA Semester - IV	404	Major Elective	MAPOL404	Project, Presentation and	4+1

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					Participation	
Political Science	MA Semester - IV	405	Major Elective	MAPOL405	Social and Political Movements in India	
Political Science	MA Semester - IV	406	Major Elective	MAPOL406	International Law	4+1
Political Science	MA Semester	407	Minor Elective	MAPOL407	Post Modernism in Social Sciences	4+1
Political Science	MA Semester - IV	408	Minor Elective	MAPOL408	Poverty Alleviation and Social Inclusion in India: Select Programmes	4+1
Political Science	MA Semester - IV	409	Minor Elective	MAPOL409	Human Rights and Decentralization in India	4+1
Political Science	MA Semester - IV	410	Minor Elective	MAPOL410	Geopolitics	4+1

THE UNIVERSITY OF BURDWAN

MASTER OF ARTS (M.A.) PROGRAMME IN PHILOSOPHY (To be effective from the academic session 2020-2022)

PRINCIPLES/FORMULA/RULES
1 LECTURE OF 1 HOUR PER WEEK $\times$ (16 WEEKS) = 1 CREDIT
CORE COURSE—75 CREDITS
MAJOR ELECTIVE/SPECIAL COURSE—MINIMUM 20 CREDITS
INTERDISCIPLINARY COURSE—MINIMUM 4 CREDITS
COMMUNITY ENGAGEMENT—2 CREDITS
CREDIT REQUIRED FOR A PG COURSE:101 CREDITS
EACH PAPER SHOULD HAVE A NOMENCLATURE AND AN ALPHA-NUMERIC CODE
EACH PAPER OF 50 MARKS HAS 10 MARKS FOR INTERNAL ASSESSMENT (WRITTEN/VIVA-VOCE)
Our Mission: Philosophy helps us to understand the principles of events, occurrences and life-experiences. Pursuing M.A. program in Philosophy has far reaching impact on the spiritual development of the students. All branches of Philosophy for them have practical applicability for better living as humans in particular, and loving other species in general. Beside Metaphysics and Epistemology, Socio-political Philosophy, the study of Logic and Ethics from both Indian and Western perspectives have been very helpful for having a comprehensive view of life. In the M.A. programme in Philosophy 3 types of courses: Core Courses, Major Elective Courses (often called Special papers) and one Minor/Interdisciplinary Elective Course. Each course is adequately designed to give extra mileage for the UGC-NET/SET as well as for the placement of our students in our country and abroad. A Glimpse of the Programme: Aggregate Marks of the M.A. programme is 1025 marks, divided into 4 semesters. Each semester comprises 5 courses of 50 marks each and also our course entitled Community Engagement based on field work of 25 marks in Sem. IV. Each course of 50 marks (except Interdisciplinary elective, which is of 4 credits) will be of 5 credits, with 80% for final written examination and 20% for internal assessment (which includes written texts. Presentations, topic-specific assignments, group discussions and other mid-term tests as a part of continuous evaluation, maintaining the UGC norms.) These are some optional courses (here called Major Electives) providing students with a wider set of choices, as well as encouraging interdisciplinary learning. This M.A. programme has one core course on Research Methodology entitled Project Writing and another on Community Engagement.

LEVEL	COURSE NO.	COURSE TYPE	COURSE TITLE	COURSE CODE	PATTERN OF TEACHING HOUR Per Week (L:T:P)	CERDIT	MARKS
MA SEM-I	101	CORE COURSE	INDIAN CLASSIC	MAPHIL 101	5:0:0	5	50
	102	CORE COURSE	INDIAN EPISTEMOLOGY	MAPHIL 102	5:0:0	5	50
	103	CORE COURSE	WESTERN CLASSIC	MAPHIL 103	5:0:0	5	50
	104	CORE COURSE	WESTERN ETHICS	MAPHIL 104	5:0:0	5	50
	105	CORE COURSE	SOCIO-POLITICAL PHILOSOPHY: INDIAN	MAPHIL 105	5:0:0	5	50
MA SEM-II	201	CORE COURSE	INDIAN ETHICS	MAPHIL 201	5:0:0	5	50
	202	CORE COURSE	INDIAN METAPHYSICS	MAPHIL 202	5:0:0	5	50
	203	CORE COURSE	WESTERN EPISTEMOLOGY	MAPHIL 203	5:0:0	5	50
	204	CORE COURSE	WESTERN LOGIC	MAPHIL 204	5:0:0	5	50
	205	CORE COURSE	SOCIO-POLITICAL PHILOSOPHY: WESTERN	MAPHIL 205	5:0:0	5	50
MA SEM-III	301	CORE COURSE	INDIAN PHILOSOPHY OF LANGUAGE	MAPHIL 301	5:0:0	5	50
	302	CORE COURSE	WESTERN METAPHYSICS	MAPHIL 302	5:0:0	5	50
	303	MAJOR ELECTIVE /SPECIAL COURSE	A: NYAYA-VAIŚEṢIKA/ B: VEDANTA/ C: APPLIED ETHICS/ D: WESTERN LOGIC/ E: SĀṂKHYA-YOGA	MAPHIL 303 [A/B/C/D/E]	5:0:0	5	50
	304	MAJOR ELECTIVE /SPECIAL COURSE	A: NYAYA-VAIŚEṢIKA/ B: VEDANTA/ C: APPLIED ETHICS/ D: WESTERN LOGIC/ E: SĀṂKHYA-YOGA	MAPHIL 304 [A/B/C/D/E]	5:0:0	5	50
	305	INTERDISCIPLINARY ELECTIVE	PHILOSOPHY FOR REAL LIFE ISSUES	MAPHIL 305	5:0:0	4	50
MA SEM-IV	400	COMMUNITY ENGAGEMENT PROGRAMME	PHILOSOPHICAL COUNSELLING	MAPHIL400	0:0:5	2	20

	401	CORE COURSE	CONTINENTAL PHILOSOPHY	MAPHIL 401	5:0:0	5	50
	402	CORE COURSE	WESTERN PHILOSOPHY OF LANGUAGE	MAPHIL 402	5:0:0	5	50
	403	MAJOR ELECTIVE	A: NYAYA-VAIŚEṢIKA/ B: VEDANTA/ C: APPLIED ETHICS/ D: WESTERN LOGIC/ E: SĀMĀKHIA-YOGA	MAPHIL 403 [A/B/C/D/E]	5:0:0	5	50
	404	MAJOR ELECTIVE	A: NYAYA-VAIŚEṢIKA/ B: VEDANTA/ C: APPLIED ETHICS/ D: WESTERN LOGIC/ E: SĀMĀKHIA-YOGA	MAPHIL 404 [A/B/C/D/E]	5:0:0	5	50
	405	CORE COURSE	PROJECT WRITING	MAPHIL 405	0:0:5	5	50

SEMESTER-I
Full Marks: 250

CORE COURSE: MAPHIL101: INDIAN CLASSICS (Marks: 50)

[This course consists of two fundamental text books, one on the *Vaisesika* philosophy and the other on the *Jaina* philosophy. This study is meant for introducing our students with the *Vaisesika* and *Jaina* views of life and the world leading to liberation.]

(i) Praśastapāda : Padārthadharmaśaṁgraha (Six padārtha-s, both uddeśa and parīkṣā) (40 Hrs.)

(ii) Umāsvāti : Tattvārthasūtra (Selections, excluding Ch-VII) (40 Hrs.)

CORE COURSE: MAPHIL102: INDIAN EPISTEMOLOGY (Marks: 50)

[This core course comprises two text books on Indian epistemology, one is *Tattvacintamani* on the *Navya-Nyaya* and the other is *Nyayabindu* on the Buddhist philosophy. Here our students are taught to acquire knowledge regarding the validity of knowledge according to the *Navya-Nyaya* philosophy and the Buddhist logic and epistemology regarding valid sources of knowledge, which will help them to comprehend various situations in practical life.]

(i) Gaṅgeśa : *Tattvacintāmaṇi* (*prāmāṇyavāda* upto the end of “*naturajatatvenapurovar-tināmiti*”) (40 Hrs.)

(ii) Dharmakīrti : *Nyāyabindu* (Up to “*trirūpāni ca*”) (40 Hrs.)

CORE COURSE: MAPHIL103: WESTERN CLASSICS (Marks: 50)

[This course consists of a single text, viz., Kant’s *Critique of Pure Reason*. In this paper we try to instill into our students knowledge regarding Kant’s views on epistemology and metaphysics.]

Syllabus for the
MASTER OF ARTS (M. A.) PROGRAMME IN PHILOSOPHY
 (To be effective from the academic session 2014-2016)
 [Including MINOR ELECTIVE]

Principle/ Formula/Rule
1 Lecture of 1hour per week x(14-16)= 1 credit
1 Lecture of 1hour=2 Tutorial/Practical/Remedial Coaching
Core Course 60 – 70 credit points
Major Elective/ Special Paper 10 Credit minimum
Credit requirement for a PG Programme : 80-100 Credit points
Each paper shall have a nomenclature and an <i>alpha-numeric</i> code

Name of the PG Programme: MA in Philosophy
Name of the Subject: Philosophy

Level	Course No.	Course Type	Course Code	Course Title	Learning Hour distribution per week	Credit	Marks
					L: T: P		
MA Semester-I	101	Core Course	MAPHIL101	Indian Classics	4: 2:0	5	50
	102	Core Course	MAPHIL102	Indian Epistemology	4: 2:0	5	50
	103	Core Course	MAPHIL103	Western Classics	4: 2:0	5	50
	104	Core Course	MAPHIL104	Western Ethics	4: 2:0	5	50
MA Semester-II	201	Core Course	MAPHIL201	Indian Ethics	4: 2:0	5	50
	202	Core Course	MAPHIL202	Indian Metaphysics	4: 2:0	5	50
	203	Core Course	MAPHIL203	Western Epistemology	4: 2:0	5	50
	204	Core Course	MAPHIL204	Western Logic	4: 2:0	5	50
MA Semester-III	301	Core Course	MAPHIL301	Indian Philosophy of Language	4: 2:0	5	50
	302	Core Course	MAPHIL302	Western Metaphysics	4: 2:0	5	50
	303N	Major Elective, Special Course	MAPHIL303N	Prācīna Nyāya-I	4: 2:0	5	50
	304N	Major Elective, Special Course	MAPHIL304N	Prācīna Nyāya-II	4: 2:0	5	50
	303V	Major Elective, Special Course	MAPHIL303V	Advaita Metaphysics	4: 2:0	5	50
	304V	Major Elective, Special Course	MAPHIL304V	Dvaitādvaita and Dvaita Metaphysics	4: 2:0	5	50

	303E	Major Elective, Special Course	MAPHIL303E	Biomedical Ethics	4: 2:0	5	50
	304E	Major Elective, Special Course	MAPHIL304E	Socio-Political Ethics	4: 2:0	5	50
	303L	Major Elective, Special Course	MAPHIL303L	Set Theory & Philosophy of Logic	4: 2:0	5	50
	304L	Major Elective, Special Course	MAPHIL304L	Non-deductive Logic	4: 2:0	5	50
	303S	Major Elective, Special Course	MAPHIL303S	Classical Sāṃkhya-I	4: 2:0	5	50
	304S	Major Elective, Special Course	MAPHIL304S	Classical Sāṃkhya-II	4: 2:0	5	50
	305	Minor Elective	MAPHIL305	Philosophy for real life issues	4: 0:0	4	50
MA Semester-IV	401	Core Course	MAPHIL401	Continental Philosophy	4: 2:0	5	50
	402	Core Course	MAPHIL402	Western Philosophy of Language	4: 2:0	5	50
	403N	Major Elective, Special Course	MAPHIL403N	Navya Nyāya-I	4: 2:0	5	50
	404N	Major Elective, Special Course	MAPHIL404N	Navya Nyāya-II	4: 2:0	5	50
	403V	Major Elective, Special Course	MAPHIL403V	Advaita Epistemology	4: 2:0	5	50
	404V	Major Elective, Special Course	MAPHIL404V	Viśiṣṭādvaita Metaphysics	4: 2:0	5	50
	403E	Major Elective, Special Course	MAPHIL403E	Applied Ethics in Indian Context	4: 2:0	5	50
	404E	Major Elective, Special Course	MAPHIL404E	Environmental Ethics	4: 2:0	5	50
	403L	Major Elective, Special Course	MAPHIL403L	The Logic of Relations and Deductive Systems	4: 2:0	5	50
	404L	Major Elective, Special Course	MAPHIL404L	Propositional Logic	4: 2:0	5	50
	403S	Major Elective, Special Course	MAPHIL403S	Later Sāṃkhya	4: 2:0	5	50
	404S	Major Elective, Special Course	MAPHIL404S	Patañjala Yoga	4: 2:0	5	50
	405	Core Course	MAPHIL405	Project, Presentation and Participation	0: 0:20	10	100

Note (1) :**Credit distribution:****For Students of MA Programme in Philosophy:**

- [General] Core Course: (5x12)+[Project, Presentation and Participation]: (10x1)=70
- Major Elective/Special Course: 20
- Minor Elective (to be chosen by the from the syllabus for MA Programme in any other subject at the beginning of Semester III): Minimum 4

Total: 90+Minimum 4**For Students of MA Programme in any subject other than Philosophy:**

- [General] Core Course + Project+ Major Elective/Special Course] in other subject: Minimum 90
- Minor Elective (that may be chosen from the syllabus for MA Programme in Philosophy at the beginning of Semester III): 4

Total: Minimum 90, Maximum 110**Note (2) :** There are Five Major Elective/Special Papers in this PG Programme in Philosophy as under:

No. of Group of Major Elective/ Special Papers	Group of Major Elective/Special Papers	Course No.	Course Type	Course Code	Name of the Course
Group-I	Nyāya-Vaiśeṣika	303N	Major Elective/ Special Course	MAPHIL303N	Prācīna Nyāya-I
		304N	Major Elective/ Special Course	MAPHIL304N	Prācīna Nyāya-II
		403N	Major Elective/ Special Course	MAPHIL403N	Navya Nyāya-I
		404N	Major Elective/ Special Course	MAPHIL404N	Navya Nyāya-II
Group-II	Vedānta	303V	Major Elective/ Special Course	MAPHIL303V	Advaita Metaphysics
		304V	Major Elective/ Special Course	MAPHIL304V	Dvaitādvai ta and Dvai ta Metaphysics
		403V	Major Elective/ Special Course	MAPHIL403V	Advaita Epistemology
		404V	Major Elective/ Special Course	MAPHIL404V	Viśiṣṭādvaita Metaphysics
Group-III	Applied Ethics	303E	Major Elective/ Special Course	MAPHIL303E	Biomedical Ethics
		304E	Major Elective/ Special Course	MAPHIL304E	Socio-Political Ethics
		403E	Major Elective/ Special Course	MAPHIL403E	Applied Ethics in Indian Context
		404E	Major Elective/ Special Course	MAPHIL404E	Environmental Ethics
Group-IV	Western Logic	303L	Major Elective/ Special Course	MAPHIL303L	Set Theory & Philosophy of Logic

		304L	Major Elective/ Special Course	MAPHIL304L	Non-deductive Logic
		403L	Major Elective/ Special Course	MAPHIL403L	The Logic of Relations and Deductive Systems
		404L	Major Elective/ Special Course	MAPHIL404L	Propositional Logic
Group-V	Sāṃkhya-Yoga	303S	Major Elective/ Special Course	MAPHIL303S	Classical Sāṃkhya-I
		304S	Major Elective/ Special Course	MAPHIL304S	Classical Sāṃkhya-II
		403S	Major Elective/ Special Course	MAPHIL403S	Later Sāṃkhya
		404S	Major Elective/ Special Course	MAPHIL404S	Patañjala Yoga

A

THE UNIVERSITY OF BURDWAN CURRICULUM FREAMWORK TWO -YEAR M.P.ED. PROGRAMME

SEMESTER - I

Part A: Theoretical Course							
Course Code	Title of The Paper	Total Hours		Credit	Internal Examination Marks	University Examination Marks	Total Marks
Core Course							
MPCC-101	Yoga Education	3		3	20	80	100
MPCC-102	Physiology of Exercise	3		3	20	80	100
MPCC-103	Test, Measurement And Evaluation in Physical Education	3		3	20	80	100
Major Elective Course (any one)							
MPEC-101	Athletic Care and Rehabilitation	3		3	20	80	100
MPEC-102	Sports Technology						
Part-B Practical Course							
MPPC-101	1. Track & Field: Running Events	A	3	3	10	40	100
	2. Gymnastics	B	3		10	40	
MPPC-102	Self Defense Specialization Karate, Judo, Boxing, Fencing, wrestling, wushu.(any two)	A	3	3	10	40	100
		B	3		10	40	
MPPC-103	Yoga (compulsory) *Aerobics/Self Defense Techniques-Martial Arts, Taekwondo/Shooting/Archer y(any one activity)	A	3	3	10	40	100
		B	3		10	40	
MPPC-104	1.Camping	A	3	3	10	40	100
	2. Mass Demonstration Activities	B	3		10	40	
Total		36		24	160	640	800

Gopa Saha Ray.

SEMESTER - II

Part A: Theoretical Course							
Course Code	Title of The Paper	Total Hours	Credit	Internal Examination Marks	University Examination Marks	Total Marks	
Core Course							
MPCC-201	Research Process in Physical Education & Sports Science	3	3	20	80	100	
MPCC-202	Applied Statistics in Physical Education & Sports	3	3	20	80	100	
MPCC-203	Sports Biomechanics and Kinesiology	3	3	20	80	100	
Major Elective Course (any one)							
MPEC - 201	Sports Management and Curriculum Design in Physical Education	3	3	20	80	100	
MPEC -202	Education Technology in Physical Education						
Part-B Practical Course							
MPPC-201	Track & Field 1. Jumping Events + Hurdles	A	3	3	10	40	100
	2. Gymnastics	B	3		10	40	
MPPC-202	1 st Games Specialization Practical Skill Kabaddi, Kho-Kho, Badminton, Table Tennis, Volleyball, Basketball, Football, Cricket, Handball, Hockey, Netball, (Any one)	A	3	3	10	40	100
		B	3		10	40	
MPPC-203	Teaching Lesson of Indigenous Activities And Sports-5 Lessons (4 Internal &1External)	6		3	20	80	100
MPPC-204	Class Room Teaching Lesson on Theory of Different Sports & Games-5 Lessons (4 Internal & 1 External	6		3	20	80	100
Total		36		24	160	640	800

Gopa Saha Ray.

SEMESTER - III

Part A: Theoretical Course

Course Code	Title of The Paper		Total Hours		Credit	Internal Examination Marks	University Examination Marks	Total Marks
Core Course								
MPCC 301	Scientific Principles of Sports Training		3		3	20	80	100
MPCC-302	Sports Psychology		3		3	20	80	100
MPCC-303	Health Education and Sports Nutrition, Physical Fitness and Wellness		3		3	20	80	100
Major Elective Course (Any one)								
MPEC-301	Olympic Studies		2		2	10	40	50
	Sports Engineering							
MPEC-302								
Part-B Practical Course								
MPPC-301	1. Track & Field Throwing Events + Introduction of Heptathlon Events		3		3	10	40	100
	2. Swimming		3			10	40	
	Laboratory Practical (Two practical for each subject)				3			100
MPPC-302	A	Sports Psychology (30 Marks)	A	2		6	24	
	B	Physiology (40 Marks)	B	2		8	32	
	C	Biomechanics & Kinesiology (30 Marks)	C	2		6	24	
MPPC-303	Coaching Lesson of Track & Field/ Gymnastics/ Swimming-5 Lessons (4 Internal & 1 External)		6		3	20	80	100
MPPC-304	Coaching Lesson of 1 st game specialization i.e Kabaddi, Kho-Kho, Badminton, Volleyball, Basketball, Football, Cricket, Handball: Total -5 Lessons (4 Internal & 1 External)		6		3	20	80	100
Total			35		23	150	600	750

Interdisciplinary Elective Course (Non Departmental)

Interdisciplinary Elective Course (Non Departmental)						
MPMEC-305	Trends and Practices in Physical Education	4	4	10	40	50
	Or					
	[Students may opt for a Credit course from SWAYAM platform and can avail the option of credit transfer]					
Total		39	27	160	640	800

Interdisciplinary Elective course for the students of other departments, candidates have to take ONE subject MPMEC-305 Interdisciplinary Elective course. Students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer.

Gopa Saha Ray.

SEMESTER - IV

Course Code	Title of The Paper	Total Hours	Credit	Internal Examination Marks	University Examination Marks	Total Marks	
Students have to take compulsory Community Engagement Course(MPCEC-400)							
MPCEC-400	Community Engagement Course	4	2	10	40	50	
Part A: Theoretical Course Core Course							
MPCC-401	Information and Communication Technology (ICT) in Physical Education	3	3	20	80	100	
MPCC-402	Sports Medicine	3	3	20	80	100	
MPCC-403	Dissertation	3	3	20	80	100	
Major Elective Course (any one)							
MPEC-401	Value and Environmental Education	2	2	10	40	50	
MPEC-402	Sports Journalism and Mass Media						
Part-B Practical Course							
MPPC-401	1. Track & Field Introduction of Decathlon events	A	3	3	10	40	100
	2. Swimming (Practical skill)	B	3		10	40	
MPPC-402	2 nd Games Specialization Practical Skill- Kabaddi, Kho-Kho, Badminton, Volleyball, Basketball, Football, Cricket, Handball (any one from major games)	A	3	3	10	40	100
		B	3		10	40	
MPPC-403	Officiating Lesson of Track & Field/ Gymnastics/ Swimming-5 Lessons (4 Internal & 1 External)	6		3	20	80	100
MPPC-404	Officiating Lessons of 1 st game specialization- i.e Kabaddi, Kho-Kho, Badminton, Volleyball, Basketball, Football, Cricket, Handball : Total -5 Lessons (4 Internal & 1 External)	6		3	20	80	100
Total		39		25	160	640	800
		150		100	640	2560	3200

SYLLABUS

For

M. Sc.

in

PHYSICS



(Effective from the academic session 2020 – 2022 and onwards)

DEPARTMENT OF PHYSICS

THE UNIVERSITY OF BURDWAN

THE UNIVERSITY OF BURDWAN
SYLLABUS FOR
EFFECTIVE FROM 2020 – 2022 SESSION



Course Structure in Physics

1 credit = 1 hour/week for theory; 2 hours/week for practical

Duration of examination for a course of 4 credits will be 2 hours for theory papers and 4 hours for practical papers.

SEMESTER – I (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A	E.T	Total	
MSPH101	Core	T	Mathematical Methods	10	40	50	4
MSPH102	Core	T	Classical Mechanics, General Relativity & Astrophysics	10	20 20	50	4
MSPH103	Core	T	Quantum Mechanics	10	40	50	4
MSPH104	Core	T	Classical Electrodynamics	10	40	50	4
MSPH105	Core	P	Practical-I	10	40	50	4
MSPH106	Core	P	Practical-II	10	40	50	4
				Total credit			24

I.A.: Internal Assessment, E.T.: End Term

SEMESTER – II (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A	E.T	Total	
MSPH201	Core	T	Atomic Spectroscopy & Laser physics	10	20 20	50	4
MSPH202	Core	T	Solid State Physics	10	40	50	4
MSPH203	Core	T	Nuclear & Particle Physics	10	40	50	4
MSPH204	Core	T	Electronics	10	40	50	4
MSPH205	Core	P	Practical-I	10	40	50	4
MSPH206	Core	P	Practical-II	10	40	50	4
				Total credit			24

SEMESTER – III (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A	E.T	Total	
MSPH301	Core	T	Statistical Mechanics	10	40	50	4
MSPH302	Core	T	Group Theory & Nonlinear dynamics	10	20 20	50	4
MSPH303	Core	P	Advanced General Practical	10	40	50	4
MSPH304 Or MSWM304	GE	T	MSPH304: Condensed Matter & Nano Physics MSWM304: May be opted from SWAYAM	5	20	25	2
MSPH305	DE	T	MSPH305-1: Advanced Electronics-I MSPH305-2: Laser Physics-I MSPH305-3: Materials Science-I MSPH305-4: Condensed Matter Physics-I MSPH305-5: Nuclear & Particle Physics-I MSPH305-6: Astrophysics & Cosmology-I	10	40	50	4
MSPH306	DE	T	MSPH306-1: Applied Electronics MSPH306-2: Advanced Solid State Physics MSPH306-3: Materials Physics MSPH306-4: Selected Topics in Nuclear & Particle Physics MSPH306-5: Lasers and Laser Spectroscopy MSPH306-6: Special Topics in General Relativity and Astrophysics MSPH306-7: Relativistic Quantum Mechanics & Quantum Field Theory MSPH306-8: May be opted from SWAYAM	10	40	50	4
MSPH307	Core	P	Community Engagement Activities (CE)	5	20	25	2
				Total credit			24

DE: Discipline-centric Elective; GE: Generic Elective

STUDENTS HAVE TO CHOOSE EITHER ‘ADVANCED ELECTRONICS-I’ OR ‘LASER PHYSICS-I’ OR ‘MATERIALS SCIENCE-I’ OR ‘CONDENSED MATTER PHYSICS-I’ OR ‘NUCLEAR & PARTICLE PHYSICS-I’ OR ‘ASTROPHYSICS & COSMOLOGY-I’ IN MSPH305

The following are the options for students for MSPH306 As per their choice in MSPH305:

Opted as DE (MSPH305)	DO NOT OPT FOR
Advanced Electronics-I	MSPH306-1: Applied Electronics
Laser Physics-I	MSPH306-5: Lasers & Laser Spectroscopy
Materials Science-I	MSPH306-3: Materials Physics
Condensed Matter Physics-I	MSPH306-2: Advanced Solid State Physics
Nuclear & Particle Physics-I	MSPH306-4: Selected Topics in Nuclear & Particle Physics
Astrophysics & Cosmology-I	MSPH306-6: Special topics in General Relativity and Astrophysics

SEMESTER – IV (TOTAL MARKS 300) (CREDIT 24)

Course				Marks			Credit
Course code	Type	T/P	Name	I.A	E.T	Total	
MSPH401	Core	T	Molecular Spectroscopy	10	40	50	4
MSPH402	Core	T	Advanced Quantum Mechanics & Computational Physics	10	20 20	50	4
MSPH403	Core	P	Advanced General Practical	10	40	50	4
MSPH404	DE	T	MSPH404-1: Advanced Electronics-II MSPH404-2: Laser Physics-II MSPH404-3: Materials Science-II MSPH404-4: Condensed Matter Physics-II MSPH404-5: Nuclear & Particle Physics-II MSPH404-6: Astrophysics & Cosmology-II	10	40	50	4
MSPH405	DE	T	MSPH405-1: Advanced Electronics-III MSPH405-2: Laser Physics-III MSPH405-3: Materials Science-III MSPH405-4: Condensed Matter Physics-III MSPH405-5: Nuclear & Particle Physics-III MSPH405-6: Astrophysics & Cosmology-III	10	40	50	4
MSPH406	Core	P	Term paper/ Project	10	40	50	4
				Total credit			24

The following are the options for students for Discipline-centric Electives in Semester-IV as per their choice in Semester-III:

Opted in Semester-III	Option to be offered in Semester-IV
Advanced Electronics-I	Advanced Electronics-II & Advanced Electronics-III
Laser Physics-I	Laser Physics-II & Laser Physics-III
Materials Science-I	Materials Science-II & Materials Science-III
Condensed Matter Physics-I	Condensed Matter Physics-II & Condensed Matter Physics-III
Nuclear & Particle Physics-I	Nuclear & Particle Physics-II & Nuclear & Particle Physics-III
Astrophysics & Cosmology-I	Astrophysics & Cosmology-II & Astrophysics & Cosmology-III

Syllabus of M. Sc. in Physics

Semester I (Total 300 Marks)

Four General Theoretical Papers:

Paper 101: Unit I - Mathematical Methods I	(23 Marks)
Unit II - Classical Mechanics	(22 Marks)
Paper 102: Unit I - Quantum Mechanics I	(23 Marks)
Unit II - Classical Electrodynamics I	(22 Marks)
Paper 103: Unit I - Solid State Physics I	(23 Marks)
Unit II - Electronics I	(22 Marks)
Paper 104: Unit I - Atomic Spectroscopy	(23 Marks)
Unit II - Nuclear Physics I	(22 Marks)

General Practical Papers:

- Paper 105: Electrical Practical for Group A of students
(75 Marks for Examinations + 25 Marks for Sessionals)
- Paper 105: Non-electrical practical for Group B of students
(75 Marks for Examinations + 25 Marks for Sessionals)

Internal Assessment on Theoretical Papers:

Mid-semester Examinations/Class Test at the middle of the semester	(20 Marks)

Semester II (Total 300 Marks)

Four General Theoretical Papers:

Paper 201: Unit I - Mathematical Methods II	(23 Marks)
Unit II - Relativity and Cosmology	(22 Marks)
Paper 202: Unit I - Quantum Mechanics II	(23 Marks)
Unit II - Classical Electrodynamics II	(22 Marks)
Paper 203: Unit I - Solid State Physics II	(23 Marks)
Unit II - Electronics II	(22 Marks)
Paper 204: Unit I - Advanced Optics	(23 Marks)
Unit II - Nuclear Physics II	(22 Marks)

Two General Practical Papers:

- Paper 205: Electrical Practical for Group A of students
(75 Marks for Examinations + 25 Marks for Sessionals)
- Paper 205: Non-electrical practical for Group B of students
(75 Marks for Examinations + 25 Marks for Sessionals)

Internal Assessment on Theoretical Papers:

Mid-semester Examinations/Class Test at the middle of the semester	(20 Marks)

Question Patterns of all general papers will remain same as per previous years. Separate answer scripts will be needed for each unit of each paper.

SEMESTER III (TOTAL 300 MARKS)

Two General Theoretical Papers:

Paper 301: Unit I - Statistical Mechanics I	(23 Marks)
Unit II - Advanced Quantum Mechanics I	(22 Marks)
Paper 302: Unit I - Group Theory	(23 Marks)
Unit II - Computer Applications in Physics-I	(22 Marks)

Two Special Theoretical Papers:

Paper 303: Special paper – I	(45 Marks)
Paper 304: Special paper – II	(45 Marks)

One Special Practical Paper:

Paper 305: (40 Marks for Examination + 10 Marks for Sessional)	(50 Marks)
Paper 306: One General (Computer) Practical	(50 Marks)

Internal Assessment on Theoretical Papers:

Mid-semester Examinations/Class Test at the middle of the semester	(20 Marks)

SEMESTER IV (TOTAL 300 MARKS)

Three General Theoretical papers:

Paper 401: Unit I - Statistical Mechanics II	(23 Marks)
Unit II - Advanced Quantum Mechanics II	(22 Marks)
Paper 402: Molecular Spectroscopy	(45 Marks)
Paper 403: Unit I - Astrophysics	(23 Marks)
Unit II - Computer Applications in Physics-II	(22 Marks)

One Special Theoretical Paper:

Paper 404: Special Paper III	(45 Marks)
(Radiophysics & Electronics, Nuclear Physics, Solid State Physics, Laser Physics, Materials Science)	

One Special Practical Paper:

Paper 405: (40 Marks for Examination + 10 Marks for Sessional)	(50 Marks)

Paper 406: Project/Term Paper:	(50 Marks)
(40 Marks for preparation and presentation of project report and 10 Marks for viva-voce)	

Internal Assessment on Theoretical Papers:

Mid-semester Examinations/Class Test at the middle of the semester	(20 Marks)

Question Patterns of 401 & 403 general papers will be same as Sem-II General papers. For 402 & 404 eight questions to be set and five questions to be answered. Separate answer scripts will be needed for each unit of papers 401 & 403 only.

For 406 a Board of Examiners comprising faculty members of Department of Physics of BU and Dept of Physics of Asansol B B College will evaluate the term paper submitted by the Sem - IV students. One External Examiner should remain present in each Board during presentation & viva-voce.

SYLLABUS FOR
M.Sc. COURSE IN PHYSIOLOGY

(With effect from the session 2020–22)
[CHOICE BASED CREDIT SYSTEM]



DEPARTMENT OF PHYSIOLOGY
THE UNIVERSITY OF BURDWAN
WEST BENGAL
INDIA

The M.Sc. syllabus (2020-2022) has been endorsed in the meeting of Ad-hoc Board of Post Graduate Studies in Physiology held on 29/03/2021. Subsequently approved the in the meeting of Faculty Council of Science on _____.

Prof. Sanjib Ray

In-charge,
Department of Physiology,
The University of Burdwan.

Dr. Alak Kumar Syamal,
Asso. Prof., HOD, P.G.
Deptt. of Physiology,
Hooghly Mohsin College.

Prof. Pabitra Kumar
Chakrabarti, The Dean,
Faculty Council of P.G.
Studies in Science and
Chairman of Ad-hoc PGBS
of Physiology, B.U.-

M.Sc. SYLLABUS
Department of PHYSIOLOGY

Annexure-I

Summary of the course and credits

Semester I [Credits – 24]

Course				Lect. Hr /week	Duration of Exam (in Hrs.)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPY101	Core	T	Cell Biology, Molecular Biology, Cytogenetics, and Immunology	4T	2	10	40	50	4
MSPY102	Core	T	Enzyme, Bioenergetics, Metabolism and Microbiology	4T	2	10	40	50	4
MSPY103	Core	T	Homeostasis of Internal Environment in Human, Stress Physiology, Alimentation, and Excretion	4T	2	10	40	50	4
MSPY104	Core	T	Biophysics, Nutrition and Histochemistry	4T	2	10	40	50	4
MSPY105	Core	P	Clinical Enzymology and Cytogenetics	8P	4	10	40	50	4
MSPY106	Core	P	Histology and Histochemistry	8P	4	10	40	50	4
				Total credit				300	24

T/P: Theory/Practical

Semester II [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPY201	Core	T	Cell Membrane Dynamics	4	2	10	40	50	4
MSPY202	Core	T	Central Nervous System and Sensory Physiology	4		10	40	50	4
MSPY203	Core	T	Sports and Exercise Physiology	4	2	10	40	50	4
MSPY204	Core	T	Ergonomics & Chronobiology	4	2	10	40	50	4
MSPY205	Core	P	Amphibian Experimental Physiology and Educational field tour report	8	4	10	40	50	4
MSPY206	Core	P	Mammalian Physiology Experiments and Human Physiology Experiments	8	4	10	40	50	4
				Total credit				300	24

T/P: Theory/Practical

Semester III**[Credits – 24]**

Course code	Type	Course		Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
		T/P	Name			I.A.	E.T	Total	
MSPY301	Core	T	Endocrinology and Bioinstrumentation	4	2	10	40	50	4
MSPY302	Core	T	Biostatistics and Computer Application	4	2	10	40	50	4
MSPY303	Core	P	Biostatistics and Computer Application	8	4	10	40	50	4
MSPY304	GE	T	Environmental Physiology and Occupational Health	2	1	5	20	25	2
MSPY305*	DE1	T	Nutrition and Dietetics	4	2	10	40	50	4
MSPY305**	DE2	T	Endocrinology and Reproduction	4	2	10	40	50	4
MSPY305***	DE3	T	Ergonomics and Occupational Health	4	2	10	40	50	4
MSPY305****	DE4	T	Environmental Physiology	4	2	10	40	50	4
MSPY305*****	DE5	T	Sports and Exercise Physiology	4	2	10	40	50	4
MSPY306*	DE1	P	Nutrition and Dietetics	8	4	10	40	50	4
MSPY306**	DE2	P	Endocrinology and Reproduction	8	4	10	40	50	4
MSPY306***	DE3	P	Ergonomics and Occupational Health	8	4	10	40	50	4
MSPY306****	DE4	P	Environmental Physiology	8	4	10	40	50	4
MSPY306*****	DE5	P	Sports and Exercise Physiology	8	4	10	40	50	4
MSPY307	CE	(NA) T/P	Community Health Assessment #	N.A.	N.A.	5	20	25	2
Total credit								300	24

T/P: Theory/Practical

CE: Community Engagement Activities; DE: Discipline-centric Elective; GE: Generic elective

* MSPY305 / 306-DE1; **MSPY305 / 306-DE2, *** MSPY305 / 306-DE3;

**** MSPY305 / 306-DE4, ***** MSPY305 / 306- DE5

DE: Discipline-centric Elective (Students need to take any one of these Discipline-centric Electives)**DE1= Nutrition and Dietetics (COURSE CODE: MSPY 305-DE1 and MSPY 306-DE1)****DE 2= Endocrinology and reproductive Physiology (COURSE CODE: MSPY 305-DE 2 and MSPY 306-DE2)****DE 3= Ergonomics and Occupational health (COURSE CODE: MSPY 305-DE3 and MSPY 306-DE3)****DE4=Environmental Physiology (COURSE CODE: MSPY 305-DE4 and MSPY 306-DE4)****DE5= Sports & Exercise Physiology (COURSE CODE: MSPY 305-DE5 and MSPY 306-DE5)****# Broad Community Engagement Programmes/ activities (UGC Prescribed)**

1. Appreciation of Rural Society
2. Understanding Rural Society
3. Rural Institutions
4. Rural Development Programmes, etc.

(For details see National Curriculum Framework and Guidelines, UGC, January 2020, page 1

Semester IV**[Credits – 24]**

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Cred it
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPY401	Core	T	Developmental Biology and Population Science	4	2	10	40	50	4
MSPY402	Core	T	Reproductive biology, Environmental Physiology and Evolution	4	2	10	40	50	4
MSPY403	Core	T	Toxicology , Xenobiotics and human health ; Evolutionary Biology	4	2	10	40	50	4
MSPY404*	DE1	T	Nutrition and Dietetics	4	2	10	40	50	4
MSPY404**	DE2	T	Endocrinology and Reproduction	4	2	10	40	50	4
MSPY404***	DE3	T	Ergonomics and Occupational Health	4	2	10	40	50	4
MSPY404****	DE4	T	Environmental Physiology	4	2	10	40	50	4
MSPY404*****	DE5	T	Biomechanics, Kinesiology in sports and exercise	4	2	10	40	50	4
MSPY405*	DE1	P	Nutrition and Dietetics	8	4	10	40	50	4
MSPY405**	DE2	P	Endocrinology and Reproduction	8	4	10	40	50	4
MSPY405***	DE3	P	Ergonomics and Occupational Health	8	4	10	40	50	4
MSPY405****	DE4	P	Environmental Physiology	4	2	10	40	50	4
MSPY405*****	DE5	P	Biomechanics, Kinesiology in sports and exercise	4	2	10	40	50	4
MSPY406	Project	T/P (NA)	Dissertation ss (Empirical or Non empirical)					50	4
								300	24

*MSPY404 / 405-DE1; **MSPY404 / 405-DE2, **MSPY404 / 405-DE3; **** MSPY404 / 405-DE4; ***** MSPY404 / 405-DE5

DE: Discipline-centric Elective: Based on Discipline-centric Elective taken in Semester -III

SS Based on Discipline-centric Elective

DE Course Code: MSPY 404-DE1, MSPY 404-DE2, MSPY 404-DE3, MSPY 404-DE4, MSPY 404-DE5

SYLLABUS FOR M.A./M.SC. IN PSYCHOLOGY

Under Choice Based Credit System (CBCS)

Effective from 2021-2022



The University of Burdwan

Burdwan-713104

West Bengal

Preamble

The M.A./M.Sc. in Psychology is a two-year, four-semester programme under Choice Based Credit System (CBCS). Total 96 credits are equally distributed in four semesters (24 credits in each semester). 74, 16, 4, 2 and 2 credits are given for 18 core courses, 4 discipline-centric Elective courses, project, 1 Generic elective course and Community Engagement Activities respectively. The programme contains theoretical, applied and along with computational skills of Psychology. Discipline-centric Elective courses can be chosen from the baskets which contain a variety of courses. The courses in 1st to 4th semesters are designed by considering the syllabi of various eligibility tests at the national level. Project or Term Paper is suggested based on theoretical or applied Psychology using real data. Community Engagement Activities are inspired based on patient counselling/survey sampling and real data collection and developing reports based on the collected data set.

Objectives

- Impart teaching so that the students could develop critical thinking ability about the fundamental aspects of Psychology along with measuring/solving any psychological or social science psychological problems based on real data sets.
- Make the students capable of pursuing research work in various emerging fields of Psychology and its related problems in different fields of Social sciences.
- Train the students with Psychological knowledge and computational techniques so that they can deal with the problems faced in the real fields / societies and industries.
- Make the students aware of their responsibility to meet the societal needs.

Pre-requisite

The students should possess the knowledge on the courses taught in the B.A./B.Sc. with Psychology Honours.

Programme Outcomes

- Development of critical thinking for carrying out psychological investigations.
- Skills to analyze problems, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- Ability to pursue research or build careers as Clinical Psychologist, or Psychology Practitioner, or Psychology adviser in Hospital, Industry, Academic Institution, Society and allied fields.
- Development of the effective Psychological and Practical communications in both oral and written forms.
- Awareness for becoming a responsible citizen with commitment to deliver one's responsibilities within the scope of bestowed rights and privileges.

Programme Specific Outcomes

- Understanding about the fundamental axioms in Psychology and capability of developing ideas based on them.
- Development of Psychological reasoning and an understanding of the underlying unifying structures of Psychology (i.e., hypotheses, testing, estimation, probabilistic models, cause-and-effect analyses, establishing functional relations, logical structure etc.) and the relationships among them.
- Motivation for research studies in Psychology and related fields with real life applications.
- Knowledge in a wide range of Psychological techniques and applications in different social, health science and industrial domains.
- Advanced knowledge in Psychological sciences.
- Nurturing problem solving skills, thinking, creativity through assignments, project work.
- Preparing for competitive examinations, like UGC/NET & SET etc.

PROFILE

Semester I

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPS101	Core	T	Human Cognition: Theory & Research	4	2	10	40	50	4
MSPS102	Core	T	Theory Construction & Research	4	2	10	40	50	4
MSPS103	Core	T	Psychometry and statistics: Part I	4	2	10	40	50	4
MSPS104	Core	T	Qualitative Research Methodology	4	2	10	40	50	4
MSPS105	Core	P	Practical Based on MSPS 101 & 102	4	4	10	40	50	4
MSPS106	Core	P	Practical Based on MSPS 103 & 104	4	4	10	40	50	4
					Total credit				24

Abbreviation used: T/P → Theory/Practical; I.A. → Internal Assessment; E.T. → Term-end examination

Semester II

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPS2 01	Core	T	Biology and Behaviour	4	2	10	40	50	4
MSPS 202	Core	T	Personality Theories	4	2	10	40	50	4
MSPS203	Core	T	Theories and Challenges of Developmental Psychology	4	2	10	40	50	4
MSPS 204	Core	T	Psychometry and statistics: Part II	4	2	10	40	50	4
MSPS 205	Core	P	Practical Based on MSPS 201, 202, 203	4	4	10	40	50	4
MSPS206	Core	P	Practical Based on MSPS 201 to 204.	8	4	10	40	50	4
					Total credit				24

Semester III

Course				Lect. Hr / week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPS 301	Core	T	Positive Psychology	4	2	10	40	50	4
MSPS 302	Core	T	Social Psychology	4	2	10	40	50	4
MSPS 303	Core	T	Clinical Psychology	4	2	10	40	50	4
MSPS 304	GE	T	Vide Appendix 1	2	1	5	20	25	2
MSPS 305	DE	T	Vide Appendix 2	4	2	10	40	50	4
MSPS 306	DE	P	Vide Appendix 3	4	4	10	40	50	4
MSPS 307	Core	P	Community Engagement Activities	N.A.	N.A.	5	20	25	2
					Total credit				24

Abbreviation used: CE → Community Engagement Activities;

DE → Discipline-centric Elective; GE → Generic elective

APPENDIX 1:

One Generic elective course (Theory) may be opted from MSPS 304-1, MSPS 304-2, MSPS 304-3, MSPS 304-4 SWAYAM.

MSPS 304-1: Elementary Qualitative Research Methodology

MSPS 304-2: Elementary Human Cognition

MSPS 304-3: Basic Psychometry and Statistics

MSPS 304-4 Course opted from SWAYAM

APPENDIX 2:

A Special Paper (or Discipline-centric Elective course) (Theory) in Semester III may be opted from MSPS 305-1, MSPS 305-2, MSPS 305-3, MSPS 305-4 SWAYAM

MSPS 305-1: **Advanced Clinical Psychology**

MSPS 305-2: **Industrial/ Organizational Psychology**

MSPS 305-3: **Advanced Qualitative Research Methodology**

MSPS 305-4: **Course opted from SWAYAM**

APPENDIX 3:

Another Special paper (or Discipline-centric Elective course) (Practical) in Semester III may be opted from MSPS 306-1, MSPS 306-2, MSPS 306-3 (SWAYAM).

MSPS 306-1: Based on MSPS 305-1 and along with three Core Courses i.e., MSPS 301, MSPS 302 & MSPS 303.

MSPS 306-2: Based on MSPS 305-2 and along with three Core Courses i.e., MSPS 301, MSPS 302 & MSPS 303.

MSPS 306-3: Course opted from SWAYAM and along with three Core Courses i.e., MSPS 301, MSPS 302 & MSPS 303.

Semester IV

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSPS 401	Core	T	Health Psychology and Stress Management	4	2	10	40	50	4
MSPS 402	Core	T	Late Adulthood Psychology	4	2	10	40	50	4
MSPS 403	DE	T	Vide Appendix 4	4	2	10	40	50	4
MSPS 404	DE	T	Vide Appendix 5	4	2	10	40	50	4
MSPS 405	Core	P	Internship, Based on MSPS 401, MSPS 402 and two opted DE papers.	4	4	10	40	50	4
MSPS 406	Core	P	Project/Term Paper	4	---	10	40	50	4
					Total credit				24

Appendix 4

A Special Paper (or Discipline-centric Elective course) (Theory) in Semester IV may be opted from MSPS 404-1, MSPS 404-2, MSPS 404-3 (SWAYAM)

MSPS 404-1: Psychotherapy

MSPS 404-2: Organizational and Human Resource Development

MSPS 404-3: Course opted from SWAYAM

Appendix 5



ପଞ୍ଚାବଳୀର ଲେଖକ ପ୍ରଫୁଲ୍ଲଚନ୍ଦ୍ର ମହାନ୍ତି
ବିଭାଗୀୟ, ପଞ୍ଚାବଳୀ
ପ୍ରକାଶନ ପ୍ରାଣୀ - ଶ୍ରୀମନ୍ତ୍ରୀ

M.A. In Santali
CBCS Syllabus
With effect from 2020-2021

The University of Burdwan
Burdwan, West Bengal -713104
The University of Burdwan

The University of Burdwan
Department of Santali
PG Course Structure

Semester	Course Code	Course Type	Course Status	Marks Distribution (End Sem. + Int. Asst)	Credit Value of the Course
Sem.-I	SANT-101	TH	Core Course	40+10=50	5
	SANT-102	TH	Core Course	40+10=50	5
	SANT-103	TH	Core Course	40+10=50	5
	SANT-104	TH	Core Course	40+10=50	5
	SANT-105	TH	Core Course	40+10=50	5
	Semester-I Total			250	25
Sem.-II	SANT-201	TH	Core Course	40+10=50	5
	SANT-202	TH	Core Course	40+10=50	5
	SANT-203	TH	Core Course	40+10=50	5
	SANT-204	TH	Core Course	40+10=50	5
	SANT-205	TH	Core Course	40+10=50	5
	Semester-II Total			250	25
Sem.-III	SANT-301	TH	Core Course	40+10=50	5
	SANT-302	TH	Core Course	40+10=50	5
	SANT303(A/B/C/D)	TH	Major Elective	40+10=50	5
	SANT304(A/B/C/D)	TH	Major Elective	40+10=50	5
	SANT305(A/B/C/D)	TH	Interdisciplinary Elective	40+10=50	4
	SANT305(A/B/C/D)	However, Students may opt for a 4 credit course from SWAYAM Platform and can avail the option of credit transfer.			
	Semester-III Total			250	24
Sem.-IV	SANT-400	PR	Community Engagement Course	20+5=25	2
	SANT-401	TH	Core Course	40+10=50	5
	SANT-402	TH	Core Course	40+10=50	5
	SANT403(A/B/C/D)	TH	Major Elective	40+10=50	5
	SANT404(A/B/C)	TH	Major Elective	40+10=50	5
	SANT-405	PR/Project	Core Course	40+10=50	5
	Semester-IV Total			275	27
Program Total				1025	101

Course outline for MA in Sanskrit (CBCS)

(Effective from the academic session 2020-2022)

FIRST SEMESTER

Semester-I	Course code	Course Type	Course Status	Marks Distribution(End Sem + Internal Assessment)	Credit Value of the course
	MASANS-101	TH	VEDIC HYMNS AND HISTORY OF VEDIC LITERATURE	40+10=50	5
	MASANS-102	TH	MEGHADUTA AND HARSACARITA	40+10=50	5
	MASANS-103	TH	BHASAPARICCHEDA (PART-I) AND SANSKRIT PHILOLOGY	40+10=50	5
	MASANS-104	TH	ARTHASASTRA AND ASOKAN EDICTS	40+10=50	5
	MASANS-105	TH	KENOPANISAD AND KRSIPARASARA	40+10=50	5
				Total Marks-250	Total Credit-25

SECOND SEMESTER

Semester -II	Course code	Cours e Type	Course Status	Marks Distribution(En d Sem + Internal Assessment)	Credi t Value of the cours e
	MASANS -201	TH	RK SAMHITA, AND RGVEDABHASYOPAKRAMANIK A	40+10=50	5
	MASANS -202	TH	MRCCHAKATIKA (PART-I) AND SAHITYADARPANA	40+10=50	5
	MASANS -203	TH	SIDDHANTAKAUMUDI AND HISTORY OF CLASSICAL SANSKRIT LITERATURE	40+10=50	5
	MASANS -204	TH	BHASAPARICCHEDA (PART-II) AND CARAKASAMHITA	40+10=50	5
	MASANS -205	TH	NIRUKTA AND YAJNAVALKYA SAMHITA	40+10=50	5
				Total Marks-250	Total Credit- 25

THIRD SEMESTER

Semester-III	Course code	Course Type	Course Status	Marks Distribution (End Sem + Internal Assessment)	Credit Value of the course
	MASANS-301	TH	SIDDHANTAKAUMUDI AND INSCRIPTIONS	40+10=50	5
	MASANS-302	TH	RESEARCH METHODOLOGY & MANUSCRIPTOLOGY AND MRCCHAKATIKA (PART-II)	40+10=50	5
	MASANS-303(A/B/C/D/E)	TH	Major Elective KAVYA-I/DARSANA-I/VEDA-I/ EPIGRAPHY-I/VYAKARANA-I	40+10=50	5
	MASANS-304 (A/B/C/D/E)	TH	Major Elective KAVYA-II/DARSANA-II/VEDA-II/ EPIGRAPHY-II /VYAKARANA-II	40+10=50	5
	MASANS-305	TH	Interdisciplinary Elective KAVYA/DARSANA/VEDA/EPIGRAPHY /VYAKARANA	40+10=50	4
				Total Marks-250	Total Credit-24

FOURTH SEMESTER

Semester -IV	Course code	Course Type	Course Status	Marks Distribution(End Sem + Internal Assessment)	Credit Value of the course
	MASANS-400	Practical	Community Engagement Course	20+5=25	2
	MASANS-401	TH	MAHABHASYA, AND, SAMKHYAKARIKA	40+10=50	5
	MASANS-402	TH	PRAKRTAPRAKASA AND ATHA KIM	40+10=50	5
	MASANS-403(A/B/C/D/E)	TH	Major Elective KAVYA-III/ DARSANA-III/ VEDA-III/ EPIGRAPHY-III/ VYAKARANA III	40+10=50	5
	MASANS-404(A/B/C/D/E)	TH	Major Elective KAVYA-IV/ DARSANA-IV/ VEDA-IV/ EPIGRAPHY-IV/ VYAKARANA-IV	40+10=50	5
	MASANS-405	PR/Project	CORE COURSE	40+10=50	5
				Total Marks-275	Total Credit- 27
Total marks in MA Course in Sanskrit : 1025					Total Credits : 101

Course outline for MA in Sanskrit (CBCS)
(Effective from the academic session 2014-2016)

FIRST SEMESTER

Course No	Course Type	Course Title	Credit	Credit Distribution T P L		
MASAN S 101	Core	VEDIC HYMNS AND HISTORY OF VEDIC LITERATURE	5	4	1	0
MASAN S 102	Core	MEGHADUTAM AND HARSACARITAM	5	4	1	0
MASAN S 103	Core	BHASAPARICCHEDA (PART-I) AND SANSKRIT PHILOLOGY	5	4	1	0
MASAN S 104	Core	ARTHASASTRA AND ASOKAN EDICTS	5	4	1	0
		Total credit in 1st semester	20	16	4	0
		SECOND SEMESTER				

Course No	Course Type	Course Title	Credit	Credit Distribution L T P		
MASAN S 201	Core	RK SAMHITA, NIRUKTA AND RGVEDABHASYOPAKRAMANIKAKA	5	4	1	0
MASAN S 202	Core	MRCCHAKATIKAM (PART-I) AND SAHITYADARPANA	5	4	1	0
MASAN S 203	Core	SIDDHANTAKAUMUDI AND HISTORY OF CLASSICAL SANSKRIT LITERATURE	5	4	1	0
MASAN S 204	Core	BHASAPARICCHEDA (PART-II) AND CARAKASAMHITA	5	4	1	0
		Total credit in 2nd semester	20	16	4	0

THIRD SEMESTER

Course No	Course Type	Course Title	Credit	Credit Distribution L T P		
MASANS 301	Core	SIDDHANTAKAUMUDI AND INSCRIPTIONS	5	4	1	0
MASANS 302	Core	RESEARCH METHODOLOGY & MANUSCRIPTOLOGY AND MRCCHAKATIKAM (PART-II)	5	4	1	0

MASANS 303	ELECTIVE-I*	KAVYA-I/DARSANA-I/VEDA-I/ EPIGRAPHY-I/GRAMMAR-I	5	4	1	0
MASANS 304	ELECTIVE-II*	KAVYA-II/DARSANA-II/VEDA-II/ EPIGRAPHY-II /GRAMMAR-II	5	4	1	0
		Total Credit in 3rd semester	20	16	4	0

***See notes 1 & 2 below**

FOURTH SEMESTER

Course No	Course Type	Course Title	Credit	Credit Distribution		
				L	T	P
MASANS 401	Core	MAHABHASYA, PRAKRTAPRAKASA, KRSIPARASARA, SAMKHYAKARIKA AND YAJNAVALKYASMRTI	5	4	1	0
MASANS 402	Core	PROJECT WORK ON HERITAGE AWARENESS WITH SOCIAL OUTREACH	15	0	3	12
MASANS 403	ELECTIVE-III*	KAVYA-III/ DARSANA-III/ VEDA-III/ EPIGRAPHY-III/ GRAMMAR-III/ EXTRA-DEPARTMENTAL PAPER-A	5	4	1	0
MASANS 404	ELECTIVE-IV*	KAVYA-IV/ DARSANA-IV/ VEDA-IV/ EPIGRAPHY-IV/ GRAMMAR-IV/ EXTRA-DEPARTMENTAL PAPER-B	5	4	1	0
Total Credit in 4th semester			30	12	6	12
Maximum credit in MA course in Sanskrit			90	60	18	12

***See notes 1 & 2 below**

Notes:

- Students will have to generally choose any two courses as Elective-I (MASANS 303 and Elective-II (MASANS 304) within the Department in the third semester. However, they may also take any 2 Elective courses from amongst the 10 Electives (conditions apply). [See courses for 3rd semester].
- While the students have to choose any two Electives (as Elective-III and Elective-IV) in the fourth semester, they may opt for any one or both the Elective papers within the departmental course structure or even in any other department in the Faculty of Arts in the fourth semester (conditions apply). Any Elective course can be shifted to a different course in the same semester within the department (conditions apply).
- Students from other departments in the faculty of Arts may opt for any Elective paper (conditions

Syllabus

MA in Sociology



DEPARTMENT OF SOCIOLOGY

THE UNIVERSITY OF BURDWAN

NEW COMPOSITE BUILDING, GOLAPBAG,

RAJBATI, BURDWAN 713104,

WEST BENGAL, INDIA

2020

(TO BE INTRODUCED FROM THE SESSION 2020-21)

COURSE OUTLINE

		First Semester					
Course No	Course Type	Course Title	Marks	Credit	Credit Distribution (L, T & P)		
SOC- 101	Core	Sociological Thought I	50	5	4	1	0
SOC- 102	Core	Society and Culture in India	50	5	4	1	0
SOC - 103	Core	Gender and Sexuality	50	5	4	1	0
SOC - 104	Core	Sociology of Development	50	5	4	1	0
SOC - 105	Core	Social Research: Philosophy, Design & Ethics	50	5	3	1	1
		Total Credit	(250)	25	19	5	1
		Second Semester					
Course No	Course Type	Course Title	Marks	Credit	Credit Distribution		
SOC- 201	Core	Sociological Thought II	50	5	4	1	0
SOC- 202	Core	Functionalist, Structuralist and Interpretative Sociology/Anthropology	50	5	4	1	0
SOC- 203	Core	Social Movements	50	5	3	1	0
SOC- 204	Core	Sociology of Work and Occupation	50	5	4	1	0
SOC- 205	Core	Qualitative and Quantitative Research: Data Management	50	5	4	1	0
		Total Credit	(250)	25	19	5	0
		Third Semester					
Course No	Course Type	Course Title	Marks	Credit	Credit Distribution		
SOC- 301	Core	Critical Theory and Neo-Marxism	50	5	4	1	0
SOC- 302	Core	Sociology and Social Anthropology in India	50	5	4	1	0
SOC- 303A	Major Elective	Environmental Sociology	50	5	4	1	0
SOC- 303B	Major Elective	Political Sociology	50	5	4	1	0
SOC- 304A	Major Elective	Cultural Studies and Everyday Life	50	5	4	1	0
SOC- 304B	Major Elective	Sociology of Medicine and Health	50	5	4	1	0
SOC- 305A	Minor Elective	Sociology of Culture	50	4	3	1	0

SOC- 305B	Minor Elective	Sociology of Social Exclusion	50	4	3	1	0
		Total Credit	(250)	24	20	4	0
		Fourth Semester					
Course No	Course Type	Course Title	Marks	Credit	Credit Distribution		
SOC- 400	Compulsory	Community Engagement Course	20	2	1	1	0
SOC- 401	Core	Postmodern, Postcolonial and Structuration Theories	50	5	4	1	0
SOC- 402	Core	Sociology of Globalisation, Modernity and Post-modernity	50	5	4	1	0
SOC- 403A	Major Elective	Rural and Urban Sociology	50	5	4	1	0
SOC- 403B	Major Elective	Science, Technology And Society	50	5	4	1	0
SOC- 404A	Major Elective	Social Work and NGO Management	50	5	4	1	0
SOC- 404B	Major Elective	Society, Culture and Counselling	50	5	4	1	0
SOC- 405	Core	Project Work DISSERTATION	50	5	0	2	8
		Total Credit	(270)	27			
		All Total Credit	1020	101			

Syllabus

MA in Sociology



**DEPARTMENT OF SOCIOLOGY
THE UNIVERSITY OF BURDWAN
NEW COMPOSITE BUILDING, GOLAPBAG,
P.O.RAJBATI, BURDWAN 713104,
WEST BENGAL, INDIA**

2015

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SYLLABUS FOR M.A./M.SC. IN STATISTICS

Under Choice Based Credit System (CBCS)
Effective from 2020-2022



The University of Burdwan
Burdwan-713104
West Bengal

Preamble

The M.A./M.Sc. in Statistics is a two-year, four-semester programme under Choice Based Credit System (CBCS). Total 96 credits are equally distributed in four semesters (24 credits in each semester). 74, 16, 4, 2 and 2 credits are given for 18 core courses, 4 discipline-centric Elective courses, project, 1 Generic elective course and Community Engagement Activities respectively. The programme contains theoretical, applied and along with computational skills of Statistics. Discipline-centric Elective courses can be chosen from the baskets which contain a variety of courses. The courses in 1st to 4th semesters are designed by considering the syllabi of various eligibility tests at the national level. Project is suggested based on theoretical or applied statistics using real data. Community Engagement Activities are inspired based on survey sampling and real data collection and developing reports based on the collected data set.

Objectives

- Impart teaching so that the students could develop critical thinking ability about the fundamental aspects of Statistics along with solving any scientific or social sciences problems based on real data sets.
- Make the students capable of pursuing research work in various emerging fields of Statistics and its applications.
- Train the students with Statistical knowledge and computational techniques so that they can deal with the problems faced by the industries.
- Make the students aware of their responsibility to meet the societal needs.

Pre-requisite

The students should possess the knowledge on the courses taught in the B.A./B.Sc. with Statistics Honours, or Mathematics Honours with Statistics General.

Programme Outcomes

- Development of critical thinking for carrying out scientific investigations.
- Skills to analyze problems, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof.
- Ability to pursue research or build careers in industry in Applied or Computational Statistical sciences and allied fields.
- Development of the effective scientific and technical communications in both oral and written forms.
- Awareness for becoming a responsible citizen with commitment to deliver one's responsibilities within the scope of bestowed rights and privileges.

Programme Specific Outcomes

- Understanding about the fundamental axioms in Statistics and capability of developing ideas based on them.
- Development of Statistical reasoning and an understanding of the underlying unifying structures of Statistics (i.e., hypotheses, testing, estimation, probabilistic models, cause-and-effect analyses, establishing functional relations, logical structure etc.) and the relationships among them.
- Motivation for research studies in Statistics and related fields with real life applications.
- Knowledge in a wide range of Statistical techniques and application of Statistical methods/tools in other scientific and engineering domains.
- Advanced knowledge in Statistical sciences.
- Nurturing problem solving skills, thinking, creativity through assignments, projectwork.
- Preparing for competitive examinations, like NET, SET, GATE, etc.

PROFILE

Department of Statistics, The University of Burdwan**Syllabus for M.Sc. Examination in Statistics, University of Burdwan****w.e.f 2020 – 2022**

Semester- I									
Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSST101	Core	T	Mathematical Analysis	4	2	10	40	50	4
MSST102	Core	T	Probability Theory	4	2	10	40	50	4
MSST103	Core	T	Statistical Methods & Measure Theory	4	2	10	40	50	4
MSST104	Core	T	Optimization Techniques& Statistical Quality Management	4	2	10	40	50	4
MSST105	Core	P	R Programming	8	4	10	40	50	4
MSST106	Core	P	Practical Basedon MSST102, 103 and 104	8	4	10	40	50	4
					TOTAL				24
Semester- II									
Course				Lect. Hr /week	Dur. of Exam (inH)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSST201	Core	T	Sampling Distributions & Inference - I	4	2	10	40	50	4
MSST202	Core	T	Multivariate Techniques	4	2	10	40	50	4
MSST203	Core	T	Linear Model& Design of Experiments-I	4	2	10	40	50	4
MSST204	Core	T	Operations Research& Reliability Theory	4	2	10	40	50	4
MSST205	Core	P	Practical Basedon MSST 201-204	8	4	10	40	50	4
MSST206	Core	P	Python Programming	8	4	10	40	50	4
					TOTAL				24

Semester- III									
Course				Lect. Hr /week	Dur. of Exam (inH)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSST301	Core	T	Inference-II	4	2	10	40	50	4
MSST302	Core	T	Regression Analysis & Design of Experiments-II	4	2	10	40	50	4
MSST303	Core	P	Practical Based on MSST301 & 302	8	4	10	40	50	4
MSST304-1	GE	T	Elementary Statistics	2	1	05	20	25	2
MSST304-2	GE	T	Elementary Stochastic Process	2	1	05	20	25	2
MSST304-3	GE	T	Numerical Methods and Matrix Algebra	2	1	05	20	25	2
MSST304-4	GE	T	Course opted from SWAYAM	2	1	05	20	25	2
MSST305-1	DE	T	Advanced Statistical Methods	4	2	10	40	50	4
MSST305-2	DE	T	Advanced Probability Theory	4	2	10	40	50	4
MSST305-3	DE	T	Course opted from SWAYAM	4	2	10	40	50	4
MSST306-1	DE	P	Practical Based on MSST305-1	8	4	10	40	50	4
MSST306-2	DE	P	Practical Based on MSST305-2	8	4	10	40	50	4
MSST306-3	DE	T	Course opted from SWAYAM	4	2	10	40	50	4
MSST307	Core	P	Community Engagement	--	---	05	20	25	2
					TOTAL				24

Semester- IV									
Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSST401	Core	T	Stochastic Process & Time Series Analysis	4	2	10	40	50	4
MSST402	Core	T	Demography & Sample Survey	4	2	10	40	50	4
MSST403-1	DE	T	Industrial Statistics (Special-I)	4	2	10	40	50	4
MSST403-2	DE	T	Biostatistics (Special-I)	4	2	10	40	50	4

MSST403-3	DE	T	Advanced Mathematical Statistics (Special-I)	4	2	10	40	50	4
MSST404-1	DE	T	Industrial Statistics (Special-II)	4	2	10	40	50	4
MSST404-2	DE	T	Biostatistics (Special-II)	4	2	10	40	50	4
MSST404-3	DE	T	Advanced Mathematical Statistics (Special-II)	4	2	10	40	50	4
MSST405	Core	P	Practical Based on MSST401,402 and opted DEs	8	4	10	40	50	4
MSST406	Core	P	Project/ Term paper	4	----	10	40	50	4
					TOTAL				24

T/P: Theory/Practical, DE: Discipline-centric Elective; GE: Generic elective

The University of Burdwan
Department of Women's Studies



Syllabus for the M.A. Degree in Women's Studies

(With effect from the academic session 2020 – '22 onwards)

Principles / Guidelines/ Rules
1 Lecture of 1 hour per week × 16 wks= 1Credit
1 Lecture of 1 hour = 2 Tutorial /Practical/ Remedial Coaching
Core Paper --75 Credits; Major Electives – 20 Credits; Minor Elective – 4 Credits, Community Engagement—2 Credits (Total:101)
Credit requirement for a PG Programme: Minimum 101 Credits
Each Course has a nomenclature and an alpha-numeric code
Each student has to take any two Major Elective courses in Semester – III and two in Semester – IV among options offered by the Department at the beginning of the session.
Each student has to take any one Interdisciplinary Elective course of 4 Credits in Semester–III from another Department of this University or opt for a course from SWAYAM
Each paper of 50 marks has an Internal Assessment/viva voce of 10 marks (viz. Written:40, Internal/viva voce:10). In case of Community Engagement it is 25 marks, 20 marks for Report Writing and 5 marks for viva voce [Total marks: 1025]

Discipline	Level	Course No.	Course Type	Course Code	Title of the Course	Credit: Marks
MA SEMESTER--I						
Women's Studies	Semester-I	101	Core Course	WS 101	Fundamentals of Women's Studies	5: 50
Women's Studies	Semester-I	102	Core Course	WS 102	Strands of Feminist Theory	5: 50
Women's Studies	Semester-I	103	Core Course	WS 103	Family, Community and State	5: 50
Women's Studies	Semester-I	104	Core Course	WS 104	Women and Social Issues	5: 50
Women's Studies	Semester-I	105	Core Course	WS 105	Women and the Economic Domain	5: 50
MA SEMESTER-II						
Women's Studies	Semester-II	201	Core Course	WS 201	Socio-Political Movements and Women	5: 50
Women's Studies	Semester-II	202	Core Course	WS 202	Women's Participation in Politics	5: 50
Women's Studies	Semester-II	203	Core Course	WS 203	Women's Education	5: 50
Women's Studies	Semester-II	204	Core Course	WS 204	Women: Health, Environment, Science and Technology	5: 50
Women's Studies	Semester-II	205	Core Course	WS205	Feminist Philosophy	5: 50
MA SEMESTER-III						
Women's Studies	Semester-III	301	Core Course	WS 301	Women and Law in India	5: 50

Women's Studies	Semester-III	302	Core Course	WS 302	Women in Literary and Communicative Media	5: 50
Women's Studies	Semester-III	303A	Major Elective	WS303A	Gender, Violence and Resistance	5: 50
Women's Studies	Semester-III	303 B	Major Elective	WS303B	Gender and Governance	5: 50
Women's Studies	Semester-III	304 A	Major Elective	WS304B	Intersectional Feminism	5: 50
Women's Studies	Semester-III	304 B	Major Elective	WS304B	Discourses on Marginalized and <i>Dalit</i> Women	5: 50
Women's Studies	Semester-III	305A	Interdisciplinary Elective	WS305A	Basics of Women's Studies and Feminist Thought	4: 50
MA Semester-IV						
Women's Studies	Semester-IV	400	Compulsory course		Community Engagement	2:25
Women's Studies	Semester- IV	401	Core Course	WS 401	Research Methodology	5: 50
Women's Studies	Semester-IV	402	Core Course	WS 402	Religion and Women	5: 50
Women's Studies	Semester -IV	403 A	Major Elective	WS403A	Politics of Body	5: 50
Women's Studies	Semester-IV	403 B	Major Elective	WS403B	Gender Roles and Psychology	5: 50
Women's Studies	Semester-IV	404A	Major Elective	WS404A	Women and Ecology	5: 50
Women's Studies	Semester-IV	404B	Major Elective	WS404B	Gender and Poverty	5: 50
Women's Studies	Semester-IV	405	Core Course	WS 405	Project Writing	5: 50

FIRST SEMESTER

WS 101: FUNDAMENTALS OF WOMEN STUDIES [Core Course]

Unit 1: Defining Women Studies

- 1.1.1.1 Women Studies as Academic Discipline–Meaning, Rationale and Scope
- 1.1.1.2 Evolution of Women Studies – Global Perspective
- 1.1.1.3 Evolution of Women Studies – Indian Perspective
- 1.1.1.4 Different Waves of Feminist Movement: Global and Indian
- 1.1.1.5 Women Studies: Challenges it Faces and the Future it Envisions

Unit 2: Basic Concepts

- 1.1.2.1 Sex and Gender – Social Construction
- 1.1.2.2 Patriarchy and Gender Discrimination
- 1.1.2.3 Phallocentrism and Androcentricism
- 1.1.2.4 Women Empowerment
- 1.1.2.5 Intersectionality

WS 102: STRANDS OF FEMINIST THEORY [Core Course]

Unit 1: Feminist Theories: Global

The University of Burdwan
Department of Women's Studies



Modified Syllabus for the M.A. Degree/Course in Women's Studies
(To be effective from the academic session 2020-'22 onwards)

Principles & Guidelines:

1 Lecture of 1 hour per week × 16 weeks = 1Credit
1 Lecture of 1 hour = 2 Tutorials /Practicals/ Remedial Coachings
Core Paper --75 Credits; Major Electives – 20 Credits; Minor Elective – 4 Credits, Community Engagement—2 Credits (Total:101)
Credit requirement for a PG Programme: Minimum 101 Credits
Each Course has a nomenclature and an alpha-numeric code
Each student has to take any two Major Elective courses in Semester – III and two in Semester – IV among options offered by the Department at the beginning of the session.
Each student has to take any one Interdisciplinary Elective course of 4 Credits in Semester–III from another Department of this University or opt for a course from SWAYAM
Each paper is of 50 marks, and has an Internal Assessment/viva voce of 10 marks (viz. Written: 40, Internal/viva voce:10). In case of Community Engagement, 10 marks for Report Writing and 10 marks for viva voce

Nature and Duration of the Course:

Regular PG MA Course of 2 Years, Distributed into 4 Semesters

Mission:

The present syllabus is prepared with the mission to familiarize and sensitize (already graduated) students, irrespective of sex, with the discipline of Women's Studies. Women's Studies is a discipline that involves not only its historical, conceptual and theoretical dimensions, but also its political and socio-cultural antecedents, ideologies and movements. The aim is to bring in a deeper understanding of the gender-related issues that concern women and people of so called third gender. It even includes the males who encounter gender-related oppression in some other ways. It will explore the various contexts and concepts that help to identify the sexist, androcentric and/or patriarchal biases. Such an exploration will help us to gain a conceptual and theoretical clarity on this subject and consequently, will help to frame courses of actions to get rid of this age-old inequity and injustice.

Objectives:

1. To help students to get systematic understanding of the discipline.
2. To encourage the students understand the emerging dimensions within the field of gender and women's studies.
3. To take students to understand the social, economic, political, intellectual or cultural contributions of women, which patriarchal history of thought often disregards.

4. To compare women and other oppressed groups across cultures and at different contexts, like race, caste, nationality, etc., using the newly commissioned methodology of intersectionality.
5. To instil confidence in them to find themselves as an indispensable part of the society.
6. To develop an attitude of help and support to other women and oppressed classes to secure equality position in their societies.
7. To equip students to apply these modes of knowledge in furthering their careers and in seeking a respectful livelihood at par with males, both in the Government sector and in the NGOs.
8. And to help them cracking different competitive examinations, like NET/SET, IAS, WBCS, etc.

Future of Women's Studies:

Women Studies has by now become a core discipline in the present-day university education. As an academic discipline, the subject is getting popular day by day, as the gender and women's issues get priority areas of operation in the modern socio-cultural and political spheres, and also from the point of view of policy initiatives. As the subject helps imparting interests among the students, both males, females or third gender persons, and as such, the students from different disciplines get interested on different types of issues compiled in this curriculum of Women's Studies for post-graduate education. The increasing popularity of this new discipline has led UGC to encourage establishing Women's Studies and Research Centres at universities and colleges, so that the so far neglected ideological layers of patriarchy and androcentricity may be taken up to fight for the causes of people who are being oppressed and discriminated due to their sex, and thereby achieve the Millennium Goal of sustainable development.

A Glimpse of the Programme:

1. Aggregate Marks of the M.A. programme is 1025 marks, divided into 4 semesters.
2. Each semester comprises 5 courses of 50 marks each.
3. Each course of 50 marks (except Interdisciplinary elective, which is of 4 credits) will be of 5 credits, with 80% for final written examination and 20% for internal assessment (which includes written tests, presentations, topic-specific assignments, group discussions and other mid-term tests as a part of continuous evaluation, maintaining the UGC norms.)
4. There are some optional courses (here called Major Electives) providing students with a wider set of choices, as well as encouraging interdisciplinary learning.
5. This M.A. programme has one core course on Research Methodology and one in Community Engagement programme.

Structure of the Syllabus and Distribution of Credits and Marks

Discipline	Level	Course No.	Course Type	Course Code	Title of the Course	Credit: Marks
MA SEMESTER--I						
Women's Studies	Semester-I	101	Core Course	WS 101	Fundamentals of Women Studies	5: 50
Women's Studies	Semester-I	102	Core Course	WS 102	Strands of Feminist Theory	5: 50

Women's Studies	Semester-I	103	Core Course	WS 103	Family, Community and State	5: 50
Women's Studies	Semester-I	104	Core Course	WS 104	Women and Social Issues	5: 50
Women's Studies	Semester-I	105	Core Course	WS 105	Women and the Economic Domain	5: 50
MA SEMESTER-II						
Women's Studies	Semester-II	201	Core Course	WS 201	Socio-Political Movements and Women	5: 50
Women's Studies	Semester-II	202	Core Course	WS 202	Women's Participation in Politics	5: 50
Women's Studies	Semester-II	203	Core Course	WS 203	Women's Education	5: 50
Women's Studies	Semester-II	204	Core Course	WS 204	Women: Health, Environment, Science and Technology	5: 50
Women's Studies	Semester-II	205	Core Course	WS205	Feminist Philosophy	5: 50
MA SEMESTER-III						
Women's Studies	Semester-III	301	Core Course	WS 301	Women and Law in India	5: 50
Women's Studies	Semester-III	302	Core Course	WS 302	Women in Literary and Communicative Media	5: 50
Women's Studies	Semester-III	303A	Major Elective	WS303A	Gender, Violence and Resistance	5: 50
Women's Studies	Semester-III	303 B	Major Elective	WS303B	Gender and Governance	5: 50
Women's Studies	Semester-III	304 A	Major Elective	WS304B	Intersectional Feminism	5: 50
Women's Studies	Semester-III	304 B	Major Elective	WS304B	Discourses on Marginalized and Dalit Women	5: 50
Women's Studies	Semester-III	305A	Interdisciplinary Elective	WS305A	Basics of Women's Studies and Feminist Thought	4: 50
MA Semester-IV						
Women's Studies	Semester-IV	400	Compulsory course		Community Engagement	2:25

Women's Studies	Semester- IV	401	Core Course	WS 401	Research Methodology	5: 50
Women's Studies	Semester-IV	402	Core Course	WS 402	Religion and Women	5: 50
Women's Studies	Semester -IV	403 A	Major Elective	WS403A	Politics of Body	5: 50
Women's Studies	Semester-IV	403 B	Major Elective	WS403B	Gender Roles and Psychology	5: 50
Women's Studies	Semester-IV	404A	Major Elective	WS404A	Women and Ecology	5: 50
Women's Studies	Semester-IV	404B	Major	WS404B	Gender and Poverty	5: 50
Studies			Elective			
Women's Studies	Semester-IV	405	Core Course	WS 405	Project Writing	5: 50

FIRST SEMESTER

WS 101: FUNDAMENTALS OF WOMEN STUDIES [Core Course]

[This core paper is the startup basics of the discipline of women's studies. It aims at defining the subject, both in the global and Indian perspectives, with its rationale. It also introduces some very basic concepts/notions, necessary for any further move in understanding women's studies.]

Unit 1: Defining Women Studies

- 1.1.1.1 Women Studies as Academic Discipline–Meaning, Rationale and Scope
- 1.1.1.2 Evolution of Women Studies – Global Perspective
- 1.1.1.3 Evolution of Women Studies – Indian Perspective
- 1.1.1.4 Different Waves of Feminist Movement: Global and Indian
- 1.1.1.5 Women Studies: Challenges it Faces and the Future it Envisions

Unit 2: Basic Concepts

- 1.1.2.1 Sex and Gender – Social Construction
- 1.1.2.2 Patriarchy and Gender Discrimination
- 1.1.2.3 Phallocentrism and Androcentricism
- 1.1.2.4 Women Empowerment
- 1.1.2.5 Intersectionality

WS 102: STRANDS OF FEMINIST THEORY [Core Course]

[This core paper is exploration of major strands/interpretations of feminist thought, both in the global and local perspectives, since, as we think, without the umbrella discourse of feminism (irrespective of whether we like this terminology or not) the discipline of women's studies can never adequately be understood. This will, consequently, help them to apply this knowledge to their social surroundings and daily lives. As it is not possible to include all different strands/ types of feminist thought, we have to be selective.]

Unit 1: Feminist Theories: Global

- 1.2.1.1. Liberal Feminism
- 1.2.1.2. Marxist Feminism
- 1.2.1.3. Psycho-Analytic Feminism
- 1.2.1.4. Radical Feminism
- 1.2.1.5. Socialist Feminism

Unit 2: Later Feminist Thought

- 1.2.2.1 Postcolonial Feminism

SYLLABUS FOR
M.Sc. COURSE IN ZOOLOGY
(With effect from Session 2020 – 2022)
[CHOICE BASED CREDIT SYSTEM]



DEPARTMENT OF ZOOLOGY
THE UNIVERSITY OF BURDWAN
BURDWAN, WEST BENGAL 713104
INDIA

The existing M.Sc. syllabus under CBCS system (2020-2022) has been placed in the meeting of Board of Post Graduate Studies in Zoology held on 11/12/2020. Members of PGBS have reorganized and approved the syllabus on 11/12/2020 to place before the meeting of Faculty Council of Science on/12/2020. Finally, Faculty Council of Science has approved the syllabus on

(Prof. Soumendranath Chatterjee)
Head & Chairman,
PGBS, Dept. of Zoology, BU

Members of the Post Graduate Board of Studies in Zoology (PGBS) in its meeting held on 10-05-2022 have approved minor corrections to be incorporated in the M.Sc. syllabus under CBCS system (2020-2022).

(Prof. Koushik Ghosh)
Head & Chairman,
PGBS, Dept. of Zoology, BU

POST GRADUATE SYLLABUS
Department of Zoology
Summary of the course and credits

Semester I [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSZO 101	Core	T	Ecology, Ethology and Conservation Biology	4T	2T	10	40	50	4
MSZO 102	Core	T	Basic and Applied Entomology	4T	2T	10	40	50	4
MSZO 103	Core	T	Parasitology and Vector Biology	4T	2T	10	40	50	4
MSZO 104	Core	T	Fish Biology and Fisheries	4T	2T	10	40	50	4
MSZO 105 (Unit I)	Core	P	Ecology and Conservation Biology	4P	2P	05	20	25	2
MSZO 105 (Unit II)	Core	P	Entomology	4P	2P	05	20	25	2
MSZO 106 (Unit I)	Core	P	Parasitology and Vector Biology	4P	2P	05	20	25	2
MSZO 106 (Unit II)	Core	P	Fish Biology and Fisheries	4P	2P	05	20	25	2
Total credit									24

T/P: Theory/Practical

Semester II [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSZO 201	Core	T	Biosystematics and Evolutionary Biology	4T	2T	10	40	50	4
MSZO 202	Core	T	Microbiology and Immunology	4T	2T	10	40	50	4
MSZO 203	Core	T	Genetics and Cell Biology	4T	2T	10	40	50	4
MSZO 204	Core	T	Physiology and Endocrinology	4T	2T	10	40	50	4
MSZO 205 (Unit I)	Core	P	Biosystematics	4P	2P	05	20	25	2
MSZO 205 (Unit II)	Core	P	Genetics and Cell Biology	4P	2P	05	20	25	2
MSZO 206 (Unit I)	Core	P	Physiology and Endocrinology	4P	2P	05	20	25	2
MSZO 206 (Unit II)	Core	P	Microbiology and Immunology	4P	2P	05	20	25	2
Total credit									24

T/P: Theory/Practical

Semester III [Credits – 24]

Course				Lect. Hr /week	Dur. of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSZO 301	Core	T	Biochemistry and Toxicology	4T	2T	10	40	50	4
MSZO 302	Core	T	Histology-Histochemistry and Comparative Anatomy	4T	2T	10	40	50	4
MSZO 303 (Unit I)	Core	P	Biochemistry and Toxicology	4P	2P	10	20	25	2
MSZO 303 (Unit II)	Core	P	Histology-Histochemistry and Comparative Anatomy	4P	2P	10	20	25	2
MSZO 304Z	GE	T	Applied Zoology	2T	1T	05	20	25	2
MSZO 305*	DE	T	Discipline-centric Elective	4T	2T	05	40	50	4
MSZO 306**	DE	P	Discipline-centric Elective	8P	4P	05	40	50	4
MSZO 307	CE	T/P	Community Engagement ##	N.A.	N.A.	05	20	25	2
Total credit									24

T/P: Theory/Practical

CE: Community Engagement Activities; DE: Discipline-centric Elective; GE: Generic elective

***Discipline-centric Elective (Students need to take any one of these Discipline-centric Electives)**

1. AQUACULTURE AND FISHERIES (**COURSE CODE: MSZO 305-DE1**)
2. ECOLOGY AND ENVIRONMENTAL BIOLOGY (**COURSE CODE: MSZO 305-DE2**)
3. ENTOMOLOGY (**COURSE CODE: MSZO 305-DE3**)
4. MOLECULAR BIOLOGY AND GENETICS (**COURSE CODE: MSZO 305-DE4**)
5. PARASITOLOGY AND MICROBIOLOGY (**COURSE CODE: MSZO 305-DE5**)

****COURSE CODE: MSZO 306-DE1, 306-DE2, 306-DE3, 306-DE4, and 306-DE5**

##Community Engagement: Based on Discipline-centric Elective

Semester IV [Credits – 24]

Course				Lect. Hr /week	Dur. Of Exam (in hr)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T.	Total	
MSZO 401	Core	T	Developmental Biology and Stem cell Biology	4T	2T	10	40	50	4
MSZO 402	Core	T	Biostatistics and Computational Biology	2T	1T	05	20	25	2

MSZO 403	Core	P	Developmental and Computational Biology	4P	2P	05	20	25	2
MSZO 404 [#]	DE	T	Discipline-centric Elective*	4T	2T	10	40	50	4
MSZO 405 ^{##}	DE	T	Discipline-centric Elective*	4T	2T	10	40	50	4
MSZO 406 ^{###}	DE	P	Discipline-centric Elective*	8P	4P	10	40	50	4
MSZO 407	Term paper / Project	T / P	Dissertation ^{\$\$} (Empirical or Non empirical)	N.A.	N.A.	10	40	50	4
Total credit									24

*Based on Discipline-centric Elective taken in Semester -III

\$\$Based on Discipline-centric Elective

[#]DE Course Code: MSZO 404-DE1, MSZO 404-DE2, MSZO 404-DE3, MSZO 404-DE4, and MSZO 404-DE5

^{##}DE Course Code: MSZO 405-DE1, MSZO 405-DE2, MSZO 405-DE3, MSZO 405-DE4, and MSZO 405-DE5

^{###}DE Course Code: MSZO 406-DE1, MSZO 406-DE2, MSZO 406-DE3, MSZO 406-DE4, and MSZO 406-DE5

Notes on marks distribution:

- In each course, 20% marks is allotted for Internal Assessment (for both theory and practical), i.e., 10 marks for a paper of 50 marks and 5 marks for a paper of 25 marks.
- Marks distribution for each paper will be as follows:
 - For **40** marks of **NON-UNIT** based paper:
Four questions (out of six) of 2 marks each, four questions (out of six) of 4 marks each and two questions (out of four) of 8 marks each are to be answered
 - For **40** marks of **UNIT** based paper:
UNIT I (Total Marks 20): *Four questions (out of six) of 1 mark each, two questions (out of four) of 4 marks each and one question (out of two) of 8 marks are to be answered*
UNIT II (Total Marks 20): *Four questions (out of six) of 1 mark each, two questions (out of four) of 4 marks each and one question (out of two) of 8 marks are to be answered*
 - For 20 marks of **NON-UNIT** based paper:
Four questions (out of six) of 1 mark each, two questions (out of four) of 4 marks each and one question (out of two) of 8 marks are to be answered

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TOTAL MARKS - 1200

Summary of the M.Sc. course in Zoology

	Theory & term paper	Practical	Marks Distribution				Total Marks
			Theory	Term paper	Practical	Internal assessment	
Semester I	4	2	180	-	100	20	300
Semester II	4	2	180	-	100	20	300
Semester III	4	2	180	-	100	20	300
Semester IV	4	2	135	50	100	15	300
	16	8	725		400	75	1200

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Total Marks: 1200
(Theoretical: 750 + Practical: 400 + Term paper: 50)

Semester- I			F.M. 300
<u>Theory</u>			
TGZ: 101 (F.M. 45)	- Unit-I	Biosystematics and Taxonomy	
	- Unit-II	Evolution and Population Genetics	
TGZ: 102 (F.M. 45)	- Unit-I	Histology and Histochemistry	
	- Unit-II	Comparative Anatomy	
TGZ: 103 (F.M. 45)	- Unit-I	Cytology	
	- Unit-II	Genetics	
TGZ: 104 (F.M. 45)	- Unit-I	Biochemistry	
	- Unit-II	Toxicology	
<u>Internal assessment:</u> (F.M. 4×5=20)			
<u>Practical</u>			
PGZ: 105 (F.M. 50)	- Unit-I	Dissection and Taxonomy	
	- Unit-II	Histology and Histochemistry	
PGZ: 106 (F.M. 50)	- Unit-I	Cytology and Genetics	
	- Unit-II	Biochemistry and Toxicology	
Semester- II			F.M. 300
<u>Theory</u>			
TGZ: 201 (F.M. 45)	- Unit-I	Ecology and Ethology	
	- Unit-II	Soil Zoology	
TGZ: 202 (F.M. 45)	-	Physiology	
TGZ: 203 (F.M. 45)	-	Microbiology	
TGZ: 204 (F.M. 45)	-	Immunology	

Internal assessment: (F.M. 4 × 5=20)		
<u>Practical</u>		
PGZ: 205 (F.M. 40+10=50)	-	Ecology and Soil Zoology & Educational tour
PGZ: 206 (F.M. 50)	-	Unit-I Physiology
	-	Unit-II Microbiology and Immunology
Semester- III		F.M. 300
<u>Theory</u>		
TGZ: 301 (F.M.-45)	-	General Entomology
TGZ: 302 (F.M. 45)	-	Parasitology and Vector Biology
TGZ: 303 (F.M. 45)	-	Ichthyology and Aquaculture
TSZ: 304 (F.M. 45)	-	Special paper
Internal assessment: (F.M. 4 × 5=20)		
<u>Practical</u>		
PGZ: 305 (F.M. 50)	-	Entomology, Parasitology and Ichthyology
PSZ: 306 (F.M. 50)	-	Special Paper
Semester- IV		F.M. 300
<u>Theory</u>		
TGZ: 401 (F.M. 45)	-	Unit-I Developmental Biology
	-	Unit-II Biostatistics and Bioinstrumentation
TSZ: 402 (F.M. 45)	-	Special Paper
TSZ: 403 (F.M. 45)	-	Special Paper
TSZ: 404 (F.M. 50)	-	Term paper/Project work (based on special paper) [Submission & Seminar Presentation – 40 (25+15) & Discussion – 10]

Internal assessment: (F.M. 3×5=15)		
<u>Practical</u>		
PGZ: 405 (F.M. 50)	-	Developmental Biology & Computer Application
PSZ: 406 (F.M. 50)	-	Special paper

Special papers offered:

1. ENTOMOLOGY
2. AQUACULTURE & FISHERIES
3. PARASITOLOGY & MICROBIOLOGY
4. ECOLOGY & ENVIRONMENT
5. MOLECULAR BIOLOGY & GENETICS