UNIVERSITY OF MYSORE
YUVARAJA'S COLLEGE, MYSORE
(A Constituent Autonomous College with Potential for Excellence)
(Accredited "A" Grade with CGPA 3.34 by NAAC)
JLB Road, Mysuru 570 005, Karnataka , INDIA

Post Graduate Programs offered in Yuvaraja's College (Autonomous): 2016-17

1. 5 Year Integrated Master of Science (M.Sc.) with **one** program specific discipline: Molecular Biology.
2. Master of Science (M.Sc.) with six program specific disciplines viz., Chemistry, Physics, Botany, Food and Nutrition, Mathematics, Sericulture and Seribiotechnology.
3. Master of Arts (M.A.) with one Program specific discipline English.
4. Master of Business Administration (MBA) which is approved by All India Council for Technical Education (AICTE).

The objectives and outcomes of the above programs have been set since the CBCS syllabus is introduced in our college.

Sl. No.	Program	Program Code	Program Specific	Program Specific Code/Open Elective Code	Outcome page no
1	5 Year Integrated M.Sc.	MSCCBCSINTYCM	1.Molecular Biology	MSCCBCSINTMBYCM	**06**
2	M.Sc.	MSCCBCSYCM	1.Botany	MSCCBCSBOTYCM	**32**
			2.Chemistry	MSCCBCSCHEMYCM	**38**
			3.Food and Nutrition	MSCCBCSFSNYCM	**54**
			4.Mathematics	MSCCBCSMATYCM	**67**
			5. Physics	MSCCBCSPHYYCM	**75**
			Open Electives: a. Sericulture Technology b. Waste Management c. Statistics		**112** **114**
3	M.A.	MACBCSYCM	English	MACBCSENGYCM	**82**
4	M.B.A.	MBAYCM	Management Science	MBAMANYCM	**89**

1. Program :5 Year Integrated Master of Science (M.Sc.)
Program Code: MSCCBCSINTYCM

Program objectives (PO):

1. To impart wholistic interdisciplinary education.
2. To inculcate the spirit of competitiveness.
3. To train critical thinking, effective communication, social interaction and effective citizenship.
4. To develop good work culture.
5. To have environmental concerns.
6. To motivate them for self-directedand lifelong learning process.
7. To develop belongingness to our locality and nation.

Program outcome (PO):

Students get/develop/learn

1. Good understanding of the study areas due to interdisciplinary nature of the program.
2. Required knowledge for clearing competitive examinations and getting selected interviews in higher percentages.
3. Critical thinking to take actions and decisions at intellectual, organizational and personal perspectives and become citizens of character.
4. Knowledge to effectively speak, read, write and listen clearly in person and through electronic media in English to develop novel ideas, connect with people, books, media and technology.
5. Capability of healthy social interaction on how to elicit views of others, mediate disagreements and reach conclusions in group settings.
6. To know about effective citizenship where they are able to demonstrate equity centered national development, and participate in civic life through volunteering.
7. passion for the chosen field and love to work which increases their efficiency
8. To recognize different value systems, understand the moral dimensions of decisions with a responsibility to accept them and practice in life.
9. Issues related environment and the need to practice them in an ecofriendly way for sustainable development.
10. The ability to engage in independent and life-long learning in the context of socio-technological changes which gives them self-directed and lifelong learning capabilities.
11. The importance of locally available resources and knowledge with pride and this helps them to think locally and act globally and have belongingness to our nation.

2. Program :Master of Science (M.Sc.)
Program Code: MSCCBCSYCM

Program objectives (PO):

1. To impart wholistic education.
2. To inculcate the spirit of competitiveness.
3. To train critical thinking, effective communication, social interaction and effective citizenship.
4. To develop good work culture.
5. To have environmental concerns.
6. To motivate them for self-directedand lifelong learning process.
7. To develop belongingness to our locality and nation.

Program outcome (PO):

Students get/develop/learn

1. Good understanding of the study areas.
2. Required knowledge for clearing competitive examinations and getting selected interviews in higher percentages.
3. Critical thinking to take actions and decisions at intellectual, organizational and personal perspectives and become citizens of character.
4. Knowledge to effectively speak, read, write and listen clearly in person and through electronic media in English to develop novel ideas, connect with people, books, media and technology.
5. Capability of healthy social interaction on how to elicit views of others, mediate disagreements and reach conclusions in group settings.
6. To know about effective citizenship where they are able to demonstrate equity centred national development, and participate in civic life through volunteering.
7. Passion for the chosen field and love to work which increases their efficiency
8. To recognize different value systems, understand the moral dimensions of decisions with a responsibility to accept them and practice in life.
9. Issues related environment and the need to practice them in an ecofriendly way for sustainable development.
10. The ability to engage in independent and life-long learning in the context of socio-technological changes which gives them self-directed and lifelong learning capabilities.
11. Will develop belongingness to our Nation.

3. Program :Master of Arts (M.A.)
Program Code: MSCCBCSYCM

Program Objectives (PO):

1. To impart core knowledge, methods, and scholarship in the chosen program.
2. To educate the students for specialization knowledge, methods, and scholarship.
3. To creative synthesis and critical thinking
4. To teach research methodology
5. To impart scholarship:
6. To make the students Independent Learners
7. To have environmental concerns.
8. To develop belongingness to our locality and nation.

Program Outcomes (PO):

1. Core Knowledge, Methods, and Scholarship: Students will acquire general knowledge of a range of historical fields and a range of theories, methods, research protocols, and scholarly practices that are necessary for strong research, teaching, and service.
2. Specialization knowledge, methods, and scholarship: Students will demonstrate Comprehensive knowledge of the literature (or film) in their chosen historical field(s) or research focus.
3. Creative synthesis and critical thinking: Students will learn a number of strategies for Analyzing individual examples of literature and film, and for thinking synthetically about works that share a formal, generic, topical, or historical impulse. They also will learn a number of strategies for sorting through the applicability of and connections among a range of scholarly approaches to those works.
4. Research methodology: Students will learn how to design and carry out original research in English literature with particular attention to their chosen historical field(s) or research focus.
5. Scholarship: Students will produce original scholarship that contributes to the growth of Knowledge in the chosen field.
6. Independent Learner: Students will demonstrate an ability to define projects and conduct investigations independently
7. Environmental concerns: Will be able to practiceeco-friendly way of life for sustainable Development
8. Belongingness: Will develop belongingness to our Nation

4. Program :Master of Business Administration (MBA)
Program Code: MBACBCSYCM

Program Objectives (PO):

1. MBA graduates shall acquire analytical skills, data management and diagnostic problem solving skills in order to support management decision making. Students will make data-driven decisions demonstrating the ability to identify alternatives.
2. **BusinessManagement& Leadership Skills**: Demonstrate an ability to apply a significant amount of business administration knowledge in Leadership & Management, Accounting &Finance, Health Care Management, Human Resource Management, IT Management, and Project Management.
3. **Strategic Planning & Problem-Solving Skills:** To demonstrate ability to identify problems, define objectives collect and analyze information, evaluate risks and alternatives, and leverage technology to solve organizational problems using a strategic planning approach.
4. **Communication and Team Management Skills:** To demonstrate ability to communicate effectively with all stakeholders and mobilize team for a common purpose with a clear understanding of organizational behaviour and change.
5. **Social Responsibility & Ethical Decision-Making Skills**: To demonstrate the ability to understand and analyze corporate social responsibilities and apply ethical decision-making principles during day-to-day operations.

MBA Program Outcomes (PO): upon completion of the MBA program, students will:

1. Gain knowledge of the key functions of business enterprises
2. Acquire advanced skills to understand and analyze significant business opportunities, which can be complex, uncertain and dynamic.
3. Use critical and analytical thinking to identify viable options that can create short-term and long-term value for organizations and their stakeholders.
4. Apply best practices to solve managerial issues.
5. Integrate theories and practice to perform strategic analysis
6. Demonstrate effective written forms of communication and oral business presentations
7. Implement leadership skills to work effectively within diverse teams
8. Identify and analyze ethical responsibilities of businesses.
9. Apply decision-making techniques, both quantitative and qualitative analysis, to management issues.
10. Motivate and work with colleagues, partners, and other stakeholders to achieve organizational purposes.
11. Help build and sustain high-performing teams by infusing teams with a variety of perspectives, talents, and skills and aligning individual success with team success and with overall organizational success.
12. Foster collaboration, communication and adaptability in helping.

Program specific and course outcomes of the above-mentioned programs of our college

Sl. No	Program	Program Code	Program Specific discipline	Program Specific Code
1	5 Year Integrated	MSCCBCSINTYCM	1.Molecular Biology	MSCCBCSINTMBYCM

Program specific Title: Five Year Integrated M. Sc. Molecular Biology

Program Specific Code: MSCCBCSINTMBYCM

Program specific objectives: (PSO)

- To impart advanced and in-depth knowledge in the area of Biological science.
- To train the students to be inquisitive and think in an innovative way.
- To impart basic and translational research skills with technical excellence and make them research and industry ready.

Program specific outcome (PSO)

- In depth knowledge gained during the course of five years helps the students to quickly acclimatize to the work environment when they join as trainees or JRF positions in most of the research institutes/industries.
- Helps the students to answer the questions with confidence in competitive examination and also in PhD interviews.
- Gain enough knowledge to propose research ideas with guidance from the concerned subject teacher.
- Develop practical skills along with their theory components, which help in their Final year Project work and in research programmes when selected for various positions in both academic institutions and R & D programmes of industries.
- Develop entrepreneurial skills with the help of skill-based courses and alumni interaction.
- Effective communication and interactive skills developed for teaching the subject at graduate and postgraduate levels.
- Overall goal is reached towards Professional Competence.

5 year Integrated Molecular Biology Course - 2016-17

COURSE STRUCTURE (Choice Based Credit System) Master of Science (Five Year Integrated) in Molecular Biology (Theory and Practical papers from first to tenth Semester) (10 semesters) (Effective from 2011-12)All modifications done (2011-2012 to 2019-2020)						
Sl. No	**Paper Code**	**Title of the Paper**	**L**	**T**	**P**	**Credits**
		I SEMESTER				
1	MBA110	General Botany	4	0	2	06
2	MBA120	General Zoology	4	0	2	06
3	MBA130	Mathematics for Biologists	3	0	0	03
4	MBA140	Constitution of India	3	0	0	03
5	MBA150	Communication Skills-1	1	1	0	02
		Total				**20**
		II SEMESTER				

6	MBB110	General & Inorganic Chemistry	4	0	1	05
7	MBB120	Physical Chemistry	4	0	1	05
8	MBB130	Physics	4	0	1	05
9	MBB140	Environmental Studies	3	0	0	03
10	MBB150	Communication Skills-2	1	1	0	02
		Total				**20**
		III SEMESTER				
11	MBC110	Organic Chemistry	3	0	1	04
12	MBC120	Basic Biochemistry	3	0	1	04
13	MBC130	Developmental Biology	4	0	1	05
14	MBC140	Cell Biology	3	0	1	04
15	MBC150	Computer Applications	2	0	1	03
		Total				**20**
		IV SEMESTER				
16	MBD110	Advanced Organic Chemistry	2	0	1	03
17	MBD120	Microbiology	3	0	2	05
18	MBD130	Plant Physiology	3	0	1	04
19	MBD140	Animal Physiology	3	0	1	04
20	MBD150	Macro Molecules	3	0	1	04
		Total				**20**
		V SEMESTER				
21	MBE110	Metabolism-I	3	1	1	05
22	MBE120	Biochemical Techniques	3	0	2	05
23	MBE130	Biophysics	4	0	1	05
24	MBE140	Principles of Genetics	3	1	1	05
25	MBE150	Elective 1	2	0	0	02
		Total				**22**
		VI SEMESTER				
26	MBF110	Molecular Cell Biology	3	1	1	05
27	MBF120	Metabolism-II	3	1	1	05
28	MBF130	Enzymology	3	1	1	05
29	MBF140	Molecular Genetics	3	1	1	05
30	MBF150	Elective – 2	2	0	0	02
		Total				**22**
		VII SEMESTER				
31	MBG110	Immunology	3	1	0	04
32	MBG120	Molecular Mechanism of Signal Transduction	2	1	0	03
33	MBG130	Molecular Mechanism of Gene Expression - I	3	1	0	04
34	MBG140	Genetic Engineering- I & Bioinformatics	4	1	0	05
35	MBG150	Molecular Biology Lab-1	0	0	4	04
36	MBG160	Elective – 3	2	0	0	02
		Total				**22**
		VIII SEMESTER				
37	MBH110	Molecular Pathology	3	1	0	04
38	MBH120	Biostatistics and Research Methodology	2	1	1	04
39	MBH130	Genomics and Phylogenetics	2	1	1	04
40	MBH140	Molecular Basis of Development and Differentiation	3	1	0	04
41	MBH150	Molecular Biology Lab-2	0	0	4	04

42	MBH160	Elective – 4/ minor project work	2	0	0	02
		Total				**22**
		IX SEMESTER				
43	MBI110	Genetic Engineering-II	3	1	0	04
44	MBI120	Proteomics and Drug designing	2	1	1	04
45	MBI130	Cancer biology	2	0	0	02
46	MBI140	Molecular mechanism of Gene Expression-II	3	1	0	04
47	MBI50	Molecular Biology Lab-3	0	0	6	06
48	MBI60	Elective- 5	2	0	0	2
		Total				**22**
		X SEMESTER				
49	MBJ110	Elective -6 (self study)	02			02
50	MBJ120	Project Work		01	07	08
		Total				**10**
		Grand Total- Credits				**200**

Course objectives and outcomes of 5 Year Integrated M.Sc. Molecular Biology

SEMESTER – I

MBA110 - GENERAL BOTANY

Course objectives:

- To understand the diversity of plant kingdom.
- To know the external morphology and internal structure of all groups of plants.
- To understand types of reproduction and evolution in plants.

Course outcome:

- Students understand the basis for classifying fungi and plants.
- They gain knowledge on the types and importance of classification.
- Students know external morphology of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.
- They acquire the knowledge of cellular diversity of fungi and plants starting from unicellular to highly complex angiosperm plants.
- They gain insight into the varied types of reproductive cycles of fungi and plants.
- Knowledge gained on the economic importance of different fungi and plants help them in future for research and other applications in agriculture, medicine and industry.
- Students understand the course of evolution in plants.

MBA120 - GENERAL ZOOLOGY

Course objectives:

- To understand the diversity of Animal kingdom.
- To know the external morphology and internal structure of all groups of animals.
- To understand types of reproduction and usefulness of different groups of animals.

Course outcome:

- Students will understand the basis for classifying animals.
- They will gain knowledge on the types and importance of classification.

- Students will know external morphology of different phyla of animals starting from Protozoa to Chordata.
- They will acquire the knowledge of different types of tissues animals with special emphasis to humans. This gives a clear dimension to the students regarding their role in different organs.
- They will gain insight into the varied types of reproductive behavior of different groups of animals. This knowledge forms a basis for further research.
- Overview of human system also gives a foundation to understand a course on Animal Physiology in the fourth semester.
- Knowledge gained on the economic importance of different animals help them in future for research and other applications in agriculture, medicine and industry.

MBA130 - MATHEMATICS FOR BIOLOGISTS

Course objectives:

- Develop the ability to explain mathematical results in language understandable by biologists.
- Solve mathematically and interpret biologically simple problems involving one and two species ecosystems, epidemics and biochemical reactions.
- To use their mathematical knowledge to solve problems related to biology.

Course outcome:

- Students will be able to design standard experiments, with consideration of selection process, data collection, and issues of bias, causality and confounding, based on specifications of a scientific study.
- This will help the students to identify limitations to statistical results and avoid misleading quantitative analysis.
- It will help the students to effectively present their research findings to an audience lacking statistical expertise.
- This forms a base for understanding bioinformatics tools in a better perspective.
- This will help in understanding the basic concepts and working knowledge of essential mathematical and statistical methods useful for applying to molecular problems. This offers a bridge between pure mathematical and statistical principles to the modern biological problems.

MBA140 - CONSTITUTION OF INDIA

Course objectives:

- To enable the student to understand the importance of constitution.
- To understand the structure of executive, legislature and judiciary.
- To understand philosophy of fundamental rights and duties.
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.
- To understand the centre and state relation, financial and administrative.

Course outcome:

- Students will be able to understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local administration.

- Students will gain knowledge on features of Indian constitution, the decentralization of power between central, state and local self-government, and the knowledge in economy of the country, new schemes- policies, amendments and finance allocation to research fields from time to time.

- This helps the students to get jobs in policy making boards and in funding agencies like UGC, CSIR, DBT and DST, and students can become policy makers.

MBA150 - COMMUNICATION SKILLS I

Course objectives:

- Communication skills 1 seeks to develop the student's abilities in grammar, oral skills, reading, writing and study skills.

- To heighten their awareness of correct usage of English grammar in writing and speaking.
- To improve their speaking ability in English both in terms of fluency and comprehensibility.
- To give oral presentations and receive feedback on their performance.

Course outcome:

- Students will be able to increase their reading speed and comprehension of academic articles and text books.
- Students will strengthen their ability to write academic papers, essays and research articles without any grammatical mistakes.

SEMESTER-II

MBB110 - GENERAL AND INORGANIC CHEMISTRY

Course objectives:

- To study the basic mechanisms of chemical bonding, their structure, coordination, complex formations, chromatography, concentration units, and concepts acids –bases and buffers.
- To understand biologically important elements, and their toxicity.

- To understand the role of biological important elements and know techniques like X-ray crystallography.

Course outcome:

- Students will understand the behaviour of gases and their laws, atomic structure and chemical bonding.
- Important techniques like chromatography and X-ray crystallography are discussed which helps students in academia and research.
- They will understand bioinorganic chemistry, chemistry of biologically important elements and porphyrin which bridges the gap between chemistry and biology for better relationship between both.

MBB120 - PHYSICAL CHEMISTRY

Course objectives:

- For basic understanding of kinetics and catalysis of important reactions.
- Overview of Important branches of chemistry like radiochemistry, photochemistry, and electrochemistry are discussed to aid better holistic understanding.

Course outcome:

- Students will understand the basics of radioactive elements, their detection and biological effects of radiation.
- Students will understand the phenomenon of photochemistry.
- Enable students to understand drug delivery, bioavailability, and protein binding and clearance mechanisms.
- Students will learn about the electrochemical cell and its conductance in detail.
- Basic understanding of chemical kinetics and catalysis of reactions including enzyme catalyzed reactions help students to better understand future semester paper enzymology and to also know how the rate of the reactions behave under the influence of a catalyst.

MBB130 - PHYSICS

Course objectives:

- To understand the biophysical methods those are being applied to study the structure and function of biological macromolecules and biological systems at the atomic level.
- To understand the working principle of different tools used in the laboratory and their applications to challenging problems in biology.

Course outcome:

- Students will be able to understand the strengths and limitations of various biophysical tools for studying macromolecular structure and function.
- This helps the students to develop theories and methods of the physical sciences for the investigation of biological systems.

MBB140 - ENVIRONMENTAL STUDIES

Course objectives:

- To understand the multidisciplinary nature of natural resources their associated problems.
- To develop the concept of conservation of biodiversity and ecosystems for future generations.

Course outcome:

- Students will understand the uses and exploitation of various natural resources like forest, water, minerals food and energy, along with case studies to preserve and sustain our environment.
- It will enable them to understand the concept and types of ecosystems.
- Conservation of biodiversity, endangered, endemic species are studied at global, national and local levels.
- Help the students to understand the causes, effects and control measures of various environmental pollution also by taking into account the social issues associated with it.

MBB150 - COMMUNICATION SKILLS - 2

UNIT I and UNIT II

Course objectives:

- To assists students to improve their accuracy and fluency in producing and understanding spoken and written English.
- To enable the students to develop their ability as critical readers and writers.
- Student will produce a short research paper using the drafting process with good English.

Course outcome:

- It will assist the students to become a more competent, efficient, and they will be able to communicate in a better way.
- Students will attain and enhance competence in writing, speaking, reading & listening.
- Students will achieve these outcomes through the focused reading skills and examine the discussions of longer articles and they will be able to write the summary.

SEMESTER-III

MBC110 - ORGANIC CHEMISTRY I

Course objectives:

- To study qualitative and quantitative aspects in the field of organic chemistry.
- To study the basic fundamentals of organic chemistry with special reference to reaction mechanisms.
- To know characteristic features of an organic compound and their properties in terms of their functional group.
- To explore in deeper the different chemical reactions of organic compounds.
- To gain the basic importance of hydrocarbons, alcohols and amines in everyday life.
- To study the cosmetic importance of carboxylic acid in the skin therapy.

Course outcome:

- Students will understand the basic organic reaction mechanisms in terms of electronic effects.
- Students will be able to classify different organic compounds based on their functional group.
- Students will understand need and importance of organic compounds in everyday life as energy sources, food, medicine, cosmetics, perfumes, soaps and so on.
- Students will develop theoretical knowledge in safety measurements of hazardous, flammable and toxic organic compounds.

MBC120 - BASIC BIOCHEMISTRY

Course objectives:

- To understand the fundamentals of acids, bases, buffers, and water in a holistic manner.
- To study the basics of biomolecules like sugars, amino acids, fatty acids, and nucleosides.
- To gain knowledge about the structures and functions of vitamins.
- To study the influence and role of structure in reactivity of biomolecules.

Course outcome:

- Students will understand in detail about structures, types, and classifications of fundamental biomolecules like amino acids, sugars, fatty acids, and nucleotides.
- The students will have a thorough understanding on the structural and functional role of biomolecules in the living system.
- Students will understand the metabolic and physiological role, their deficiency disorders and therapeutic functions associated with vitamins.

MBC130 - DEVELOPMENTAL BIOLOGY

Course objectives:

- To impart knowledge on gametogenesis, fertilization and development in mammals.
- To understand the cytology of parthenogenesis and cloning.
- Developmental biology provides the basis for understanding of processes and mechanisms of development of both plant and animals.
- To teach the importance of developmental biology in agriculture and food sectors.

Course outcome:

- Students will understand the early and post embryonic development in animals.
- Students will acquire knowledge of molecular events in fertilization.
- Students will be able to understand the processes of gastrulation.
- Students will acquire knowledge on microsporogenesis, megasporogensis and development of male and female gametophyte in plants.
- It helps the students to understand the development of plants and animals at cellular and embryonic level.
- Applications of embryology are understood as experimental embryology which has agricultural relevance.

MBC140 - CELL BIOLOGY

Course objectives:

- Students will understand the structure and functions of prokaryotic and eukaryotic cells, the cellular mechanism, cell signaling & communication, cell division, cell cycle regulation, cell mobility and microscopy types.
- To address different components of the organelles and cytoskeleton elements which are playing an important role in maintaining cell shape, movement, cell-cell communication and how do cells conduct, coordinate, and regulate each other.
- To provide an understanding of the structure of cell and function of various subcellular organelles.

Course outcome:

- Students will understand the structure and functions of cell organelles.
- They will acquire knowledge of mechanisms of cell membrane transport.
- They will get the knowledge on the role of ligands and receptors for cell signalling.
- This will enable them to understand the internal features of the cell and cell mobility.
- They will understand the stages of cell division, cell cycle.
- They will gain knowledge on principle and applications of microscopy.

MBC160 - COMPUTER APPLICATIONS

Course objectives:

- To provide opportunity for the study of modern methods of information processing and its applications.
- To enable the students to obtain problem solving skills through programming.

Course outcome:

- It helps the students to apply knowledge of computing and mathematics appropriate to the biology discipline.
- Students will be able to design and develop bioinformatics software for molecular data analysis.

SEMESTER –IV
MBD110 - ADVANCED ORGANIC CHEMISTRY

Course objectives:

- To study the basic features of oxidation and reduction reactions.
- To understand the synthetic applications of oxidising and reducing agents in the functional group interconversion.
- To explore chemistry of natural products such alkaloids, terpenes and dyes.
- To understand the structure, synthesis and pharmacological importance of alkaloids.
- To study the biological importance of terpenes.
- To study the application of dyes in textile industries.
- To govern the knowledge of basic correlation of structure to molecular drugs and their application.

Course outcome:

- Students will be able to differentiate oxidising agent and reducing agent with their synthetic application.
- Students will be able understand the structural correlation with their pharmacological and biological application of organic drugs.
- Student will govern the structural features of alkaloids, terpenes and dyes.
- Students will be able to understand the basic principles involved in isolation of different natural products from their natural resources.
- They will understand the importance of insecticides and fungicides in agricultural industries and their environmental effects on living system.

MBD120 - MICROBIOLOGY

Course objectives:

- To equip the students to gain knowledge about microbes in human health and the environment in many ways.
- This course paper emphasizes to acquire knowledge about microbial diversity and their interactions among themselves, and with the environment and biological systems under various conditions.
- To address the relevance of microbiology in other disciplines.

Course outcome:

- Student will understand Koch's postulates which is the basic requirement to study plant, animal and human diseases.
- Students will learn how to identify and isolate pure cultures, maintenance and preservation of different microbes.
- Students will acquire the skills to qualify for broad range of positions in academic and research institutions in different discipline to increasing need for skilled scientific manpower with an understanding of research involving microorganisms to contribute to application, advancement and impartment of knowledge in the field of microbiology and molecular biology globally.
- The laboratory training will empower them to prepare for careers in broad range fields.

MBD130 - PLANT PHYSIOLOGY

Course objectives:

- To give students a greater understanding of the physiological processes, plant responses and environmental factors affecting growth and development.
- To identify the physiological factors that regulates growth and developmental processes of plants.
- To understand the importance of photosynthesis, respiration, phytochrome, physiological stress, hormones and their roles in plant development.
- To understand the physiological responses produced by plants against environmental stresses during different stress conditions such as water deficit, salinity, heat and chilling.

Course outcome:

- Students will understand the plant water relation, solute transport, different bio-physico-chemical phenomenon.
- Students will gain knowledge about photosynthesis, nutrient uptake and assimilation.
- Students will understand the mechanism of crop stress tolerance to various abiotic stresses.
- Students will be able to integrate and apply their knowledge of plant physiology for analytical thinking and solving practical problems experienced in agricultural systems.

MBD140 - ANIMAL PHYSIOLOGY

Course objectives:

- To provide a comprehensive overview of physiological systems in a well-organized and concise manner to understand the interaction between animal and its environment.
- To understand physiology and functions of the body parts in regulation of metabolic processes like temperature and hormones etc.

Course outcome:

- This course helps students to understand the biological processes that occur in animal life at various levels of organization such as cells, organ system and complete animal.
- It provides notable clear and detailed account of physiological principles of different physiological processes such as digestion, excretion, respiration, circulation in animals, their adaptations to environments.
- It enables comprehensive understanding of endocrine and reproduction systems.
- Students will gain basic knowledge of physiology and related disorders/ diseases; this will open up opportunities in a wide variety of research areas.

MBD150 - MACROMOLECULES

Course objectives:

- To study the classification, functions, and application aspects of biomolecules.
- To train students to appreciate the salient features of biomolecules in the organization of life.
- To study the significance and methodology involved in isolation and characterizing major biomolecules including nucleic acids.

Course outcome:

- Students will understand the properties of carbohydrates, proteins, lipids, nucleic acids, and their importance in biological systems.
- The students will understand the structure and functional roles of the macromolecules in detail.
- The students will be able to understand the chemical properties and three-dimensional structure of the biological macromolecules in relationship to their biological function.
- They will also gain knowledge about the isolation and identification methods of macromolecules.

SEMESTER V

MBE110 – METABOLISM - I

Course objectives:

- To understand the basic aspects of metabolic pathways and regulation of biomolecules.
- To study and understand the structural and functional aspects of mitochondrial electron transport chain in detail.
- To gain deeper insights on photosynthesis and its associated process.

Course outcome:

- Students will acquire the concept of anabolism, catabolism, anapleurotic reactions, redox balance etc. and the role of high energy compounds in the cell.
- They will acquire knowledge related to regulation of various pathways.
- The role of lipids as storage molecules and structural component of bio membranes will be understood in detail.
- Students will learn about importance of high energy compounds, electron transport chain, and synthesis of ATP under aerobic and anaerobic conditions will be understood.
- Students will gain knowledge about the fundament aspects of photosynthesis and its associated processes in depth.

MBE120 - BIOCHEMICAL TECHNIQUES

Course objectives:

- To give theoretical background regarding biomolecular preparative and analytical methods.
- To impart practical skills regarding the above.

Course outcome:

- This course explores the basic principles of biochemical methods and develops the student's appreciation and understanding of biological process.
- Course will teach the students the various instrumentations that are used in the analytical laboratories.
- Course covers both fundamental and applications of the instruments that are routinely used for the characterization of biomolecules.
- At the end of the course, the student has the basic knowledge on the theory, operation and function of analytical instruments.

- After the completion of this course students will gain a fundamental knowledge of biochemical concepts and techniques which is necessary for future scientific endeavours.

MBE130 - BIOPHYSICS

Course objectives:

- To understand the scope and role of biophysics in natural science.
- To understand the various techniques like microscopy, SPR etc associated with it.

Course outcome:

- Students will understand the principle and applications of spectroscopy and X-ray diffraction techniques.
- Enabling them to learn radiation biophysics and various advanced microscopy including surface plasma resonance.
- Important biological phenomenon like Neurobiophyscis and photo biological mechanism of viruses, proteins, nucleic acids, photodynamic dye and concepts of photoperiodism, phototaxis, photomorphogenesis, bioluminenece are studied for better understanding and multidisciplinary approach is used to aid better relationship for students.

MBE140 - PRINCIPLES OF GENETICS

Course objectives:

- To understand the basic principles of genetics, Mendelism, extension of Mendelism.
- To learn about chromosome, Chromosomal aberrations and population genetics.

Course outcome:

- Students study about the history, experiments of Mendel`s laws along with statistical testing of hybrid crosses.
- Extension of Mendelism is studied which includes concepts of dominance, alleles, interaction of genes, polygenic inheritance, and pleotropism.
- Students will understand chromosomal aberrations and extra chromosomal inheritance which in turn help to understand various disease mechanisms associated with aberrations.
- Enabling students to learn about lethal mutations and mutation detection tests like Ames test, CIB technique.
- Students are exposed to concepts of population genetics and darwinism and mutation studies.

SEMESTER VI

MBF110 - MOLECULAR CELL BIOLOGY

Course objectives:

- To give deeper knowledge on cellular processes that drive biological systems.
- To build the fundamental concepts of cellular structural organization and functional understanding of sub-cellular components.

Course outcome:

- Students will obtain understanding of the molecular aspects of biology.
- It also helps in understanding the concepts of cellular function.
- Students obtain fundamental knowledge required for understanding the cancer/apoptosis at molecular level.
- The course addresses molecular mechanisms underlying several central themes in cellular biology like cell division and replication, the transport of proteins and other macromolecules within cells.
- Students of this course will obtain an elementary introduction to the study of molecular biology.

MBF120 – METABOLISM - II

Course objectives:

- To study about the importance of, nitrogen containing compounds, porphyrins, and steroid hormones.
- To study and appreciate the integrated approach of interrelated pathways of catabolism and anabolism.
- To emphasizes on metabolic disorders at molecular level.
- To learn the regulatory aspects of metabolism for better understanding of physiology and therapeutic applications.

Course outcome:

- Students will learn about the importance of nitrogen and nitrogen containing compounds in biological system.
- Students will learn to explain/describe the synthesis, degradation and functional aspects of amino acids, nucleic acids, steroid hormones and vitamins in detail.
- Students will learn about the regulatory aspects of metabolic pathways at various phases like transcriptional, translational, and post-translational levels.

MBF130 - ENZYMOLOGY

Course objectives:

- To study general aspects of enzymes and its classification.
- To study the molecular mechanisms of enzyme reactions using inhibitors and activators.
- To learn about kinetics and regulation of enzymes to drug delivery and discovery which helps to establish a strong background for future endeavours.

Course outcome:

- Students will be able to understand the general aspect of enzymes, their activity measurements and kinetic reactions.
- They will be able to learn about enzyme reactions using inhibitors and activators.
- Enabling to understand the nature of catalysis, action and type of inhibition.
- Students will understand the regulation of enzymes in metabolic reactions.
- Students will get a deeper level knowledge about the mechanism of action of specific enzymes, important for biological function.

MBF140 - MOLECULAR GENETICS

Course objectives:

- To describe the central dogma of molecular biology.
- To understand crossing over, linkage mapping in both prokaryotes and eukaryotes.
- To study sex determination.

Course outcome:

- Enable students to know about the historical perspective and experiments that led to the discovery of central dogma of molecular biology.
- To briefly understand DNA, replication, transcription, translation processes.
- Students will understand the concept of gene and sex determination and dosage compensation of genes in fruit fly and man.
- Crossing over, linkage and mapping studies in both prokaryotes and eukaryotes are discussed along with problems are studied by students for better understanding and to enable construction of gene maps.

SEMESTER VII

MBG110 - IMMUNOLOGY

Course objectives:

- To gain knowledge of the development of the various cells and tissues of the human immune system.
- To model the physiological and pathological functions of the immune system at a molecular level.
- To demonstrate some of the major modern techniques influenced by immunology and to understand types of immune responses seen in the body in normal and pathological conditions.
- To acquire knowledge about research and development of novel vaccines and immunotherapeutic.

Course outcome:

- Students will have knowledge of different types of immunity, protection barriers, different cells which are participating in the immune responses. Applications of monoclonal antibodies. Immunology of cancer and other disorder.
- Students will understand the importance of ongoing research like production of vaccines for emerging pathogens, also in immunotherapy, autoimmune diseases.
- This will helps the students in advancing understanding of basic immunology which is essential for clinical and commercial application and will facilitate the discovery of new diagnostics and treatments to manage a wide array of diseases.
- Students will understand the role of immune responses in numerous disciplines of medicine, particularly in the field of organ transplantation, oncology etc.

MBG120 - MOLECULAR MECHANISM OF SIGNAL TRANSDUCTION 2

UNIT I and UNIT II

Course objectives:

- To understand the basic concepts of signal transduction and its impact on physiology and pathology.
- To understand the role of secondary messengers and their mechanism of action in up regulations and down regulations of various signalling pathways.

Course outcome:

- It will help to understand the basic principles of signal transduction mechanisms, in particular the concepts of sensory transduction pathways, signal amplitude and signal integration.
- Students will understand the role of hormones in signal transduction.
- Students will acquire the knowledge of signal transduction in bacteria, yeast, plant and animal models. Also to study the signalling processes in healthy and diseased conditions.

MBG130 - MOLECULAR MECHANISM OF GENE EXPRESSION - I

Course objectives:

- To learning the molecular events in the DNA replication, transcription and translation and to understand the role of different enzymes during these processes.
- To understand the molecular events of translation leading to protein synthesis and post translational modification.
- To acquire knowledge about the mechanism of DNA repair at molecular level.

Course outcome:

- It helps the students to get deeper understanding of key events of molecular biology comprising of mechanism of DNA replication, transcription and translation in prokaryotes and eukaryotes.
- Students will have adequate knowledge about post transcriptional modifications and processing of eukaryotic RNA.
- To develop comprehensive understanding regarding DNA Repair Mechanisms.
- This builds the basic foundation to the students to understand further deeper molecular events and mechanism occurring in various life processes.

MBG140 - GENETIC ENGINEERING - I & BIO-INFORMATICS

Course objectives:

- To understand the different tools of genetic engineering such as enzymes, vectors, labelling methods and PCR.
- To impart knowledge on the use of different tools in genetic engineering.

Course outcome:

- Students will become familiar with the tools and techniques of genetic engineering.
- Students will be able to perform basic genetic engineering experiments at the end of course.
- Students will acquire knowledge of advances in biotechnology through recombinant DNA technology.
- Students will be able to describe the importance of DNA and protein sequence alignments, methods of alignment.
- Students will learn various biological databases and tools in bioinformatics.

MBG150 - MOLECULAR BIOLOGY LAB - 1

Course objectives:

- To develop key practical skills in immunology, molecular mechanism of signal transduction, molecular mechanism of gene expression and genetic engineering.
- To provide students with experimental knowledge of molecular biology and genetic engineering.
- To develop an understanding about practical aspects of components of immune system as well as their function. Basic as well as advanced methods will be taught to detect different antigen and antibody interactions, isolation of different lymphocyte cells etc. and how they can be used in respective research work.
- Students will learn the isolation of Plasmid, DNA and RNA from different source.

Course outcome:

- Students will gain practical skills required to effectively do scientific research.
- Students will develop the sequential and conceptual thinking and paradigms of cellular and molecular basis of immune system and their applications.
- Students will understand the usefulness of immunology in different pharmaceutical companies; identify the proper research lab working in the area of their own interests and they can apply their knowledge and design molecular diagnostic kits for detection of diseases.
- This course paper will make students to learn about the structural features of the components of the immune system as well as their function. The major emphasis of this course will be on the development of the immune system and mechanisms by which our body elicit the immune response. It also provides the conceptual framework for the development of immuno- and molecular diagnostics and their applications in agricultural, biomedical and veterinary sciences.
- Students will be able to conduct independent work in a laboratory to conduct molecular and cell-based experiments.
- Students will understand the principles and have practical experience of a wide range of basic and advance molecular and biochemical techniques.

SEMESTER VIII

MBH110 - MOLECULAR PATHOLOGY

Course objectives:

- Study of aetiology, symptoms, predisposing factors and recurrence of plant and animal and human infectious and other diseases.
- To understand molecular mechanism of infectious human diseases and predisposing genetic factors in common diseases.

Course outcome:

- Study of this course enables the students to know how pathogens cause disease, including analysis of the molecular signalling among plant, pathogens and genes. The scope and responsibilities is to prevent and control plant diseases of economic importance and thereby maximize crop yield.
- Understanding genetics of resistance, host pathogen interaction and key proteins which are involved in plant defence.
- Understanding the molecular and genetic basis of common human disorders.
- Students will know challenges faced by humans during a pandemic, especially emerging viral diseases.

MBH120 - BIOSTATISTICS AND RESEARCH METHODOLOGY

Course objectives:

- To introduce students to the various research methodologies in a systematic approach for data analysis.
- To encourage the students to take up research challenge in proper direction and validation of research data.
- To train the students to review a given research paper, prepare research project proposal to funding agencies.

Course outcome:

- Biostatistics helps the students to understand numerous modern biological theories. Genetic studies and to understand observed experimental results.
- Students will understand the statistical advances with the development of methods and tools for many genetic data analysis like NGS.
- Overall biostatistics provides tools and techniques for collecting data and then summarizing, analyzing, and interpreting biological data accurately in the field of life science research to the students of molecular biology.
- Research methodology helps the students to follow certain methods, prediction and accuracy of observations.
- It helps to produce new knowledge and deepens understanding of a research task through proper research design.

MBH130 - GENOMICS AND PHYLOGENETICS

Course objective:

- To teach genomics, using model organisms representing plants and animals.
- To give understanding of the diversity and complexity of genomes.
- To give insights to the recent developments in the genomics field and to give exposure on different tools used for biological data and its annotations.
- To equip the students to develop skills in preliminary data analysis and experimental design.

Course outcome:

- Students will understand the basics of genetic analysis of the gene, genome.
- Enables them to understand the basic organization of prokaryotic and eukaryotic genomes.
- This course introduces the students to conceptualize the principles of different tools in bioinformatics.
- The student will be able to apply basic principles of biology, computer science and mathematics to address complex biological problems.
- This course provides the knowledge and practical skills of functional genomics.
- The course also teaches the techniques used in functional genomics such as microarrays, NGS, mRNA expression and miRNA expression.

MBH140 - MOLECULAR BASIS OF DEVELOPMENT AND DIFFERENTIATION

Course objective:

- To understand the molecular basis and genes involved in the development and regulation of various model organisms and, plants and differentiation of neurons, muscles, bone, heart, and pancreas.
- To study development in plants from embryogenesis to seed development.

Course outcome:

- Students will learn briefly about gametogenesis and fertilization to better understand the development and differentiation that happens later.
- To aid deeper understanding of Molecular basis of development and differentiation in various model organisms like *C. elegans*, Drosophila, Mammals and plants.
- Students will learn the later developmental process like myogenesis, osteogenesis, and angiogenesis.
- They will study about reproductive biotechnology and parthenogenesis which helps in understanding the industrial commercial importance.
- Development in plants from embryogenesis, vegetative development to flowering and seed are extensively discussed to help students to understand its importance in agriculture especially in floriculture.

MBH 150 - MOLECULAR BIOLOGY LAB - 2

(Molecular Pathology, Molecular Basis of Development and Differentiation)

Course objectives:

- Students will understand the fundamental knowledge in animal and plant molecular biology experiments and their applications.
- Students will learn to isolate pathogens from diseased plants.
- Students will understand the principles and have practical experience of a wide range of basic and advance molecular and biochemical techniques related to developmental biology.
- Students will get to know the different types of mutants on different model systems.

Course outcome:

- Students will be able to evaluate usefulness of immunology in different pharmaceutical companies; identify proper research lab working in area of their own interests and apply their knowledge and design immunological experiments.
- Students will have strong practical knowledge in molecular biology & genetic engineering. So students can get placement in the relevant pharmaceutical and biotech industries.
- Students will understand the effect of Homeotic genes and its role during the development.

ELECTIVE - 4 /MINOR RESEARCH PROJECT

Course objectives:

- To enable the students to define a research problem.
- To enable the students to undertake research paper review published in peer reviewed journals.
- To train the students to write a report on a given research problem following all the basic requirements.

Course outcome:

- Students will be able to select a research problem of their interest.
- They will acquire in depth knowledge on a particular research problem.
- They will be trained to search different sources of research materials.
- They will be able to write a good review on a given research problem which includes writing introductions, categorising the contents summerizing the research review and listing references following a standard style.

SEMESTER IX

MBI110 - GENETIC ENGINEERING II

Course objectives:

- To understand the prokaryotic and eukaryotic expression systems.
- To impart knowledge on plant and animal cell culture.
- To give deeper knowledge on the mechanism of RNA interference and antisense RNA.
- To introduce fundamental aspects of intellectual property rights to students who are going to play a major role in development and management of innovative projects in industries.

Course outcome:

- Students will be able to get knowledge on selection of suitable expression system for a specific metabolic product.
- Students will learn the application of plant and animal cell culture.
- It enables the students to acquire knowledge on biomarkers and their application in molecular biology during molecular breeding.
- Students will become aware of genetic engineering and its applications in various fields like medicine, vaccine production, disease diagnosis, agriculture and environment.
- Students will acquire knowledge on bio safety, handling, testing & evaluation of GMO's, and animal ethical issues.
- Students will learn the disposal methodologies and safety concerns related to GMO's by understanding the role of different committees such as IBSC, RCGM, and GEAC.
- The students once they complete this course shall get an adequate knowledge on patent and copyright for their innovative research works during their research career.
- Knowledge gained after completing this course, will make the students to get jobs in R&D. They can also become entrepreneurs.

MBI120 - PROTEOMICS AND DRUG DESIGNING

Course objectives:

- To provide the students with an introduction to current methodologies and trends in the field of proteomics.
- To give an overview and awareness of typical proteomics applications.
- To give knowledge on protein characterization methodology, protein-drug and protein interaction.
- To provide the fundamentals and applications involved in protein characterization.

Course outcome:

- Students will learn about the databases used in bioinformatics.
- Students will be trained to use databases for structure determination of different proteins.
- This course introduces the students with molecular dynamics, simulation, and modelling for drug discovery.
- This paper introduces to the basic biology of proteins and the new advanced science
- The techniques involved at large in major contribution in transition from protein chemistry to proteomics are learnt.
- This course will enable the students to describe and apply the methods for the analysis of proteomes, of genomics and of functional proteomics.
- The student will learn about the understanding of the diversity and complexity of proteomes and potential applications of proteomics data in different biological problems.
- The outcome of the course is to train the students in use of computer aided technology to fasten the drug discovery through simulation and modelling.

MBI130 - CANCER BIOLOGY

Course objectives:

- To understand basic aspects of cancer pathology.
- To understand the genetic alterations, genomic instability, apoptosis and proteins which enable the transformation of a normal cell to a cancer cell.
- To understand the current concepts in cancer therapy.

Course outcome:

- Students will be able to understand the concepts of oncogenes and signal transduction.
- Students will be able to gain knowledge on various factors responsible for the stages of oncogenesis.
- It will make the students aware of ongoing cancer treatment strategies.

MBI140 - MOLECULAR MECHANISM OF GENE EXPRESSION - II

Course objectives:

- Learning structural and functional levels of nucleic acids through operon models.
- To give the overview of DNA packaging; synthesis and processing of RNA and proteins; regulation of gene expression.
- To provide an understanding of the regulation of transcription and translation in both prokaryotic and eukaryotic organisms.

Course outcome:

- Students will be able to understand the regulation of gene expression in prokaryotes and Eukaryotes.
- It helps the students to understand how transcriptional control is achieved through alterations in chromatin structure.
- Students will learn the mechanism of RNA processing and export.

MBI150 - MOLECULAR BIOLOGY LAB - 3

Course objectives:

- To impart hands on training to the students on recent advances in genomics and techniques/tools in molecular breeding, gene expression profiling and bioinformatics.
- Students will study the different model organisms like *Arabidopsis thaliana* and *Drosophila* and their mutants
- Students will understand the principles and have practical experience of a wide range of basic and advance molecular and biochemical techniques.

Course outcome:

- Students will acquire knowledge on various techniques of plant tissue culture and plant genetic transformation and their application.
- Students will be able to gain hands-on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.
- Students will have strong practical knowledge in molecular biology & genetic engineering. So students can get placement in the relevant pharmaceutical and biotech industries.
- It can create job opportunities in pharmaceutical companies or they can have their own start-ups. They can also become entrepreneurs.

SEMESTER X

MBJ 110 Elective 6 (Self study) 02 Credits

MBJ 120 Project work 08 credits

Total Credits for 10 semesters is 200

Syllabus for Elective Papers

ELECTIVE PAPERS (One paper per semester from 5th Semester onwards) - 2 credits (32 hours of teaching)

INDUSTRIAL BIOTECHNOLOGY – I

Biotechnology of Fermentation, Biotransformation and Bioprocess Engineering

Course objectives:

- To teach students the basic principles of processing of bioproducts from biological resources in the areas industrial biotechnology.
- To equip students with skills on recent methodologies and practice in industrial biotechnology.
- To expose students to relevant and recent advances in industrial biotechnology.
- To develop knowledge of a variety of fermentation strategies to obtain various products.

Course outcome:

- It helps the students to understand the principles underlying design of fermenters, fermentation process and downstream processing and its applications.
- It helps the students to acquire, integrate the scientific and technological knowledge on the use of bioprocesses for industrial products.
- This will help the students to apply the practical skills for entrepreneurial development.

INDUSTRIAL BIOTECHNOLOGY - II

Course objectives:

- To introduce students to the ongoing recent developments and advancement made in the field of microbial technology.
- To understand the techniques and applications of matrices and methods of immobilization of enzymes and cells.

Course outcome:

- Students will come to know the biotechnological advances in productions of different primary and secondary metabolites of biological importance.
- Students will develop deeper understanding of the industrial biotechnology and its applications.
- Students will get good knowledge on production of enzymes, antibiotics, alcohols and alcoholic beverages.
- Students will have the deeper knowledge on recent advances in biotransformation products.
- This course will help the students to establish industrial start ups.

CELL AND TISSUE CULTURE TECHNOLOGY

Course objectives:

- To develop basic aseptic skills for cell culture and their applications.
- To understand media constituents and media formulation strategies for cell and tissue culture.
- To provide complete exposure as how plant and animal cells are isolated, cultured and genetically manipulated in laboratory.

Course outcome:

- Students will get knowledge of cell and tissue culture which is required for biological science research.
- Based on the knowledge gained after studying this course, students will able to conduct *in-vitro* experiments using different cell lines and tissues during their research work.
- It can create job opportunities in pharmaceutical companies or they can have their own startups.

HUMAN NUTRITION

Course objectives:

- To understand the role of nutrition in health.
- To understand about the physiological and biochemical aspects of the nutrition.
- To plan the therapeutic diet and monitor the evaluation of nutrition therapy according to the disease conditions.

Course outcome:

- Students will learn about the fundamentals of nutrition from the angle of clinical perspective.
- They will understand the concepts like glycemic index, balanced diet, micronutrient deficiencies and their remedies, nutraceuticals and their importance, junk foods and their hazards in the holistic manner.
- The course will assist the students to gain employability in diagnostic and research institutes.

EVOLUTION AND BEHAVIOUR

Course objectives:

- To provide a course on evolutionary biology that introduces students to the major principles of evolutionary theory.
- To show how natural selection ultimately underpins all biological processes and how evolution has generated biological diversity.
- To understand the molecular aspects of evolution and animal behavior.

Course outcome:

- Students will have a greatly enhanced knowledge and appreciation of evolutionary biology and behaviour.
- Student will appreciate the contributions of evolutionary biologist and their thought processes. This will help the students to think better.
- Students will acquire knowledge on evolutionary time scale.
- Student will get a complete perspective on animal behaviour.
- The study on biological clock will enable the students to connect this to behavioural pattern of organisms.

ETHOLOGY

Course objectives:

- To understand the different patterns of animal behavior and social organization from biological perspective.
- To impart knowledge on biochemical basis of instinctive behavior.
- To comprehend the reflex and complex behaviors of the animals.
- To understand the causes of behavioral changes during development and sexual imprinting in birds and mammals.

Course outcome:

- It helps the students to understand the deeper aspects of memory, foraging and biological communications.
- Students will understand the biological patterns of learning.
- Students will acquire knowledge on sexual behaviour and social organization of primates and honey bees.
- At the end of the course, student will have the knowledge of relationship among the animals including the evolutionary process and the environmental adaptations.

CLINICAL BIOCHEMISTRYUNIT I and II

Course objectives:

- To understand the concept of health & diseases, communicable, non-communicable diseases. Metabolic diseases & deficiency.
- To give knowledge on various bio-molecules and their use in diagnosis and treatment of diseases.
- To create awareness of different lifestyle diseases including its management.
- To give insights to the recent developments in clinical diagnosis.

Course outcome:

- It illustrates the mechanism of metabolic disorders at molecular level.
- Students will learn about the normal constituents of urine, blood and their significance in maintaining good health.
- Students will get the knowledge of marker enzymes useful in diagnosis of various diseases.
- It is directed towards the employability in diagnostic centers.

Sl. No	Program	Program code	Program specific discipline	
2	M.Sc.	MSCCBCSYCM	1.Botany	MSCCBCSBOTYCM

M.Sc. Botany Choice - Based Credit System (CBCS) Syllabus and continuous assessment grading pattern (CAGP) for post graduate degree program

CORE SUBJECT: BOTANY – [Post Graduate course]
DEGREE: M.Sc. Botany

ALLOCATION OF CREDITS FOR M.Sc. BOTANY CBCS (CGPA) 2016-17

M.SC. BOTANY: I YEAR

SEMESTER- I **Credits: 22**

No	Hard core/ Soft core/ Open elective	Title of the course paper	Hrs/week L:T:P	Credits
1.	**HARD CORE 1.1**	Microbiology and Plant Pathology Theory & Practical	2:1:1	4
2.	**HARD CORE 1.2**	Algae, Bryophytes, Pteridophytes and Gymnosperms-Theory & Practical	2:1:1	4
3.	**HARD CORE 1.3**	Taxonomy of Angiosperms and Economic Botany – Theory & Practical * Field Study/ Tour	2:1:1 (*1+2**)	4 2
4.	**SOFT CORE 1.1**	*To be Selected by the student	2:1:1	4
5.	**SOFT CORE 1.2**	*To be Selected by the student	2:1:1	4
			Total	**14 + 08 = 22**

*Field Study/Tour: The student should undertake a field trip of minimum of three days and shall submit the herbarium and report for evaluation.

SEMESTER – II **Credits: 20**

No	Paper Code	Title of the course paper	Hrs/week L:T:P	Credits
1.	**HARD CORE 2.1**	Reproductive Biology of Angiosperms and Plant Morphogenesis-Theory & Practical	2:1:1	4
2.	**HARD CORE 2.2**	Genetics, Plant Breeding and Evolutionary Biology- Theory & Practical	2:1:1	4
3.	**SOFT CORE 2.1**	*Any **TWO** of the soft core subjects to be selected by the candidate	2:1:1	4
4.	**SOFT CORE 2.2**		2:1:1	4
5.	**Open Elective 2.1**	Plant diversity and Human Welfare	2:1:1	4
			Total	**08 + 08 + 04 = 20**

M.SC. BOTANY: II YEAR				
SEMESTER-III				**Credits: 20**
No	**Paper Code**	**Title of the course paper**	**Hrs/wk L/T:P**	**Credits**
1.	**HARD CORE 3.1**	Plant Physiology and Biochemistry Theory & Practical	2:1:1	4
2.	**HARD CORE 3.2**	Molecular Biology- Theory & Practical	2:1:1	4
3.	**SOFT CORE 3.1**	*Any **TWO** of the soft core subjects to be selected by the candidate	2:1:1	4
4.	**SOFT CORE 3.2**		2:1:1	4
5.	**Open Elective 3.1**	Plant Propagation Techniques	2:1:1	4
			Total	**08 + 08 + 04 = 20**

***Project Work: The student shall undertake a project work in the department or in any other university or institute under the guidance of a research supervisor shall submit a report which will be evaluated as per university norms.

SEMESTER- IV				**Credits: 20**
No	**Paper Code**	**Title of the course paper**	**Hrs/wk L/T:P**	**Credits**
1.	**HARD CORE 4.1**	Ecology, Conservation Biology and Phytogeography- Theory & Practical	2:1:1	4
2.	**HARD CORE 4.2**	***Project Work		8
3.	**SOFT CORE 4.1**	*Any **ONE** of the soft core subject to be selected by the candidate	2:1:1	4
4.	**Open Elective 4.1**	Plant Biotechnology / Medicinal Botany	2:1:1	4
			Total	**12 + 08 + 04 = 20**

Total credits 42 + 28 + 12 = 82

***SOFT CORE COURSES - [Semester - wise]**

Minimum requirement for Soft Core Paper: Candidate should have completed bachelor degree with Botany as Elective / Core subject

Sl. No	**Semester**	**Title of the Soft Course Papers**	**Hrs/wk L/T:P**	**Credits**
1.	**I Semester**	Mycology	2:1:1	4
		Phycology	2:1:1	4
		Plant Pathology	2:1:1	4
2.	**II Semester**	Plant Anatomy and Histochemistry	2:1:1	4
		Ethno botany and IPR	2:1:1	4
		Economic Botany	2:1:1	4
		Cell Biology	2:1:1:	4
3.	**III Semester**	Plant Molecular Genetics	2:1:1	4
		Evolutionary Biology	2:1:1	4
		Plant Biotechnology	2:1:1	4
4.	**IV Semester**	Molecular Plant Pathology	2:1:1	4
		Biodiversity and Conservation Biology	2:1:1	4
		Seed Technology	2:1:1	4
		Plant Genetic Engineering	2:1:1	4

****OPEN ELECTIVE COURSES - [Semester - wise]**

Sl. No	Semester	Title of the Open Elective Paper	Hrs/wk L/T:P	Credits
1	**II Semester**	Plant Diversity and Human Welfare	2:1:1	4
2	**III Semester**	Plant Propagation Techniques	2:1:1	4
3	**IV Semester**	Plant Biotechnology/ Medicinal Botany	2:1:1	4

Note: Regulations for Admissions, credits system and Award of the degree will be as per common regulations of CBCS and CAGP adopted by the University of Mysore from time to time.

I SEM COURSE STRUCTURE

Sl. No	Sem	Module	Practical/ Theory	Code	Paper	Hrs/ Week	Credits	Max marks
1	I	H.C.1.1	Theory	BOA110	Microbiology and Plant pathology	2+2	2+1	70+30
	I	H.C.1.1	Practical	BOA113	,,	3	1	70+30
2	I	H.C.1.2	Theory	BOA120	Algae, Bryophytes, Pteridophytes and Gymnosperms	2+2	2+1	70+30
	I	H.C.1.2	Practical	BOA123	,,	3	1	70+30
3	I	H.C.1.3	Theory	BOA130	Taxonomy of Angiosperms and Economic Botany	2+2	2+1	70+30
	I	H.C.1.3	Practical	BOA133	,,	3	1	70+30
4	I	S.C.1.1	Theory	BOA140	Plant pathology	2+2	2+1	70+30
	I	S.C.1.1	Practical	BOA143	,,	3	1	70+30
5	I	S.C.1.2	Theory	BOA150	Phycology	2+2	2+1	70+30
	I	S.C.1.2	Practical	BOA153	,,	3	1	70+30
6	I	H.C.1.4		BOA160	Field Study			

Course outcome:

1. MICROBIOLOGY AND PLANT PATHOLOGY:

i. To understand the General characters Classification and Economic importance of Mollicutes, Viruses, Bacteria, Cyanobacteria.
ii. To Learn the Structure and Reproduction of various forms included in the syllabus
iii. To acquire the basic knowledge of various plant diseases mentioned in the syllabus and their management
iv. To acquire the basic knowledge of various plant diseases mentioned in the syllabus and their management

2. ALGAE, BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS:

i. To study the Salient features, Classification and Economic importance of Algae, Bryophytes Pteridophytes and Gymnosperms
ii. To study the Morphology, Anatomy and Reproduction of Pteridophytes and Gymnosperms included in the syllabus
iii. To acquire the knowledge of Geological time scale, Fossils and Fossilization

3. TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY:

i. To study the types of classification- Artificial, Natural, Phylogenetic and Recent trends in Taxonomy
ii. To acquire the knowledge about Botanical Survey of India (BSI), Herbarium,
iii. Brief study of the Economic products of Angiosperms and Ethnobotany

4. PLANT PATHOLOGY:

i. To study different types of plant diseases, their disease cycle.
ii. To acquire the basic knowledge of various plant diseases mentioned in the syllabus and their management.

5. PHYCOLOGY:

i. To study the Salient features, Classification and Economic importance of Algae.
ii. To Learn the Structure and Reproduction of various forms included in the syllabus

6. FIELD STUDY:

i. Field visit for different places of western ghat regions to collect plant species and to study different family characteristics. To know vegetation.

II SEM COURSE STRUCTURE

Sl. No	Sem	Module	Practical/ Theory	Code	Paper	Hrs/ Week	Credits	Max marks
1	II	H.C.2.1	Theory	BOB110	Reproductive Biology of Angiosperms and Plant Morphogenesis	2+2	2+1	70+30
	II	H.C.2.1	Practical	BOB113	”	3	1	70+30
2	II	H.C.2.2	Theory	BOB120	Genetics, Plant breeding and Evolution	2+2	2+1	70+30
	II	H.C.2.2	Practical	BOB123	”	3	1	70+30
3	II	S.C.2.1	Theory	BOB130	Economic Botany	2+2	2+1	70+30
	II	S.C.2.1	Practical	BOB133	”	3	1	70+30
4	II	S.C.2.2	Theory	BOB140	Cell Biology	2+2	2+1	70+30
	II	S.C.2.2	Practical	BOB143	”	3	1	70+30

Course outcome:

1. REPRODUCTIVE BIOLOGY OF ANGIOSPERMS & PLANT MORPHOGENESIS

i. To study the development and structure of male and female Gametophyte, Embryo, Endosperms in Angiosperms
ii. To acquire the knowledge of Experimental Embryology and plant morphogenesis

2. GENETICS, PLANT BREEDING AND EVOLUTION:

i. To understand Mendel's principles, deviations from Mendelism, Mutation and its significance
ii. To learn the principles, techniques and applications of Plant Breeding
iii. To understand the concept of Evolution, theories and evidences

3. ECONOMIC BOTANY:

i. Brief study of the Economic products of Angiosperms and Ethnobotany

4. CELL BIOLOGY:

i. To study the ultrastructure of cell organelles
ii. To acquire the knowledge of underlying principles of different microscopes
iii. To learn chromosomal aberrations and their significance

III SEM COURSE STRUCTURE

Sl. No	Sem	Module	Practical/ Theory	Code	Paper	Hrs/ Week	Credits	Max marks
1	III	H.C.3.1	Theory	BOC110	Plant Physiology and Biochemistry	2+2	2+1	70+30
		H.C.3.1	Practical	BOC113	"	3	1	70+30
2	III	H.C.3.2	Theory	BOC120	Molecular Biology	2+2	2+1	70+30
		H.C.3.2	Practical	BOC123	"	3	1	70+30
3	III	S.C.3.1	Theory	BOC130	Evolutionary Biology	2+2	2+1	70+30
		S.C.3.1	Practical	BOC133	"	3	1	70+30
4	III	S.C.3.2	Theory	BOC140	Plant Biotechnology	2+2	2+1	70+30
		S.C.3.2	Practical	BOC143	"	3	1	70+30

Course outcome:

1. PLANT PHYSIOLOGY AND BIOCHEMISTRY:

i. To understand the underlying principles of various physiological processes and metabolism in plants
ii. To study the roles of minerals in plant metabolism
iii. To study plant growth and development.
iv. To study the ultra structure of cell organelles and its biochemistry
v. To acquire the knowledge of underlying principles of different microscopes
vi. To learn chromosomal aberrations and their significance

2. MOLECULAR BIOLOGY:

i. To acquire the knowledge of principles, techniques and applications of Plant Biotechnology
ii. To understand methods of gene transfer in Recombinant DNA technology
iii. To acquire the knowledge on chemistry, structure, types of genetic material and protein synthesis
iv. To learn the concepts of gene and mechanism of gene regulation
v. Applications of Biotechnology in Human welfare, IPR, Biosafety and Bioethics
vi. To understand the principles, tools and techniques of Genetic Engineering

3. EVOLUTIONARY BIOLOGY:

i. To understand the concept of Evolution, theories and evidences

4. PLANT BIOTECHNOLOGY:

i. To acquire the knowledge on principles, techniques and applications of Plant Biotechnology
ii. To understand methods of gene transfer in Recombinant DNA technology
iii. Applications of Biotechnology in Human welfare, IPR, Biosafety and Bioethics
iv. To understand the principles, tools and techniques of Genetic Engineering

IV SEM COURSE STRUCTURE

Sl. No	Sem	Module	Practical/ Theory	Code	Paper	Hrs/ Week	Credits	Max marks
1	IV	H.C.4.1	Theory	BOD110	Ecology, Conservation Biology and Phytogeography	2+2	2+1	70+30
		H.C.4.1	Practical	BOD113	”	3	1	70+30
2	IV	S.C.4.1	Theory	BOD150	Biodiversity and Conservation Biology	2+2	2+1	70+30
		S.C.4.1	Practical	BOD153	”	3	1	70+30

Course outcome:

1. ECOLOGY, CONSERVATION BIOLOGY AND PHYTOGEOGRAPHY:

i. To acquire the knowledge of Biodiversity, conservation and biolegislations
ii. To study the geographical distribution of plants
iii. To acquire the basic knowledge of Plant community and their adaptations
iv. To study the environmental factors and their impact on Plant community
v. To acquire the knowledge of various Ecosystem and energy flow
vi. To learn the principles, techniques and applications of Plant Breeding

2. BIODIVERSITY AND CONSERVATION BIOLOGY:

i. To acquire the knowledge of Biodiversity, conservation and biolegislations
ii. To study the geographical distribution of plants

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Sl. No	Program	Program Code	Program Specific discipline	Program Specific code
2	M.Sc.	MSCCBCSYCM	2.Chemistry	MSCCBCSCHEMYCM

WITH RESPECT TO ASSESSMENT OF CREDITS

Semester	Hard Core		Soft Core			Open Elective
	Theory			Theory	Practicals	
I	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2	0 + 0 + 2 = 2	--
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
	A	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
II	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2	0 + 0 + 2 = 2	-
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
	G	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
III	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2	-	4 + 0 + 0 = 4
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
	G	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2	-	
IV	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2	-	--
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2	-	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2	-	
	A	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2	0 + 0 + 2 = 2	
			DISSERTATION		0 + 0 + 4 = 4	
Total Credits	48		54 (Minimum 24)			(Minimum 04)

Note:
A – Analytical; I – Inorganic; O – Organic; P – Physical; G – Spectroscopy; e.g., (L + T + P): Theory + Tutorial + Practical.

SCHEME OF STUDY AND EXAMINATION
FIRST SEMESTER
HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 1.1	Concepts and Models of Inorganic Chemistry	3	3	100	15	15	03	70
CHO HCT:1.2	Stereochemistry and Reaction Mechanism	3	3	100	15	15	03	70
CHP HCT: 1.3	Basic Physical Chemistry	3	3	100	15	15	03	70
CHA HCT:1.4	Analytical data assessment and Titrimetric analysis	3	3	100	15	15	03	70

SOFT CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHA SCT:1.1	Kinetic and Optical Method of Analysis	2	2	100	15	15	3	70
CHI SCT: 1.2	Chemistry of Selected Elements	2	2	100	15	15	3	70
CHO SCT: 1.3	Chemistry of Natural Products-I	2	2	100	15	15	3	70
CHP SCT: 1.4	Biophysical Chemistry	2	2	100	15	15	3	70

PRACTICALS

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHA SCP:1.1	Analytical Practicals - I	4	2	100	15	15	6	70
CHI SCP: 1.2	Inorganic Practicals - I	4	2	100	15	15	6	70
CHO SCP: 1.3	Organic Practicals - I	4	2	100	15	15	6	70
CHP SCP: 1.4	Physical Practicals - I	4	2	100	15	15	6	70

SECOND SEMESTER

HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 2.1	Coordination Chemistry	3	3	100	15	15	03	70
CHO HCT: 2.2	Synthetic Organic Chemistry	3	3	100	15	15	03	70
CHP HCT: 2.3	Principles of Physical Chemistry	3	3	100	15	15	03	70
CHG HCT: 2.4	Molecular Symmetry and Spectroscopy	3	3	100	15	15	03	70

SOFT CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHA SCT:2.1	Analytical separations	2	2	100	15	15	3	70
CHI SCT: 2.2	Chemistry of Selected Elements	2	2	100	15	15	3	70
CHO SCT:2.3	Chemistry of Natural Products-I	2	2	100	15	15	3	70
CHP SCT:2.4	Biophysical Chemistry	2	2	100	15	15	3	70

PRACTICALS

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHA SCP: 2.1	Analytical Practicals-II	4	2	100	15	15	6	70
CHI SCP: 2.2	Inorganic Practicals - II	4	2	100	15	15	6	70
CHO SCP: 2.3	Organic Practicals - II	4	2	100	15	15	6	70
CHP SCP: 2.4	Physical Practicals - II	4	2	100	15	15	6	70

OPEN ELECTIVE (for Non-Chemistry Students only)

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CH OET: 2.1/3.1	General Chemistry	4	4	100	15	15	03	70

NOTE: The students can study this course either in III or IV Semester

THIRD SEMESTER

HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 3.1	Advanced Inorganic Chemistry	3	3	100	15	15	03	70
CHO HCT: 3.2	Organometallic and Photochemistry	3	3	100	15	15	03	70
CHP HCT: 3.3	Advanced Physical Chemistry	3	3	100	15	15	03	70
CHG HCT: 3.4	Molecular Spectroscopy	3	3	100	15	15	03	70

SOFT CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHA SCT: 3.1	Electrochemical methods of chemical analysis	2	2	100	15	15	3	70
CHI SCT: 3.2	Frontiers in Inorganic Chemistry	2	2	100	15	15	3	70
CHO SCT: 3.3	Chemistry of Natural Products-II	2	2	100	15	15	3	70
CHP SCT: 3.4	Materials Chemistry	2	2	100	15	15	3	70

PRACTICALS

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI SCP: 3.1	Inorganic Practicals- III	4	2	100	15	15	6	70
CHP SCP: 3.2	Organic Practicals – III	4	2	100	15	15	6	70

OPEN ELECTIVE (for Non-Chemistry Students only)

The course is same as described in II Semester

FOURTH SEMESTER

HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 4.1	Bioinorganic Chemistry	3	3	100	15	15	03	70
CHO HCT: 4.2	Heterocyclic and Bioorganic Chemistry	3	3	100	15	15	03	70
CHP HCT: 4.3	Nuclear, Radiation and Photochemistry	3	3	100	15	15	03	70
CHA HCT: 4.4	Principles,Chromatographic Separations and Thermal Methods of Analysis	3	3	100	15	15	03	70

SOFT CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHA SCT: 4.1	Automated and methods of chemical analysis	2	2	100	15	15	3	70
CHI SCT: 4.2	Bioinorganic Photochemistry	2	2	100	15	15	3	70
CHO SCT: 4.3	Medicinal Chemistry	2	2	100	15	15	3	70
CHP SCT: 4.4	Quantum Chemistry and Biosensors	2	2	100	15	15	3	70

PRACTICALS

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI SCP: 4.1	Physical Practicals –III	4	2	100	15	15	6	70
CHD SCP: 4.1	Dissertation	---	4	100	15	15	-	70

CONCEPTS AND MODELS OF INORGANIC CHEMISTRY:

Course objectives:

- To learn the Structures and energetics of ionic crystals and inorganic molecules.
- To learn the Modern concept of acids and bases, non aqueous solvents.
- To learn the properties of ionic liquid and supercritical fluids.
- To learn the chemical properties of f-block elements.

Course outcome:

- Students able to understand the structure of Ionic crystal like sodium chloride, cesium chloride and zinc sulphide.
- Students able to understand the VSEPR model for explaining structure of molecules.
- Students able to understand the classification, properties and reactions of non aqueous solvents and hard acids/bases and soft acids/bases.
- Students able to understand the examples and applications of ionic liquids and supercritical fluids in science field.
- Students able to understand the extraction of f-block metals from its ore and their appliacations.

Practical:

Course objectives:

- To learn the determination of metal concentration by gravimetrically, volumetrically and spectrophootometrically.
- To learn the determination of metal concentration present in the different ores like haematite, dolomite and pyrolusite.
- To learn the determination of metals concentration present in the different alloys like copper/nickel alloy and solder alloy.
- To learn the spectrophotometric determination of metal concentration present in the different solutions.

Course outcome:

- Students able to understand the conditions and applications of different analyses like gravimetric, volumetric and spectrophootometry.
- Students able to understand about separation and estimation of metals from it’s ore, like, Iron from haematite, Calcium and Magnesium from Dolomite and Manganese from Pyrolusite.
- Students able to understand about separation and estimation of metals from its alloys like, copper and nickel in alloy and lead and tin in solder alloy.
- Students able to understand about determination of concentrations of metals like Iron, Titanium and Nickel by spectrophotometric method.

STEREOCHEMISTRY AND REACTION MECHANISM:

Course objectives:

- To gain knowledge about reaction intermediates in organic chemistry.
- To acquire knowledge in aliphatic nucleophilic substitution reactions.

- To suggest synthetic route for simple organic compounds with stereochemistry.
- To make the students understand and appreciate the concept of stereochemistry. Conformational analysis of organic compounds.
- To acquire a thorough knowledge on the concept of addition reaction on carbon multiple bonds and their reaction mechanism.
- To understand the mechanism of a chemical reaction, the path and the feasibility of a reaction.

Course outcome: The student

- Can have understanding about the nature and reactivity of reactive intermediates.
- Can determine the mechanism of chemical reactions.
- Will have thorough knowledge about the mechanism of substitution involving emulates, asymmetric alkylation and addition reactions, and hence will be able to optimize the yield of a reaction and control there geochemical as well a stereo chemical outcome of chemical reactions.
- Can find out whether the compound is chiral or not
- Can determine the configuration and conformation of organic compounds, an essential skill in drug development.

Practicals:

Course objectives: To develop analytical skill in

- Organic preparations involving two stages.
- To understand the techniques involved in estimations of organic compounds.
- To develop the skill in interpretation of spectral data of various organic compounds

Course outcome: The student

- Acquires knowledge in preparing organic compounds.
- Acquires the skill in estimation of organic compounds.
- Possess the ability to interpret any spectral data which help heron

BASIC PHYSICAL CHEMISTRY:

Course objectives:

- To understand the concept of thermochemistry.
- To understand the concept of different laws of thermodynamics.
- To understand the Debye Huckel Theory of ion-ion interactions.
- To understand the effect of temperature on reaction rates.
- To understand the different theories of chemical kinetics
- To understand the Energetic of cell reaction

Course objectives: The student

- Get knowledge on the basic fundamental concepts of physical chemistry i.e., Thermodynamics, Chemical kinetics and Electrochemistry.
- Explore the topics such as second law of thermodynamics, partial molar properties, fugacity, statistical thermodynamics, kinetics of fast reaction, some of the important theories of kinetics, isotopic effects, batteries construction and working, liquid junction potential, etc.
- Apply the reaction rate for simple, complex reaction and also fast reactions.
- Understand primary and secondary batteries. Knowledge on Energetic of cell reaction.

Practicals:

Course objectives:

- To understand the handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
- To understand the kinetic methods.
- To understand the different between physical properties of substances or compounds.
- To understand the different thermodynamic parameters.

Course outcome:

- An idea about handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
- Determine the concentration of the species in given solutions using kinetic methods.
- Distinguish between different physical properties of substances or compounds.
- Acquire knowledge of different thermodynamic parameters.

ANALYTICAL DATA ASSESSMENT AND TITRIMETRIC ANALYSIS:

Course objectives:

- To study how to handle analytical data
- To learn about how error, occur and how to minimize them
- To learn sampling techniques and how to handle the sample
- To learn the how acid base reaction, neutralization titrations and application of these titrations
- To study theory behind and applications of complex metric and precipitation titration

Course outcome:

- Students able to identify and rectify the errors in practical and in measurement techniques.
- Students learn how we can collect the sample from air, soil, etc.
- Students able to apply simple titration techniques in estimation of several organic and inorganic compounds.

Practicals:

Course objectives:

- To study visual methods for estimation of alkalinity, acidity of water and purity of vinegar, wine etc.
- To study complexometric methods for estimation of calcium, magnesium and iron in different substance like milk powder, antacid tablet and blade.
- To study the amount of vitamin c in orange juice, copper in copper wire by iodometric titration and iron in iron tablet by ceremetric titration.
- To study estimation of alkalinity, acidity and purity of iron tablet, creatinine in urine and pKa of weak acid and indicator by different instrumental method like conductometric, potentiometric and spectrometric methods.

Course outcome:

- Students learn how simple the methods are applied to study the various estimations by titrations.
- Students are well-versed in visualizing end point and calculating the equation.
- Students are well trained in handling and performing various experiments by instruments.
- Students are well trained for clinical and industrial sector for performing the experiments.

SECOND SEMESTER

HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 2.1	Coordination Chemistry	3	3	100	15	15	03	70
CHO HCT: 2.2	Synthetic Organic Chemistry	3	3	100	15	15	03	70
CHP HCT: 2.3	Principles of Physical Chemistry	3	3	100	15	15	03	70
CHG HCT: 2.4	Molecular Symmetry and Spectroscopy	3	3	100	15	15	03	70

NOTE:

Soft Core Theory: All Courses are same as that described in I Semester

Practicals: Same as that of I Semester. Students who have studied Analytical and Inorganic or Organic and Physical Practicals in the I Semester will get interchanged during II Semester.

COORDINATION CHEMISTRY:

Course objectives:

- To learn the preparation and stability of coordination compounds.
- To learn the concept of Crystal field theory and Molecular Orbital Theory.
- To learn the electronic spectra and magnetic properties of coordination compounds.
- To learn the reactions and photochemistry of coordination compounds.

Course outcome:

- Students able to understand the different methods for the preparation of coordination compounds and determination of stability constants of coordination compounds.
- Students able to understand the crystal field theory of octahedral, tetrahedral and square planar complexes.
- Students able to understand the electronic spectra of octahedral and tetrahedral complexes.
- Students able to understand the reaction mechanism in reactions of coordination compounds.

Practical:

Course objectives:

- To learn the estimation of TWO anions and TWO cations present in the salt mixture qualitatively.

Course outcome:

- Students able to understand the separation and qualitative estimation of anions like chloride, bromide, carbonate, nitrate, sulphate, acetate etc., and cations like lead, cadmium, bismuth, aluminium, manganese, zinc, barium, strontium, calcium and magnesium etc.,
- Students able to understand the separation and qualitative estimation of less common cations like tungsten, molybdenum, cerium, titanium, zirconium, vanadium and lithium.

SYNTHETIC ORGANIC CHEMISTRY

Course objectives:

- To understand the mechanism of organic chemical reactions.
- To appreciate the concept of substitution, elimination and rearrangement reactions and their reaction mechanisms.
- To acquire a sound knowledge in the reagents employed for oxidation and reduction reactions.
- To gain knowledge about retrosynthesis of organic compound.

Course objectives: The student

- Will have thorough knowledge about the mechanism of electrophilic substitution reactions involving mechanism and elimination reactions and hence will be able to optimize the yield of a reaction and control the region chemical as well as the stereo chemical outcome of chemical reactions.
- Cansuggestwaystotransformfunctionalgroupsthroughrearrangementsandbyemploying reagents for oxidation and reduction.
- To gain knowledge about various reagent for synthesis of organic compound.

Practicals:

Course objectives: To develop analytical skill in

- Separation and identification of organic mixture.
- Bulk separation and identification of groups.

Course outcome: The student

- Acquires knowledge in separate any organic mixture and identify it.
- Acquires knowledge in bulk separation and groups identification of

PRINCIPLES OF PHYSICAL CHEMISTRY

Course objectives:

- To understand the concept of quantum mechanics
- To understand the concept of microwave, vibration, Raman, UV-Visible, NQR and 47 Mossbauer spectroscopic techniques.
- To understand the concept of electromagnetic radiation with matter.
- To understand knowledge about the fundamental concepts like black body radiation, photoelectric effect, Schrodinger wave equation and applications, etc.

Course outcome: The student

- Learn the principles of microwave, vibration, Raman, UV-Visible, NQR and 47 Mossbauer spectroscopic techniques.
- Know the interaction of electromagnetic radiation with matter.
- Gain knowledge about the fundamental concepts like black body radiation, photoelectric effect, Schrodinger wave equation and applications, etc.
- Acquire knowledge on calculation of ionization energy and binding energy by simple expressions.

MOLECULAR SYMMETRY AND SPECTROSCOPY

Course objectives:

By studying this unit we come across many of the things which you are not aware of:

- The significance of group theory for chemistry is that molecules can be categorized on the basis of their symmetry properties, which allow the prediction of many molecular properties.
- The process of placing a molecule into a symmetry category involves identifying all of the lines, points, and planes of symmetry that it possesses; the symmetry categories the molecules may be assigned to are known as point groups.
- It allows you to determine that which vibrational transitions are allowed or forbidden on the basis of symmetry.
- How EMR interact to show different phenomenon like polarization, Dispersion, Refraction etc.
- What is Transition & transition probability?

Course Outcome: Helps to understand

- Molecular structure, some chemical properties, and characteristics of physical properties
- (spectroscopy) – used with group theory to predict vibrational spectra for the identification of molecular shape.
- And as a tool for understanding electronic structure and bonding.

THIRD SEMESTER

HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 3.1	Advanced Inorganic Chemistry	3	3	100	15	15	03	70
CHO HCT: 3.2	Organometallic and Photochemistry	3	3	100	15	15	03	70
CHP HCT: 3.3	Advanced Physical Chemistry	3	3	100	15	15	03	70
CHG HCT: 3.4	Molecular Spectroscopy	3	3	100	15	15	03	70

ADVANCED INORGANIC CHEMISTRY

Course objectives:

- To learn the Preparation, bonding, structures and **Fundamental concepts** of organometallic compounds.
- To learn the **Homogeneous and heterogeneous catalysis of** organometallic compounds and their biological applications.
- To learn the **Chemistry of main group elements and properties of silicates.**

Course outcome:

- Students able to understand the Preparation, bonding, structures of **Ferrocene**, metal carbenes, **Complexes containing alkene, alkyne, arene and allyl ligands**
- Students able to understand the **Industrial Applications** of coordination compounds like Wacker's process, Monsanto acetic acid process and L-DOPA synthesis etc., and **Biological and Medicinal Applications of** Organomercury, organoboron, organosilicon and organoarsenic compounds.
- Students able to understand the preparation, properties, structure and bonding of diborane, and Structure, classification of silicones.

Practicals:

Course objectives:

- To learn the electrogravimetric estimation of copper and nickel and Spectrophotometric determination of the *p*Ka value of methyl red.
- To learn the Preparation and characterization of coordination compounds.
- To learn the Determination of the composition of iron-phenanthroline complex by, Job's method, mole-ratio method and Slope-ratio method.

Course outcome:

- Students able to understand the gravimetric estimation of copper in copper sulphate and nickel in nickel sulphate solution by gravimetric method.
- Students able to understand the Preparation and characterization of coordination compounds like Chloropentammine cobalt (III) chloride.
- Students able to understand the composition of iron-phenanthroline complex by, Job's method, mole-ratio method and Slope-ratio method.

ORGANOMETALLIC AND PHOTOCHEMISTRY

Course objectives:

- To understand the basic principle in photochemical reactions.
- To understand the concept behind pericyclic reactions
- To have a thorough knowledge in identifying the aromaticity concepts in organic compounds.
- To identify the reactions involving specific reagents and their mechanism.
- To acquire knowledge in retro synthetic analysis.

Course outcome:

- Can suggest methodologies to synthesize compounds with high stereochemical and regiochemical selectivity by employing light/ heat energy/modern reagents.
- Can determine whether a compound is aromatic/non aromatic /antiaromatic.
- Can analyse the target material and design its synthesis through retrosynthesis.

Practicals:

Course objectives: To develop analytical skill in

- Organic compound purification
- To understand the techniques involved in estimations of organic compounds.
- To develop the skill in interpretation of spectral data of various organic compounds

Course outcome: The student

- Can separate any organic mixture and identify it.
- Acquires knowledge in estimation of organic compounds.
- Acquires the skill in estimation of organic compounds.

ADVANCED PHYSICAL CHEMISTRY

Course objectives:

- To study kinetics of reaction in solution and influence of pressure, ionic strength, solvent on reaction rates.
- To learn about kinetics of catalytic reactions i.e. acid-base catalysis, heterogeneous catalysis and enzyme catalysis.
- To evaluate Michaelis's constant for enzyme-substrate binding by Lineweaver-Burk plot.
- To study concept of electrochemical cells, batteries and corrosion.
- Learn X-ray crystallography, etc. CO2: Learn the fundamentals of semiconductors, superconductors, nanomaterials and the methods by which nanoparticle is synthesized.

Course outcome: The student

- To learn kinetics of reaction in solution and influence of pressure, ionic strength, solvent on reaction rates.
- To learn about kinetics of catalytic reactions i.e. acid-base catalysis, heterogeneous catalysis and enzyme catalysis.
- To learn to evaluate Michaelis's constant for enzyme-substrate binding by Lineweaver-Burk plot.
- Learn concept of electrochemical cells, batteries and corrosion.
- Learn X-ray crystallography, etc. CO2: Learn the fundamentals of semiconductors, superconductors, nanomaterials and the methods by which nanoparticle is synthesized.

Practicals:

Course objectives:

- To understand the handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
- To understand the kinetic methods.
- To understand the different between physical properties of substances or compounds.
- To understand the different thermodynamic parameters.

Course objectives:

- An idea about handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
- Determine the concentration of the species in given solutions using kinetic methods.
- Distinguish between different physical properties of substances or compounds.
- Acquire knowledge of different thermodynamic parameters.

MOLECULAR SPECTROSCOPY

Course objectives:

- Explain what it means to use spectroscopic methods for qualitative and quantitative analysis.
- Identify the terms in and describe deviations to Beer's Law.
- Describe the effect of changing the slit width and the impact it will have on qualitative and quantitative analyses.
- Qualitatively determine the relative error in absorbance measurements and determine the optimal range for measurement purposes.
- Describe the desirable features of a radiation source.
- Explain the advantages of a dual versus single-beam spectrophotometer.
- Explain the difference between a 3- and 4-level laser and why it is not possible to have a 2-level laser
- Compare the output of and advantages of prisms and gratings as dispersing elements
- Explain how a photomultiplier tube works.
- Explain how an array detector works and describe the advantages of using an array detector.

Course objectives: Students will be able to

- Explain the behaviour of molecular systems in external electromagnetic field.
- Understand the principles and theories of rotational, vibrational, UU-Vis, Fluorescence, Mass and NMR spectroscopy methods.
- Interpret the molecular spectra and find molecular properties from molecular spectra.

FOURTH SEMESTER

HARD CORE THEORY

Courses	Title	Contact Hours/ week	Credit	Max. Marks	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration (Hrs)	Marks
CHI HCT: 4.1	Bioinorganic Chemistry	3	3	100	15	15	03	70
CHO HCT: 4.2	Heterocyclic and	3	3	100	15	15	03	70

	Bioorganic Chemistry							
CHP HCT: 4.3	Nuclear, Radiation and Photochemistry	3	3	100	15	15	03	70
CHA HCT: 4.4	Optical, thermal and kinetic methods of analysis	3	3	100	15	15	03	70

BIOINORGANIC CHEMISTRY

Course objectives:

- To learn the Structural and molecular biology of metals, Sodium and potassium-channels and pump and role of Vitamin B12 and Coenzymes.
- To learn the Oxygen transport and oxygen uptake proteins, Electron transport proteins and redox enzymes and Structure and reactivity of Non-redox metalloenzymes.
- To learn the Medicinal Inorganic Chemistry, Disease due to metal deficiency and treatment and Treatment of toxicity due to inorganics.

Course outcome:

- Students able to understand the General features of DNA, structural building blocks of proteins and nuclic acids.
- Students able to understand the role of ATP in metabolism, Biological roles of calcium and Special characteristics of B12 co-enzyme.
- Students able to understand the oxygen transport mechanism in Haemoglobin (Hb) and Myoglobin (Mb), electron transport mechanism in Iron – sulfur proteins and Carboxypeptidase-A.
- Students able to understand the Disease due to metal deficiency like Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

HETEROCYCLIC AND BIOORGANIC CHEMISTRY

Course objectives:

- To understand the techniques involved in the extraction and methods of determination of structure of natural products.
- To enable the student to understand and appreciate the importance of biomolecules.
- To apply the knowledge of protecting groups in organic synthesis.
- To comprehend the importance of heterocyclic compounds.

Course outcome: The student

- Can suggest methodologies for stereoselective synthesis of organic compounds by employing chiral substrates/reagents/catalysts.
- Can suggest methods for the synthesis and transformation of natural products, biomolecules and heterocyclic compounds.
- Has familiarity with green methods for the synthesis.

NUCLEAR, RADIATION AND PHOTOCHEMISTRY

Course objectives:

- To explain the concept of photochemistry and study Beer-Lambert law.
- To describe and explain photochemical and photophysical processes using Jablonski
- Diagram and their quantum yield expressions.
- To study the selection rules for electronic transitions and develop quantum mechanical
- Formulation of Franck-Condon principle.
- To study about the photodegradation properties of ZnO photocatalyst.
- To study about the radiation and nuclear chemistry.

Course objectives: The student

Students will get the knowledge photochemistry, radiation chemistry and nuclear chemistry.

- Explain Jablonski diagram which include, fluorescence, phosphorescence etc.
- Explain photodegradation of dyes, pesticides and industrial effluents by using photocatalyst.

OPTICAL, THERMAL AND KINETIC METHODS OF ANALYSIS

Course objectives:

- Study of properties of a substance or medium, such as its chemical composition o r the size of particles suspended in it, through observation of effects on transmitte d light, such as scattering, absorption, refraction, and polarization.
- To understand the response and performance of a structure. Based on the modeling needs, chained or coupled analysis can be performed by engineers to study temperature variations and effects on structural behavior, both in terms of the stress response and failure.
- Find the degree of conversion for given temperature conditions, if the chemical mechanism of reaction is unknown and not really important... Determine and describe the kinetic mechanism if the chemical mechanism of reaction is unknown or partially unknown.

Course outcome:

- Can be used to evaluate the applicability of enzymes for the hydrolysis of substrates and lays a theoretical foundation for improving the enzymatic reaction efficiency.

To explore various properties of a nanomaterial against time and temperature

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Sl No.	Program	Program code	Program Specific Discipline	Program Specific code
2	**M.Sc.**	**MSCCBCSYCM**	**3.Food Science and Nutrition**	**MSCCBCSFSNYCM**

Program specific Title: M.Sc. Food Science and Nutrition (Two years, four semesters)

Program specific objectives (PSO)

- To impart advanced and in-depth knowledge in the area of Food science and Nutrition
- To train the students to be inquisitive and think in an innovative way
- To impart basic and translational research skills with technical excellence and make them research and industry ready

Program specific outcome (PSO)

- In depth knowledge gained during the course of two years, helps the students to quickly acclimatize to the work environment when they join as trainees in the research institutes/industries and gain eligibility for JRF/GATE/NET/KSET/ASRB examinations
- Gain enough knowledge to propose research ideas and implementation
- Develop practical skills along with their theory components, which help in their research programs in both academic institutions and R & D programs of industries.
- develop entrepreneurial skills with the help of skill-based courses and alumni interactions
- Effective communication and interactive skills for teaching at graduate and postgraduate levels
- To develop Professional Competence

Choice Based Credit System (CBCS) Syllabus
M.Sc. in Food Science & Nutrition-2016-17

No.	Paper Code	Title of course - Hard Core Subjects	No. of credits			
			L	T	P	Total
I Semester (16 Credits)						
1	FSA110	Food Science and Food Processing- I	2	1	2	**5**
2	FSA120	Nutritional Biochemistry	2	1	2	**5**
3	FSA130	Body composition and macronutrients	2	1	-	**3**
4	FSA140	Community nutrition	2	1	-	**3**
II Semester (16 Credits)						
1	FSB110	Food Science and Food Processing- II	2	1	2	**5**
2	FSB120	Micronutrients-I -Minerals	1	1	2	**4**
3	FSB130	Food laws and food safety	1	1	-	**2**
4	FSB140	Micronutrients-II –Vitamins	1	1	-	**2**
5	FSB150	Research methods and statistical analysis	2	1	-	**3**
III Semester (16 Credits)						
1	FSC110	Product development and sensory evaluation	2	2	1	**5**
2	FSC120	Food Preservation	2	1	2	**5**
3	FSC130	Principles of clinical nutrition	2	2	-	**4**
4	FSC140	Term paper**	-	2	-	**2**
No.	**Paper Code**	**Title of course -Soft Core Subjects**	**No. of credits**			
			L	**T**	**P**	**Total**
I Semester (to choose 4 credits)						
1	FSA150	Food fortification	-	2	-	**2**
2	FSA160	Food Hygiene and Sanitation	2	-	-	**2**
3	FSA170	Food Microbiology	2	-	-	**2**
4	FSA180	Assessment of Nutritional status	2	-	-	**2**
II Semester (to choose 4 credits)						

1	FSB160	Food packaging technology	2	-	-	**2**
2	FSB170	Enzymes in food processing (self-study)	-	2	-	**2**
3	FSB180	Functional properties of foods	2	2	-	**4**
III Semester (to choose 4 credits)						
1	FSC150	Biostatistics & computer applications	1	1	-	**2**
2	FSC160	Entrepreneurship and Marketing	2	-	-	**2**
3	FSC170	Quality control in food industries	2	-	-	**2**
4	FSC180	Food Additives	2	-	-	**2**
5	FSC190	Advances in nutrition research	1	1	-	**2**
IV Semester (to choose 8 credits)						
1	FSD110	Dissertation work***	-	8	-	**8**
2	FSD120	Diet in diseases	3	2	-	**5**
3	FSD130	Storage and handling of fresh produce (self-study)	-	3	-	**3**
4	FSD140	Food Biotechnology (self-study)	-	3	-	**3**
5	FSD150	Nutraceuticals and health foods	2	-	-	**2**
Title of course - Open Elective Subjects						
II Semester						
1	FSB190	Nutrition for Health	2	2	-	**4**
III Semester						
1	FSC200	Culinary Science- Principles & Techniques	2	2	-	**4**
Remedial course subjects						
I Semester						
1	FSA190	Basics of Food Sciences	2	-	-	**2**
2	FSA200	Basics of nutritional sciences	2	-	-	**2**

I SEMESTER
HARD CORE SUBJECTS

FSA110 - FOOD SCIENCE AND FOOD PROCESSING- I

Course objectives:

- To understand the structures, compositions, processing methods, preparations and quality characteristics of Cereals, Legumes and oil seeds
- To understand the compositions, processing methods, preparations and quality characteristics of fruits and vegetables

Course outcome: students will acquire knowledge on:

- Nutritional composition, preparations, and quality parameters of Cereals, Legumes, oil seeds, Fruit and vegetables, different processing techniques and their effects on nutritional composition

FSA120 - NUTRITIONAL BIOCHEMISTRY

Course objectives:

- To understand the chemical characteristics of different classes of nutrients with reference to their physical properties, and to relate it to their functions
- To explain the processes of digestion, absorption and metabolism of the macronutrients and energy flux

PRACTICALS:

Course objectives:

To understand basic biochemical techniques and its uses in analysis of foods

- Determination of PH: in acids, alkalis and buffers using PH meter and indicators
- Colorimeters: use of colorimeter in UV and visual range, Flame Photometer, flourimeter (principle to be explained & demonstrated with one example for each).
- Separation techniques: Chromatography- paper and column. Centrifugation, Electrophoresis and Dialysis. (One example for each may be demonstrated).
- Enzyme Assays - Amylase, protease, lipase or alkaline phosphatase using suitable substrates, Effect of pH, temperature & substrate concentration on any one enzyme activity may be included

Course outcome: students will acquire knowledge on:

- Functions of biological molecules
- Biochemical pathways relevant to nutrient metabolism
- Biological mechanisms, such as the processes and control of bioenergetics and metabolism, as chemical reactions

FSA130 - BODY COMPOSITION AND MACRONUTRIENTS

Course objectives:

- To understand the basis for computing nutrient requirements and the latest concepts in dietary recommendations.
- To acquaint students with the concepts, physiological functions, influencing factors and the disorders related to metabolism of macronutrients.
- To understand the various methods of assessing body composition their applications and changes during the life cycle.

Course outcomes: students will acquire knowledge on:

- nutritional significance of macronutrients and body composition
- Recent and commonly used methods for the determination of human body composition with relevance for nutritional assessment.
- Integration of metabolic events to nutritional disorders and its effect on body composition.

FSA140 - COMMUNITY NUTRITION

Course objectives:

- To attain knowledge on nutritional needs and demands of different age groups.
- To understand various deficiency disorders and the importance of intervention programs at community level.

Course outcome: students will acquire knowledge on:

- Nutrition to work in nutrition sector on community level and NGO's
  Identifying and preventing nutrition disorders

SOFT CORE SUBJECTS
I SEMESTER

FSA150 - FOOD FORTIFICATION

Course objectives:

- To understand rationale behind fortification and technology involved in fortifying various products.
- To understand the current national food fortification programs which are involved in fortifying common staple foods

Course outcome: students will acquire knowledge on:

- The importance of fortification and consumption of fortified foods among the people.
- The national programs which are involved in fortification.

FSA160 - FOOD HYGIENE AND SANITATION

Course objectives:

- To study the general principles of food hygiene and sanitation.
- To learn to maintain the safety of food.
- To get a knowledge about the sanitary aspect of water and waste disposal.
- To study the design of a food plant.

Course outcome: students will acquire knowledge on:

- Food safety and hygiene aspect helps in maintaining the food from contamination and also food bone illness.
- The development and maintenance of a food plant.

FSA170 - FOOD MICROBIOLOGY

Course objectives:

- To provide knowledge of microorganisms associated with foods.
- To attain Knowledge of the factors that determines the presence, growth and survival of microorganisms in food.

Course outcome: students will acquire knowledge on:

- Microbiological food control through appropriate and targeted applications of physical chemical and biological treatments.
- Various safety parameters and microbial control in food and its products.

FSA180 - ASSESSMENT OF NUTRITIONAL STATUS

Course objectives:

- To study on assessing individual's nutrition status through different physical and chemical methods.
- To acquire knowledge on food and nutrition security

Course outcome: students will acquire knowledge on:

- Assessing one's nutritional status of an individual.
- Planning a menu and diet plan using nutritional status.
- Food and nutrition security which help in working towards their improvement

II SEMESTER
Hard Core Papers

FSB110 - FOOD SCIENCE AND FOOD PROCESSING- II

Course objectives:

- To understand the compositions, processing methods, preparations and quality characteristics– Fats and oils, Milk and milk products, Eggs, Meat and Flesh foods, Sugars and jaggery, Beverages.
- To study the effect of processing on various nutrient content of different food groups.

Course outcome: students will acquire knowledge on:

- Different food groups, nutritional composition, preparations, and quality parameters.
- Different processing techniques and its effect on nutritional composition.

FSB120 - MICRONUTRIENT - I: MINERALS

Course objectives:

- To impart the knowledge on nutritional importance of the minerals in human health
- To make student Understand the metabolism of micronutrients

Course outcome: Students will acquire knowledge on:

- Significance of minerals, their optimal amount and the sources of it.
- knowledge of minerals their toxicity and deficiency

PRACTICAL - FOOD ANALYSIS

Course objectives:

- Acquire scientific information and develop laboratory skills in food analysis
- Develop an understanding of the different analytical instruments
- To provide an integrated picture of the field of food analysis with emphasis on its Importance in food industry, governmental agencies and universities

Course outcome: students will acquire skills on:

- Different analytical methods used for measuring the chemical composition of food and the principles behind analytical techniques associated with food analysis

FSB130 - FOOD LAWS AND FOOD SAFETY

Course objectives:

- To understand the food quality, safety, adulteration, natural toxins, laws and regulations.
- To understand about the safety aspects of food contaminants, pesticide residues, processing techniques and food additives.

Course outcome: students will acquire knowledge on:

- Safety and regulatory aspects involved in food handling.
- Health and safety of consumers by reducing food-related risks

FSB140 - MICRONUTRIENTS-II - VITAMINS

Course objectives:

- To understand the importance of vitamins and their requirement in the body
- To provide knowledge on vitamin deficiency and toxicity

Note: All the vitamins will be dealt with Digestion, absorption, transport and excretion, functions, interaction with other nutrients (if any), RDA, Deficiency and toxicity, major sources, Assessment of nutriture and analysis in food material

Course outcome: students will acquire knowledge on:

- Significance of vitamin, their optimal amount and the sources of it.
- Deficiency disorder and the corrective measure for it.

FSB150 - RESEARCH METHODS AND STATISTICAL ANALYSIS

Course objectives:

- To Develop the ability to apply the methods of statistics on a research project work
- To Choose the appropriate research design and develop appropriate research hypothesis for a research project
- To Describe the appropriate statistical methods required for a particular research design

Course outcome: students will acquire knowledge on:

- Application of statistics to experimental and applied research.
- Application of different forms of qualitative analysis, including the analysis of themes and discourse analysis
- methodological designs and select appropriate analytical strategies for research projects
- Understand the interpretation and appropriate reporting requirements for statistical and qualitative data.

II SEMESTER
Soft Core Papers

FSB160 - FOOD PACKAGING TECHNOLOGY

Course objectives:

- To acquaint students with the principles, packaging methods and materials used for safe packaging of foods.
- To provide an understanding of different packaging materials and their use in food industry and learn about the packaging requirements of different foods.
- To develop an understanding and methodologies of different techniques used in food packaging and to know the advances in modern packaging technology.

Course outcome: students will acquire knowledge on:

- The importance of packaging, different types of packaging materials, methods used for packaging foods, the manufacturing processes for different packaging materials and their applications in food industry.
- The design& testing of package materials and package performance.
- The novel packaging used in food industry.

FSB170 - ENZYMES IN FOOD PROCESSING

Course objectives:

- To educate the students about fundamental principles of enzymes and their applications in food processing for quality enhancement of various foods.
- To acquaint students with the knowledge related to the use of enzymes in the basic processes of food industry and provide students with the need for enzyme usage, impact, characteristics of enzymes and mechanism of their actions in processing.

Course outcome: students will acquire knowledge on:

- The mechanism of action of enzymes used in specific processes and co-relate enzymes used in various branches of food industry.
- Appropriate process conditions (temperature, pH, time), depending on the type of enzyme in the process and control the enzymatic reactions that influence the food processing with emphasis on their applications to enhance product properties.

FSB180 - FUNCTIONAL PROPERTIES OF FOODS

Course objectives:

- To know the functional aspects of food components & their role in food processing.
- To understand the Physico-chemical properties of food and to familiarize the students with changes occurring in various foodstuffs as a result of processing.
- Discuss major chemical reactions that occur during food preparation and storage and to identify and apply food principles to food and nutrition systems in end use quality.

Course outcome: students will acquire knowledge on:

- The characteristics & behavior of food constituents, changes during food processing.
  Processing conditions that are likely to change the reactivity of food components and determine approaches that may be used to control the reactivity of those food components that are likely to impact the overall quality of finished products.

Suggested Reading:

- Functional Foods: Biochemical & Processing Aspects, Giuseppe Mazza; CRC Press.
- Vaclavik, Vickie A., Elizabeth W. Christian, Essentials of food science. Vol. 42
- Campbell-Platt, Geoffrey, ed. Food science & technology. John Wiley & Sons, 2017.
- Anklam, Elke. H.D. Belitz, W.Grosch, P. Schieberle: 'Food Chemistry'(2005):10-11.
- AVI. Fennema OR.1996. Food Chemistry.

III SEMESTER
Hard Core Papers

FSC110 - PRODUCT DEVELOPMENT AND SENSORY EVALUATION

Course objectives:

- To attain knowledge on different aspects of product development
- To understand the significance of sensory evaluation, processing technology and consumer behavior.
- To gain knowledge on different sensory techniques and responses utilized for prepared food products.
- To understand Stepwise development of a new food product, standardization and acceptability studies

Course outcome: students will acquire knowledge on:

- Different methods used in sensory evaluation and processing technology
- Working outline of product development in industries

FSC120 - FOOD PRESERVATION

Course objectives:

- To know the importance and need of food preservation
- To familiarize with various type of food preservation techniques, principle behind those techniques and its practical application
- To learn about advanced methods which are being used in food processing sector

PRACTICAL SESSIONS

Course objective:

- To familiarize students with various physical and chemical preservation techniques by its practical application
- To make students understand the need of different food preservation techniques in product formulation
- To analyze the preserved food for its chemical and sensory quality during storage
- To analyze preserved products for its microbial quality

Food preservation techniques (use of different techniques in product Formulation and analysis of product for quality standards)

- Sun drying and dehydration: Cereals, legumes, vegetable based
- Preservation with sugar: Jams, jelly, preserves
- Preservation with salt, oil, vinegar: Pickling
- Preservation of foods using chemicals: Tomato ketchup, squash

Course outcome: students will gain knowledge on:

- Various physical and chemical preservation methods
- Analysis of nutritive value and chemical preservatives used
- Evaluation of microbial safety
- The principle behind each technique and the factors affecting the efficiency.
- Various equipment and chemicals used for preservation.

FSC130 - PRINCIPLES OF CLINICAL NUTRITION

Course objectives:

- To understand the functioning of dietary department and all the aspects of food service management.
- To gain knowledge to practice evidence based dietetics and acquisition of skills in tube feeding and therapeutic diets management.

Course outcomes: students will acquire knowledge on:

- Nutritional management (Nutrition Care Process, Screening, Diagnosis, Intervention and Follow-up) of various diseases as well as documentation
- Nutrition counselling-techniques, dietary recommendation, food selection and preparation of nutrition guidelines for patients

FSC140 - TERM PAPER

Course objectives:

- To learn literature review & technical writing
- To provide students an opportunity to develop in-depth expertise in an aspect of interest.
- To guide students through the process of planning and executing a substantial project.

Course outcome: students will acquire knowledge on:

- Writing and planning work for future projects.
- Formulating hypothesis which could be used in future piece of research.

III SEMESTER
Soft Core

FSC150 - BIOSTATISTICS & COMPUTER APPLICATIONS

Course objectives:

- To understand the role biostatistics serves in the discipline of public health.
- To understand the basic concepts of probability, random variation and commonly used statistical probability distributions.
- To understand basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation.

Course outcome:

- Recognize the importance of data collection, scope of inference.
- Choose and apply appropriate statistical methods for analyzing one or two variables.
- Use technology to perform descriptive & inferential data analysis for 1 or 2 variables
- Interpret statistical results correctly, effectively, and in context.

FSC160 - ENTREPRENEURSHIP AND MARKETING

Course objectives:

- To understand basic concepts of entrepreneurship,
- To understand the role and importance of entrepreneurship for economic development, developing personal creativity and entrepreneurial initiative, adopting of the key steps in the elaboration of business idea,
- To understand the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures

Course outcome: students will acquire knowledge on:

- Fundamental concepts of entrepreneurship and management skills for startup.
- Apply knowledge of entrepreneurship to various sectors in food, nutrition and Dietetics.

FSC170 - QUALITY CONTROL IN FOOD INDUSTRIES AND INSTITUTIONS

Course objectives:

- To understand the meaning of food quality and concepts of quality management.
- To expose to different quality standards and regulations with respect to food industries and institutions.
- To provide knowledge about the standard protocol of quality control in food institutions.
- To make familiar with different subjective and objective methods of food quality evaluation.

Course outcome: students will gain knowledge on:

- Importance of quality control, continuous monitoring in maintaining food standard.
- Designing quality assessing protocol for different food industries.
- Different food regulatory agencies at national and international level.

FSC180 - FOOD ADDITIVES

Course objectives:

- To understand the chemical, technological and toxicological aspects of food additives.
- To know the permissible limits of food additives to be added in different processing methods and product development

Course outcome:

- To gain knowledge on different aspects of food additives.
- To gain knowledge additives and amount to be added in different products

FSC190 - ADVANCES IN NUTRITION RESEARCH

Course objectives:

- To familiarize with various research methods used in clinical nutrition.
- To provide knowledge on the role of nutrition in physical and mental development.
- To have knowledge about recent concept and development in the field of nutrition.
- To plan and prepare diet for various physiological conditions.

Course outcome: students will acquire knowledge:

- Designing diet plan for different physiological requirement.
- Using different survey methods in clinical research.
- Interpretation of the nutritional status of an individual based on various assessment methods.

IV SEMESTER

FSD110 - DISSERTATION WORK ***

Course objectives:

- The aim of dissertation is to develop skills in conducting a research study/ working in a project and learn the process of writing a dissertation/ project report
- Dissertation in a chosen area congruent to their discipline/ field of study
- To create scientific evidences in the fields of community nutrition, new food product development and stability studies, clinical nutrition, Food Analysis, Food Science, Nutrition Science, Food Technology, Supplementary trails on developed products
- To develop the skills on statistical methods and to understand data analysis for writing up a dissertation/thesis/research article

An independent research project work undertaken by student under the guidance of an advisor, can either be a survey or Laboratory oriented research. The research should be submitted at the end of semester in the form of a thesis/ dissertation. The project work can be undertaken at University departments, affiliated research institutions, quality

control laboratories, food industries or other institutions with prior approval. Students have to work full time at any research centres/ laboratory/ departments for the period of minimum 3 - 4 months and conduct experiments. At the end of the semester they have to prepare thesis/dissertation that shall be submitted for the evaluated. The topic will be selected by the student under the guidance of an advisor, can either be an independent study based on research [experimental, clinical, survey, case study, etc].

Course outcome: students will acquire knowledge on:

- the practical aspects of collecting data/ project work
- to evaluate, select and use appropriate strategies for reduction, analysis and presentation of data collected during research process/ project work
- to suitably illustrate data/ insights using various graphical and other methods.
- to prepare a dissertation document/ project report based on research process/ project work done.
- the importance of research work and have some contribution towards science in the fields of community nutrition, clinical nutrition, food science, nutrition science and supplementary trials for products developed.

FSD120 - DIET IN DISEASES

Course objectives:

- To gain knowledge on various disease conditions and their medical nutrition therapy
- To understand the importance of therapeutic diets.

Course outcome: students will acquire knowledge on:

- The work of dietitians and nutritionist in hospital and community setup.
- The development, implementation and evaluation of nutrition intervention programs.

FSD130 - STORAGE AND HANDLING OF FRESH PRODUCE

Course objectives:

- To provide knowledge on various sources of food contamination and its effect.
- To obtain knowledge on the role of food packaging and preservation methods in preventing food spoilage and extension of shelf-life.

Course outcome: students will gain knowledge on:

- The need of food storage.
- Usage of various food storage techniques.

FSD140 - FOOD BIOTECHNOLOGY

Course objectives:

- To provide knowledge on various biotechnological methods used for food processing.
- To learn mechanism of different processing techniques used and their advantages.
- To know about modern techniques and new inventions with respect to food handling.
- To understand the need, challenges, benefits and safety of genetically modified foods.

Course outcome: Students will gain knowledge on:

- Use of various biotechnological methods for food processing.
- Benefits of fermentation methods in the formulation of new products.

FSD150 - NUTRACEUTICALS AND HEALTH FOODS

Course objectives:

- To provide overview of functional foods, nutraceuticals and natural health products.
- To understand the functional food concept as related to ingredient efficacy and safety.
- To familiarize bioactive ingredient-disease relationships & importance of clinical study support

Course outcome: students will acquire knowledge on:

- Components of nutraceutical and functional foods
- Identify functional foods and pharmaceutical foods
- Apply the concepts of nutraceuticals in dietary supplements
- Translating knowledge of functional foods into management of health and diseases

OPEN ELECTIVE SUBJECTS

II SEMESTER

FSB190 - NUTRITION FOR HEALTH

Course objectives:

- To gain the knowledge on various aspects of diseases and deficiency
- To understand the importance of nutrition, nutrients on health

Course outcome:

- It enables the students to understand the concepts of nutrients and health
- It helps to assess nutritional status of the community

III SEMESTER

FSC200 - CULINARY SCIENCE - PRINCIPLES AND TECHNIQUES

Course objectives:

- To attain knowledge on different aspects of culinary techniques and food science, processing, safety in handling foods
- It understands cuisine of arts of food preparation of cooking and presentation of foods

Course outcome:

- To gain Practical knowledge on different food groups
- To apply principles from the various culinary techniques, equipment, nutrient enhancement and ingredient substitution

REMEDIAL COURSES (For Non-cognate students)

I Semester

FSA190 - BASICS OF FOOD SCIENCE

Course objectives:

- Its scope is to help and gain knowledge on applied agriculture science, nutrition, food safety and food processing and development of products
- To develop the knowledge on sensory attributes of foods and to study the food groups

Course outcome:

- It helps to know about the use of technology, evidence-based practice, and improvement on the quality
- To learn the principles of preservation, cleaning and sanitation and utilisation of waste and storage

FSA200 - BASICS OF NUTRITION SCIENCE

Course objectives:

- To gain the information on community nutrition
- Apply knowledge on the role of different nutrients, causes and prevention

Course outcome:

- To acquire skills in nutritional management in deficiency and diseases
- To develop expertise in nutrition management and skills.

M.Sc. Mathematics-2016-17

Sl No.	Program	Program Code	Program Specific discipline	Program Specific code
2	M.Sc.	MSCCBCSYCM	4.Mathematics	MSCCBCSMATYCM

- **Program Specific objectives:**

The M.Sc. course in Mathematics aims at developing mathematical ability in students with acute and abstract reasoning.

- **Learning outcome:**

The course will enable students to cultivate a Mathematician's habit of thought and reasoning and will enlighten students with Mathematical ideas relevant for oneself and for the course itself.

Semester	Courses	Course Code
I Semester	Algebra – I	MAA110
	Real Analysis – I	MAA120
	Real Analysis – II	MAA130
	Complex Analysis – I	MAA140
	Linear Algebra	MAA150
II Semester	Algebra II	MAB110
	Real Analysis III	MAB120
	Complex Analysis II	MAB130
	Graph Theory	MAB150
	Ordinary and Partial Differential Equations	MAB140
III Semester	Elements of Functional Analysis	MAC110
	Topology I	MAC120
	Commutative Algebra	MAC130

	Theory of Numbers	MAC140
IV Semester	Measure and Integration	MAD110
	Topology II	MAD120
	Advanced Graph Theory	MAD130
	Theory of Partitions	MAD140

I SEMESTER

MAA110 - ALGEBRA – I

Course objectives:

- Student will learn to identify patterns represent real world situations using expressions and equations and simplify expression using the order of operations.
- Student will solve various types of inequalities and graph their result on a number line.
- Student will use laws of exponents to simplify expressions.

Course outcome:

- Student can able to use numeric or variable substitution while working with expressions.
- Student solve equations involving linear polynomial, radical, rational, exponential or logarithmic expressions.
- Student are able to use function composition to show two functions are inverses.

MAA120 - REAL ANALYSIS I

Course objectives:

- Student are able to demonstrate understanding of the theory of sequence and series , continuity ,differentiation and integration.
- Student will able to define the real numbers, least upper bound and lower bound and triangular inequality.
- Student are able demonstrate skills in constructing rigorous mathematical argument.

Course outcome:

- Student are able to describe the fundamental properties of the real number that underpin the formal development of real analysis.
- Student are able to describe the basic difference between the rational and the real number.
- Student are able to develop in a rigorous and self contained manner the elements of real variable function.

MAA130 - REAL ANALYSIS II

Course objectives:

- Student are able to learn about real number and the axioms of completeness.

- Student are able to learn about sequence, compact, perfect connect sets and limit of sequence.
- Student are able to explain what a definition or theorem says.

Course outcome:

- Student are able to answer the question concerning numerical convergence of concrete numerical sequences and series.
- Student are able to give the definition of concept related to metric spaces such as continuity compactness, completeness and connectedness.
- Student are able to give the essence of the proof of stone weirstrass theorem the construction of theorem as well as the existence of the convergent sub sequences using equi continuity.

MAA140 - COMPLEX ANALYSIS I

Course objectives:

- Student are able to identify curves and regions in the complex plane define by simple expressions.
- Student are able to describe basic properties of complex integration and having the ability to compute such integrals.
- Student are able to decide when and where a given function is analytic and be able to find it series development.

Course outcome:

- Student are able to define the concept of derivation of analytical functions.
- Students are able to define the concept of sequence and series of the complex functions.
- Student are able to express the concepts of convergent sequence and series of the complex functions.

MAA150 - LINEAR ALGEBRA

Course objectives:

- Student are able to prove statement of an algebraic nature concerning linear transformation.
- Student are able to calculate eigen values and their corresponding eigen spaces.
- Student are able to determine if it is diagonalize it.

Course outcome:

- Student are able to express some of the algebraic operations between linear transformations and explain matrix representation of linear transformation.
- Student are able to use computational techniques and algebraic skills essential for the study of system of linear equations , matrix algebraic , vector space , eigen values and eigen vectors.
- Student are able to use visualization, spatial reasoning as well as geometric
    - properties and strategies to model, solve problems and view solutions.

II SEMESTER

MAB110 - ALGEBRA - II

Course objectives:

- Students acquire basic knowledge of algebra needed to understand algebra
- Understanding basic concepts of algebra.

Course outcome:

- On satisfying the requirements of this course, students will have the knowledge and skills to:
- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Explain Demonstrate accurate and efficient use of advanced algebraic techniques.
- Demonstrate capacity for mathematical reasoning through analyzing, Proving and explaining concepts from advanced algebra.
- Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematical

MAB120 - REAL ANALYSIS - II

Course objectives:

- This course is designed to provide the student with an intense foundation in fundamental concepts of real analysis
- After completing the course the student should be able to work basic problems (proofs, construction of examples, counter-examples) and become familiar with convergent, divergent, bounded.

Course outcome:

After completion of this course, students will be able to

- Read analyzes and write logical arguments to prove mathematical concepts
- Communicate mathematical ideas with clarity and coherence both written and verbally
- Fundamental objects, techniques and theorems in the mathematical sciences including the fields of analysis
- Master the object material in the four required core course that form the academic pillars of the program
- Demonstrate a competence in formulating, analysing and solving problems in several core areas of mathematics at a detailed level, including analysis

MAB130 - COMPLEX ANALYSIS - II

Course objectives:

- To understand and apply the fundamental concepts in complex analysis.
- To apply complex analysis based tools in solving practical problems

Course outcome:

Upon successful completion of this course, the student will be able to:

- Justify the need for a Complex Number System and explain how is related to other existing number systems
- Define a function of complex variable and carry out basic mathematical operations with complex numbers.
- Know the condition(s) for a complex variable function to be analytic and/or harmonic
- State and prove the Cauchy Riemann Equation and use it to show that a function is analytic.
- Define singularities of a function, know the different types of singularities, and be able to determine the points of singularities of a function
- Explain the concept of transformation in a complex space (linear and non-linear) and sketch associated diagrams.
- Understand the concept of sequences and series with respect to the complex numbers
- system and establish whether a given series/ sequences is convergent/ divergent at a specified point or interval.

MAB140 - ORDINARY & PARTIAL DIFFERENTIAL EQUATION

Course objectives:

- Understand the basic principles connected to both ordinary & partial differential equations
- Demonstrate different methods and solve problems

Course outcome:

After completion of this course, students will be able to:

- The study of Differential focuses on the existence and uniqueness of solutions and also emphasizes the rigorous justification of methods for approximating solutions in pure and applied mathematics.
- It plays an important role in modelling virtually every physically technical or biological process from celestial motion to bridge design to interactions between neurons.
- Theory of differential equations is widely used in formulating many fundamental laws of physics and chemistry.
- Theory of differential equation is used in economics and biology to model the behaviour of complex systems.
- Differential equations have a remarkable ability to predict the world around us. They can describe exponential growth and decay population growth of species or change in investment return over time.

MAB150 - GRAPH THEORY-I

Course objectives:

- To understand and apply the fundamental concepts in graph theory
- To apply graph theory based tools in solving practical problems.

Course outcome:

Upon successful completion of this course, the student will be able to:

- Explain the fundamental concepts of Graph Theory and their role in modern mathematics and applied contexts
- Demonstrate accurate and efficient use of GraphTheoritical techniques.
- Demonstrate capacity for mathematical reasoning through analysing proving and explaining concepts from Graph Theory.
- Apply problem-solving using Graph Theory technique applied to diverse situations in physics, engineering and other mathematical context

III SEMESTER

MAC110 - ELEMENTS OF FUNCTIONAL ANALYSIS

Course objectives:

- Students acquire basic knowledge of Functional Analysis needed to understand Metric theorem and applications.
- Understanding basic concepts like Open Mapping and Closed Graph Theorems and Hilbert spaces.

Course outcome:

Upon successful completion of this course, the student will be able to:

- Explain the fundamental concepts of functional analysis and their role in modern mathematics and applied contexts
- Demonstrate accurate and efficient use of functional analysis techniques.
- Demonstrate capacity for mathematical reasoning through analysing proving and explaining concepts from functional analysis.
- Apply problem-solving using functional analysis technique applied to diverse situations in physics, engineering and other mathematical context.

MAC120 - TOPOLOGY - I

Course objectives:

- This course is designed to provide the student with an intense foundation in fundamental concepts of topology.
- After completing the course the student should be able to work basic problems (proofs, construction of examples, counter-examples) and become familiar with separability, completeness, connectedness, and compactness.

Course outcome:

After completion of this course, students will be able to:

- Topology uses to analyze complex networks
  Ex: Social networks, Biological networks, Internet etc.
- It applies Differential Topology to probability to identity multivariate interactions. This was used in neuro science recently to deduce how neurons are interacting.
- This paper discusses using cell phones to actually map out the topology of indoor spaces.

- Another cool application is in the world of chemistry where one can discuss the shape of molecules by an analysis of the topology of a related graph.
- There is also an application for medical imaging software and technology.

MAC130 - COMMUTATIVE ALGEBRA

Course objectives:

- To understand and apply the fundamental concepts in
- To apply Commutative Algebra based tools in solving practical problems

Course outcome:

- On satisfying the requirements of this course, students will have the knowledge & skills to:
- Explain the fundamental concepts of commutative algebra and their role in modern mathematics and applied contexts.
- Explain Demonstrate accurate and efficient use of commutative algebraic techniques.
- Demonstrate capacity for mathematical reasoning through analyzing, Proving and explaining concepts from commutative algebra.
- Apply problem-solving using commutative algebraic techniques applied to diverse situations in physics, engineering and other mathematical.

MAC140 - THEORY OF NUMBERS

Course objectives:

Elementary Number Theory is the study of the basic structure and properties of integers. Learning Number Theory helps improving one's ability of mathematical thinking. Successful completion of this course will enable you to:

Course outcome:

Upon successful completion of this course, the student will be able to:

- Prove results involving divisibility and greatest common divisors;
- Solve systems of linear congruences;
- Find integral solutions to specified linear Diophantine Equations;
- Apply Euler-Fermat's Theorem to prove relations involving prime numbers;
- Apply the Wilson's theorem.

IV SEMESTER

MAD110 - MEASURE AND INTEGRATION

Course objectives:

- Students acquire basic knowledge of measure theory needed to understand probability theory, statistics and functional analysis.
- Understanding basic concepts of measure and integration theory.

Course outcome:

Upon successful completion of this course, the student will be able to:

- Students will understand the fundamentals of measure theory and be acquainted with the proofs of the fundamental theorems underlying the theory of integration.
- They will also have an understanding of how these underpin the use of mathematical concepts such as volume, area, and integration .
- They will develop a perspective on the broader impact of measure theory in ergodic theory and have the ability to pursue further studies in this and related area.
- The students will learn about measure theory random variables, independence,expectations and conditional expectations, product measures and discrete parameter matingalus.
- Explain the concept of length, area, volume using lebesgue's theory.
- Apply the general principles of measure theory and integration in such concrete subjects as the theory of probability or financial mathematics.

MAD120 - TOPOLOGY PAPER - II

Course objectives:

- This course is designed to provide the student with an intense foundation in fundamental concepts of topology.
- After completing the course the student should be able to work basic problems (proofs, construction of examples, counter-examples) and become familiar with separability, completeness, connectedness, compactness.

Course outcome:

After completion of this course, students will be able to:

- Topology uses to analyze complex networks
  Ex: Social networks, Biological networks, Internet etc.
- It applies Differential Topology to probability to identity multivariate interactions.This was used in neuro science recently to deduce how neurons are interacting.
- This paper discusses using cell phones to actually map out the topology of indoor spaces.
- Another cool application is in the world of chemistry where one can discuss the shape of molecules by an analysis of the topology of a related graph.
- There is also an application for medical imaging software and technology.

MAD130 - ADVANCED GRAPH THEORY

Course objectives:

- To understand and apply the fundamental concepts in graph theory
- To apply graph theory based tools in solving practical problems

Course outcome:

Upon successful completion of this course, the student will be able to:

- Explain the fundamental concepts of Graph Theory and their role in modern mathematics and applied contexts
- Demonstrate accurate and efficient use of GraphTheoritical techniques.
- Demonstrate capacity for mathematical reasoning through analysing proving and explaining concepts from Graph Theory.
- Apply problem-solving using Graph Theory technique applied to diverse situations in physics, engineering and other mathematical context.

MAD140 - THEORY OF PARTITIONS

Course objectives:

- This course is designed to provide the student with an intense foundation in Fundamental concepts of Theory of partitions.
- To understand and apply the fundamental concepts in theory of partitions

Upon successful completion of this course, the student will be able to:

- Understand the basic principles connected to partitions of numbers and generating functions
- Apply Jacobi's Triple product Identity to determine solutions
- Demonstrate different Euler's methods and proofs to solve problems
- Write model problems in Theory of partitions using Roger's-Ramanujan's identities
- Demonstrate the ability to write and evaluate Euler's,Gauss,Heine's,Jacobi's Identities.

M.Sc. Physics-2016-17

Sl. No	Program	Program code	Program specific Discipline	Program specific code
2	**M.Sc.**	**MSCCBCSYCM**	**5. Physics**	**MSCCBCSPHYYCM**

CREDIT PATTERN

Sl. No	Paper Code	Title of course - Hard Core Subjects	No. of credits			
			L	T	P	Total
I Semester (18 Credits)						
1	YPH 101	Classical Mechanics	3	0	0	**3**
2	YPH102	Linear Vector Space and Special Functions	3	0	0	**3**
3	YPH103	Group Theory and Fourier Transforms	3	0	0	**3**
4	YPH104	Classical and Relativistic electrodynamics, Optics	3	0	0	**3**
5	YPH105	Computer Lab CL-A	0	0	2	**2**
		Soft-core				
6	YPH106	Electronics Lab	0	0	4	**4**
II Semester (18 Credits= Hard core + Soft core)						
1	YPH 201	Continuum Mechanics and Relativity	3	0	0	**3**
2	YPH202	Thermodynamics, Classical and Quantum Statistical Mechanics	3	0	0	**3**
3	YPH203	Quantum Mechanics I	3	0	0	**3**
4	YPH204	Spectroscopy and Fourier Optics	3	0	0	**3**
5	YPH205	Computer Lab CL-B	0	0	2	**2**
		Soft-core				
6	YPH206	Optics Lab	0	0	4	**4**
		Open Elective Paper				
7	YPH207	Modern Physics	3	1	0	**4**
III Semester (18/19 Credits= Hard core 10 + Soft core 8 or 9)						
1	Hardcore	Paper	**L**	**T**	**P**	**Total**
2	YPH 301	Quantum Mechanics 2	3	0	0	**3**
3	YPH302	Condensed Matter Physics	3	0	0	**3**
4	YPH306	Condensed Matter Physics Lab	0	0	4	**4**

Soft-core						
	YPH 303	Solid State Physics 1	3	0	0	**3**
	YPH307	Solid State Physics Lab 1	0	0	2	**2**
	YPH304	Nuclear Physics 1	3	0	0	**3**
	YPH308	Nuclear Physics Lab 1	0	0	2	**2**
	YPH305	Theoretical Physics 1	3	0	0	**3**
	YPH 309	Theoretical Physics Lab 1	0	0	2	**2**
No			**L**	**T**	**P**	**Total**
IV Semester (to choose 4 credits) (18/19 Credits= Hard core 7 + Soft core 11 or 12)						
1	PY210	Nuclear and particle Physics	3	0	0	**3**
2		Nuclear physics Lab	0	0	2	**2**
3	PY220	Solid State Physics 2	3	0	0	**3**
4	PY230	Solid State Physics 3	3	0	0	**3**
5		Solid State Physics Lab	0	0	2	**2**
6	PYD240	Electronics	3	0	0	**3**
7		Electronics Lab	0	0	2	**2**

Sl. No	Semester	Course Title	Course code
1.	I	Classical Mechanics	YPH 101
		Linear Vector Space and Special Functions	YPH102
		Group Theory and Fourier Transforms	YPH103
		Classical and Relativistic electrodynamics, Optics	YPH104
		Computer Lab CL-A	YPH105
		Electronics Lab	YPH106
	II	Continuum Mechanics and Relativity	YPH 201
		Thermodynamics, Classical and Quantum Statistical Mechanics	YPH202
		Quantum Mechanics I	YPH203
		Spectroscopy and Fourier Optics	YPH204
		Computer Lab CL-B	YPH205
		Optics Lab	YPH206
	III	Quantum Mechanics 2	YPH 301
		Condensed Matter Physics	YPH302
		Condensed Matter Physics Lab	YPH306
		Solid State Physics 1	YPH 303
		Solid State Physics Lab 1	YPH307
		Nuclear Physics 1	YPH304
		Nuclear Physics Lab 1	YPH308
		Theoretical Physics 1	YPH305
		Theoretical Physics Lab 1	YPH 309
		Numerical Methods	PYC250
		Accelerator Physics	PYC140
	IV	Nuclear and particle Physics	PYD210
		Nuclear physics Lab	
		Solid State Physics 2	PYD220
		Solid State Physics 3	PYD230
		Solid State Physics Lab	
		Electronics	PYD240
		Electronics Lab	

1 SEMESTER

YPH101 - CLASSICAL MECHANICS

Course objectives:

To apprise the students of lagrangian and Hamiltonian formulations and their applications

Course outcome:

Necessity of lagrangian and Hamiltonian formulations. Essential features of a problem (like motion under central force, rigid body dynamics, periodic motions), use them to set up and solve the appropriate mathematical equations, and make quick and easy cheeks on the answer to catch simple mistakes. Theory of small oscillations which is important in several areas of physics e.g., molecular spectra, acoustics, vibrations of atoms in solids, coupled mechanical oscillators and electrical circuits.

YPH102 - LINEAR VECTOR SPACE & SPECIAL FUNCTIONS

Course objectives:

To understand the underlying Physics in respective specialization and able to teach and guide successfully. To introduce advanced ideas and techniques that is applicable in respective fields. To develop human resources with a solid foundation in theoretical and experimental aspects of respective specialization as a preparation for career in academic and industry.

Course outcome:

Students will have understanding of Fundamentals and advancements in nuclear physics and their applications in the area of nuclear reactors, accelerates and medicine. Fundamentals and advancements in electronics, microprocessors and their applications in electronic devices and microwave and optical fiber communications. Fundamentals and electromagnetic properties of materials their characterization techniques as well as advancements in the area of nano materials.

YPH103 - GROUP THEORY N FOURIER TRANSFORMS

Course objectives:

This Course Enables the Student to understand the linear equations, vector spaces, matrices, linear transformations, determinants, eigen value, eigenvectors, etc Learn to use Laplace transform methods to solve differential equations. Introduce the Fourier series and its application to the solution of partial differential equations

Course outcome:

Upon successful completion of this course, it is intended that a student will be able to: Students will demonstrate competence with the basic ideas of linear algebra including concepts of linear systems, independence, theory of matrices, linear transformations, bases and dimension, eigen values, eigenvectors and Diagonalization. Use the method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients. Solve a Cauchy problem for the wave or diffusion equations using the Fourier Transform.

YPH104 - CLASSICAL & RELATIVISTIC ELECTRODYNAMICS, OPTICS

Course objectives:

The objective of the course is to apprise the students about the process which help In communication. About the various devices which are optoelectronic. Circuit analysis of operational amplifier and IC. Knowledge about digital electronics and digital technique.

Course outcomes:

After the completion of the course, Students will be able to Students shall learn about the significance of communication process which are very useful in daily life. Significance of various devices which are which are beneficial to understand how they will operate and use. Due to circuit analysis of Ic and opamp, it will help in performing the mathematical operation. The modern world is digital world. It is very useful in this time.

II SEMESTER

YPH201 - CONTINUUM MECHANICS & RELATIVITY

Course objectives:

This Course Enables the Student to distinguish between 'inertia frame of reference' and 'non-inertial frame of reference' To know how to impose constraints on a system in order to simplify the methods to be used in solving physics problems to know what central, conservative and central-conservative forces mathematically understand the conservative theorems of energy, linear momentum and angular Momentum. To know the importance of concepts such as generalized coordinates and constrained motion to establish that Kepler's laws are just consequences Newton's laws of gravitation and that of moment.

Course outcomes:

Upon successful completion of this course, it is intended that a student will be able to: Students learn about Lagrangian and Hamiltonian formulation of Classical Mechanics. State the conservation principles involving momentum, angular momentum and energy and understand that they follow from the fundamental equations of motion. Have a deep understanding of Newton's laws, Students learn about motion of a particle under central force field.

YPH202-THERMODYNAMICS, CLASSICAL & QUANTUM STATISTICAL MECHANICS

Course objectives:

The objective of this course is to learn the properties of macroscopic systems using the knowledge of the properties of individual particles.

Course outcome:

Students will have understanding of connection between statistics and thermodynamics, different ensemble theories to explain the behavior of the systems. Difference between theories to explain the behavioro the systems. Difference between classical statistics and quantum statistics. Statistical behavior of ideal Bose and fermi systems.

YPH203 - QUANTUM MECHANICS I

Course objectives:

To give exposure about the various tools employed to analyze the quantum mechanical problems.

Course outcome:

Students will have understandings of importance of quantum mechanics compared to classical mechanics at microscopic level. Various tools to calculate eigen values and total angular momentum of particles. Application of approximation methods and scattering theories.

YPH204 - SPECTROSCOPY & FOURIER OPTICS

Course objectives:

To impart knowledge about various mathematical tools employed to study physics problems.

Course outcome:

Students will have understanding of various techniques to solve differential equations. How to use special functions in various physics problems.

YPH207 - MODERN PHYSICS

Course objectives:

This Course Enables the Student to study and develop the Bohr Theory of the hydrogen atom. Observe the fine structure lines of HCl molecule and the Zeeman splitting of one or more of these lines as a function of magnetic field. Outline the selection rules for rotational and vibrational spectra and rationalize the role of the molecular dipole moment in the selection rules. Distinguish between the energy levels of a rigid and a non-rigid rotor.

Course outcome:

Upon successful completion of this course, it is intended that a student will be able to: They should be able to calculate the Zeeman Effect and the Lande g-factor they should be able to calculate the effects of an electric field on the energy levels of the hydrogen atom (the Stark effect). They should be able to discuss the rotational spectra of molecules. They should be able to apply the Simple Harmonic Oscillator to determine the vibrational spectrum of diatomic molecules.

III SEMESTER

YPH301 - QUANTUM MECHANICS II

Course objectives:

To give exposure about the various tools employed to analyze the quantum mechanical problems.

Course outcome:

Students will have understandings of importance of quantum mechanics compared to classical mechanics at microscopic level. Various tools to calculate eigen values and total angular momentum of particles. Application of approximation methods and scattering theories.

YPH302 - CONDENSED MATTER PHYSICS-1

Course objectives:

To study some of the basic properties of the condensed phase of materials especially solids.

Course outcome:

Students will have understandings of structures in solids and their determination using XRD. Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties. Electrical, thermal, magnetic and dielectric properties of solids.

YPH303 - SOLID STATE PHYSICS-1

Course objectives:

To study some of the basic properties of the condensed phase of materials especially solids.

Course outcome:

Students will have understandings of structures in solids and their determination using XRD. Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties. Electrical, thermal, magnetic and dielectric properties of solids.

YPH304 - NUCLEAR & PARTICLE PHYSICS-1

Course objective:

The objective of the course is to appraise the students about the particles. To learn about the decay phenomenon and the process how they will occur. Knowledge of various model compare to nucleus. Knowledge of scattering process.

Course outcome:

After the completion of the course, Students will be able to Students shall learn about the knowledge of particles. Significance of various decays tells the students about the nuclear process. It will teach the students about the spin parity concept &magic no. Related to shell. About the scattering process how it will occur.

YPH305 - THEORETICAL PHYSICS-1

Course objective:

To give exposure about the various tools employed to analyze the quantum mechanical problems

Course outcome:

After studying this course, students can calculate the ground state and excited state energies of various real-life systems by using Principle, WKB method and perturbation methods. Students will be knowing about the Einstein's coefficients and relating them to lasers. They know about scattering in two different frames and can easily calculate scattering amplitude and scattering cross section. Students can write total energy and wave function as slater determinant for system of identical fermions.

IV SEMESTER

YPH401 - NUCLEAR AND PARTICLE PHYSICS

Course objective:

The objective of the course is to appraise the students about the particles. To learn about the decay phenomenon and the process how they will occur. Knowledge of various model compare to nucleus. Knowledge of scattering process.

Course outcome:

After the completion of the course, Students will be able to Students shall learn about the knowledge of particles. Significance of various decays tells the students about the nuclear process. It will teach the students about the spin parity concept &magic no. Related to shell. About the scattering process how it will occur.

YPH402 - SOLID STATE PHYSICS - 2

Course objectives:

To study some of the basic properties of the condensed phase of materials especially solids.

Course outcome:

Students will have understandings of structures in solids and their determination using XRD. Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties. Electrical, thermal, magnetic and dielectric properties of solids.

YPH403 - SOLID STATE PHYSICS - 3

Course objectives:

To study some of the basic properties of the condensed phase of materials especially solids.

Course outcome:

Students will have understandings of structures in solids and their determination using XRD. Behavior of electrons in solids including the concept of energy bands and effect of the same on material properties. Electrical, thermal, magnetic and dielectric properties of solids.

YPH412 - ELECTRONICS

Course objectives:

The objective of the course is to apprise the students about the process which help in communication. About the various devices which are optoelectronic. Circuit analysis of operational amplifier and IC. Knowledge about digital electronics and digital technique.

Course outcome:

After the completion of the course, Students will be able to 1. Students shall learn about the significance of communication process which is very useful in daily life. 2. Significance of various devices which are which are beneficial to understand how they will operate and use. 3. Due to circuit analysis of Ic and pomp, it will help in performing the mathematical operation. 4. The modern world is digital world. It is very useful in this time.

M.A. in English-216-17

Sl. No.	Program	Program Code	Program Specific discipline	Program Specific Code
3	**M.A.**	**MACBCSYCM**	**English**	**MACBCSENGYCM**

Semester	Course Title	Theory Course
I	Paper –I – (Hard Core-I) English Literature From Chaucer To Milton	ENA110
	Paper –II – (Hard Core-II) Elizabethan Age	ENA120
	Paper –III – (Hard Core-III) 17th And 18th Century English Literature	ENA130
	Paper-IV (Hard Core – IV) - 19th Century English Literature	ENA140
	Paper V- Soft Core I Introduction to Phonetics	ENA150
	Soft Core II Cross-Cultural Women Writers	
Semester	**Course Title**	**Theory Course**
II	Paper I –The Modern Age - I	ENB110
	Paper II - Literary Criticism	ENB120
	Paper III– Indian Writing In English - I	ENB130
	Paper- IV (Soft Core) Feminism	ENB140
	Soft Core II :Carrebean fiction and Poetry	---
	Paper- V (Open Elective) Communication Skills	ENB160
III	Paper- I – (Hard Core-I) The Modern Age-II	ENC110
	Paper- II– (Hard Core-Iv) Indian Writing In English-II	ENC120
	Paper- III – (Hard Core-Iii) New Literatures In English	ENC130
	Soft Core Paper 1 Modern Indian Poetry In English	ENC140

	Soft Core Paper II Nobel Laureates	---
IV	Paper- I – (Hard Core-I) Literary Criticism-Ii	END110
	Paper- II – (Hard Core-Ii) American Literature	END120
	Paper- III European Classics (Compulsory Soft Core Paper)	END130
	Paper – IV (Soft Core I) Contemporary South Asian Immigrant Novel	END140
	Soft Core II Subaltern Women's Autobiographies	END160
	Soft Core III Partition Literature	END170

M.A IN ENGLISH: PROGRAMME SPECIFIC OBJECTIVES

- Critically interact with works from different contexts: social, political, economic, historical and national as subjects conscious of their own socio-historic specificity and thus their level of critical thinking is enhanced.
- To become thorough with application of theoretical basis to the reading of texts.
- To be inspired by fiction, stimulate a sympathetic/empathic imagination by allowing them to see the world through other's eyes as well to foster intercultural dialogue.
- To appreciate Indian literature in English and explore its uniqueness and its place among the literatures in English.
- To gain perceptive insights into the socio-political dynamics, the structuring points of view, the dominant ideology, hegemony, the prevailing common sense and communal underpinnings that mediate the writing, production, reception and survival of a work.

I SEMESTER

ENA110 - ENGLISH LITERATURE FROM CHAUCER TO MILTON

Course objectives:

- To provide the students with a historical perspective of the age
- To familiarize the students with representative texts of the period.

Course outcome:

- A fair understanding of the evolution of literature from the 15 th century down to the 17^{th} century
- Knowledge of Elizabethan, Jacobean, Caroline, Commonwealth, Restoration, Neoclassical and the Augustan eras

ENA120 - ELIZABETHAN AGE

Course objectives:

- To provide the students with an overview of the Elizabethan Age
- To introduce the students to the works of Shakespeare

Course outcome:

- An understanding of the social, political and economic conditions of the Elizabethan age
- A fair knowledge of the Humanist traditions that characterise the poetry and drama of the age

ENA130 - 17th and 18th CENTURY ENGLISH LITERATURE

Course objectives:

- To provide the students with an overview of Restoration Age
- To introduce the students to the texts of the period

Course outcome:

- Familiarity with the Age of Prose and Reason
- An understanding of the growth of cities and urbanization and its impact on literature

ENA140 - 19TH CENTURY ENGLISH LITERATURE

Course objectives:

- To familiarize students with artistic, moral imagination and aesthetics of 19thCentury poetry and prose, and
- To inspire them to nurture and develop spiritual affinities with Nature and instill in them a sense of compassionate aesthetics that promotes social conscience

Course outcome:

- An understanding of the revolutionary Romantic movementand its aesthetics
- Tracing the effects of the industrial revolution and the loss of the agrarian way of life

SOFT CORE I

ENA150 - INTRODUCTION TO PHONETICS

Course objectives:

- To introduce the students to acquire Phonetic Skills required for oral communication
- To enable students to acquire the required skills in speech mechanism and introduce the students to word accent and speech rhythm

Course outcome:

- An understanding of the fundamentals of Modern Phonetics
- Enunciation of Speech skills

II SEMESTER
ENB110 - THE MODERN AGE - PART I

Course objectives:

- To introduce the students to the social, political and cultural milieu of the age
- To familiarize the students with the representative texts of the period

Course outcome:

- Knowledge of the literary trends in the aftermath of the world-wars
- An understanding of the major writers of the twentieth century

ENB120 - LITERARY CRITICISM - I

Course objectives:

- To facilitate students with Aristotle's Poetics and basics of literary criticism and to read and understand the basics of literary/ critical theories;
- To equip them to read relevant theories in depth in the III Sem. and prepare them for practical criticism.

Course outcome:

- An understanding of the critical tradition
- Ability to apply theoretical analysis for evaluation of literary texts

ENA130 - INDIAN WRITING IN ENGLISH - I

Course objectives:

- To introduce the students to the social, political and cultural milieu of the age
- To familiarize the students with the representative texts of the period

Course outcome:

- Ability to trace the cultural heritage of Indian literary tradition
- An understanding of the contemporary literary forms and issues

SOFT CORE PAPERS

ENB140 - SOFT CORE I - FEMINISM

Course objectives:

- To introduce students to the different phases of the feminist movement
- To enable them to distinguish the critical aspects of feminist aesthetics

Course outcome:

- Knowledge of the history of the feminist movement
- Ability to apply feminist standpoints for the evaluation of texts

ENB160 - OPEN ELECTIVE - COMMUNICATION SKILLS

Course objectives:

- To introduce basic grammar through ample practice exercises for effective language learning
- To teach to use vocabulary appropriately and grammatical structures correctly
- To adopt strategies for developing effective reading and listening skills while engaging students in using correct pronunciation
- To develop in students the ability and skill to accomplish speaking and writing goals by carrying out intensive reading and listening activities
- To instil confidence and develop competence in students in order to communicate in grammatically correct English.

Course outcome:

- Students will be able to enrich their vocabulary and enhance their comprehension skills.
- They will acquire grammatical competence and communicative skill which in turn will improve their command over English
- Language learning is facilitated while learners are encouraged to engage in interaction and meaningful communication
- Students will acquire greater fluency in English which is an important dimension of language learning.

III SEMESTER

ENC110 - THE MODERN AGE - II

Course objectives:

- To introduce the students to the social, political and cultural milieu of the age
- To familiarize the students with the representative texts of the period

Course outcome:

- Focus on the theorists of fiction through a study of the most renowned writers of the novel
- A fair understanding of the various aspects and types of novel

ENC120 - INDIAN WRITING IN ENGLISH - II

Course objectives:

- To further the knowledge of contemporary Indian English writers
- To engage with the methods of literary expression

Course outcome:

- Students will acquire an understanding of the character of contemporary Indian English literature.
- Knowledge of the element and devices of literary expression

ENC130 - NEW LITERATURES IN ENGLISH

Course objectives:

- To introduce the students to the social, political and cultural milieu of the age
- To familiarize the students with the representative texts of the period

Course outcome:

- An understanding of the history of the Commonwealth nations
- Knowledge of the Anglophone literature emerging from former colonies and its characteristic features

SOFT CORE PAPER 1

ENC140 - MODERN INDIAN POETRY IN ENGLISH

Course objectives:

- To familiarize students with the trends of modern Indian poetry in English
- To introduce some of the representative poets of the time

Course outcome:

- Ability to distinguish the critical concerns of modern Indian poetry in English
- A fair knowledge of the representative poets

IV SEMESTER

END110 - LITERARY CRITICISM-II

Course objectives:

- To facilitate students who are already familiar with Aristotle's Poetics and basics of literary criticism (completed in the I Sem.) to read and understand the basics of the cross-disciplinary dimensions of modern/contemporary critical theories;
- To equip them to read relevant theories in depth in the III Sem. and prepare them for practical criticism.

Course outcome:

- Aptitude to integrate the basics of critical theories
- Felicity to relate contemporary discussions to ideology, race, class and gender

END120 - AMERICAN LITERATURE

Course objectives:

- To introduce the students to American Social, Political and Cultural temper
- To familiarize the students with the representative Poets and Prose Pieces of the period.

Course outcome:

- Familiarity with American political, social and cultural history
- Ability to classify strains of major American socio-cultural phenomenon in literature

END130 - EUROPEAN CLASSICS (Compulsory Soft Core Paper)

Course objectives:

- To introduce students to representative literature from Spain, France, Germany and Russia
- To familiarize with the core concerns pertinent to the literary expression

Course outcome:

- Knowledge of Spanish, French, German and Russian literature in relation to the encompassing cultural and socio-political concerns contemporary to the writers
- Ability to distinguish core characteristics of European trends of Realism, Naturalism, Surrealism and Psychoanalysis

END140 - CONTEMPORARY SOUTH ASIAN IMMIGRANT NOVEL

Course objectives: To investigate the notions of multiculturalism, religion, gender, family and the individual presented in the contemporary South Asian Immigrant Novel and to analyze the narrative strategies employed by the novelists.

Course outcome: Knowledge of the representative South Asian Immigrant novelists, their works and concerns.

END160 - II SUBALTERN WOMEN'S AUTOBIOGRAPHIES

Course objectives:

- To introduce the students to subaltern history
- To familiarize the students to the major concerns of women's identity literature

Course outcome:

- Ability to trace Subaltern history
- Discoursing the meaning, nature and reach of identity literature

PROJECT AND DISSERTATION
OR
PAPER V – SOFT CORE PAPER

END170 - PARTITION LITERATURE

Course objectives:

- To introduce students to the critical aspects of Partition literature
- To familiarize with the major writers of Partition literature

Course outcome:

- A fair knowledge of the social, political and cultural milieu that characterises Partition literature
- Application of various theoretical stands to analyse individual texts

Program: Master of Business Administration

Program specific Title: MBA in Management Science-2016-17

Sl. No	Program	Program Code	Program Specific discipline	Program Specific Code
4.	**M.B.A.**	**MBACBSCSYCM**	**Management Science**	**MBACBSCSMANYCM**

The Syllabus, Course Objectives and Outcomes is the same from 2015-2020

PROGRAM OBJECTIVES AND OUTCOME P.G

MASTER OF BUSINESS ADMINISTRATION (MBA)

MBA PROGRAM OBJECTIVES:

MBA graduates shall acquire analytical skills, data management and diagnostic problem solving skills in order to support management decision making.Students will make data-driven decisions demonstrating the ability to identify alternatives.

Business Management& Leadership Skills: Demonstrate an ability to apply a significant amount of business administration knowledge in Leadership & Management, Accounting & Finance, Health Care Management, Human Resource Management, IT Management, and Project Management

Strategic Planning & Problem-Solving Skills: To demonstrate ability to identify problems, define objectives collect and analyze information, evaluate risks and alternatives, and leverage technology to solve organizational problems using a strategic planning approach.

Communication and Team Management Skills: To demonstrate ability to communicate effectively with all stakeholders and mobilize team for a common purpose with a clear understanding of organizational behaviour and change

Social Responsibility, Ethical Decision-Making Skills and Ethical leadership: To demonstrate the ability to understand and analyze corporate social responsibilities and apply ethical decision-making principles during day-to-day operations. Students will demonstrate knowledge of ethical frameworks for management decision-making and leadership. They will demonstrate capability to follow legal principles, ethical guidelines and social responsibility.

Analytical and critical thinking: Students will develop the ability to analyze complex management situations by managing information, applying qualitative and quantitative solutions, and integrating information technology to improve decision making and increase competitive advantage in an environment of rapid change.

Knowledge of Integrating Functional Areas: Students will successfully apply and integrate the functional areas of business to improve strategic decision making. Students will be able to take strategic, comprehensive, and innovative approaches in making business decisions to create value in a challenging environment. Students will be able to integrate knowledge of the core business functions to solve complex, ambiguous and unfamiliar management problems.

Global awareness: Students will demonstrate an appreciation for conducting business in a global environment. Students will be able to identify factors affecting the global economy and international business, and develop a comprehensive understanding of the factors. Students will be able to apply knowledge of the global economy and international business to make informed business decisions.

MBA PROGRAM OUTCOMES:

Upon completion of the MBA program, students will:

- Gain knowledge of the key functions of business enterprises
- Acquire advanced skills to understand and analyze significant business opportunities, which can be complex, uncertain and dynamic.
- Demonstrate ability to think critically and communicate effectively that can create short-term and long-term value for organizations and their stakeholders
- Apply best practices to solve managerial issues
- Integrate theories and practice to perform strategic analysis
- Demonstrate effective written forms of communication and oral business presentations
- Implement leadership skills to work effectively within diverse teams
- Have an understanding of global perspective of business.
- Demonstrate ability to reorient things in the light of constant change
- Identify and analyze ethical responsibilities of businesses
- Apply decision-making techniques, both quantitative and qualitative analysis, to management issues

- Foster collaboration, communication and adaptability in helping organizations excel in a changing business scenario.
- Exhibit high moral and ethical values and emotional intelligence needed for corporate leadership.
- Demonstrate high level of transparency in corporate governance.
- Ability to learn and achieve standards.
- Demonstrate high level of Employee Empowerment and Engagement.
- Exhibit Organizational Citizenship Behaviour

Elective Areas:

1. Marketing Management (MM)
2. Financial Management (FM)
3. Human Resource Management (HRM)

ELECTIVE: MARKETING MANAGEMENT

Marketing Management: Program Specific Objectives:

- To enable the students to understand consumer behavior from personal, socio-cultural and environmental perspectives. Analyze the buying decisions of consumers. Understand tools of market research design. Study market research for sales, pricing and distribution.
- Helps to understand the sales management and personal selling process. Handling and evaluating the performance of sales teams. Understand various aspects of sales force management. Gain knowledge about key areas of logistics, material handling and manage warehousing.
- To help the students understand determinants of promotion mix and sales promotion. Helps students plan and design creative approaches for advertisements and advertisement campaigns. Builds ability to plan and evaluate advertising budgets
- To impart knowledge about the product, product mix and marketing strategies; help understand new product development and product launching strategies; provide insights about marketing and pricing strategies; develops ability in brand management and design programs to build brand equity.
- To enable students to understand difference between business and consumer marketing, understand consumer buying behavior, enhance knowledge about, how to plan for marketing from economic and industry perspective, gain knowledge about supply chain and logistics management, and learn different marketing channels.
- Learn about the emerging trends in services marketing; understand customer expectations; design service development strategies; Identify the gap between

customers expectations and service delivery; Understanding the integrated gap models to improve the service quality.

- Understand emergence of and basics of international marketing. Study international marketing environment from various perspectives and understand marketing mix strategy. Recognize the various facilities and provisions for exports by government of India and other institutions. Enable the students to understand global level platforms for international economics and trade.

Marketing Management: Program Specific Outcome:

- At the end of this program the students will be able to appraise the consumer behavior and buying decision. Study various marketing research designs and techniques. Apply various statistical tools and techniques for market research data analysis; Able to arrive at pricing of product.
- The student will be able to sell a product in the open market and carefully handle the sales personnel. Get an insight into the emerging trends in retailing and wholesaling. Design and manage distribution channels. Awareness about software packages to enhance the quality of logistics.
- The students will be able to evaluate the sales promotion mix; design and draft advertisement layout for effective communication; ability to choose optimal advertisement media through proper agency; develop ability to ensuring ethics and standards of advertising.
- The students will be able to assess potential for product development and growth. Demonstrate ability of developing and launching a new product. Formulate marketing plan and ensure effective brand management will demonstrate potential to design and implement branding strategies.
- The students will be able to assess and evaluate organizational consumer buying behavior; formulate industrial product strategy and assess product life cycle; Ensure effective logistics and supply chain management; design and plan advertising and sales promotion; demonstrate ability in bidding and leasing.
- The students will be able to analyze and evaluate consumer behaviour in the services sector; ensuring customer service delivery through various channels; and able to promote services across various service sectors.
- The students will be able to appreciate and extend their marketing boundaries across the world; apply market entry strategies effectively. Evaluate the factors affecting international marketing. Develop aptness towards export planning and appreciate the role of various forums for international trade negotiations.

ELECTIVE: FINANCIAL MANAGEMENT

Financial Management: Program Specific Objectives:

- To familiarize the students with basic concepts of financial management and capital budgeting. Ranking and analyzing various investment proposals. Understand the importance and relevance of dividend decisions under legal framework. Gain knowledge about firm valuation using various models. Gain insight into Information asymmetry and principal-agent conflicts.
- Helps the students to understand the Indian financial system provides an overview of capital markets and market for government securities. Throws light about Banking functions and regulatory framework; imparts knowledge about merchant banking and functions of credit rating agencies; Comprehends fraudulent activities under companies act.
- Enables the students to gain knowledge about valuation of equity, debt and mutual funds; provides understanding of the concept of market efficiency; impart awareness about EIC framework and technical analysis for making equity investment decisions; enables portfolio construction and evaluation using various measures.
- To help students acquaint to the methodology of Mergers and Acquisitions, Leverage Decisions and its practical impact. They learn about Financial Distress and Restructuring. To study the impact of Dividend policy on the market value of the firm. To be acquainted with the influence of Stock Repurchases on market capitalization.
- To help students gain an insight on the basics of derivatives; cognize the operations of Forward and Future Contracts; Comprehend the manoeuvres of Options Contracts and trading Strategies; fathom the working of Valuation of options; apprehend the functioning of Commodity derivatives.
- Helps students to apprehend the role of International Financial Management in Corporate Financial Management, gain acumen on the Foreign Exchange Market structure and proceedings, achieve knowledge on Measurement of Exposure and risk in exchange rates of International Markets, gets acquainted with the Management of Foreign Exchange exposure develops competence on evaluation of international investment decision.
- The students develop competencies on the basics of Income Tax, gain insight on the computation of income from business of a corporate entity, develop a vision on the computation of income from Capital Gains of Company, learn visualization on the set off and carry forward losses of corporate entity, develop prophecy on the tax implications in business Restructuring.

Financial Management: Program Specific Outcome:

- At the end of the course students will be able to apply capital budgeting techniques to evaluate various investment proposals. Design suitable dividend policy. Firm valuation based on various models and information asymmetry in an ideal capital market.

- The student will be equipped about Indian financial system; Thorough about various financial instruments and stock market operations; Proficient enough to design corporate debt restructuring mechanism. Will be capable of assessing credit rating and take up the role of merchant bankers practically. Investigate into fraudulent activities under SEBI framework.
- At the end of the course the student will be able to make investment decisions into equity and debt; Will be able to predict the intrinsic value of investment and future stock price movements; Construct and manage active portfolio; Evaluate the performance of portfolio based on the performance measures.
- Acquire knowledge on the methodology, synergy of Mergers and Acquisitions, theories of Leverage Decision. Develop capability to analyze cause and effect of Financial Distress and Restructuring of corporate. Develops ability to understand the impact of dividend policy and stock repurchases on market value of the firm. Enthralls mastery over Managing Internal Equity, Seasoned Equity Offerings and its pricing phenomenon.
- The students build capability to apply the basics of various derivative instruments in practical tasks, acquires proficiency on the operations of Forward and Future Contract's hedging and valuation in current scenario, Twigs the exercises of Options Contracts and trading Strategies and its practical implications, probes the operations of Valuation of options, captures the working knowledge of Commodity derivatives.
- Demonstrates capability to understand the role of International Financial Management in managing Corporate finance, develops insight into Foreign Exchange Market, get acquainted to Measurement of exchange rates, obtains Exposure to risk in exchange rates transactions of International Markets, develops an aptitude in evaluation of international investment decision.
- Students establishes mastery over the basic concepts of Income Tax demonstrate ability to compute income from business of a Company with statutory compliance. achieves computational proficiency of income from Capital Gains of Company and its exemptions, comprehends the set off and carry forward losses treatment of corporate entity, upsurge knowledge on the tax collection at source and tax deducted at source, triumphs the computational expertise of the tax implications in business restructuring.

ELECTIVE: HUMAN RESOURCE MANAGEMENT

Human Resource Management: Program Specific Objectives

- To understand the basic concepts and nature of HRD, its importance in the present day context. They gains insight into HRD in Government, PSU's and IT sector. Understand the importance of coaching, mentoring and counselling in development of human resources. Understand learning and development in the knowledge setting and understand the importance of career planning and development.
- To understand the importance of planned systemic change; learn about value, assumption and belief in organizational development; understand the different types of intervention adopted and consultant and client issues.
- To understand the importance of training and its diversity; learn about the different challenges, training need assessment, training delivery, training evaluation and training interventions.
- Understand the meaning and nature of strategic HRM; complex relationships between business strategy and human resource management; contribution that strategic human resource management can make to promoting and achieving the organization's strategic intent. They get to know the strategic HR issues in International assignments.
- Know the origin and factors responsible for the growth of labour legislations. Helps to understand the Indian Factories Act 1948; Bonus Act 1965 and Gratuity Act 1982; Workmen's Compensation Act 1932; ESI Act 1948 and Provident Fund; Payment of wages Act; Payment of Gratuity Act and code of discipline.
- Be aware of the present state of Industrial relations in India. Be acquainted with the concepts, principles and issues connected with trade unions, collective bargaining, workers participation, grievance redressal, and employee discipline and dispute resolution. Understand the various processes and procedures of handling Employee Relations. They get insight into the disciplinary procedure, lay off and retrenchment. They learn about the procedure for collective bargaining and its importance.
- The course helps students to understand the importance of Knowledge management, application of knowledge in work practices, how to build knowledge management into strategic framework. They get insight into contributory disciplines to knowledge leadership, the importance of knowledge culture, the impact of organization structure on Knowledge management.

Human Resource Management: Program Specific Outcome

- Students will be in a position to manage employees effectively. Understand the role of coaching, mentoring and counselling in managing HR. Able to identify Key

Performance areas and key result areas that contributes to effective management of HR. Demonstrate ability to apply modern techniques of performance management in managing HR.

- Students will be able to manage planned change in organization effectively; will understand the importance of values, assumptions and beliefs in organization development; demonstrate ability to apply intervention techniques in managing Organization Development.
- Students will be able demonstrate the ability to carry out training need assessment by specifying goals, identifying constraints, resource analysis; they will be implement the traditional and modern methods of training delivery and evaluate training programs with the use of different models and designs.
- Students will be able to understand the need for different HRM practices in alignment with different business strategies through closed system as well as open system models such as behavioural perspective and cybernetic systems.
- They will be able to critically analyze the legal rules and institutions which regulate Indian work relationships using theoretical, contextual and historical perspectives. They demonstrate ability to implement the legal rules for the benefit of employees.
- Will be in a position to understand and apply the knowledge and understanding of Industrial relations in effectively managing human resources, create a sense of understanding and good relations between management and HR. Develop ability handle the grievances and participate effectively in collective bargaining. They will demonstrate a clear view of the different types of settlement available for employees. They will have an insight with regard to standing orders and disciplinary procedure.
- Demonstrate ability to investigate various issues in the application of knowledge management to organizational learning and decision-making. Develop ability to formulate action plans for knowledge intensive organizations; formulate a framework for thinking about knowledge intensive organizations; describe and work with intangibles.

COURSE CURRICULUM & REGULATIONS GOVERNING
MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE COURSE-2016-17

COURSE STRUCTURE

	First Semester	Course Code	Credits*			Marks		
Sl No	Subjects		(L+P/S/F)			Intl. Asst.	End Term	Total
			L	P/S/F	Total			
1	Management Concepts and Theories	CBA110	2	1	3	25	75	100

2	Organizational Behaviour	CBA120	2	1	3	25	75	100
3	Business Environment	CBA130	3	0	3	25	75	100
4	Managerial Communication	CBA140	2	1	3	25	75	100
5	Managerial Accounting	CBA150	3	1	4	25	75	100
6	Managerial Economics	CBA160	2	1	3	25	75	100
7	Statistics for Management	CBA170	3	1	4	25	75	100
	Total		17	6	23	175	525	700

	Second Semester	Course Code	Credits*			Marks		
Sl No	Subjects		(L+P/S/F)			Intl. Asst.	End Term	Total
			L	P/S/F	Total			
1	Marketing Management	CBB110	2	1	3	25	75	100
2	Human Resource Management	CBB120	2	1	3	25	75	100
3	Corporate Finance	CBB130	3	1	4	25	75	100
4	Quantitative Methods	CBB140	3	1	4	25	75	100
5	Business Research Methods	CBB150	3	0	3	25	75	100
6	Operations Management	CBB160	2	1	3	25	75	100
7	Management Information Systems	CBB170	2	1	3	25	75	100
	Total		17	6	23	175	525	700

	Third Semester	Course Code	Credits*			Marks		
Sl. No.	Subjects		(L+P/S/F)			Intl. Asst.	End Term	Total
			L	P/S/F	Total			
1	Project Management	CBC110	2	1	3	25	75	100
2	Strategic Management	CBC120	2	1	3	25	75	100
Elective–Marketing Management								
3	MM-I:ConsumerBehavior and Marketing Research	CBC210	3	1	4	25	75	100
4	MM-IISales and Logistics Management	CBC220	3	1	4	25	75	100
5	MM-IIIIntegrated Marketing communication	CBC230	3	1	4	25	75	100
Elective – Financial Management								
3	FM-I:Investment Management	CBC130	3	1	4	25	75	100
4	FM-II:Financial Services	CBC140	3	1	4	25	75	100

5	FM-III:Portfolio Management	CBC150	3	1	4	25	75	100
Elective–Human Resource Management								
3	HRM-I: Human Resource Development	CBC160	3	1	4	25	75	100
4	HRM-II: Organizational Change and Development	CBC170	3	1	4	25	75	100
5	HRM-III: Training and Development	CBC180	3	1	4	25	75	100
6	Project Work Diary	CBC190	0	3	3	50	---	50
7	Summer Internship Report	CBC200	---	---	---	50	---	50
	Total		13	8	21	225	375	600

	Fourth Semester	Course Code	Credits*			Marks		
Sl No	Subjects		(L+P/S/F)			Intl. Asst.	End Term	Total
			L	P/S/F	Total			
1.	Entrepreneurship	CBD110	2	0	2	25	75	100
Elective–Marketing Management								
2.	MM 4: Product and Brand Management	CBD220	3	1	4	25	75	100
3.	MM5:Business Marketing Management	CBD230	3	1	4	25	75	100
4.	MM6:Services Marketing	CBD240	3	1	4	25	75	100
5.	MM7: International Marketing	CBD250	3	1	4	25	75	100
Elective – Financial Management								
2	FM4:Financial Strategies	CBD120	3	1	4	25	75	100
3	FM5: Derivatives	CBD130	3	1	4	25	75	100
4	FM6:InternationalFinancial Management	CBD140	3	1	4	25	75	100
5	FM7:CorporateTaxation	CBD150	3	1	4	25	75	100
Elective – Human Resource Management								
2	HRM4:International Human Resource Management	CBD180	3	1	4	25	75	100
3	HRM5:LabourLegislations	CBD190	3	1	4	25	75	100
4	HRM6:Industrial Relations and Collective Bargaining	CBD200	3	1	4	25	75	100
5	HRM 7:Personal Growth and Interpersonal Effectiveness	CBD210	3	1	4	25	75	100
6	Project Report	CBD160	0	3	3		75	75
7	Project Viva-voce	CBD170	---	---	---	---	25	25
	Total		14	7	21	125	475	600

L=Lecture – 1 hour of lecture per week for 15 weeks = 1 credit

P/S/F= Practicals /Seminars/Field Work – 2 hours of Practicals / Seminars / field work per week for 15 weeks = 1 credit

Project report guidance work load: Guiding 10 students for project report amounts to 3 hours of lecture per week

Elective Papers: Marketing:

MM 1: Consumer Behavior and Marketing Research

MM 2: Sales and Logistics Management

MM 3: Integrated Marketing communication

MM 4: Product and Brand Management

MM 5: Business Marketing Management

MM 6: Services Marketing

MM 7: International Marketing

Elective Papers: Finance

FM 1: Investment Management

FM 2: Financial Services

FM 3: Portfolio Management

FM 4: Financial Strategies

FM 5: Derivatives

FM 6: International Financial Management

FM 7: Corporate Taxation

Elective Papers: Human Resource Management

HRM 1: Human Resource Development

HRM 2: Organizational Change and Development

HRM 3: Training and Development

HRM 4:International Human Resource Management

HRM 5:Labour Legislations

HRM 6: Industrial Relations and Collective Bargaining

HRM 7:Personal Growth and Interpersonal Effectiveness

I SEMESTER

CBA110 - MANAGEMENT CONCEPTS & THEORIES

Course objectives: To help students gain understanding of management concepts and theories, functions and responsibilities of managers. To enable them to analyze and understand the various functional areas of the organization and it's functioning.

Course outcome: On completion of this course, the students will be able to understand the concepts related to Business, demonstrate the roles, skills and functions of management,

analyze effectively apply management concepts to diagnose and solve organizational problems and develop optimal managerial decisions. Understand the complexities associated with management of human resources in the organizations.

CBA120 - ORGANIZATIONAL BEHAVIOR

Course objectives: To help the students develop cognizance of the importance of human behavior, to understand how people behave under different conditions and understand why people behave as they do and use this knowledge in managing human resources effectively. They learn how to predict and control behaviour.

Course outcome: Demonstrate capability to predict behavior and use this knowledge effectively. Understand how people behave in groups and how to manage groups effectively. Demonstrate the ability to analyse complexities associated with management of individual behaviour, group behaviour and understanding the motive behind such behaviour in the organization.

CBA130 - BUSINESS ENVIRONMENT

Course objectives: It accentuates the students to develop conceptual framework of business environment, Provides insight into the importance of economic structure of a country.

Course outcome: Students will be able to evaluate the various components in business decision-making and also the scope for ethics in business.

CBA140 - MANAGERIAL COMMUNICATION

Course objectives: It enables the students to sensitize the importance of communication skills and emphasizes on effective writing of business communication.

Course outcome: At the end of this course students are equipped about effective communication under multifaceted situation and also would be able to prepare business proposals.

CBA150 - MANAGERIAL ACCOUNTING

Course objectives: It helps the students to understand fundamental accounting concepts and to prepare the company's financial statements. It also helps them understand various costs and costing methods involved in manufacturing concerns.

Course outcome: At the end of this course students will be capable of preparing the financial statement of a company and evaluate its performance based on the final accounts. And also they will be able to evaluate relevant costs involved in the production process.

CBA160 - MANAGERIAL ECONOMICS

Course objectives: This course gives a comprehensive overview of distinction between micro and macroeconomics concepts with the aim of developing within students a picture of how business organizations relate to the economy as a whole. The course then focuses on practical applications of economic analysis to problems of concern. Case studies and projects are used to demonstrate the methods used to determine economic feasibility and cost-effectiveness of products, services, and programs.

Course outcome: At the end of this course students will be able to design various competitive strategies and also production and cost optimization techniques for making optimal managerial decisions.

CBA170 - STATISTICS FOR MANAGEMENT

Course objectives: This course gives the exposure towards the analytical skills required to handle data and enables them to enhance their knowledge on descriptive and inferential statistics in decision-making.

Course outcome: Students will be able to apply various statistical data analysis tools and techniques for making business decisions.

II SEMESTER

CBB110 - MARKETING MANAGEMENT

Course objectives: Course familiarizes the students with the fundamental concepts of marketing. Understand the elements of marketing mix and marketing strategies to influence the consumer buying behavior.

Course outcome: At the end of this course, the students will be able to formulate marketing strategies that incorporate psychological and sociological factors which influence buying. Understand branding; identify marketing channels and product distribution through various sales promotion techniques

CBB120 - HUMAN RESOURCE MANAGEMENT

Course objectives: To enable the students to understand the HR Management system at various levels in organizations, focus and analyse issues and strategies required to select and develop manpower resources, develop relevant skills necessary for application in HR related issues. Enable the students to integrate the understanding of various HR concepts along with the domain concept in order to take correct business decisions

Course outcome: Effectively manage and plan key human resource functions within organizations. Examine current issues, trends, practices, and processes in HRM. Contribute to employee performance management and organizational effectiveness. Problem-solve human resource challenges.

CBB130 - CORPORATE FINANCE

Course objectives: To familiarize the students with basic concepts of financial management and financial system. Understand stock valuation models. To evaluate various investment proposals based on various capital budgeting techniques. Understand the optimal capital structure for a firm and dividend decisions.

Course outcome: At the end of the course the student will be able to apply basics of financial concept to choose among various investments, proposals. Estimate the working capital requirements; Design the optimal capital structure with relevant decisions on dividends.

CBB140 - QUANTITATIVE METHODS

Course objectives: Understand the mathematical tools that are needed to solve optimization problems. Understand and practice allocation problems, Assignments problems, Transportation problem, Queuing models for service allocation and Network Analysis (PERT & CPM) for project management. Get an insight into decision making under various situations.

Course outcome: At the end of this course the students will be able to use optimization techniques for profit and cost functions. Apply appropriate models for allocation of limited resources for logistics and assignment problems in the production area. Apply PERT and CPM for project management and game theory for managerial decisions.

CBB150 - BUSINESS RESEARCH METHODS

Course objectives: It imparts the knowledge about the basics components of research design. Helps students understand various research analytical tools used in business research and enhance the critical thinking skills.

Course outcome: At the end of the course the student will be able to understand various research approaches, techniques and strategies appropriate in business research. Apply a range of quantitative and qualitative research techniques to business in day to day operations of organization.

CBB160 - OPERATIONS MANAGEMENT

Course objectives: To acquaint the students with the basics of production and operations functions. To understand how to select a good plant location and design plant layout. Understand the need for ensuring total quality, certifications and quality standard.

Course outcome: At the end of the course the students will be able to design production strategies, plant layout and choose feasible Plant Location. Scope for lean manufacturing and develop Total Quality Management Strategies. Understand the importance of ISO standards in production and supply chain management from the global perspective.

CBB170 - MANAGEMENT INFORMATION SYSTEMS

Course objectives: To understand the importance and emerging technologies in the field of management. Study telecommunication networks, understand SDLC. Study ERP Package, Web publishing and e-commerce. Understand the ethical issues in information management.

Course outcome: At the end of the course, students will be able identify to telecommunication networks. Will be able to develop functional modules for business case studies using ERP and upload the content on internet through web publishing.

III SEMESTER

CBC110 - PROJECT MANAGEMENT

Course objectives: To enable the students to understand project management and feasibility studies. Analyze project work break down structure, cost and time estimation. Understand project risk management with contingency planning; Evaluating project team performance and control; Ensuring project closure with post audit.

Course outcome: At the end of this course the students will be able to choose feasible project and allocate resources optimally. Develop responsibility matrix and arrive at project completion time and cost. Mitigate risk factors and project crashing. Develop and manage virtual project teams.

CBC120 - STRATEGIC MANAGEMENT

Course objectives: The course provides insights into the core concepts of strategic management; to evaluate various business strategies in dynamic market environments. Provides insights into various strategic management models; importance of ensuring corporate ethics and governance. Understand growth strategy for business and strategy implementation process. Evaluating and monitoring strategy implementation.

Course outcome: At the end of this course the student will be able to craft a suitable business strategy. Incorporate various factors in environmental analysis. Develop a strategic business model in the competitive environment ensuring ethics and corporate governance; able to manage business portfolio; will be proficient in strengthening the core competencies of the firm; develops policies and procedures for strategy implementation.

ELECTIVE PAPERS

MARKETING MANAGEMENT

CBC210 - Marketing Management I: Consumer Behavior and Marketing Research

Course objectives: To enable the students to understand consumer behaviour from personal, socio-cultural and environmental perspectives. Analyze the buying decisions of consumers. Understand tools of market research design. Study market research for sales, pricing and distribution.

Course outcome: At the end of this course the students will be able to appraise the consumer behaviour and buying decision. Study various marketing research designs and techniques. Apply various statistical tools and techniques for market research data analysis; Able to arrive at pricing of product.

CBC220 - MARKETING MANAGEMENT II: SALES AND LOGISTICS MANAGEMENT

Course objectives: Helps to understand the sales management and personal selling process. Handling and evaluating the performance of sales teams. Understand various aspects of sales force management. Gain knowledge about key areas of logistics, material handling and manage warehousing.

Course outcome: At the end of this course the student will be able to sell a product in the open market and carefully handle the sales personnel. Get an insight into the emerging

trends in retailing and wholesaling. Design and manage distribution channels. Awareness about software packages to enhance the quality of logistics.

CBC230 - MARKETING MANAGEMENT III: INTEGRATED MARKETING COMMUNICATION

Course Objectives: To help the students understand determinants of promotion mix and sales promotion. Helps students understand planning and designing creative approaches for advertisement and advertisement campaigns. Builds ability evaluate advertising budget and developing strategies to tap the rural markets.

Course Outcomes: At the end of this course the students will be able to evaluate the sales promotion mix; design and draft advertisement layout for effective communication; ability to choose optimal advertisement media through proper agency; develop ability to ensuring ethics and standards of advertising.

FINANCIAL MANAGEMENT

CBC130 - FINANCIAL MANAGEMENT I: INVESTMENT MANAGEMENT

Course objectives: To familiarize the students with basic concepts of financial management and capital budgeting. Ranking and analyzing various investment proposals. Understand the importance and relevance of dividend decisions under legal framework. Gain knowledge about firm valuation using various models. Gain insight into Information asymmetry and principal-agent conflicts.

Course outcome: At the end of the course students will be able to apply capital budgeting techniques to evaluate various investment proposals. Design suitable dividend policy. Firm valuation based on various models and information asymmetry in an ideal capital market.

CBC140 - FINANCIAL MANAGEMENT II: FINANCIAL SERVICES

Course objectives: This course helps the students to understand the Indian financial system provides an overview of capital markets and market for government securities. Throws light about Banking functions and regulatory framework; imparts knowledge about merchant banking and functions of credit rating agencies; Comprehends fraudulent activities under companies act.

Course outcome: At the end of this course the student will be equipped about Indian financial system; Thorough about various financial instruments and stock market operations; Proficient enough to design corporate debt restructuring mechanism. Will be capable of assessing credit rating and take up the role of merchant bankers practically. Investigate into fraudulent activities under SEBI framework.

CBC150 - FM FINANCIAL MANAGEMENT III: PORTFOLIO MANAGEMENT

Course objectives: This course enables the students to gain knowledge about valuation of equity, debt and mutual funds; provides understanding of the concept of market efficiency; impart awareness about EIC framework and technical analysis for making equity investment decisions; enables portfolio construction and evaluation using various measures.

Course outcome: At the end of the course the student will be able to make investment decisions into equity and debt; Will be able to predict the intrinsic value of investment and future stock price movements; Construct and manage active portfolio; Evaluate the performance of portfolio based on the performance measures.

HUMAN RESOURCE MANAGEMENT

CBC160 - HUMAN RESOURCE MANAGEMENT I: HUMAN RESOURCE DEVELOPMENT

Course objectives: Understand the basic concepts and nature of HRD, its importance in the present day context. They gains insight into HRD in Government, PSU's and IT sector. Understand the importance of coaching, mentoring and counselling in development of human resources. Understand learning and development in the knowledge setting and understand the importance of career planning and development.

Course outcome: Students will be in a position to manage employees effectively. Understand the importance of coaching, mentoring and counselling in managing HR. Able to identify Key Performance areas and key result areas that contributes to effective management of HR. Demonstrate ability to apply modern techniques of performance management in managing HR.

CBC170 - HUMAN RESOURCE MANAGEMENT II: ORGANIZATIONAL CHANGE AND DEVELOPMENT

Course objectives: To understand the importance of planned, systemic change; learn about value, assumption and belief in organizational development; understand the different types of intervention adopted and consultant and client issues.

Course outcome: Students will be able to manage planned change in organization effectively; will understand the importance of values, assumptions and beliefs in organization development; demonstrate ability to apply intervention techniques in managing Organization development.

CBC180 - HUMAN RESOURCE MANAGEMENT III: TRAINING AND DEVELOPMENT

Course objective: The course helps students to understand the importance of training and its diversity; learn about the different challenges, training need assessment, training delivery, training evaluation and training interventions.

Course outcome: Students will be able demonstrate the ability to carry out training need assessment by specifying goals, identifying constraints, resource analysis; they will be implement the traditional and modern methods of training delivery and evaluate training programs with the use of different models and designs.

IV SEMESTER

CBD110 - ENTREPRENEURSHIP

Course objectives: To help the students to develop entrepreneurial skills and mindset among the students. Understand the role of financial and educational institutions in fostering the entrepreneurial development. Analyze various perspectives of business environment and import-export policy from global perspective.

Course outcome: At the end of the course the students will be able to conceptualize the ideas and develop business models; Operate the business under the socio-economic and legal frame work; plan strategies to develop small scale business; gains exposure to international trade.

ELECTIVE PAPERS

MARKETING MANAGEMENT

CBD220 - MARKETING MANAGEMENT IV: PRODUCT AND BRAND MANAGEMENT

Course objectives: To impart knowledge about the product, product mix and marketing strategies; help understand new product development and product launching strategies; provide insights about marketing and pricing strategies; develops ability in brand management and design programs to build brand equity.

Course outcome: At the end of this course the students will be able to assess potential for product development and growth. Demonstrate ability of developing and launching a new product. Formulate marketing plan and ensure effective brand management will demonstrate potential to design and implement branding strategies.

CBD230 - MARKETING MANAGEMENT V: BUSINESS MARKETING MANAGEMENT

Course objectives: To enable the students to understand the difference between business and consumer marketing; understand the organizational customers buying behaviour; enhance knowledge about marketing planning from the economic and industry perspectives; help students gain knowledge about supply chain management, marketing and distribution channels.

Course outcome: At the end of this course the students will be able to assess and evaluate organizational consumer buying behaviour; formulate industrial product strategy and assess product life cycle; Ensure effective logistics and supply chain management; design and plan advertising and sales promotion; demonstrate ability in bidding and leasing.

CBD240 - MARKETING MANAGEMENT VI: SERVICES MARKETING

Course objectives: To study the emerging trends in services marketing; Enables students to understand customer expectations; Learn to design service development strategies; Identify the gap between customers' expectations and service delivery; Understanding the integrated gap models to improve the service quality.

Course outcomes: At the end of this course the students will be able to analyse and evaluate consumer behaviour in the services sector; ensuring customer service delivery through various channels; and able to promote services across various service sectors.

CBD250 - MARKETING MANAGEMENT VII: INTERNATIONAL MARKETING

Course objective: Understand emergence of and basics of international marketing. Study international marketing environment from various perspectives and understand marketing mix strategy. Recognize the various facilities and provisions for exports by government of India and other institutions. Enable the students to understand global level platforms for international economics and trade.

Course outcome: At the end of this course the students will be able to appreciate and extend their marketing boundaries across the world; apply market entry strategies effectively. Evaluate the factors affecting international marketing. Develop aptness towards export planning and appreciate the role of various forums for international trade negotiations.

CBD120 - FINANCIAL MANAGEMENT IV: FINANCIAL STRATEGIES

Course objectives: To help students acquaint to the methodology of Mergers and Acquisitions, Leverage Decisions and its practical impact. They learn about Financial Distress and Restructuring. To study the impact of Dividend policy on the market value of the firm. To be acquainted with the influence of Stock Repurchases on market capitalization.

Course outcome: Acquire knowledge on the methodology, synergy of Mergers and Acquisitions, theories of Leverage Decision. Develop capability to analyze cause and effect of Financial Distress and Restructuring of corporate. Develops ability to understand the impact of dividend policy and stock repurchases on market value of the firm. Enthrallsmastery over Managing Internal Equity, Seasoned Equity Offerings and its pricing phenomenon.

CBD130 - FINANCIAL MANAGEMENT V: DERIVATIVES

Course objectives: The students gain an insight on the basics of derivatives, cognize the operations of Forward and Future Contracts, comprehend the manoeuvres of Options Contracts and trading Strategies, fathom the working of Valuation of options apprehend the functioning of Commodity derivatives.

Course outcome: The students build capability to apply the basics of various derivative instruments in practical tasks, acquires proficiency on the operations of Forward and Future Contract’s hedging and valuation in current scenario, Twigs the exercises of Options Contracts and trading Strategies and its practical implications, probes the operations of Valuation of options, captures the working knowledge of Commodity derivatives.

CBD140 - FINANCIAL MANAGEMENT VI: INTERNATIONAL FINANCIAL MANAGEMENT

Course objectives: Helps students to apprehend the role of International Financial Management in Corporate Financial Management, gain acumen on the Foreign Exchange Market structure and proceedings, achieve knowledge on Measurement of Exposure and risk in exchange rates of International Markets, gets acquainted with the Management of Foreign Exchange exposure develops competence on evaluation of international investment decision.

Course outcome: Demonstrates capability to understand the role of International Financial Management in managing Corporate finance, develops insight into Foreign

Exchange Market, get acquainted to Measurement of exchange rates, obtains Exposure to risk in exchange rates transactions of International Markets, develops an aptitude in evaluation of international investment decision.

CBD150 - FINANCIAL MANAGEMENT VII: CORPORATE TAXATION

Course objectives: The students develop competencies on the basics of Income Tax, gain insight on the computation of income from business of a corporate entity, develop a vision on the computation of income from Capital Gains of Company, learn visualization on the set off and carry forward losses of corporate entity, develop prophecy on the tax implications in business Restructuring.

Course outcome: Students establishes mastery over the basic concepts of Income Tax demonstrate ability to compute income from business of a Company with statutory compliance. Achieves computational proficiency of income from Capital Gains of Company and its exemptions, comprehends the set off and carry forward losses treatment of corporate entity, upsurge knowledge on the tax collection at source and tax deducted at source, triumphs the computational expertise of the tax implications in business restructuring.

HUMAN RESOURCE MANAGEMENT

CBD180 - HUMAN RESOURCE MANAGEMENT IV: INTERNATIONAL HUMAN RESOURCE MANAGEMENT

Course objectives: International HRM is the study of the management of human resources in an international context. This course focuses on the HR challenges which affect or influence the success of the entire enterprise, challenges that are often far beyond the scope of the traditional "personnel" function

Course outcome: It enhances to develop managerial skills, organisational knowledge and technical abilities of HR managers and employees; to develop more and better handle of global business operations; To manage and secure the performance, compensation and career path of employees.

CBD190 - HUMAN RESOURCE MANAGEMENT V: LABOUR LEGISLATIONS

Course objectives: Know the origin and factors responsible for the growth of labor legislations. Helps to understand the Indian Factories Act 1948; Bonus Act 1965 and Gratuity Act 1982; Workmen's Compensation Act 1932; ESI Act 1948 and Provident Fund; Payment of wages Act; Payment of Gratuity Act and code of discipline.

Course outcome: They will be able to critically analyze the legal rules and institutions which regulate Indian work relationships using theoretical, contextual and historical

perspectives. They demonstrate ability to implement the legal rules for the benefit of employees.

CBD200 - HUMAN RESOURCE MANAGEMENT VI: INDUSTRIAL RELATIONS AND COLLECTIVE BARGAINING

Course objectives: Be aware of the present state of Industrial relations in India. Be acquainted with the concepts, principles and issues connected with trade unions, collective bargaining, workers participation, grievance redressal, and employee discipline and dispute resolution. Understand the various processes and procedures of handling Employee Relations. They get insight into the disciplinary procedure, lay off and retrenchment. They learn about the procedure for collective bargaining and its importance.

Course outcome: The students will be in a position to effectively manage human resources, create a sense of understanding and good relations between management and HR. Develop ability handle the grievances and participate effectively in collective bargaining. They will demonstrate a clear view of the different types of settlement available for employees. They will have an insight with regard to standing orders and disciplinary procedure.

CBD210 - HUMAN RESOURCE MANAGEMENT VII: PERSONAL GROWTH AND INTERPERSONAL EFFECTIVENESS

Course objectives: Understand how to set priorities according to *objectives*, planning, and time management; Acquire information about assertive *communication* and the transactional analysis model; Learn about concepts like emotional intelligence, stress management, and *self*-motivation.

Course outcome: Interpersonal skills are extremely important for creating and maintaining meaningful personal relationships in the workplace. People with good interpersonal communication skills can, therefore, build healthy relationships with their colleagues and work much better as a team.

PROJECT REPORT

Course objectives: It helps the students to get an exposure into the industry and helps the students to gain hands on experience with professional management practices in all the functional areas that are essential for effective sustainable and holistic development both for the students as well as the organizations.

Course outcome: At the end of this course, students gain the managerial and professional skills which enhance their employability. They learn how to communicate and negotiate effectively from the organizational perspective. It sensitizes the students to understand ethical issues and dilemmas that business often face.

PROJECT VIVA VOCE:

Course objectives: Students need to present before a panel of three faculties about how they carried out their project work.

Course outcome: Students gain confidence and ability to present the report effectively in an organized manner.

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M.Sc. Open Electives

Sl. No.	Program	Program Code	Open Elective Paper	Course Code (Open Elective)
2	**M.Sc.**	**MSCCBCSYCM**	**a. Sericulture Technology (by Sericulture department)**	**MSCCBCSSSBYCM**

As M.Sc. Students applicants are not sufficient in number, only open elective is offered by the department

OPEN ELECTIVE PAPER FOR MASTER'S DEGREE COURSES (MSC.)

Program Specific Title: Sericulture as an Open Elective subject for MSc students

Program specific objectives (PSOs):

- To impart advanced and in-depth knowledge in the area of agriculture in general and sericulture in particular.
- To gain knowledge on various activities of the industry to become self-employed or entrepreneurs.
- To develop the spirit of competitiveness, develop good work culture and to have an environmental concern.
- To motivate them for self-directed and lifelong learning process and to develop belongingness to our locality and nation
- To train the students to become progressive and innovative.
- To ready the students' industry ready with basic and translational research skills with technical excellence.

Program specific outcome (PSOc):

- Students will gain required knowledge to become self-employed or entrepreneurs as it is a job-oriented subject. They develop entrepreneurial skills, with effective communication and interactive skills.

- It imparts a know how about various aspects of sericulture industry as an interdisciplinary subject.
- Sericulture deals with every individuals social, economic and traditional values of the country.
- Quality followed by Quantity is the outcome of the subject in terms of economy, social wellbeing, building unity among those involved, understand the moral dimensions of decisions with a responsibility to accept them and practice in life.
- Sericulture is an ecofriendly organization, teaches the values of environment and its protection.
- Gender sensitization comes naturally among students of Sericulture as 40% of the workforce is women in sericulture, teaches the importance of gender equality among those study the subject and practice it.
- Since the subject involves continues development in terms of methodology, technology and practices that gives the ability to engage in life-long learning.

COURSE: SERICULTURE TECHNOLOGY

Course objectives:

- To impart advanced and in-depth knowledge in the area of agriculture in general and sericulture in particular.
- To gain knowledge on various activities of the industry to become self-employed or entrepreneurs.
- To train the students to become progressive and innovative.
- To ready the students' industry ready with basic and translational research skills with technical excellence.

Course outcome:

- Students will gain required knowledge to become self-employed or entrepreneurs as it is a job-oriented subject. They develop entrepreneurial skills, with effective communication and interactive skills.
- Since it is an agro-based cottage industry, it teaches the importance of locally available resources and knowledge of how effectively can be used in day today life. That will help and protect the interests of the local artisans' traditions and culture that's the backbone of our country.
- Gain enough knowledge to propose research ideas in their higher studies.
- Develop practical skills along with their theory components, which helps in various positions selected in both academic institutions and R & D programs of industries.

Sl No.	Program	Program Code	Open Elective Paper	Course Code (Open Elective)
2	M.Sc.	MSCCBCSYCM	b. Waste Management (by Environmental Science department)	MSCCBCSSSBYCM

Course objectives:

- To impart advanced and in-depth knowledge in the area waste management
- To gain knowledge on various aspects of waste management
- To train the students to become progressive and innovative in this area .
- To ready the students' industry ready with basic and translational research skills with technical excellence in this field

Course outcome:

- Students will gain required knowledge to improve the status of our environment.
- Since it is of great environmental concern, taking this course will help the future generations also .