

Office of the Principal, Govt. College, Narnaul

The following Post Graduate Programs are running in this college in the academic session-2020-21

1. M.A. Geography
2. M.A. English
3. M.Sc. Geology
4. M.Sc. Chemistry
5. M.Sc. Botany
6. M.Sc. Zoology
7. M.Sc. Mathematics
8. M.Com
9. M.A. Hindi
10. M.Sc. Computer Science

The Program outcomes (POs), Program Specific Outcomes & Course Outcomes are described program-wise for academic session: 2020-21 are attached herewith.


Principal
Govt. College
Narnaul

Program Name: M.A. English

POs, PSOs, COs of Syllabus Offered in session: 2016-17 to 2021-22

PROGRAMME OUTCOMES (POs):

PO1: Critical Thinking: Apply theoretical knowledge to make a critical analysis, intervene using innovative frameworks and evaluate and follow up.

PO2: Effective Communication: Engage in inter and intra personal communications, behavioural change communication and proficiency in information Communication Technology.

PO3: Scientific Temper: To build essential skills of life including questioning, observing, testing, hypothesizing, analysing and communicating.

PO4: Effective Citizenship: Demonstrate empathetic social concern and engage in service learning and community engagement programmes for contributing towards achieving of local, regional and national goals.

PO5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions and accept responsibility for them.

PO6: Environment and Sustainability: Participate and promote sustainable development goals.

PO7: Gender Sensitization and Social Commitment: To imbibe Gender sensitivity and the sense of social responsibility for self and community for the benefit of the society at large. **PO8:** Self-directed and Life-long learning: Engage in continuous learning for professional growth and development.

Programme Specific Outcomes (PSO's):

PSO1: To familiarise with the writers of English literature across different ages and continents, their theories, perspectives, models and methods.

PSO2: To be able to demonstrate competence in analysis and critically analyse scholarly work in the areas of English language teaching, literary research and translation.

PSO3: To enhance literary and critical thinking.

PSO4: Application of the knowledge of Literature, theories, research and skills in different fields of literary practice.

PSO5: To develop the technical skills and ethical decisions appropriate for the holistic professional development in the field.

Outcomes of the courses:

1st Semester

Course Details	Course Outcomes
Reading, Writing and Documentation	☑ Students will be able to learn the basic documentation skills required for effective communication and research.

Skills	<ul style="list-style-type: none"> They will develop critical ability to appreciate complexity and ambiguity of prose They will enhance their grammar skills
British Poetry	<ul style="list-style-type: none"> The students will learn a historical overview of the developments in poetry The students will be able to engage themselves in critical reception of poetry They will enhance their critical ability to interpret poetry
British Drama	<ul style="list-style-type: none"> The students will understand plays both as literary and performative texts They will learn the relation between literary texts and social environment. They will be able to think critically and rationally.
British Novel	<ul style="list-style-type: none"> students will learn the historical development of the novel They develop a better understanding of the relationship between history, culture and literature through novels They will have an enhanced critical understanding of the novels and their technical aspects
British Prose	<ul style="list-style-type: none"> The Students will be able to differentiate various types and techniques of prose writing. They will be able to examine the socio-historical issues discussed in the essays. They will be able to develop critical thinking by analyzing the cultural contexts of these texts.
Self Study	<ol style="list-style-type: none"> The students will be able to develop a flair for reading They will also gain confidence for giving free expression to their ideas in speaking as well as writing They will learn to organize their ideas and thoughts in a rational, logical and spontaneous manner while writing On the whole, it will help students build tremendous confidence
Computer Application	<ol style="list-style-type: none"> Students will emerge more confident after learning computer applications Knowledge of computer application will make them fit for variety of career options.

2ndSemester

Course Details	Course Outcomes
American Literature-I	<ul style="list-style-type: none"> Students will be able to read critically and appreciate the genres of American Literature. Students will be able to understand the nature of problems in American society. Students will be able to understand and compare the literary movements of American with other movement in same time period across world. Students will be able to understand American culture and people etc.
Modern British Literature	<ul style="list-style-type: none"> Students will be able to know the nature and genres of Modern British Literature. Students will be able to understand and appreciate the difference of pre-modern and modern period British literature. Students will be able to know the current social, economical, psychological and other problems.
Indian Writings in English	<p>Students will be able to know the growth and development of Indian literature in English.</p> <ul style="list-style-type: none"> Students will have an insight to locate Indian Writings in English in literature of different countries.

Diasporic Literature	Students will be able to understand the notion of diaspora. ☐ Students will be able to understand the problems of diaspora and the country they live in.
Self Study	The students will be able to develop a flair for reading 6. They will also gain confidence for giving free expression to their ideas in speaking as well as writing
Seminar	The students will be inclined towards a habit of reading and widen their horizons of knowledge 2. Their presentation skills,(Vocabulary, tonepatterns etc) will be improved

3rdSemester

Course Details	Course Outcomes
Literary Criticism & Theory - II	Comprehend a range of theoretical aspects and their progress in literary studies. 2. Recognize and understand literary premises and the philosophical background of a particular theoretical approach.
American Literature - II	1. Get a good grasp of the historical, political, and cultural contexts of American literature. 2. Recognize and explain distinct characteristics of American literature of a particular era and tradition.
Study of Language-I	1. Get an understanding of the contemporary approaches to the study of language. 2. Understand the nuances of English speech sounds, word stress, intonation, and rhythm.
Literature and Gender	1. Theorize about gender in literary texts 2. Build upon their knowledge of Gender theory and its evolution.
South Asian Literature	1. Demonstrate a deep understanding of the cultural, historical geopolitical contexts of South Asian literature. 2. Gain an understanding of the principal thematic concerns of South Asian literature.

4thSemester

Course Details	Course Outcomes
Criticism & Literary Theory - III	Students will be able to apply theoretical approaches to the literary texts. ☐ It will enhance their knowledge on the major concepts given by different literary and cultural theorists
Non-Fictional Narratives	☐ Familiarizing the students about major Non-fiction narratives ☐ Enabling critical thinking in students to appreciate these narratives in their cultural as well as personal contexts
Study of Language-II	☐ To introduce the students to various types of communication and its regional variation. ☐ To Make the students familiar to historicity of language, socio-linguistics and psycho-

	linguistics
Self Study	1. Improve their existing skills through independent reading, guided research, and analytical writing on specific texts. 2. Read critically literary works not discussed in class.
Seminar	1. The students will be inclined towards a habit of reading and widen their horizons of knowledge 2. Their presentation skills,(Vocabulary, tone patterns etc) will be improved
Dalit Literature	1. The students will get acquainted with a neglected social the history of the oppressed. 2. The students will get knowledge of the caste system and untouchability and social ramifications
Literature of Protest	☐ Students will get familiar with the history and political analysis of protest and dissent in literary tests ☐ It will make them reflect upon constraints and challenges culture or social structure poses. ☐ It will improve their critical thinking skills

Program Name: M.Sc. in Geology

POs, PSOs, COs of Syllabus for the program

PROGRAMME OUTCOMES(POs):

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO4	Problem Solving	Capability of applying knowledge to solve scientific and other problems
PO5	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member Or leader in diverse teams, in multidisciplinary settings.
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO8	Science and Society	Ability to apply reasoning to assess the different issues related to Society and the consequent responsibilities relevant to the professional scientific practices
PO9	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
PO10	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behavior such as fabrication of data, committing plagiarism and

		unbiased truthful actions in all aspects of work
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

Programme Specific Outcomes (PSO's):

PSO1: Basic understanding of fundamental concepts of Geology and applying it on the various natural processes occurring on and inside the Earth as a complete system.

PSO2: Clearly formulate and solve real life challenges with respect to human environment interactions.

PSO3: Applications of fundamental principles of Geology in finding out various minerals and other natural resources for the betterment of the human society.

PSO4: Acquisition of skills to effectively communicate the knowledge of Geology.

PSO5: Enable the learners to be responsible and Aware citizen who will think about society for safeguarding the physical environment.

Outcomes of the courses designed for M.Sc. in Geology

The courses are designed in the semester system and options are given to opt the course of interest of the learners. The following Courses, in syllabus for the above said program, with the given course outcomes statements:

1st Semester

Course Details	Course Outcomes
Geosciences- I	Students will learn about origin and evolution of Planets in Solar System. This course will help the learner in the understanding the nature and behavior of Earth material. They can develop an understanding about the geomorphic and sedimentological processes related to fluvial, coastal, aeolian, and glacial regimes. Ocean floor morphology can be understood by explaining depth wise division of it.
Geosciences- II	Students will get the knowledge about the basics of Palaeontology, Stratigraphy, Structural Geology, Engineering Geology, Mining and Remote Sensing.
Mineralogy and Crystallography	The students will get to know about fundamentals of crystallography and mineralogy so that they can understand Geosciences.
Igneous Petrology	Study of igneous rocks is a key component of geology curriculum (because these rocks not only abundant throughout the crust of the Earth, but, dominate some crustal and upper mantle environments) that provides understanding of melt generation and crystallization mechanisms, diverse rock types and their link to tectonic settings.
Structural Geology	Successful students in this course be able to demonstrate proficiency in common skills in Structural Geology, including structural features of a region from this interpret geological history of area. Successful students be able to apply this study in various other branch of Geology e.g. Groundwater geology, petroleum geology, engineering geology etc.
Practical based on GEOL-101 & GEOL-102 &	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.

GEOL-103	
Practical based on GEOL-104 & 105	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Geological Field Training- I	Students get knowledge about Brunton compass, topographic sheet , geological maps and mapping and their uses in field.

2ndSemester

Course Details	Course Outcomes
Geomorphology and Geotectonics	The course will provide an understanding of the conceptual and dynamic aspects of landform development. Students will also learn the relevance of applied aspects of Geomorphology in various fields. Successful students in this course be able to understand evolution of the Great Himalaya and other mountains of the world.
Paleontology and Stratigraphy	In tandem with Stratigraphic studies, the course will give students the understanding of the geological history of the planet.
Metamorphic Petrology	Identifying equilibrium mineral assemblages through textural and mineralogical observations. Plotting the quantitative as well as qualitative mineral and mineral assemblage data to interpret the discontinuous reactions and to infer the nature of continuous reactions.
Engineering Geology	This will help students to develop an understanding of the geological factors responsible to create a sound structure whether it is a dam, tunnel or bridge. It may ensure that students understand the factors responsible for instability of slope and how to improve slope stability.
Climatology and Oceanography	On successful completion of this course, students should be able to understand the mean global atmospheric circulations and disturbances, world climate systems, climatic variability and change.
Practical based on GEOL-201 & GEOL-202	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Practical based on GEOL-203 & GEOL-204/GEOL-205	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Foundation Elective	The students will be able to choose the basic course of their choice.
Open Elective	The students can study the course of their interest out of Geoscience domain.

3rdSemester

Course Details	Course Outcomes
Sedimentology and Fuel Geology	Sedimentology is the study of sediments, particularly focusing on how it is produced, transported, and deposited.
Advanced Paleontology	In this course we will understand in depth about different life forms that evolved over the years on earth.
Ore Geology and Indian Mineral Resources	The students will gain knowledge regarding ore deposits, their genesis and mineral economics.
Mineral Exploration and Mining Geology SUMMER INTERNSHIP (ACADEMIC OR INDUSTRIAL)	The students will get knowledge regarding the fundamentals of Mineral Exploration and various mining methods along with mine safety measures and legislations. The understanding of subject increases by visiting research institutes or industries. The students may learn some of the leading software useful in industries and in research. They shall understand the challenges and required skills to be a researcher or to work in an industry. They shall be motivated to embody those skills and understand the kind of challenges they are going to face after they graduate with a master's degree.
Practical based on GEOL-301 & GEOL-302	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Practical based on GEOL-303 & GEOL-304/GEOL-305	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Geological Field Training- II	Students get knowledge about large scale mapping methods and techniques, sampling in field using different tools and instruments.
Open Elective	The students will be able to choose the basic course of their choice.

4thSemester

Course Details	Course Outcomes
Geochemistry	The students will get to know the vast applications of geochemistry in the field of geosciences.
Geohydrology	The students will learn about the water bearing formations, water wells and how to acquire various aquifer parameters by carrying out pumping tests, slug tests etc. The students will learn about the methods of groundwater exploration and quality

	parameters.
Stratigraphy and Paleogeography	The students will get to know the basic concepts of geohydrology, groundwater prospecting and management.
Geophysical Prospecting and Instrumentation	Students will be able to operate various instruments for analytical techniques and understand the Geo-scientific data.
Environmental Geology Or Remote Sensing & GIS	The students will acquire knowledge regarding our environment and its significance in the field of geology and our society. Acquisition of knowledge regarding basics of remote sensing, GIS and their application in geo-science.
Practical based on GEOL-401 and GEOL-402	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.
Practical based on GEOL-403 & GEOL-405/GEOL-406	Students will gain the practical knowledge about the subject and will be able to apply it in the field of geo-scientific projects professionally.

Program Name: M.Sc. & M.A (Pass Course) Geography

Program Outcomes (PO): Common for M.Sc. & M.A (Pass Course) Geography

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study
PO2	Research Aptitude	Capability to ask relevant/appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large
PO4	Problem Solving	Capability of applying knowledge to solve scientific and other problems
PO5	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.

PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research-based knowledge including design of experiments, analysis and interpretation of data to provide conclusions
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices
PO8	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices
PO9	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life
PO10	Ethics	Capability to identify and apply ethical issues related to one's work, avoid unethical behaviour such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects

Program Specific Outcomes (PSO's):

- **PSO1:** Understanding the human and physical environmental phenomena using specialized knowledge pertaining to various sub-fields of geography.□
- **PSO2:** Ability to use the state of art geospatial knowledge for resolving the social, economic, cultural and physical problems of the society.□
- **PSO3:** Learning the techniques of data acquisition, data processing and interpretation of locational and spatial data.□
- **PSO4:** Ability to demonstrate and communicate the geographical knowledge and inculcate analytical ability, research aptitude and relevant skills.□

Core Course(cc)

Sr. No.	Course Code	Nomenclature of the course
1	GEOG101	Climatology
2	GEOG102	Geomorphology
3	GEOG103	Advance Geography of India
4	GEOG104	Computer Applications
5	GEOG105	Seminar/Journal Club
6	GEOG106	Self-Study Paper

7	GEOG107	Lab Course-I: Study and Interpretation of Topographical sheets
8	GEOG108	Lab Course-2: Climatology and Geomorphology

9	GEOG109	Urban Geography
10	GEOG110	Rural Geography
11	GEOG111	Resource Geography
12	GEOG112	Cultural Geography

M. Sc. Geography
Semester – II Core

Sr. No.	Course Code	Nomenclature of the course
1	GEOG201	Geographical Thought
2	GEOG202	Economic Geography
3	GEOG203	Population Geography
4	GEOG204	Statistical Methods in Geography
5	GEOG205	Seminar/Journal Club
6	GEOG206	Self-Study Paper
7	GEOG207	Lab Course-I: (Economic Geography & Population Geography)
8	GEOG208	Lab Course-2: Computer based data management and Cartography.
9	GEOG209	Oceanography
10	GEOG210	Soil Geography

Foundation Course (Compulsory)

11	GEOG211	Communication Skills & Personality Development
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Semester – III Core Courses (CC)

Sr. No.	Course Code	Nomenclature of the course
1	GEOG301	Regional development and Planning with special reference to India
2	GEOG302	Environmental Geography
3	GEOG303	Remote Sensing (RS)
4	GEOG304	Geographical Information System (GIS)
5	GEOG305	Seminar/Journal Club
6	GEOG306	Self-Study Paper
7	GEOG307	Lab Course-I: Visual Interpretation of Aerial Photographs
8	GEOG308	Lab Course -2 (Field- Work): Socio- Economic Survey & Report Writing)
9	GEOG309	Agricultural Geography
10	GEOG310	Biogeography
11	GEOG311	Political Geography
12	GEOG312	Fundamentals of Geography

M. Sc. Geography
Semester – IV Core Courses (CC)

Sr.No.	Course Code	Nomenclature of the course
1	GEOG401	Research Methodology
2	GEOG402	Geography and Disaster Management
3	GEOG403	Application of Remote Sensing and Geographical Information system
4	GEOG404	Hydrology
5	GEOG405	Seminar/Journal Club
6	GEOG406	Self-Study Paper
7	GEOG407	Lab Course-I: Digital Image Processing Techniques
8	GEOG408	LabCourse-2: GIS Exercises

M. Sc. Botany Program and Coures Outcome

On completion of program students will be able to

1. Think Critically - Get ability to apply the process of science by formulating hypotheses and design experiments based on the scientific method.
2. Analyze and interpret results generated through studies in botany, taxonomical treatments, field studies, excursion tours and laboratory techniques used in the subject.
3. Use quantitative reasoning by using mathematical calculations and graphing skills to solve problems in plant science (Botany)
4. Effective Communication and collaborate with other disciplines by effectively communicating the fundamental concepts of Botany in written and oral format.
5. Identify credible scientific sources to interpret and evaluate the evidences
6. Understand the relationship between science and society by recognizing and discussing logical, scientific and ethical issues in Botany subject.
7. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development with respect to assessment, conservation and utilization of floral diversity

Program specific outcomes

On completion of program students will be specifically able to

1. Identify classify the plants by using the key characters.
2. Prepare and view specimens for examination using light microscopy
3. Use pure culture and selective techniques to isolate fungi, plant pathogens, algae and identify them growing on media.
4. Qualitative and quantitative estimate the number of floral components by using enumeration and suitable sampling and techniques.
5. Use appropriate plant molecular techniques and use of instrumentation related to it.
6. Practice safe laboratory procedures, using appropriate protective, biosafety and emergency procedures.
7. Documentation and report writing on experimental protocols, results and conclusions, study tours and field visits etc.

BOT 101 CELL BIOLOGY

COURSE OBJECTIVES

The main objective of the course is to make students aware of -

- **Prokaryotic and eukaryotic Cell:** The ultra-structural details and comparative assessment.
- **Plasma membrane:** Molecular organization, current models and functions. Cell wall architecture, biosynthesis, assembly, growth and cell expansion.
- **Plasmodesmata:** Structure and role in movement of molecules and macromolecules.
- **Cytoskeleton:** Organization and role of microtubules and microfilaments. Implications in flagellate and other movements.
- **Plant vacuole:** Tonoplast membrane, ATPases, transporters, as storage organelle.
- **Chloroplast and Mitochondria:** Ultrastructure, function and biogenesis. The organization of genome and patterns of gene expression.
- **Nucleus:** Microscopic and submicroscopic organization. Structure and function of nuclear envelope. The ultrastructure of nucleolus and its role in rRNA biosynthesis.
- **Ribosomes:** Structure and site of protein synthesis. Mechanism of translation, details of initiation, elongation and termination. The structure and role of RNA.

COURSE OUTCOMES

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

- The cell structures in relation to function of cells the fundamental unit of life, are concerned in this course along with molecules present in cells.
- Apply the principles of cell biology in designing experiment, statistical analysis, and interpretation of results
- Operate and solve exercise using computation statistics software.
- Get acquainted with basic approach in the research methodology.

BOT 102 MOLECULAR BIOLOGY

COURSE OBJECTIVES

- To understand the concepts in prokaryotic, eukaryotic Plant system with respect to-
- To study the central dogma of molecular biology (replication, transcription, and translation)
- **Cell signaling**
- **Protein sorting**
- **Cell Cycle and its molecular aspects**
- **Molecular Cytogenetics**
- **Restriction mapping**
- **Laboratory Techniques:**

COURSE OUTCOMES

- After successful completion of this course, students will be able to:
- Acquaint with concepts in prokaryotic, eukaryotic, and viral genetics
- Explain central dogma of molecular biology (replication, transcription, and translation)
- Enlist and explain types of mutation, gene regulation and transposable element
- **Conversant with Laboratory Techniques** viz. Microscopy, SEM & TEM, Ultracentrifugation, fractionation, Electrophoresis, PCR, GISH, FISH and Immunochemical techniques. The flow cytometry and confocal microscopy in karyotype analysis.
- Isolation of plant DNA and its quantification.
- Isolation of RNA and its quantitation
- Estimation of seed proteins

BOT 103 BIOLOGY AND DIVERSITY OF VIRUS, PHYTOPLASMA, BACTERIA, ALGAE AND FUNGI

COURSE OBJECTIVES

- To understand the phycology with special reference to Indian work.
- Algae in diversified habitats (Terrestrial, fresh water, marine) Criteria used in classification of algae, Role of algae in human welfare
- General account of thallus organization, reproduction and life history of algae.
- Study of important groups of algae **Cyanophyta** , **Chlorophyta**, **Xanthophyta** , **Bacillariophyta**, **Phaeophyta & Rhodophyta**
- **Fungi:** General Characters, Classification., Economic importance of fungi in medicine, Agriculture (Biopesticide and biofertilizer), food (SCP Mushrooms)
- Fungi as plant pathogen – General account of different groups and type study of fungi as pathogen. **Mastigomycotina** , **Zygomycotina**, **Ascomycotina**, **Basidiomycotina** & **Deuteromycotina**
- **Bacteria:** General characters, ultrastructure, classification, Role of bacterium in crop improvement and bacterial disease of plants.
- **Phytoplasma:** General characters, economic uses, classification, role and disease of plants.
- **Viruses:** General account, ultrastructure and economic importance of viruses.

COURSE OUTCOMES

- Comprehend the diversity of lower cryptogams (Algae, Fungi, Bacteria, Phytoplasma and viruses. Collection and study of algae, fungi, bacteria from different localities, Identification up to generic level.
- Recognize the morphology, anatomy , physiology, reproduction and lifecycle pattern.
- Their diversification and familiarize with various ecological niche.
- Positive and negative values.

BOT 104 TAXONOMY OF ANGIOSPERMS

COURSE OBJECTIVES

- Deals with naming and classification of plants their interrelationships and evolution.
- Deals with recent developments in plant systematic and phylogenetics
- Criteria used for classification; phases of plant classification and brief history on account
- Botanical Nomenclature: Concept of nomenclature, Binomial nomenclature and its advantages.
- Taxonomic literatures and Use of computers in angiosperms taxonomy.
- Taxonomic evidences: Morphology, anatomy, embryology, palynology, cytology, phytochemistry and numerical taxonomy
- Angiosperm Families: Nymphaeaceae, Hydatellaceae, Magnoliaceae, Papaveraceae, Malvaceae, Sapotaceae, Apiaceae, Asteraceae, Arecaceae and Poaceae

COURSE OUTCOMES

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

- Study plant morphology
- Description of a plant specimen.
- Study of at least 20 locally available families of flowering plants.
- Identification of genus and species of locally available wild plants.
- Preparation of botanical keys at generic level by locating key characters.
- Knowledge of at least 10 medicinal plant species.
- Knowledge of secondary metabolites and its use in taxonomy.

BOT 105 CYTOLOGY AND GENETICS

COURSE OBJECTIVES

To understand the concepts and details of heredity and variation at molecular and cellular levels.

Deals with more recent development which have taken place in the field of genetics besides providing introduction to methods of plant breeding of improvement of crop plants with respect to --

- Genetics of prokaryotic and eukaryotic organelles
- Chromatin organization
- Structural and Numerical alterations in chromosomes
- Mutation
- DNA Damage and repair mechanism
- Cytogenetics of aneuploids and structural heterozygotes:

COURSE OUTCOMES

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

- Know about the induction of polyploidy in plants using colchicines, methods of application of colchicine.
- Isolation of biochemical mutants following physical and chemical mutagenic
- Isolation of chlorophyll mutants following physical and chemical mutagenic treatments.
- Isolation of morphological mutants following physical and chemical mutagenic treatments.
- Karyotype analysis , Meiosis of complex translocation heterozygotes.
- Meiotic behaviour of monosomy, trisomy in plants and its effect.
- Chromosomal behaviour in mutagen treated plants.
- Chromatin organization, Structural and Numerical alterations in chromosomes

BOT 201 PLANT DEVELOPMENT AND REPRODUCTION

COURSE OBJECTIVES

Deals with regulation of growth and development of plant as affected by various growth regulations, thus cross talk and extrinsic biotic and abiotic factors.

To know the various structural and anatomical components of plant tissue and reproductive parts *viz.*

- **Meristems:** Organization of shoot and root apical meristem its structure and function,
- **Tissue systems:** Differentiation and functions of epidermis, parenchyma, chlorenchyma, sclerenchyma, laticifers and glands.
- **Vascular tissues:** Origin, structure and functions its taxonomic significance, development of wood in relation to environment.
- **Leaf:** Growth and differentiation, differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll.
- **Root:** Initiation and development
- **Structure and development of** Flower, Male gametophyte, Female gametophyte, Seed development and fruit growth
- Mechanism of pollination

COURSE OUTCOMES

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

- Know about plants anatomical structure, their developmental patterns.
- Plant reproductive parts development of male, female gametophytes and fruits.
- Vascular tissues and its constituents by sections and maceration, wood anatomy, TS, TLS and RLS
- Mechanical tissues (Collenchyma, Sclerenchyma, Stone cells and Xylem), Secretory tissues (Mucilage Canals, Resin canals, Nectaries, and oil glands), laticifers (Latex cells and Vessels).
- Normal and abnormal secondary growth etc.

BOT 202 BIOTECHNOLOGY

COURSE OBJECTIVES

Provides a detailed view of the visualizing concepts and technique for genetic engineering and biotechnology.

Deals mainly with science, methodology and applications of plant tissue culture methods in

- Cell and organ culture
- Practical approaches of single cell culture
- Applications of tissue culture
- Somatic embryogenesis, protoplast isolation, regeneration of protoplasts and protoplasts fusion, Synthetic seeds, generation of cybrid and hybrids.
- Cryopreservation technique.
- Recombinant DNA technology Gene cloning, Vectors, Role of *Agrobacterium*, Gene cloning techniques.

COURSE OUTCOMES

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

- Know about Equipment's required in Tissue culture Lab
- Media preparation techniques for different plants
- Sterilization techniques for media as well as for explants
- Explant Culture.- Anther culture Pollen culture, Micropropagation. Embryo rescue technique.
- Somaclonal variation. *In vitro* mutation. Isolation of plant protoplasts and viability testing.
- Protoplast fusion techniques.
- Tissue culture of important Horticultural, medicinal plants

BOT 203 PLANT PHYSIOLOGY AND METABOLISM

COURSE OBJECTIVES

Deals with selected topics of high important plant Physiology and Biochemistry.

- Plant water relations
- Enzyme
- Photosynthesis
- Respiration
- Nitrogen Metabolism
- Lipid Metabolism
- Plant Growth
- Plant Development

COURSE OUTCOMES

- After completion of the course the students are familiar with various physiological aspects involved in the plant development.
- Also the role of enzymes in it and mechanism of photosynthesis, respiration, nitrogen and lipid metabolism.
- The students are able to isolate starch, pectine and various nutritive products from the plants.
- Qualitative and quantification of the plant contents and its biochemistry and mode /mechanism of synthesis etc.

BOT 301 BIOLOGY AND DIVERSITY OF BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

COURSE OBJECTIVES

- Highlights advances made in diversity analysis, developmental biology, reproductive biology and phylogenetics of the lower plants with female organ being archegoniuous present in bryophytes, pteridophytes and some most gymnosperms.
- Adaptive mechanism of the lower plant.
- Economic importance of the bryophytes, pteridophytes and gymnosperms

COURSE OUTCOMES

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

- To know about morphological, anatomical and developmental patterns in the bryophytes, pteridophytes and gymnosperms.
- To know about the reproductive parts their development and mechanism of reproduction and life cycle pattern.
- Thallus and wood anatomy, Mechanical tissues (Collenchyma, Sclerenchyma, Stone cells and Xylem) , Secretary tissues (Mucilage Canals, Resin canals, Nectaries, and oil glands), laticifers (Latex cells and Vessels).
- Economic values of the lower plants.

BOT 302 ECOLOGY AND CONSERVATION

COURSE OBJECTIVES

Strategies adopted by the organisms under changing environment in relation to their biogeographic distribution. The students are made conversant with the following topics-

- **Structure of ecosystem:**
- **Functions of ecosystem:**
- **Community ecology:**
- **Biogeography:**
- Environmental pollution in relation to air, water and soil. Use of fertilizer, pesticides and other chemicals in agriculture and hygiene and their disposal.
- **Climate change:** Greenhouse gases, their sources, trends and role, Ozone layer and its depletion (Global warming, Sea level rise, UV radiation) acid rain, Bioindicator and biomarkers of environmental health.
- **Biodiversity:** Concept, types and situation in India. IUCN categories. Strategies of conservation: *In situ* conservation & *Ex situ* conservation measures.
- Various act related to Bio Diversity conservation and protection and international conventions.

Knowledge on ecology, and ecological dynamics CO2 Ability to correlate ecological dynamics and regulation of vital processes on earth as biogeochemical cycles CO3 Ability to interpret ecosystem services, ecological resilience, ecological economics, and landscape ecology CO4 Set up experiments to appreciate concepts of Ecology CO5 Critically examine the forces impacting ecosystems viz., climate change, stress, population, consumerism, globalization, land use change

COURSE OUTCOMES

- On completion of this course the students are able to analyze various types of ecosystems, correlate different ecosystems.
- To analyze the threat and suggest conservative measures.
- The students are also trained in the environmental impact analysis
- Students are able to analyze, monitor various physical, chemical and biological properties of soil water and air.

BOT 303 APPLIED MYCOLOGY –I

COURSE OBJECTIVES

- Understanding the concept of fermentation and various fermentation techniques.
- Use of fungi in food feed and various industrial products.
- Various types of Mushroom cultivation practices and its importance and economics.
- Screening techniques of the fungi for various industrial application.

COURSE OUTCOMES

- Describe the microorganisms that participate in fermentation – production & processes.
- Evaluate the impact of different types of microorganisms on the final characteristics of the product.
- Identify the origin of the principal microorganisms of importance in the industrial environment.
- Know procedures and strategies for mushroom cultivation.
- Know the role of microorganisms in different production processes in order to improve these processes and ensure their success.

BOT 304 APPLIED MYCOLOGY –II

COURSE OBJECTIVES

- Detection and assay of fermentation products
- Principal and working process of instruments used in fermentation industry.
- Role of fungi in cheese production, its types and process

COURSE OUTCOMES:

After completion of the course the students are able to –

- Handle instruments related to fermentation
- Conversant with Spectroscopic, Chromatographic, techniques, HPLC, HPTLC, and various techniques,
- Screening of fungi for acid, alcohol, cellulose, amylase and various organic acid production

BOT 401 BIODIVERSITY –I

COURSE OBJECTIVES

- Biodiversity concept, Origin and evolution of diversity, Types of biodiversity, Estimation of known floras and faunas, Importance of Biodiversity, Revision of ecosystem: organization, structure, function and energetics.
- **Genetic Diversity:** Definition, Concept and importance, Nuclear centre and regional centres of origin, Germ-plasm,
- **Species diversity:** Species concept and definition, estimation and plant global status and with India, taxonomic procedure, taxa delimitation.
- **Ecological Diversity:** Types ecosystem diversity (Terrestrial and aquatic), Forest ecosystem types (Tropical, Subtropical, temperate and alpine).
- **Agricultural and cropland diversity:** Agricultural and cropland diversity concept, Crop domestication, India's status for primary and secondary agricultural crops.

COURSE OUTCOMES

- Systematically understand biodiversity and its vital role in ecosystem function
- Identify the importance of biodiversity in natural environments Critically examine biodiversity and human linkages, and help policy formulating for conservation Application of knowledge in general communication for public extension

BOT 401 BIODIVERSITY –II

COURSE OBJECTIVES

- **Diversity Distribution:** Mega diversity regions, Endemism concept and its types, World Hots spots, Western Ghats and Eastern Himalayas.
- **Modern methods in taxonomy:** Comparative morphology, Cytological methods, dermal studies, root and stem anatomy, vessel study, Chemotaxonomy, Embryology And Palynology.
- **Numerical Taxonomy:** Numerical treatment data generation: Similarity concept, matrix building, assessment, correlation, distance calculation cluster method, dendrograms, computer programs.
- **Cladistics and Phenetics:** Introduction, definition of Cladistics and phenetics, methodology of genetics, diversity concept and importance of gene mapping, DNA finger printing and its applications.

COURSE OUTCOMES

- Appreciate the need of biodiversity conservation in the context of various developmental pathways and policy framework that the mankind has been undergoing
- Concepts of Hotspots, megadiversity regions of the world.
- Use of modern methods in plant taxonomy viz. Cytological, chemical, embryological pollen characters along with micromorphological features.
- Concept of numerical taxonomy
- Concept and use of cladistics, phenetics, and molecular tool in biodiversity studies.

BOT 402 BIOPROSPECTING AND PLANT RESOURCE UTILIZATION

COURSE OBJECTIVES

: Is to apprise students of conventional and non-conventional plant resources being used by human, their effective and sustainable utilization and improvement by biotechnological tools.

- **Medicinal Plants:** Bioprospecting/ Pharmaceutical Bioprospecting: for new drugs, assays in Bioprospecting, Antioxidant assay – NO free radical scavenging assay, Antigenotoxicity assay – MTT assay, Antiviral activities of plants – SRB assay.
- **Marine Bioprospecting:** Sources of marine planktons and their bioprospecting, Isolation and cultivation of marine bioresources, Isolation of Marine Yeast and its industrial applications, bioactive chemicals from seaweeds and their applications. Understand the common cultivation methods of microalgae including photobioreactors and open ponds.
- Analyze the major cultivation methods of seaweeds, along with detailed life history of selected high-value seaweed species from India
- **Microbial Bioprospecting:** Isolation of microbial metabolites and their bio-activity, endophytic microbial products as antibiotics.
- **Origin, evolution, cultivation and uses** - food, fodder, fibers, oil yielding crops, wood and timber (at least 5 examples each), Non-wood forest products (NWFPs): Bamboos, Gums, Dyes, Resins, Fruits etc.
- **Medicinal and Aromatic plants:** Morphological peculiarities, chemical properties and uses (at least 5 examples each)
- **Phytochemistry:** Separation techniques – column chromatography and HPLC technique, secondary metabolites, pharmacognostic procedures, authentication of specimens, Preservation of plants and plant products.

COURSE OUTCOMES

On completion of this course, the students will be able to:

- Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems
- Develop critical understanding on the evolution of concept of organization of apex new crops/varieties, importance of germplasm diversity, issues related to access and ownership.
- Develop a basic knowledge of taxonomic diversity and important families of useful plants.
- Understand the common cultivation methods of microalgae including photobioreactors and open ponds, Seaweed bioresources etc.
- Appreciate the diversity of plants and the plant products in human use.
- Understand the concept of IPR, various legal issues related to IPR.
- Exploring the potential of Marine bioresources, Microbial, medicinal plants etc.
- Various phytochemical techniques, industrial process, pharmacognostic procedures, authentication of specimens, Preservation of plants and plant products

BOT 403 GENETIC ENGINEERING AND BIOINFORMATICS

COURSE OBJECTIVES

Deals with fundamentals of bioinformatics tools, computational biology and statistical methods utmost necessary for contemporary research in plant science.

- To get introduced to the basic concepts of genetic engineering
- To get introduced to Bioinformatics and its significance in Biological data analysis.
- Describe the history, scope and importance of Genetic Engineering, Bioinformatics and role of internet in Bioinformatics.
- Explain about the methods to characterize and manage the different types of Biological data.
- Classify different types of Biological Databases. Introduction to the basics of sequence alignment and analysis.
- Explain about different types of protein and other organism specific databases.

COURSE OUTCOMES

On completion of this course, the students will be able to:

- To use genetic engineering tools in crop improvement
- Use the Bioinformatics tool in Biological data analysis.
- Able to explain the methods used for characterizing and managing Biological data.
- Classify different types of Biological Databases.

Programme Name: M.Sc. Zoology

Program Outcomes, Program Specific Outcomes and Course Outcomes

Program Outcomes:

The primary objective of the program is to impart quality education in the subject of Zoology as a basic science and its applied branches to the students. The programme also works across related majors within the Bio Sciences. The programme is designed with following outcomes:

- Distinguish between the Structure, Function, Behaviour and evolution of different animals.
- For instance if you major in zoology, you can also still take courses from across the other complementary.
- Master of Science majors of conservation biology and ecology, giving you an in-depth knowledge of those most closely related programmes.
- Apply the wide range of subject based skills to various fields that provide a base for future career in disciplines such as Health Sciences, Agriculture, Environmental Management, Biotechnology, Publishing, Teaching and Research.
- Perform, Assess and implement practical techniques and procedure to solve biological problems and analyse and quantify data collected during any project.
- Understand the applications of Biological techniques to various fields of biology.
- When you graduate with a Master of Science (Zoology) you will have learned how to work at a high level of academic achievement.

Program Specific Outcomes (PSOs):

- Used the evidences of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth.
- They are able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.
- Explicated the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They are able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.
- Subjects such as invasive or endangered species, embryonic development in mammals and ageing in social insects. Lead to advances in medicine to prevent disease amongst both animals and human beings.
- Developed knowledge and understood of living organisms at several levels of Zoological and Biological organization from the molecular, through to cells and whole organisms and ecosystems all organs of evolutionary perspectives.
- Understood how the chemistry and structure of the major biological macromolecules, including proteins and nucleic acids, determines their biological properties.

COURSE OUTCOMES (COs):

COURSE Title - ANIMAL DIVERSITY

- Understood the Classification and Phylogeny of Animals
- Described General characteristics, classification of invertebrates and vertebrates.
- Described General characteristics, classification and systematic portion of Minor phyla Described the general biology of few selected non-chordates and chordates which are useful to mankind?
- Enriched knowledge on ecology of some important fishes, amphibians, reptiles, birds and mammals

COURSE Title - BIOCHEMISTRY

- Identified the five classes of polymeric biomolecules and their monomeric building blocks.
- Explained the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.

- Understood types, Structure, biochemical properties and functions of vitamins.
- Explained how the metabolism of organic compounds leads ultimately to the generation of large quantities of ATP.
- Described the structure and classification of hormones.

COURSE Title - CELL AND MOLECULAR BIOLOGY

- Described the ultra-structure and functions of cell organelles.
- Understood DNA replication, RNA and protein synthesis and came to know protein synthesis can be controlled at the level of transcription and translation.
- Understood cell signaling and cellular communication.
- Described the oncogenes
- Understood the types and applications of stem cells.

COURSE Title - BIOSTATISTICS

- Came to know the data collection, tabulation and presentation.
- Described the mean, median, mode and SD.
- Understood the Analysis of Variance.
- Described Student 't' test and probability
- Understood the Correlation and Regression.

COURSE Title - LAB – ANIMAL DIVERSITY, BIOCHEMISTRY AND CELL AND MOLECULAR BIOLOGY

- Performed and understood the anatomy and physiology of animals by dissection.
- Performed by experiments to analyze the macromolecules in animals
- Understood the principles and types of PCR demonstration.
- Described the fine structure and functions of cell organelles.
- Performed a variety of molecular and cellular biology techniques.

COURSE OUTCOMES – ANIMAL PHYSIOLOGY

- An integrated Understanding of physiological mechanisms

- Described the physiology of digestive and respiratory system of human beings.
- Understood the blood composition, types, groups and circulatory system.
- Described the physiology of excretory system and nervous system of human beings.
- Came to know the physiology of sense organs, muscles and reproductive system.

COURSE OUTCOMES – GENETICS

- Described the fundamental molecular principles of genetics
- Understood the structure and function of DNA & RNA
- Understood about the transmission, distribution, arrangement, and alteration of genetic information and how it functions and is maintained in populations
- Described the basics of genetic mapping.

COURSE OUTCOMES – IMMUNOLOGY AND MICROBIOLOGY

- Outline the key components of the innate and adaptive immune responses.
- Described about cell types and organs which are involved in an immune response
- Described the Infectious diseases, hypersensitivity, autoimmune disorders, immunodeficiency diseases
- Understood the microbial diversity, ultra structure, culture techniques of microbes.
- Came to know about the various pathogenic fungi and viruses and beneficial microbes.

COURSE OUTCOMES – LAB – ANIMAL PHYSIOLOGY, GENETICS, IMMUNOLOGY AND MICROBIOLOGY

- Biological chemistry and its importance in physiology by testing
- Performed an experiment to culture Drosophila, Identifications of sex & mutants.
- Observed ABO blood grouping and studied the lymphoid organs
- Performed an experiments about the immunodiffusion
Immunoelectrophoresis and Immunoelectrophoresis

- Learnt about the microbial culture methods.

COURSE OUTCOMES – SERICULTURE

- Described the Taxonomy, Morphological sex differences in larva and adult of beneficial and harmful insects.
- Understood the culture of mulberry plants, mulberry silk and silk gland.
- Came to know the culture methods of *B.mori* and *Apis*
- Described the diseases and pests of *B.mori* and plants.
- Studied the quality of silk and marketing strategies of silk.

COURSE OUTCOMES – DEVELOPMENTAL BIOLOGY

- Understood and mastered on the basic concepts of developmental biology.
- Understood how fertilisation, cleavage and gastrulation occur.
- Understood the basic concepts of organogenesis.
- Understood about the basic concepts of growth, regeneration and ageing
- Described the test tube baby and placentation in mammals.

COURSE OUTCOMES – ECOLOGY

- Demonstrated an Understood of ecological relationships between organisms and their environment.
- Presented an overview of diversity of life forms in an ecosystem.
- Explained and identified the role of the organism in energy transfers
- Described the Habitat ecology and Resource ecology
- Understood the Environmental Pollution and their management

COURSE OUTCOMES – EVOLUTION

- By biological evolution we could understand that many of the organisms that inhabit the Earth today are different from those that inhabited it in the past
- Understood that the four propositions underlying Darwin's theory of evolution through natural selection are:
- more individuals are produced than can survive;
- There is therefore, a struggle for existence
- Individuals within a species show variation
- Offspring tend to inherit their parental characters
- Explained adaptation, providing examples from several different fields of biology
- Explained how the molecular record provides evidence for evolution
- Understood the Human origin and evolution.

COURSE OUTCOMES – LAB – DEVELOPMENTAL BIOLOGY, ECOLOGY AND EVOLUTION

- Performed to know the various embryonic stages of animals.
- Learnt that the mounting of chick blastoderm and observation of sperm motility
- Confirmed the role of iodine and thyroxin in Amphibian metamorphosis.
- Analysed various physicochemical parameters in environmental matrices.

- Came to knowing the Animals of evolutionary importance, fossils, analogous and homologous organs, Mimicry and Colouration.

COURSE OUTCOMES – ANIMAL CELL CULTURE TECHNOLOGY

- Described the structure and Organisation of animal cell.
- Understood the preparation of the culture medium.
- came to knowing the basic techniques of mammalian cell culture *in vitro*.
- Understood about Cell cloning and micro manipulation
- Applications of cultured animal cells are known.

COURSE OUTCOMES – TRANSGENIC TECHNOLOGY

- Described the history and scope of transgenic animals.
- Understood Recombinant DNA technology.
- Described the Systems and strategies for improvement of livestock for milk, meat, wool production and poultry for eggs and meat.
- Described the production of transgenic Cattle, pigs, sheep etc.
- Understood the History, definition, importance and application of cell technology

COURSE OUTCOMES – ANIMAL BIOTECHNOLOGY

- Understood animal cell structure, scope of biotechnology.
- Described the Gene cloning and gene transfer methods.
- Came to know the concept of PCR, Screening of recombinant clones – nucleic acid hybridisation, DNA sequencing, DNA fingerprinting.
- Described the Animal tissue culture techniques.
- Understood Embryo transfer & transgenic animal technology.

COURSE OUTCOMES – FISHERY BIOLOGY AND AQUACULTURE

- Learnt the general classification of fishes, economically important marine and freshwater fishes, migration and fishery products.
- Described recent concepts in fisheries management, endangered species management.
- Came to know the various aquaculture systems.

- Understood the type of hatchery, brood stock, larval production, feed management water quality and disease management in cultivable species, live feed production.
- Described the feed and disease management.

Program Name: M.Sc. Mathematics

Course Objective & Outcomes

Subject: Abstract Algebra-I

Class: M.Sc. Maths 1st Sem.

Course Objective

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.

Outcomes

After the completion of the course, Students will be able to

1. Generate groups given specific conditions.
2. Investigate symmetry using group theory.
3. Identify plane periodic patterns (lattices).
4. Understand the base of the coding theory as an application of finite fields.
5. Demonstrate knowledge that the rational numbers and real numbers can be ordered and that the complex numbers cannot be ordered, but that any polynomial equation with real coefficients can be solved in the complex field.

6. Discuss the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic.
7. Describe other applications of abstract algebra such as in avoiding problems of round off in computations

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Ordinary Differential Equation

Class: M.Sc. Maths 1st Sem.

Course Objective

1. To aware the students about initial value and boundary value problems and their corresponding equivalent integral equations.
2. To aware the students about concepts of approximate solution and existence theorem.
3. To familiarize the students about Adjoint system in detail.
4. Detailed study of Fundamental Set and matrix.
5. To demonstrate knowledge and understanding of Critical points in Autonomous system and their stability.

Course Outcomes

After the completion of the course, Students will be able to

1. Solve problems in ordinary differential equations, dynamical systems, stability theory, and a number of applications to scientific and engineering problems.
2. Demonstrate their ability to write coherent mathematical proofs and scientific arguments needed to communicate the results obtained from differential equation models.
3. Demonstrate their understanding of how physical phenomena are modelled by differential equations and dynamical systems.
4. Implement solution methods using appropriate technology, and
5. Investigate the qualitative behavior of solutions of systems of differential equations

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Mathematical Statistics

Class: M.Sc. Maths 2nd Sem.

Course Objective

The objectives of this course are to:

1. Understand the theory of statistics and their applications.
2. Understand the concepts of Probability.
3. To analyse different distributions along with their properties.
4. Aware the students about mathematical expectation, variance, moment generating function and moment about mean & about origin.
5. To understand the concepts of testing hypothesis.

Course Outcomes

After the completion of the course, Students will be able to

1. Differentiate between discrete and continuous random variables.
2. Solve the problems related to Bay's theorem.
3. Calculate mean, variance, Standard deviation of different types of theoretical distribution.
4. Apply different types of tests of significance.
5. Differentiate between types of error.
6. Understand Null & alternative hypothesis for testing.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Complex Analysis

Class: M.Sc. Maths 1st Sem.

Course Objective

1. To provide an introduction to the theories for functions of a complex variable.
2. To explore algebraic, geometric and topological structures of the complex number field.
3. To introduce the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
4. To present Complex integration and complex power series.

5. To discuss the classification of isolated singularities and examine the theory and illustrate the applications of the calculus of residues in the evaluation of integrals.

Course Outcomes

After the completion of the course,

1. Student will have introduced to the fundamental concepts of complex analysis and their role in modern mathematics and applied contexts.
2. Student will demonstrate to accurate and efficient use of complex analysis techniques.
3. Student will be able to understand capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis
4. Student will be able to apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.
5. Student will be able to apply problem-solving using evaluation of improper integral by Cauchy Residue Theorem.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Measure & Integration

Class: M.Sc. Maths 2nd Sem.

Course Objective

1. Revision of basic tools, including in particular the concept of countable/uncountable sets.
2. Be able to describe at least one approach to the construction of Lebesgue measure, the Lebesgue integral of a function and measure spaces.
3. Know the principal theorems as treated and their proofs and be able to use them in the investigation of examples.
4. Be able to prove simple unseen propositions concerning measure spaces, Lebesgue measure and integration.
5. To gain understanding of the abstract measure theory and definition and main properties of the integral.
6. To construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.
7. To explain the basic advanced directions of the theory.

Course Outcomes

After the completion of the course, Student will be able to

1. understand σ -algebras, measurable sets, measures, outer measures, Lebesgue measure and its properties, completion of measures.
2. understand measurable functions, approximation by simple functions.
3. understand Lebesgue integral, Monotone Convergence Theorem, Dominated Convergence Theorem, coincidence of Lebesgue and Riemann integral for Riemann integrable functions.
4. develop an appreciation of the basic concepts of measure theory. These methods will be useful for further study in a range of other fields, e.g. Stochastic calculus, Quantum Theory and Harmonic analysis.
5. establish relation to graduate attributes: The above outcomes are related to the development of the Science Faculty Graduate Attributes, in particular: Research, inquiry and analytical thinking abilities, Communication, and Information literacy

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Abstract Algebra-II

Class: M.Sc. Maths 2nd Sem.

Course Objective

1. Present the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Present concepts of and the relationships between operations satisfying various properties (e.g. commutative property).
3. Present concepts and properties of various algebraic structures.
4. Discuss the importance of algebraic properties relative to working within various number systems.
5. Develop the ability to form and evaluate conjectures.

Course Outcomes

After the completion of the course,

1. Student will be able to understand the relationships between abstract algebraic structures with familiar numbers systems such as the integers and real numbers.
2. Student will be able to verify relationships between operations satisfying various properties (e.g. commutative property).

3. Student will be able to work within various algebraic structures.
4. Students will have a working knowledge of important mathematical concepts in abstract algebra such as definition of a module, properties of module and application of module.
5. Students will be knowledgeable of different types of modules such as noetherian module, artinian module and understand the structure and characteristics of these modules.
6. Students will be introduced to and have knowledge of many mathematical concepts studied in abstract mathematics such as Nil ideal and Nilpotent ideal.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Elementary Topology

Class: M.Sc. Maths 2nd Sem.

Course Objective

1. Students will learn the fundamentals of point-set topology
2. Students will learn the fundamentals of algebraic topology
3. Students will be prepared to begin thesis research.
4. Have the knowledge of basic properties of the field of real numbers.
5. Studying Bolzano –Weirstrass theorem and Cauchy criteria.
6. Studying the basic topological properties of the real numbers
7. Studying the notion of continuous functions and their properties

Course Outcomes

After the completion of the course, Students will be able to

1. Define and recognize the basic topological properties of \mathbb{R}
2. Students will know the definitions of standard terms in topology.
3. Students will know how to read and write proofs in topology.
4. Students will know a variety of examples and counter examples in topology.
5. Students will know about the fundamental group and covering spaces.

6. Define and recognize the continuity of real functions.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Functional Analysis

Class: M.Sc. Maths 3rd Sem.

Course Objective

1. To know and be able to use the elementary properties of normed and inner product spaces.
2. To be able to check whether a linear operator is bounded, to find its adjoint and determine whether operators are normal, self adjoint, unitary or positive.
3. To determine whether a bounded operator is invertible and understand the importance of the spectrum of a bounded linear operator.
4. To study normed linear spaces and some of the linear operators between them and give some applications of their use.
5. To introduce the theory of Lebesgue integration with the aim of providing examples of complete normed linear spaces of integrable functions.

Course Outcomes

After the completion of the course, Students will be able to

1. improve abilities in mathematical reasoning and in expressing themselves accurately in writing by producing correct mathematical proofs.
2. use logical reasoning to prove theorems.
3. introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
4. understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
5. understand the concept of Signed measure, Baire measure and continuous function with compact support.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Fluid Dynamics

Class: M.Sc. Maths 3rd Sem.

Course Objectives

1. The student will learn analytical solution techniques for diverse fluid problems, including lubrication flows, boundary layers, and Stokes flow, in steady and unsteady conditions.
2. learn analytical techniques required to solve fluid flow equations for different geometries and flow conditions.
3. learn the fundamentals physics involved in modelling fluids and hydrodynamic phenomena .
4. Through learned analytical methods and basic numerical techniques presented in this course the students will be able to determine volumetric flow rates, shear and pressure drag, and lift forces for different geometric configurations.
5. The course provides fundamental tools for professional engineers working in fluid mechanics.

Course Outcomes

1. Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow [SO1].
2. Analyze microscopic continuum fluid mechanics where flow is governed by the continuity equation and Navier-Stokes equation (differential forms of conservation equations). Evaluate a problem and arrive at reasonable approximations to put the equations in a more soluble form [SO1].
3. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations (Bernoulli's equation) [SO1,SO3].
5. Evaluate pressure distributions in a static fluid, taking account of hydrostatic pressure, buoyancy force, and interfacial tension (Laplace pressure and capillary action).

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Inner Product Space & Measure Theory

Class: M.Sc. Maths 4th Sem.

Course Objective

1. To know and be able to use the elementary properties of normed and inner product spaces.
2. To be able to check whether a linear operator is bounded, to find its adjoint and determine whether operators are normal, self adjoint, unitary or positive.
3. To determine whether a bounded operator is invertible and understand the importance of the spectrum of a bounded linear operator.
4. To study normed linear spaces and some of the linear operators between them and give some applications of their use.
5. To introduce the theory of Lebesgue integration with the aim of providing examples of complete normed linear spaces of integrable functions.

Course Outcomes

After the completion of the course, Students will be able to

1. improve abilities in mathematical reasoning and in expressing themselves accurately in writing by producing correct mathematical proofs.
2. use logical reasoning to prove theorems.
3. introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;
4. understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
5. understand the concept of Signed measure, Baire measure and continuous function with compact support.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject : Classical Mechanics

Class: M.Sc. Maths 4th Sem.

Course Objective

1. To demonstrate knowledge and understanding of the following fundamental concepts in the dynamics of system of particles,

2. To demonstrate knowledge and understanding of the following fundamental concepts in motion of rigid body,
3. To demonstrate knowledge and understanding of the following fundamental concepts in Lagrangian and Hamiltonian formulation of mechanics
4. To represent the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics.
5. To develop math skills.

Course Outcomes

After the completion of the course, Students will be able to

1. define and understand basic mechanical concepts related to discrete and continuous mechanical systems,
2. describe and understand the vibrations of discrete and continuous mechanical systems,
3. describe and understand planar and spatial motion of a rigid body,
4. describe and understand the motion of a mechanical system using Lagrange-Hamilton formalism.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Viscous Fluid Dynamics

Class: M.Sc. Maths 4th Sem.

Course Objectives:

1. Learn the fundamentals physics involved in modelling fluids and hydrodynamic phenomena.
2. Learn analytical techniques required to solve fluid flow equations for different geometries and flow conditions.
3. The student will learn analytical solution techniques for diverse fluid problems, including lubrication flows, boundary layers, and Stokes flow, in steady and unsteady conditions.
4. Through learned analytical methods and basic numerical techniques presented in this course the students will be able to determine volumetric flow rates, shear and pressure drag, and lift forces for different geometric configurations.
5. The course provides fundamental tools for professional engineers working in fluid mechanics.

Course Outcomes

1. Explain the fundamental properties of fluids, including viscosity, Newtonian and non-Newtonian rheology, and viscoelasticity [SO1].
2. Analyze microscopic continuum fluid mechanics where flow is governed by the continuity equation and Navier-Stokes equation (differential forms of conservation equations). Evaluate a problem and arrive at reasonable approximations to put the equations in a more soluble form [SO1].
3. Analyze systems using macroscopic fluid mechanics, using the integral form of the conservation equations (Bernoulli's equation) [SO1,SO3].
4. Identify the relevant parameters that govern a fluid system and use dimensional analysis to identify the fundamental variables that define flow [SO1].
5. Evaluate pressure distributions in a static fluid, taking account of hydrostatic pressure, buoyancy force, and interfacial tension (Laplace pressure and capillary action) [SO1].
6. Identify conditions under which flows are turbulent and derive equations that approximate its properties (time averages and fluctuations). Compare turbulent flow with those of laminar flow [SO1].

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Graph Theory

Class: M.Sc. Maths 4th Sem.

Course Objective

The objectives of this course are to

1. Introduce the concepts of Graph and their different types as well as the isomorphism between them.
2. Introduce the classes of Eulerian and Hamiltonian graphs, trees and weighted graphs.
3. Illustrate how to find minimal walks in graphs.
4. Introduce vertex and edge colourings of graphs.
5. Find out the different methods of searching tree.

Course Outcomes

After the completion of the course, Students will be able to

1. Understand the theoretical base of the subject.
2. Identify different types of the graphs and be able to apply different operations on them.
3. Identify Eulerian and Hamiltonian graphs.
4. Apply special algorithms to find minimal walks in weighted graphs.
5. Apply special algorithms to find spanning trees in graphs.
6. Find chromatic numbers and be able to find out planer graphs.

DEPARTMENT OF MATHEMATICS

Course Objective & Outcomes

Subject: Information and Communication Technology

Class: M.Sc. Maths 4th Sem.

Course Objective

This paper's scope is to propose one possible set of objectives that could realize above defined aim. For each objective a set of applications, change drivers, requirements and possible leaders will be identified.

Education processes differ among themselves because of the subject of Course, required Course outcomes, previous knowledge, Course styles, culture, industry and many other factors. On the other hand, ICT can be used in a variety of ways in any traditional or new activity.

These two factors combined derive numerous activities in educational process in which ICT is or can be implemented. In order to streamline them and to try to identify some common points and shared resources, it is proposed to group them in three sets of objectives:

1. Support functions: administrative, technical, and supportive functions.
2. Course assistance: assistance and support for Course and teaching,

3. New Course: new teaching and Course methods, techniques, and tools.

Course Outcomes

After the completion of the course, Students will be able to

1. understand the meaning of all the terms highlighted in the text
2. demonstrate an awareness of the main processes in an ICT system (sending, receiving, storing, retrieving, manipulating, conveying)
3. demonstrate an awareness of some of the hardware, software and communication components used in ICT systems
4. use a system map or a block diagram to identify the components of an ICT system

Name of the program: Master of Commerce (M.Com.)

Programme Outcomes

PURPOSE OF THE COURSE:

The commerce stream has witnessed a sea change over the past decades, with a range of specialisations and career options emerging in recent years. Commerce education is specialisation to develop the required knowledge, skills and attitudes for the successful handling of trade, commerce and industry. M.Com is the most exalted two year full time postgraduate programme in commerce. The 2-year course delves deeper into the functioning of the economy, capital, revenue, trade, taxes, etc. taught in B.Com. The course aims at providing specialization to the students in the field of Finance and Marketing. The course provides an extreme and rigorous base for teaching, research and allied business administration. The programme is well received in the industry and for years had been serving the needs of managerial cadre. The course serves the needs of academics and prepares students for research and teaching.

PROGRAMME OBJECTIVES:

The aim of this Programme is to develop Commerce professionals with specialised skills and applied competencies in theoretical and practical knowledge of Finance and Marketing that will cater the contemporary needs of industry and academia by providing student-centric learning ambience backed with critical thinking and problem solving capabilities. The main objective of this Programme is to train the student to develop conceptual, applied and research skills as well as competencies required for effective problem solving and right decision making in routine and special activities relevant to financial management, security market transactions, corporate governance practices, and marketing management of a business. The Programme will enable students:

- To acquaint with conventional as well as contemporary areas in the discipline of Commerce.
- To well versed in national as well as international trends.
- For conducting business, accounting and research practices.
- To understand role of regulatory bodies in corporate and financial sectors.

SKILLS:

The students after completing the program should inculcate the following skills:

- The techniques of managing the business with special focus on marketing and finance.

- Application oriented research through research for business decisions.
- Effective use of Statistical methods for analysis of business data.
- Adopt a suitable corporate tax planning and management for the growth of business within the legal framework.
- Investment and portfolio management skill to examine different investment schemes with respect to risk and return and to construct optimum portfolio.
- Adopt a reflective approach to personal development and embrace the philosophy of continual professional development.
- Plan and undertake independent research in a chosen discipline.

COURSE OUTCOME

Course name	Course Objectives and Outcomes
Accounting and Finance: Financial Management, Accounting theory, Corporate Tax Planning, Management of Financial Services, Advanced Cost Accounting, Accounting for Managerial Decisions and Cost Management	<ul style="list-style-type: none"> • Know the developments in accounting theory, financial reporting and disclosure practices at the national and international level. • Explain terms such as incomes, revenues, expense, losses, and gains. • Compute tax liability of a company. • Consider tax implications while taking business decisions. • Assess impact of taxation on trade off of financial decisions. • Compute tax liability of a company. • Consider tax implications while taking business decisions. • Assess impact of taxation on trade off of financial decisions.
Management Group MC&OB, Portfolio Management, Investment Management and Strategic Management	<ul style="list-style-type: none"> • It provides the understanding about organisational culture and develop a technique to create a sound culture for the organisation • They understand the role of the Power and politics in the organisation and develop the rational political behaviours • To describe the role of strategic management and the strategic management process. • To understand the importance of strategy

	<p>formulation and strategy implementation.</p> <ul style="list-style-type: none"> • The student will also be able to appreciate the principles, theories and models of corporate governance.
Business Research Methods and Statistical Technique	<ul style="list-style-type: none"> • To develop logical reasoning ability in decision making. • To apply various parametric and non- parametric tests in the real life case situation. • To make decisions under uncertain business situations. • To bring out clearly the importance of statistics in solving different research problems. • This course enables the student to know the scientific approach to decision making when solving business problems. • Determining the most profitable distribution pattern.
Human Resource Management	<ul style="list-style-type: none"> • Build an understanding, perspective and appreciation for HRD as discipline, process, and activity and come to know the competitive environment. • Students come to know after completing this about the various aspects of the personal as well as professional life and try to balance between these both. • Develop the decision making skills in different situations and enhances the skills regarding specific work. • Develop the competency mapping skills, self, peers, superiors and subordinate appraisal skills.

DEPARTMENT OF CHEMISTRY
PROGRAM NAME-M.Sc (PASS COURSE) CHEMISTRY

Program Outcomes

1: Creative Thinking: Students will be able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems in chemistry. The skills of observations and drawing logical inferences from the scientific experiments will also be developed.

2: Interdisciplinary Approach: Students will realize how developments in any science subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments. Also the knowledge of subjects in other faculties such as humanities, performing arts, social sciences etc. can have greatly and effectively influence which inspires in evolving new scientific theories and inventions.

3: Personality Development: Students will imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality. They will also realize that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.

4 Skills in research and industrial field: Students will build a scientific temper and will be able to learn the necessary skills to succeed in research or industrial field. In addition they will acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.

5 Communication Skills: Students will develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

6 Environmental monitoring: Students will be able to understand the environmental issues Global warming, Climate change, Acid rain, Ozone depletion and will create awareness in society .

COURSE OUTCOMES

COURSE NAME: LIGAND FIELD THEORY

CLASS - M.Sc. Chemistry SEMESTER – I

Objectives: This course aims at acquainting students to concept of Crystal field and Ligand field theory. The symmetry, magnetic properties and spatial arrangements of molecules are studied in good detail.

Programme Learning Outcomes:

A. Knowledge and Understanding:

Students will be able to analyse the point group of chemical molecules. They will learn the relation of structure to magnetic properties.

B. Intellectual (Cognitive and Analytical) Skills:

Students will be able to understand the structure and arrangement of ligands around different oxidation state of metals.

C. Practical Skills

Students will learn the theoretical basis of stability of different electronic states.

D. Transferable Skills

Students will be able to make a correlation between structure and stability of different metal compounds.

COURSE NAME: ORGANIC REACTION MECHANISM-I

CLASS - M.Sc CHEMISTRY SEMESTER – I

Objectives of the Course ;

This course aims at acquainting students with the knowledge of organic reaction mechanisms of aromatic electrophilic substitution and aromatic nucleophilic substitution reactions. It provides an introduction to the synthesis of complex organic molecules. Transformations for C-X and C-C bond-formation, functional group reactivity, chemoselectivity, regioselectivity, and the strategy of multistep synthesis will be the core topics that are covered.

Program Learning Outcomes:

The aim is to help the students to study in detail the basics of very important substitution reactions in organic chemistry. Along with the revision of basic concepts of electrophilic and nucleophilic reactions, further applications in advanced fields of organic chemistry are aimed to be discussed. Concepts include strategy/retrosynthesis, advanced aromatic chemistry, protecting groups, stereochemistry, enolates and other carbonyl chemistry, alkene synthesis, reduction/oxidation (introductory), heterocycles, cross-coupling reactions and other modern methods of synthesis.

COURSE NAME: PHYSICAL CHEMISTRY – THERMODYNAMICS

CLASS - M.Sc CHEMISTRY SEMESTER – I

Objectives of the Course :

1. This course aims at to accustom the students the basic concepts of thermodynamics along with the Non-ideal systems including the basic Debye Huckel theory.

2.Students will be guided to apply phase rule to various systems (2 and 3 component systems) and introduction to the basic concepts of non equilibrium thermodynamics along with the applications is another purpose.

Program Learning Outcomes:

Knowledge and Understanding:

Students will explain statistical chemistry and thermodynamics as logical consequences of the postulates of statistical mechanics;

Intellectual (Cognitive and Analytical) Skills:

Apply the principles of statistical mechanics to selected problems;

Practical Skills

Apply techniques from statistical mechanics to a range of situations;

Transferable Skills

Use the tools, methodologies, language and conventions of chemistry to test and communicate ideas and explanations.

COURSE NAME: SPECTROSCOPY A: TECHNIQUES FOR STRUCTURE ELUCIDATION OF ORGANIC COMPOUNDS

CLASS - M.SC CHEMISTRY SEMESTER – I

Objectives of the Course:

Modern theoretical and experimental methods used to study problems of molecular structure and bonding; emphasis on spectroscopic techniques.

Program Learning Outcomes:

The student will learn :

1. To perform rigorous characterization of their compound using 1- and 2-dimensional NMR techniques (^1H and ^{13}C),

2. Mass spectrometry, infrared spectroscopy and UV-Vis spectroscopy.

COURSE NAME: COMPUTER FOR CHEMISTS – THEORY

CLASS - M.SC CHEMISTRY SEMESTER – I

Objective of the Course:

This course aims at acquainting students with learn various concepts and basic techniques essential for conduct of practical in computers

Course Outcomes:

A. Knowledge and understanding:

Basic understanding about Computer

Understanding the basic concept associated with C- Language and program designing

Students will develop different programs, Run and Retrieve results.

B. Intellectual (Cognitive/Analytical) skills:

Design program in C-language on the basis of given query.

Use of data structures in C

C. Practical skills:

Use of standard input (scanf) and standard output (printf) functions

Use of variables, keywords, arithmetic operators, relational operators, logical operators, unary operators, assignment operator, arithmetic assignment operators and conditional operator.

Use of library functions and user defined functions.

Use of Looping Statement (like while, do-while, for loops) and branching statements (like if, if-then, if-then-else).

Create functions and to show different calls: Call by reference, Call by value.

In future student may be able to develop a big program(s)(Software) which may simulate the behavior of the chemical reaction/processes/events

COURSE NAME: ORGANOMETALLICS CHEMISTRY

CLASS - M.Sc CHEMISTRY SEMESTER – II

Objectives of the Course:

This course aims at acquainting students to complete knowledge of catalytic and industrial uses of organometallic compounds.

Course Outcomes:

A. Knowledge and Understanding:

Students will be able to understand the role of coordination number, coordination geometry and oxidation state of metal in catalytic cycles.

B. Intellectual (Cognitive and Analytical) Skills:

Students will be able to study the wide variety of organometallic compounds and the choice of hapticity in different conditions.

C. Practical Skills

Students will learn to go through some important emerging compounds especially multi-decker sandwich compounds.

D. Transferable Skills

Students will be able to study the reactions at coordinated ligands.

COURSE NAME: ORGANIC REACTION MECHANISM -II

CLASS - M.Sc CHEMISTRY SEMESTER – II

Objectives of the Course:

- The aim of the course is to provide the vast knowledge to the Students regarding various topics related to Organic Chemistry such as Free Radical reactions, Elimination Reactions and their Mechanisms, Addition to C-C and C- Hetero Multiple bonds etc.

Course Outcomes:

- The aim is to provide vast knowledge of Organic Reactions and their mechanisms along with their Stereo-chemical aspects.

COURSE NAME: PHYSICAL CHEMISTRY – QUANTUM CHEMISTRY

CLASS - M.Sc CHEMISTRY SEMESTER – II

Objectives of the Course ;

This course aims at to accustom the students the principles and applications of quantum mechanics in detail with further introduction of different types of operators later on used in the solution of conjugated systems.

Course Outcomes:

The aim is to help the students to revise the basic principles of quantum mechanics. Introduction to new operators such as Hermitian and Hamiltonian and their use in the solution of Hydrogen and Hydrogen like atoms.

Students will also be able to apply quantum postulates in solution of particles in one, two and three dimensional boxes.

COURSE NAME: REACTION MECHANISMS AND METAL CLUSTERS

CLASS - M.Sc CHEMISTRY SEMESTER – II

Objectives of the Course:

This course aims at acquainting students to reaction mechanisms of Inorganic complex ions.

Inorganic reaction mechanisms are point of study due to variable coordination number and oxidation states of metal ions.

Programme Learning Outcomes:

A. Knowledge and Understanding:

Students will be able to interpret the different mechanisms of reactions based on rate constant data available.

B. Intellectual (Cognitive and Analytical) Skills:

Students will be able to predict whether reaction follows outer sphere path or inner sphere path in the reaction mechanisms under study.

C. Practical Skills

Students will learn to understand the preference of a metal ion to undergoing a particular pathway of reaction mechanism.

D. Transferable Skills

Students will be able to judge the relative stability of products in variety of reactions.

COURSE NAME: SPECTROSCOPY B: TECHNIQUES FOR STRUCTURE ELUCIDATION OF INORGANIC COMPOUNDS

CLASS - M.Sc CHEMISTRY SEMESTER – II

Objectives of the Course:

This course aims at acquainting students with techniques that measure the elemental composition at microscopic level, electronic state, chemical state of matter, binding energy, empirical formula and more of surface region of solids

Course Outcomes:**(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:**

Students will know how to define the various electronic energy levels in atoms and molecules ,excitations & ejection of electrons, understand and explain the basic concepts associated with Symmetry & molecular orbitals, Dissociation, Predissociation, change of shape on excitation.

COURSE NAME: MATHEMATICS FOR CHEMISTS**CLASS - M.Sc. CHEMISTRY SEMESTER – II****Course Objectives:**

This course introduces the math content to chemistry students. It has been designed to compliment lecture material with particular focus on the application of math's in chemistry.

Course Outcomes:**A. Knowledge and Understanding:**

Students will be able to know

- 1.Matrix and its types, Determinant and its properties.
- 2.Define the derivative and integral of the trigonometric, logarithmic and inverse trigonometric and rational functions
- 3.Recognize the different techniques of integration (by parts, trigonometric integrals, partial fractions).
- 4.definite integrals

B. Intellectual(cognitive/Analytical) skills:

- 1.Calculate the rank of matrix
- 2.Determine derivatives of function using different techniques.
- 3.Evaluate integrals by different methods of integration.
- 4.Calculate the areas of plane regions.

C. Practical skills:

1. Have the ability to carry out complex calculations orally and mentally.
2. Present mathematics to others in oral and written form clearly and in a well organized manner.

COURSE NAME: BIOLOGY FOR CHEMISTS**CLASS - M.Sc CHEMISTRY SEMESTER – II**

Course Name: **Course–XIII BIOLOGY FOR CHEMISTS**

Class: M Sc. (Chemistry)

Semester - II

Objectives of the course:

1. To study the structure and organization of cell membrane and cell wall, process of membrane transport and membrane models.
2. To understand the DNA structural organization and biochemical composition of genetic material.
3. To understand the vascular tissues, structure of woods and anomalous secondary growth, anatomical variations and tissue systems in plant shoot system.
4. To know various tissue systems and understand the normal and anomalous secondary growth in plants

Course Outcomes:

(a) Knowledge and Understanding: Student will know about whittaker system of classification, plant and animal tissue systems, genetic principles, structure and functional aspects of biomolecules.

(b) Intellectual Cognitive /Analytical skills: Students will be able to understand the basic principles of biology and biomolecules.

(c) Transferable skills: communicate and interact about the biological principles applied to chemistry.

COURSE NAME: INORGANIC CHEMISTRY-II**CLASS - M.Sc CHEMISTRY SEMESTER – III****Objectives of the Course:**

This course aims at acquainting students to concept of bio-inorganic chemistry. Due to ever increasing role of metals in medicine, these topics are of good concern in chemistry.

Course Outcomes:**A. Knowledge and Understanding:**

Students will be able to analyse the relation between oxidation state of metals and their biological behaviour.

B. Intellectual (Cognitive and Analytical) Skills:

Students will be able to understand the role of metals and chemicals in biological systems.

C. Practical Skills

Students will learn the use of porphyrins of different metal ions in biological systems.

D. Transferable Skills

Students will be able to make a correlation between enzymatic functions and metals.

COURSE NAME: ORGANIC SYNTHESIS**CLASS - M.Sc CHEMISTRY SEMESTER – III****Objectives of the Course:**

This course aims at acquainting students to concept of synthesis in organic chemistry. This will cover a wide area of synthesis including polynuclear compounds, heterocyclic compounds, reagents in organic synthesis, and basic concepts of supramolecular chemistry.

Course Outcomes:**A. Knowledge and Understanding:**

Students will be able to analyse the difference in the basic types of synthetic approaches.

Intellectual (Cognitive and Analytical) Skills:

Students will be able to understand the role of reagents and catalysts in organic synthesis.

Transferable Skills

Students will be able to make a correlation between supramolecular and normal organic synthesis.

COURSE NAME: SURFACE AND POLYMER CHEMISTRY**CLASS - M.Sc CHEMISTRY SEMESTER – III****Objectives of the Course ;**

This course aims at acquainting the students the knowledge of the basic concepts of polymers. A complete packet of knowledge of the kinetics, thermodynamics of polymerization, various techniques

of determination of molecular mass and applications of polymers in various fields of life will be provided to the students.

Various factors affecting the structure and properties of polymers will be discussed in detail which makes students aware of the things to be considered while preparing polymers commercially.

Program Learning Outcomes:

This course will equip the students with the necessary detailed chemical knowledge concerning the chemistry of macromolecules.

This will also help to develop skills to interpret and explain various factors affecting structure and property of macromolecules. The students will be able to pursue their career objectives in higher education, scientific research and teaching.

COURSE NAME: ELECTROCHEMISTRY AND CHEMICAL DYNAMICS

CLASS - M.Sc CHEMISTRY SEMESTER – III

Objectives of the Course ;

1.This course aims at acquainting students with the knowledge of various concepts and theories related to physical chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject.

2.To equip students with necessary chemical knowledge concerning the concept of reaction rates and electro analytical techniques and to bring forth the importance of academic and laboratory skill for the students.

Program Learning Outcomes:

Learning Outcomes(Knowledge and Understanding):

Students will understand the fundamentals of Chemical dynamics and Voltammetry and their applications.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to develop the academic and laboratory skills.

C. Practical Skills

Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

D.TransferableSkills :

Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

COURSE NAME: PHOTOCHEMISTRY AND PERICYCLIC REACTIONS

CLASS - M.Sc CHEMISTRY SEMESTER – III

Objectives of the Course ;

This course aims at acquainting students with the detailed knowledge of pericyclic as well as photochemical reactions. Starting from the very basic ideas, and moving towards the classification using different approaches, electrocyclic and sigmatropic rearrangements will be discussed.

Program learning outcomes:

Students will learn the basic difference between photochemical and thermal reactions. Based on the different principles of photochemistry, they will be able to solve different practical problems. Further some well known named reactions in this field will add on to the knowledge of the students.

COURSE NAME: ADVANCED INORGANIC CHEMISTRY

CLASS - M.Sc CHEMISTRY SEMESTER – IV

Objectives of the Course:

This course aims at acquainting students to the knowledge of transition metal compounds with bonds to hydrogen. Such compounds have wide synthetic applications from study point of view.

Course Outcomes:

A. Knowledge and Understanding:

Students will be able to characterise theoretically the type of bond of hydrogen with the transition metal.

B. Intellectual (Cognitive and Analytical) Skills:

Students will be able to understand the reducing properties of compounds and the chemical reactions.

C. Practical Skills

Students will learn to make difference of terminal and bridging hydrogen bonds.

D. Transferable Skills

Students will be able to think and devise new synthetic applications of such compounds.

COURSE NAME: NATURAL PRODUCTS**CLASS - M.Sc CHEMISTRY SEMESTER – IV****Objectives of the Course:**

1. Recognize and draw particular carbohydrate structures
2. Know general structural elements of cyclic monosaccharides and disaccharides, and their implications for structure/function
3. Predict the products of condensation reactions and hydrolysis.
4. Knowledge of Sequence determination of amino acids
5. Familiarity with Enzymes, Kinetics, inhibition mechanism.
6. Know general structure of Nucleosides, nucleotides, DNA, RNA structure etc.

Course Outcomes:

- Students will able to Recognize and draw particular carbohydrate structures, general of cyclic monosaccharides and disaccharides, and their implications for structure/function.
- Students will able to predict the products of condensation reactions and hydrolysis.
- Students will capable of determining the Sequence of amino acids

Students will be Familiar with Enzymes, Kinetics, inhibition mechanism and structure of Nucleosides, nucleotides, DNA, RNA structure etc.

COURSE NAME: CHEMISTRY OF MATERIALS**CLASS - M.Sc CHEMISTRY SEMESTER – IV****Objectives of the Course ;**

- This course aims at acquainting the students the knowledge of the factors affecting glass formation various thermodynamic, kinetic factors controlling the designing of glass materials, important compositions and different properties.
- A complete packet of knowledge of the preparation of smart materials and their applications as nano drug delivery agents and energy storage materials.

Program Learning Outcomes:

- The aim is to help the students to understand the basics of glass formation from different materials along with different kinetic and thermodynamic aspects discussing the applications also. Smart materials will be introduced while discussing different electrical and magnetic properties.

Program Specific Outcomes

1. Students will understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life. They will also be able to acquire knowledge about the fundamentals and applications of chemical and scientific theories.
2. Students will find that every branch of science and technology is related to Chemistry. They will develop scientific outlook not only with respect to science subjects but also in all aspects related to life.
3. Students will become familiar with the different branches of chemistry like analytical, organic, inorganic, physical, environmental, polymer and biochemistry. They will also learn to apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.
4. The student will acquire knowledge of Chemical Thermodynamics, Kinetics, Electrochemistry, Atomic Structure, Organic Chemistry, Spectroscopy and Skill in Industrial Chemistry.
5. Viewing chemistry as a tool the developing mind and critical attitude and the faculty of logical reasoning that is prepared to serve in diverse fields.
6. Students will gain a thorough Knowledge in the subject to be able to work in projects at different research as well as academic institutions.

M.Sc. (Computer Science)

Programme Outcomes

After successfully completing M. Sc. (Computer Science) Programme students will be able to:

PO1: Use creativity, critical thinking, and analysis and research skills to solve theoretical and real-world problems in computer science

PO2: Work effectively both individually and as member of team to design and implement solution to computational problems.

PO3: Discuss various algorithms and analysis of algorithms with its complexity

PO4: Illustrate the concepts of networking, computation, and security.

PO5: Gain the knowledge about programming languages like PROLOG, LISP, Dot Net.

PO6: Communicate effectively for different purposes and in different situations.

PO7: Gain self-discipline in everyday aspects of life and work.

PO8: Make use of Application fundamentals, including information management and intelligent applications.

PO9: Apply current technical concepts and practices in the core information Technologies

PO10: Apply the knowledge about software engineering fundamentals, including software analysis and design, evaluation and testing, and software engineering processes.

Program Specific Outcomes

PSO1: Students get knowledge and training of technical subjects so that they will be technical professional by learning C/C++, JAVA, C#.net, Visual Basic programming, Database Management, Data Structure, Software Engineering, Computer Architecture, Theoretical Computer Science, Web Technology using HTML.

PSO2: Students understand the concepts of software application and projects.

PSO3: Students understand the computer subjects with demonstration of all programming and theoretical concepts with the use of ICT.

PSO4: Development of in-house applications in terms of projects

PSO5: Students will build up programming, analytical and logical thinking abilities.

PSO6: Aware them to publish their work in reputed journals

PSO7: To make them employable according to current demand of IT Industry and responsible citizen.

MSC COMPUTER SCIENCE Course Outcomes

Paper name: DISCRETE MATHEMATICS

Code: MCS101

Course Outcomes:

- Verify the validity of an argument using propositional and predicate logic.
- Understand allocations of set theory by applying operations on set.
- Apply operations of relations and functions in discrete structures.
- Understand applications of Lattices and Boolean algebra in computer science domain.
- Identify Group, Ring and Field in Group Theory

- Understand applications of Graph Theory and Tree
- Apply the concepts of graph theory and trees to formulate problem solving

Paper name: Computer Fundamentals and Programming in C

Code: MCS102

Course Outcomes:

- Understand computer basics and role of operating system.
- Learn about concept of computer network, Internet and social impacts of IT.
- Gain understanding of PC Software Tools – Word, Excel and Power-Point.
- Design an algorithm and draw flowchart for simple problems.
- Develop C programs implementing all features of C.

Paper name: Data Base Management Systems

Code: MCS103

Course Outcomes:

- The key goal is to prepare students for a professional career in the field of data administration and database design.
- To get acquainted students with good knowledge of DBMS. During the course, students will learn about database design and database handling activities.
- For a given query write relational algebra expressions for that query and optimize the developed expressions
- For a given specification of the requirement design the databases using ER method and normalization
- For a given specification create the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
- For a given evaluation of transaction processing system, determine the transaction atomicity, consistency, isolation, and durability
- Through polyglot persistence They will understand how different database technologies can work together
- Students will be able to select database according to their needs

Paper name: COMPUTER ORGANIZATION & ARCHITECTURE

Code: MCS104

Course Outcomes:

- Identify, understand and apply different number systems and codes.
- Understand the digital representation of data in a computer system.
- Understand the general concepts in digital logic design and their use in sequential and combinational circuit design.

- Describe fundamental organization of a computer system.
- Explain addressing modes, instruction formats and program control statements.
- Understand computer arithmetic formulae and solve problems.
- Distinguish the organization of various parts of a system memory hierarchy.
- Identify and compare different methods for computer I/O

Paper name: Seminar

Code: MCS105

Course Outcomes:

- To analyze a current topic of professional interest and present it before the audience.
- To familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
- Acquired the basic skills to for performing literature survey and paper presentation
- To improve skills to read, understand, and interpret material on technology.
- To improve communication and writing skills.
- Prepare the report.

Paper name: SELF-STUDY PAPER

Code: MCS106

Course Outcomes:

- To create habits of reading books and to develop writing skills.
- Develop skills of creativity and originality.
- Select a topic of their own interest with consultation with their teachers/In charge/mentors.
- Encourage students to go beyond what is available to them in their text book and what is taught to them by their instructors.
- Inspires curiosity and motivates further discovery.

Paper name: Practical-I (Based on MCS102 & MCS103)

Code: MCS107

Course Outcomes:

- Students will get to know how to apply DML/DDDL commands on database.
- To apply knowledge of Programming in PL/SQL including stored function, cursor, trigger, designing the normalized database.
- Understanding the practical knowledge of exception handling.
- Understanding the fundamental tags used in HTML.
- Develop the web page in various applications and web page using various ordered and unordered listing commands.
- Understanding the simple programs using basic control statement, GUI based program using Basic ActiveX Control.
- Knowledge about different advanced ActiveX control with example application programs.
- Knowledge about various types of data base handling with MS-Access and Oracle
- Describe the concepts of data report for an organization.
- Able to devise pseudo code and flowchart for computational problems.
- Understand how to write, debug and execute simple programs in C.

Paper name:Data Structures and Algorithms

Code: MCS201

Course Outcomes:

- Knowledge of basic data structures and algorithms.
- Understand concepts of searching and sorting techniques
- Understand concepts of stacks, queues, lists, trees and graphs.
- Able to write algorithms for solving problems with the help of fundamental datastructures

Paper name: Object Oriented Programming Using C++

Code: MCS202

- Understanding of Object-oriented programming and advanced C++ concepts.
- Use C++ Concepts for solving real life problems.
- Develop problem solving skills using object-oriented techniques.

Paper name: Software Engineering

Code: MCS203

Course Outcomes:

- Able to apply the concepts of software engineering which is essentially important while working on big modules and or projects.
- Understand the concept of system and able to analyse its feasibility study.
- Understand software process framework, requirement modelling approaches, software design, software quality.
- Able to apply software metrics and software testing.

Paper name: COMPUTER NETWORKS

Code: MCS204

Course Outcomes:

- Understand the basics concepts of computer network organization and implementation.
- Describe theoretical understanding of layered network models - OSI and TCP/IP Models.
- Illustrate the functionalities of different network layers.
- Analyze the network application such as data transmission between client and server, file transfer, real-time and multimedia transmission.
- Explain the security aspects in networks and principles of cryptography.

Paper name: Practical-II (Based on MCS201 & 4 MCS202)

Code: MCS207

Course Outcomes:

- Programs using Object oriented programming paradigm – Encapsulation (Classes and objects), Polymorphism and Inheritance.
- Apply various features like constructors and destructors, overloading- function and operators.
- Able to acquire in depth knowledge and develop software in C/C++
- Utilize different types of inheritance to suit different applications.
- Write efficient programs consuming less memory.
- Compile and Execute programs using required data structures.
- Implement the algorithms using C/C++.
- Debug programs

Paper name: COMPUTER GRAPHICS

Code: MCS301

Course Outcomes:

- Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
- Extract scene with different clipping methods and its transformation to graphics display device. CO3: Explore projections and visible surface detection techniques for display.
- Explore object representations and surface detection methods.
- Understand techniques and OpenGL programming concepts

Paper name: Management Information System

Code: MCS302

Course Outcomes:

- Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.
- Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.
- Effectively communicate strategic alternatives to facilitate decision making.
- Evaluate the role of information systems in today's competitive business environment
- Assess the relationship between the digital firm, electronic commerce, electronic business and internet technology.

Paper name: Operating System and UNIX

COURSE Code: MCS303

Course Outcomes:

- Understand the basic components of a computer operating system.
- Compare and interpret the applications of Process and threads.
- Describe the policies for scheduling, deadlocks, synchronization, system calls, and file systems. CO4: Illustrate the functioning of process management, memory management and file management Modules present in an OS.
- Differentiate various types of scheduling algorithms.
- Understand the concepts of Three-Tier Client/Server Architecture, Middleware and the characteristics of mobile operating systems.

Paper name: Visual Programming

Code: MCS04

Course Outcomes:

- Basic Concepts of Program building block control statements and the basic concepts of function and procedure.
- Knowledge of the functionality and properties of GUI based ActiveX Control with example programs.
- About graphics handling related control and properties.
- About the fundamental functions and properties of Advanced ActiveX Control.

Paper name: Practical-II (Based on MCS303, MCS304,MCS301C)

Code: MCS307

Course Outcomes:

- Discuss the knowledge of programming terminology and how it is applied using Visual Basic.
- Demonstrate an Event Planning Chart based on problem description so as to define the processing that is to occur based on specific.
- Implement UNIX/Linux Commands.
- Demonstrate the use of various system calls.
- Apply various graphics drawing algorithms and 2D -3D transformations using C
- Apply optimization techniques for intermediate code and generate machine code for high level language program.

Paper name: Java Programming

Code: MCS401

Course Outcomes:

- Learn Java programming language which can be utilized to develop windows and internet-based software solutions.
- Able to understand and apply the knowledge of object-oriented principles, applets, graphical user-interface for scientific and business-oriented applications.

Paper name: DATA WAREHOUSE AND DATA MINING

Code: MCS402

Course Outcomes:

- Understand the basic concepts of Data mining and warehousing.
- Identify the different techniques of data preprocessing.

- Analyze patterns that can be discovered by classification and clustering.
- Understand data mining techniques of clustering.
- Identify complex data types based on spatial and web mining

Paper name: Internet & Web Designing
Code: MCS403

Course Outcomes:

- Knowledge about the concepts of markup languages, unordered list, table, formatting, linking and frames.
- Understanding about the creation of cascading style sheets, backgrounds, media types and building a dropdown menu.
- To explain the JavaScript, control structure, if structure, switch, do-while and logical operators.
- To describe the javascript functions, javascript arrays and javascript objects.

Paper name: Practical-II (Based on MCS401, MCS403A)

Code: MCS406

Course Outcomes:

- Skill of writing core Java application using OOP concept.
- Skill of writing applet for internet applications.
- Skill of writing GUI based windows applications
- Understanding the fundamental tags used in HTML.
- Develop the web page in various applications and web page using various ordered and unordered listing commands.
- Understanding the simple programs using basic control statement, GUI based program using Basic ActiveX Control.

Paper name: PROJECT REPORT

Code: MCS407

Course Outcomes:

- Demonstrate a depth of knowledge of modern technology. Practice to communicate effectively and to present ideas clearly and coherently to specific audiences in both the written and oral forms.
- Practice different phases of software/system development life cycle.
- To introduce the student to a professional environment and/or style typical of a global IT industry,
- Understand the project requirements, reflect on their learning and take appropriate actions to implement it.

- Estimate, plan, calculate, and adjust project variables.
- Understand the importance of iteration, evaluation and prototyping in design of a software system.

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PROGRAMME SPECIFIC OUTCOME 1, 2, 3

- 1- The student should be able to:
 - 33 identify the different types of research methods used in the field of psychology.
 - analyse and evaluate research findings in the field of psychology.
 - design and conduct a research project in the field of psychology.
 - communicate research findings in the field of psychology.
 - apply research findings in the field of psychology to real-world situations.

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