



DEPARTMENT OF BOTANY

UG-Course Outcomes

I Sem-Microbial Diversity and Lower Plants

On completion of the course students are able to

- \star To gain knowledge about microbial biodiversity
- ★ Understand the diversity and life cycle patterns of algae, fungi, bryophytes and pteridophytes.
- \star To know about the various plant diseases and their control measures.
- \star To explore economic importance of algae and fungi.
- \star To know the evolution of sporophytes of bryophyte and stelar evolution in pteridophytes.

II Sem-Gymnosperms, Taxonomy of Angiosperms and Ecology

On completion of the course students are able to

- \star To gain the knowledge about the life cycles and the economic importance of gymnosperms.
- \star To understand about the geological time scale.
- ★ To understand about the diversity of the plants, their description, identification, nomenclature and their classification including recent advances in the field of plant taxonomy.
- \star To understand the ecological relationships between the plants and their environments.
- \star To compare the ecological adaptations of hydrophytes, mesophytes and xerophytes.

III Sem- Plant Anatomy and Embryology

On completion of the course students are able to

- \star To gain knowledge of plant cells, tissues and tissue systems and their functions.
- ★ To identify and compare the differences in the anomalous secondary growth of dicots and monocots.
- \star To understand the structure of anther, ovule and pollen grains.
- \star To gain knowledge about the micro And mega sporogenensis.
- \star To understand and gain knowledge about the economic importance of wood.

IV Sem- Cell Biology, Genetics and Plant Physiology

On completion of the course students are able to

- ★ To understand and describe the organization, structure and functions of a cell and cell organells.
- \star To know about the significance of meiosis.
- \star To have knowledge of the nature and functions of genes and the processes of inheritance.
- \star T o understand the various physiological processes in plants.
- ★ To explain the role of nutrients and the phytohormones in the growth and development of plant.

V Sem-Biodiversity and Conservation

On completion of the course students are able to

- \star To understand the role that biodiversity plays in conservation science.
- \star To understand the current threats to the biodiversity.
- \star To understand the role and the principles of operation of different types of protected areas.
- \star To develop a deeper concern for the biodiversity and its conservation.
- \star To understand the role of plants in human welfare.

VI. Sem-Tissue Culture and Biotechnology

On completion of the course students are able to

- The students will learn about the concepts, tools and the techniques related to the *in vitro* propagation of the plants.
- The students will have the scientific understanding of the subject and also have the good knowledge of application of recombinant DNA technology.
- To know about the gene cloning and the cloning vectors.
- To explain the construction of c DNA library and their applications.
- To compare the pros and cons of the transgenic plants on the environment.
- Students able to publish their research findings in Journals.





DEPARTMENT OF CHEMISTRY B.Sc. (CHEMISTRY) COURSE OUTCOMES (COs)

SEMESTER-I

PAPER-I

CO1: Able to understand the concepts of chemical bonding and chemical and structural aspects of representative compounds Group-13, 14 and 15.

CO2: Able to answer structural impact on properties of organic compounds and specific reactions of alicyclic and aromatic compounds.

CO3: Student will have strong foundation in the concepts of atomic structure, gaseous state, liquid state and solutions.

CO4: Student can able to perform salt analysis to detect anionic and cationic parts and also understand structural aspects like isomerism, conformational analysis and Crystallography.

SEMESTER-II

PAPER-II

CO1: Able to understand the concepts of chemical bonding and chemical and structural aspects of oxides, interhalogens, polyhalides and student can able to analyze the concepts behind the peculiarity of d-block elements.

CO2: Able to describe preparation, specific chemical reactions and identification tests of Halogen compounds, hydroxyl compounds, ethers and carbonyl compounds.

CO3: Student will have fundamental knowledge in the concepts of Electrochemistry and their applications and also able to calculate EMF of simple Electrochemical cells.

CO4: Student can able to perform volumetric, gravimetric and water analysis of given sample and also have knowledge of specific properties of dilute solutions and Colligative properties.



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SEMESTER-III

PAPER-III

CO1: Students can be able to analyze the concepts behind the peculiarity of f-block elements. Students can be able to understand the basic concepts of coordination complexes like nomenclature, coordination number, EAN and isomerism. Students should also have basic knowledge of structural aspects of metal carbonyls and organometallics.

CO2: Able to describe preparation, specific chemical reactions, synthetic applications and identification tests of carboxylic acids, nitrohydrocarbons, amines and cyanides and isocyanides.

CO3: Students will have fundamental knowledge of thermodynamic and their applications with chemical transitions with special focus on numerical and derivatives.

CO4: Students can be able to analyze and evaluate the analytical data based on basic statistical operations. Students should also have basic knowledge of Phase rule and fundamental synthetic applications of carbanions.

SEMESTER-IV

PAPER-IV

CO1: Able to understand the advanced concepts of coordination complexes along with CFT and HSAB theories and also the applications of coordination complexes. Students should also have basic knowledge of role of essential elements in biological processes.

CO2: Able to describe Synthesis, inter-conversion, specific chemical reactions, structural aspects and identification tests of carbohydrates, amino acids and heterocyclic compounds.

CO3: Students will have core knowledge in the concepts of Chemical kinetics and their applications with specific examples. Student will have the basic concepts and mechanisms involved in photochemical changes. CO4: Students will have core knowledge of theories of bonding in metal complexes, advanced synthetic applications of carbanions and basic concepts of chemistry beverages.



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SEMESTER-V

PAPER-V

CO1: Student can understand the basic concepts of Rotational, IR and Electronic spectroscopy and apply them in determination of bonding aspects of simple molecules.

CO2: Student will have the knowledge of principles and concepts of 1H-NMR spectroscopy and Mass spectrometry for the determination of structural, molecular and isotopic aspects of simple molecules. CO3: Student will able to understand concepts, techniques and applications of solvent extraction and chromatographic methods like TLC and PC.

CO4: Student should have basic knowledge of principles and techniques involved in CC, IEC, GC and HPLC along with their applications in chemical analysis.

SEMESTER-VI

PAPER-VI

CO1: Able to understand the basic terminology involved in the medicinal chemistry. CO2: Student will have core knowledge of Enzymes and Receptors in Medicinal chemistry.

CO3: Student can able to depict the synthesis of selected drugs using organic synthetic strategies and understand their therapeutic actions.

CO4: Student will able to understand the physiological role of hormones, neurotransmitters and Drugs acting on specific metabolic and neural targets along with their synthesis. Students will also have basic knowledge of concepts involved in drug analysis.



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Course outcomes:

COURSE: BUSINESS OR GANISATION AND MANAGEMENT CREDITS: 5

	Outcomes
CO-1	Learn basic concepts of business, commerce and trade
CO-2	Understands different business organisation.
CO-3	Read theories in management.
CO-4	Apply management techniques in daily life like planning, directing etc
CO-5	Learn co-ordination and co-operation among employees

COURSE: FINANCIAL ACCOUNTING

CREDITS: 5

	Outcomes
CO-1	Learn basic concepts in financial accounting.
CO-2	Understands ledger creation and maintenance of bills in order.
CO-3	Recognise the importance of accounts.
CO-3	Apply accounts knowledge in preparation of balance sheet asset valuation etc.
CO-1	Learn preparation of balance sheet and trail balance

COURSE: FINANCIAL ACCOUNTING -II

CREDITS: 5

	Outcomes
CO-1	Learn advanced concepts in financial accounting
CO-2	Use accounts for new concepts like consignment, Joint ventures etc.
CO-3	Analyse more meaning full contributions to the organisation
CO-4	Improves decision making skills
CO-5	recognizes entrepreneur skills

COURSE: BUSINESS LAWS CREDITS:5

	Outcomes
CO-1	Learn basic concepts in Business laws
CO-2	Recognise the importance of laws in daily life
CO-3	Read theories in management.
CO-4	Apply management techniques in daily life like planning, directing etc
CO-5	Learn co-ordination and co-operation among employees

COURSE: ADVANCED ACCOUNTING CREDITS:5

	Outcomes
CO-1	Analyze accounting problems and apply accounting principles in needed scenario.
CO-2	Analyse partnership accounts and solve them in different cases like admission, retirement etc.
CO-3	Understands accounting process of accompany.
CO-4	Calculate goodwill of accompany and share value of it.
CO-5	Learn accounting concepts for advancement in their career.

COURSE: BUSINESS STATISTICS-I CREDITS:5

	Outcomes
CO-1	Learn basic statistical tools.
CO-2	Recognise the importance of statical tools and principles in the daily life.
CO-3	Solve simple problems like mean median mode Etc.
CO-4	Apply statistical techniques in appropriate way.
CO-5	Understands different sources of data collection, analyzing and interpretation.

COURSE: BUSINESS STATISTICS -II CREDITS:5

	Outcomes
CO-1	Understands theoretical principles of statistics.
CO-2	Apply statistical principles in daily life.
CO-3	Explain the statical concepts of central tendency, index numbers etc.
CO-4	Calculate and interpret the various measures of central tendency.
CO-5	Classify the data by means of diagrams and graph.

COURSE: INCOME TAX CREDITS:5

	Outcomes
CO-1	Identify the basic concepts and terms related to income tax.
CO-2	Know the residential status of an assessee.
CO-3	Calculate the income from different sources like income from salary house property etc
CO-4	Understands the taxable incomes, and exempted incomes
CO-5	Understands the deductions u/s 80C ,80D 80G etc

COURSE: COST ACCOUNTING CREDITS:5

	Outcomes
CO-1	Identify the basic concepts about costing.
CO-2	Understands cost techniques and methods.
CO-3	Apply cost control techniques in daily life.
CO-4	Evaluate the budgets.
CO-5	Estimates various cost of factors of production.

COURSE: COMPUTERIZED ACCOUNTING CREDITS:5

	Outcomes
CO-1	Knows the software available for computerized accounting
CO-2	Understands the importance of computerised accounts for an organisation.
CO-3	Learn creation of ledgers, vouchers, and inventory.
CO-4	Preparation of e-statements and reports.
CO-5	Identify the need of the ICT in accounting field.

COURSE: MANAGEMENT INFORMATION SYSTEMI CREDITS:5

CO-1	Identify the in information system.
CO-2	Demonstrate the challenges faced while acquiring the adoption of MIS
CO-3	Recognise the benefits of Mis in an organisation.
CO-4	Preparation of reports.
CO-5	Know the need of information system

COURSE: COST CONTROL AND MANAGEMENT Credits:5

	Outcomes
CO-1	Recall the basics of costing.
CO-2	Apply the basics in preparation control
CO-3	Calculate the nation Income.
CO-4	Analy the concepts like demand production etc
CO-5	Learn different utility concepts.

Course: Theory and practice of GST Credits:05

	Outcomes
CO-1	Gain knowledge about goods and service tax
CO-2	Create quick employment.
CO-3	Understand the procedure for registration payment and refund of tax.
CO-4	Know the tax related activities.
CO-5	Learn Inter &Intra state transactions.

Course: Research methodology & project report Credits:04

	Outcomes
CO-1	Gain knowledge in research related activities.
CO-2	Analyse the data .
CO-3	Understand the problem-solving methods.
CO-4	Draft the solution for given problem.
CO-5	Know the need of research.

Course outcomes of Skill Enhancement Courses & General Elective papers:

Course	Туре	Credits	Outcomes
Business Economics	General Elective	4	 *Knows the importance of economics. *Learn theories in economics. *Calculate the nation Income. *Analyze the concepts like demand production etc. *Learn the utility concept.
Principles Of Insurance	Skill Enhancement Course	2	*Know the basic terms in insurance. *Understand risk management. *Analyze the insurance products. *Classify insurance plans.
Practice Of General Insurance	Skill Enhancement Course	2	*Learn different insurance policies. *Understands the process of claim management. *Classify types of reserves. *Evaluate risk sharing methods.



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I YEAR

SEMESTER I: PROGRAMMING IN C

Course Outcomes:

Learners could able to:

- Determine when computational methods and computers would be beneficial.
- ◆ Identify and abstract the programming work involved in a computational challenge.
- Write pseudo-code and apply the concepts acquired to the programming challenges.
- Based on the problem's needs, select the appropriate data representation formats.
- Choose the proper programming construct for the job by comparing and contrasting the various programming constructs.
- On a computer, write the software, edit it, compile it, debug it, correct it, recompile it, and run it.
- Identify tasks where the numerical concepts learnt may be applied and use them to develop programmes, allowing computers to solve the task successfully.

SEMESTER II: PROGRAMMING IN C++

Course Outcomes:

Learners could able to:

- ◆ Take note of the difference between the top-down and bottom-up methods.
- ♦ Give an example of an object-oriented programming strategy using C++.
- ✤ Apply object-oriented programming principles.
- ♦ Using C++, demonstrate how to manipulate data files.
- Virtual and pure virtual functions can be used in difficult programming settings.

II YEAR

SEMESTER III: DATA STRUCTURES USING C++

Course Outcomes:

Learners could able to:

Establish a system for classifying the many distinct types of data structures that are used in computer systems.

- ✤ Investigate and put into practice several methods of searching and sorting.
- ✤ Incorporate a variety of linear and non-linear data structure

Use the right data structures to solve specific issues.

Examine how difficult it is to perform simple operations on algorithms and data structures in terms of their time and space complexity.

SEMESTER IV: DATABASE MANAGEMENT SYSTEM

Course Outcomes:

Learners could able to:

- Describe the main elements of relational database management systems
- Relational database design, relational algebra and SQL are some of the fundamental ideas that will be covered in this course.
- Simple database application situations can be represented using ER models.
- Assemble an RDBMS, populate it with relevant data, and write SQL queries to access it.
- ✤ Normalize the database to improve the design.
- Basic database storage structures and access strategies, including as file and page organisations, indexing algorithms such as B-trees, and hashing, are well-known.

III YEAR

SEMESTER V: PROGRAMMING IN JAVA

Course Outcomes:

Learners could able to:

- use the syntax and semantics of Java programming language and the basic principles of OOP after completing the course.
- Create reusable applications by combining inheritance, polymorphism, interfaces, and packages.
- Use the concepts of multithreading and exception handling to create error-free and fast programming.
- Create real-world-like GUI and web-based apps that are driven by events.

SEMESTER VI: WEB TECHNOLOGIES

Course Outcomes:

- By using JavaScript and DHTML, students can create a dynamic web page.
- In this course, students will learn how to write an XML document that is well-formed and valid.

- This course will teach students how to link a Java application with a SQL database and conduct actions on the database table (insert, update, and delete). Form data supplied from the client is processed and stored in a database using the server-side Java application known as Servlet.
- To save data sent from a client form, students will be able to construct a server-side Java programme known as a JSP.

I YEAR

SEMESTER I: FUNDAMENTALS OF INFORMATION TECHNOLOGY

Course Outcomes:

- Determine when computational methods and computers would be beneficial.
- ✤ Identify and abstract the fundamental work involved in a computational challenge.
- Design the various documents and concepts with help of system applications and external applications.
- ✤ Based on the problem's needs, select the appropriate data representation formats.
- On a computer, write the software, edit it, compile it, debug it, correct it, recompile it, and run it.
- Identify tasks where the numerical concepts learnt may be applied and use them to develop programmes, allowing computers to solve the task successfully.
- By using MS-OFFICE, every user should maintain any task into formally.

SEMESTER II: PROGRAMMING WITH C & C++

Course Outcomes:

- ◆ Take note of the difference between the top-down and bottom-up methods.
- ♦ Give an example of an object-oriented programming strategy using C++.
- ✤ Apply object-oriented programming principles.
- ♦ Using C++, demonstrate how to manipulate data files.
- Virtual and pure virtual functions can be used in difficult programming settings.
- Choose the proper programming construct for the job by comparing and contrasting the various programming constructs.
- On a computer, write the software, edit it, compile it, debug it, correct it, recompile it, and run it.
- Identify tasks where the numerical concepts learnt may be applied and use them to develop programmes, allowing computers to solve the task successfully.

II YEAR

SEMESTER III: RELATIONAL DATABASE MANAGEMENT SYSTEMS

Course Outcomes:

Learners should be able to:

- Describe the main elements of relational database management systems
- Relational database design, relational algebra and SQL are some of the fundamental ideas that will be covered in this course.
- Simple database application situations can be represented using ER models.
- Assemble an RDBMS, populate it with relevant data, and write SQL queries to access it.
- ✤ Normalize the database to improve the design.
- Basic database storage structures and access strategies, including as file and page organizations, indexing algorithms such as B-trees, and hashing, are well-known.

SEMESTER IV: WEB TECHNOLOGY

Course Outcomes:

- By using JavaScript and DHTML, students can create a dynamic web page.
- In this course, students will learn how to write an XML document that is well-formed and valid.
- This course will teach students how to link a Java application with a SQL database and conduct actions on the database table (insert, update, and delete). Form data supplied from the client is processed and stored in a database using the server-side Java application known as Servlet.
- To save data sent from a client form, students will be able to construct a server-side Java programme known as a JSP.

III YEAR

SEMESTER V: ELECTRONIC COMMERCE

Course Outcomes:

- Analyze the impact of E-commerce on business models and strategy.
- ✤ Describe the major types of E-commerce.
- Explain the process that should be followed in building an E-commerce presence.
- ♦ Identify the key security threats in the E-commerce environment.
- Describe how procurement and supply chains relate to B2B E-commerce.

SEMESTER VI: CYBER SECURITY

Course Outcomes:

Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.

- Design, develop, test and evaluate secure software. Develop policies and procedures to manageenterprise security risks.
- ✤ To protect the data from hackers through security applications.

DEPARTMENT OF DATA SCIENCES

SEMESTER I: FUNDAMENTALS OF INFORMATION TECHNOLOGY

Students should be able to

- Identify the components of a computer and their functions.
- Understand the concept of networking, LAN, Internet, and working of www.
- Understand the notion of problem-solving using computer by programming
- Understand the notion of Software Project and the Process of software development.

SEMESTER II: PROBLEM SOLVING AND PYTHON PROGRAMMING

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

- Develop algorithmic solutions to simple computational problems.
- Develop and execute simple Python programs.
- Develop simple Python programs for solving problems.
- Structure a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs

SEMESTER III: DATA ENGINEERING WITH PYTHON

Outcomes: At the end of the course the student will be able to:

- Handle different types of files and work with text data
- Use regular expression operations
- Use relational databases via SQL
- Use tabular numeric data
- Use the data structures: data series and frames
- Use PyPlot for visualization.

SEMESTER IV: MACHINE LEARNING

Outcomes: At the end of the course the student will be able to understand

- Basics of Machine Learning and its limitations
- Machine Learning Algorithms: supervised, unsupervised, bio-inspired
- Probabilistic Modeling and Association Rule Mining



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COURSE OUT COMES OF DEPARTMENT OF ECONOMICS

Paper-I (Micro Economics – I)

CO 1: Students will be able to recognize, apply and analyse concepts and theories in microEconomics

CO 2: Student will develop an ability to attempt questions in competitive examinations

CO 3: Students will be able to understand the concepts of consumer behaviour like cardinalUtility and ordinal utility analysis

CO 4: Students will be able to understand the Application of Indifference curve analysis inDeriving demand curves, price effect, income effect and substitution effect

CO 5: Students will be able to understand the Theory of production- iso-quants, laws of

Returns to scale, law of variable proportion Traditional and modern theory of cost

CO 6: Students will be able to understand the decision-making process in different marketSituations such as perfect competition, monopolistic competition, monopoly and

Oligopoly markets

Paper-II (Macro Economics-II)

- CO 1: Concepts and methods of National income accounting
- CO 2: Theories of aggregate income and employment-classical and Keynes analysis
- CO 3: Theories of consumption function and investment spending
- CO 4: Rate of interest- Classical, Keynesian and IS-LM Model
- CO 5: Money- functions- theories of money
- CO 6: Inflation and trade cycles

Paper-III (Statistics for Economics)

CO 1: Basic concepts of statistics

- CO 2: Census methods and sampling method
- CO 3: Measures of central tendency
- CO 4: Measures of dispersion
- CO 5: Correlation and simple regression
- CO 6: Index numbers.
- CO 7: Time series analysis

CO 8: Students will be able to recognize, apply and analyse concepts of statistics in research.

Paper-IV (Indian Economy)

CO 1: Indian Economy at the time of independence.

- CO 2: Changes in the composition of national income
- CO 3: Natural Resource base: land, water, ores, mineral and metal Resources
- CO 4: Population: size, growth and composition
- CO 5: Importance and role of agriculture.
- CO 6: Trends in agricultural Productivity, land reforms, green revolution, agricultural

Finance, agricultural marketing, agricultural price policy and food security in India.

- CO 7: Role and importance of industrialization, industrial policy resolutions
- CO 8: NITI Aayog
- CO 9: Student will be able to attempt questions in competitive examinations.

Generic Elective -Paper -I (Telangana Economy)

- CO 1: State and district domestic product in Telangana
- CO 2: Trends in population growth in Telangana
- CO 3: The structure of agriculture and allied sectors in Telangana
- CO 4: The structure of industrial development in Telangana
- CO 5: The structure of tertiary sector in Telangana
- CO 6: Student will be able to attempt questions in competitive examinations of TSPSC.
- Paper-V (A)(Agricultural Economics)

- CO 1: Nature and scope of agricultural economics
- CO 2: Factors affecting agricultural development
- CO 3: Concept of production function: input and product relationship in farm production
- CO 4: Growth and productivity trends in Indian agriculture
- CO 5: Agrarian reforms and their role in economic development
- CO 6: New agriculture strategy, green revolution, marketing and exports

Paper-V (B) (Public Economics)

- CO 1: Role and significance of public finance including market economy.
- CO 2: Public revenue tax and non-tax revenue, theories of taxation etc.
- CO 3: Pattern and trend of Public expenditure.
- CO 4: Public debt sources, methods of debt redemption, debt management policy.
- CO 5: Fiscal federalism, India's finance commission
- CO 6: Budget- concepts and deficits
- CO 7: Fiscal crisis and fiscal sector reforms in India

Paper-V(C) (Economics of Environment)

- CO 1: Theory and Concept of Environmental Economics
- CO 2: Environment and Economics
- CO 3: Environmental Problems
- CO 4: Environmental Pollution Control
- CO 5: Indian environment policies and performance

Paper-VI (A) (International Economics)

CO 1: Classical trade theories- Adam Smith's absolute advantage, Ricardo's comparative Advantage, Neo-classical models, offer curve, Heckscher-Ohlin theorem

CO 2: Terms of trade and gain from trade, Prebisch-Singer views on deterioration of terms of trade

- CO 3: Balance of payments
- CO 4: International movement of labour, international lending and world debt crisis,

Paper-VI (B) (Development Economics)

CO 1: Development- concepts and measurement-GDP and PCI, PQLI, HDI, HPI etc.

CO 2: Obstacles to development, Indian economy as a developing economy, occupational

Pattern etc.

CO 3: Different concepts of poverty and unemployment with reference to developing Countries

CO 4: Theories of Economic growth – Classical, Harrod-Domar, Solow, endogenous growth.

CO 5: Theories of persistence of underdevelopment- vicious circle of poverty, Myrdal's

Cumulative causation, Rostow's stages of growth, balanced and unbalanced growth

Strategy, Lewis's theory of unlimited labour supply.

Paper-VI(C) (Industrial Economics)

CO 1: Meaning and classification of Industries

CO 2: Market Structure and Market Performance

- CO 3: Industrial Pattern under Five Year Plan
- CO 4: LPG programs and recent trends in industrial growth
- CO 5: Industrial Finance



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DEPARTMENT OF ENGLISH

COURSE OUTCOMES

DEPARTMENT OF ENGLISH

SEMESTER-1: PAPER 1 (English Enhanced Competence -1)- 4 CREDITS			
CO1	Poems enhance students' appreciation for language, rhythm, imagery, and symbolism, enriching their understanding of literary devices and techniques.		
Co2	Understanding root words enables students to comprehend how words are formed and how their meanings can be modified through the addition of prefixes, suffixes, or other root words.		
Co3	Understanding grammar rules helps students communicate more effectively and clearly, whether speaking or writing. Proper grammar usage enhances the clarity and coherence of their messages.		
CO4	Soft skills and value education contribute significantly to personal and professional development. The outcomes include improved communication, teamwork, leadership abilities, adaptability, emotional intelligence, and ethical decision-making.		
SEMESTER-2: PAPER 2 (English Enhanced Competence-I)- 4 CREDITS			
CO1	Studying articles, non-finite verbs, and adjectives increases students' awareness of grammar rules and structures. They become more conscious of language usage and develop a deeper understanding of how grammar impacts communication.		
CO2	Students can understand the values of literature		
	Phonetics is the study and understanding of the sounds used in human speech, including their production, transmission, and perception.		
CO3	Development of critical thinking skills.		
	Strengthened vocabulary and language skills.		
CO4	Value education instills principles such as integrity, empathy, respect, and responsibility, fostering well- rounded individuals capable of navigating diverse situations with empathy		

SEMESTER-3: PAPER 3 (English Enhanced Competence -ll) - 3 CREDITS			
CO1	Stories captivate students' attention and create an engaging learning environment, making the lesson more enjoyable and memorable.		
CO2	Anagrams provide an engaging way for students to practice spelling, as they rearrange letters to form correct words. This improves their spelling skills and reinforces the correct spelling of words.		
CO3	Students can able to learn idioms and phrasal verbs to enhance their speaking skills by allowing them to express themselves more creatively and vividly. They learn to use idiomatic expressions and phrasal verbs to convey		
	SEMESTER-3		
	SEC-I (Communication Skills)		
	Credits: 2		
CO1	Understanding the importance of effective communication in personal, academic, and professional contexts.		
	Developing active listening skills to enhance comprehension and empathy in interactions with others.		
	Practicing clear and concise verbal communication, including articulation, tone, and pacing.		
	Enhancing nonverbal communication skills, such as body language, facial expressions, and gestures.		
CO2	Understanding the role and impact of social media and digital media in contemporary society. Examining the influence of digital media on information consumption, dissemination, and manipulation. Understanding the ethical implications of digital media usage, such as data privacy, intellectual property rights.		

SEMESTER-4: PAPER 4(English Enhanced Competence -II)- 3 CREDITS			
CO1	Student will able to learn eponyms that exposes students to a wide range of words derived from people's names, historical figures, places, or fictional characters. This expands their vocabulary and enhances their understanding of word origins.		
CO2	Learning punctuation fosters attention to detail as students focus on correctly using punctuation marks such as commas, periods, semicolons, and quotation marks. Attention to punctuation enhances the overall professionalism and polish of their written work.		
CO3	Students will able to learn to write an Expository essays that provide students with a platform to express their ideas, opinions, and perspectives on a particular topic. They learn to articulate their thoughts in a structured and coherent manner.		
	SEMESTER-5: PAPER 5 (English Enhanced Competence -ll) - 3 CREDITS		
CO1	Understands structural elements in literary genres such as poem, song, textual poetry, short poetry forms.		
CO2	Understands the literary genre of Essay. This knowledge of Essay genre will helpsto become great essay writers to excel in the future.		
CO3	Adopts a culture of study. Awareness of Literary study benefits, foreword, bookreview, folklore and makes them good creators. Makes Literary creators in thesegenres.		
SEMESTER-6 : PAPER 6 (English Enhanced Competence -II) - 3 CREDITS			
CO1 U	nderstanding the historical context and evolution of feminist movements.		
	Analyzing gender-based inequalities and their impact on society.		
	This course explains about news, news writing, news structure, news article,		
CO2	interview, translation etc. and will help to become a good news reporter. Extensiveemployment opportunities can be found in the field of journalism.		
CO3	Practicing effective use of acronyms and abbreviations in writing and speech to enhance clarity and efficiency.		



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DEPARTMENT OF HISTORY

SEMESTER-I

Understanding History

<u>course out come</u>: student understand earn the basic skills of history writing & research they tress out the root of contemporary society from the past ,they realize the importance of socio cultural moral value.they understand the depth of subject of history from macro to micro level.

(from earliest times to 700 CE)

Course Outcomes:

- Learn the Characteristics of Pre-Historic age.
- Learn in depth of development of Urbanization.
- Learn about Ancient administration and Culture.
- Understand the Art and Architectural development.

Paper II

History of India from (700-1526CE)

Course Outcomes:

- Understand Rajput Society and Culture.
- Learn of depth invasions of Arabs and Turkish rulers and it's effects on Indian Culture.
- Learn about formation of local ruling dynasty in Southern part like Kakatiyas.
- Learn about Vijayanagara empire and their culture.

Paper III

(History of India from 1526-1857 CE)

Course Outcomes:

- Understand Mughal administration.
- Learn in depth of rise of Regional powers.
- Learn in depth of European powers.
- Understand Colonialism, Mercantilis

Paper IV

(History of India 1858 to 1964 CE)

Course outcomes:

- Learn about East India company rule.
- Learn about social religion reforms movement
- Understand in depth of nationalism
- Understand about revolutionary movement.
- Learn in depth about India after independence.

Paper V

History of modern World (From 1453 CE to 1964 CE)

Program outcomes:

- Understand about Renaissance and its impact.
- Learn in that about revolutionary movements.
- Learn about World wars, importance of league of nation and United Nationorganization.

Paper VI

History and Culture of Telangana(From earliest time to 2014 CE)

Program outcomes:

- Understand pre-study of Telangana and administration of Satavahana.
- Learn in depth about foundation Asaf Jahi dynasty and their rule.
- Understand Social, Culture and Political awakening in Telangana.
- Learn in depth about separate Telangana movement.





Department of Mathematics

COURSES OUTCOMES

SEMESTER-1: DIFFERENTIAL AND INTEGRAL CALCULUS-5 CREDITS

- **CO1:** The course is aimed at exposing the students to some basic notations in differential calculus.
- **CO2:** Students can visualize the two variable functions and able to find the partial derivatives of two variable functions
- CO3: Students will learn how to apply concepts of maxima and minima of functions of two variables in real life
- **CO4:** Students can understand the concepts of curvature, evolutes and involutes and able to find the same for Various popular curves.
- **CO5:** Students can find the lengths of various curves and Volumes and Surfaces of Revolution

SEMESTER-2: DIFFERENTIAL EQUATIONS-5 CREDITS

- CO1 The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.
- CO2 After learning the course the students will be equipped with the various tools to solve few types of differential equations that arise in several branches of science.
- CO3 Students will be able to solve Differential Equations of first order and first degree.
- CO4 Students can find integrating factors to make certain kinds of Differential Equations exact and thereby solve the equations.
- CO5 Students will be able to solve Differential Equations first order but not of first degree.
- CO6 Students can formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day to day problems like Growth and Decay, Dynamics of Tumour Growth, Radioactivity and Carbon Dating, Compound Interest and Orthogonal Trajectories arising in physical, chemical and biological disciplines.
- CO7 Students will be able to solve Higher order Linear Differential Equations
- CO8 Students can form and solve Partial Differential Equations

SEMESTER-3: REAL ANALYSIS - 5 CREDITS

- CO1 The course is aimed at exposing the students to the foundations of analysis which will be useful in Understanding various physical phenomena
- CO2 After the completion of the course students will be in a position to appreciate beauty and applicability of the course
- CO3 Students can recognize bounded, convergent, divergent, Cauchy and monotonic sequences and can calculate their limit superior, limit inferior and the limits of convergent sequences.
- CO4 Students can apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers and able to find the sum of infinite terms of some convergent series.
- CO5 Students can identify Continuous and Uniformly Continuous Functions
- CO6 Students can understand the properties of Continuous Functions
- CO7 Students can find the limits of functions
- CO8 Students can understand Basic Properties of the Derivatives
- CO9 Students can understand the Mean Value Theorem, L'Hospital Rule and Taylor's Theorem and their applications.
- CO10 Students can understand the concept of Riemann Integration.
- CO11 Students can understand the Properties of Riemann Integral.
- CO12 Students can understand the applications of the fundamental theorems of integration.

SEMESTER-4: ALGEBRA-5 CREDITS

- CO 1 The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.
- CO2 On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.
- CO3 Students can understand the concept of algebraic structures Groups, Subgroups and identify Groups, Subgroups.
- CO4 Link the fundamental concepts of groups and symmetries of geometrical objects.
- CO5 Students can Classify Subgroups and Cyclic Groups
- CO6 Students can understand Permutation Groups and Properties of Permutations

- CO7 Students can understand the notions of cosets, normal subgroups, and factor groups.
- CO8 Students can analyze consequences of Lagrange's theorem.
- CO9 Learn about structure preserving maps between groups and their consequences.
- CO10 Students can understand the concepts of Rings, Integral Domains, Ideals, Factor Rings, Prime Ideals, Maximal Ideals and Ring Homomorphisms
- CO11 Students will learn important applications of groups like check digit systems which is applied in bank Notes serial numbers.
- CO12 Students can able to understand Modular arithmetic, which is vital in cryptography.

SEMESTER-5: LINEAR ALGEBRA- 5 CREDITS

- CO1 Students can understand the concepts of vector spaces, subspaces, bases, dimension and their properties, Coordinate Systems which play key role in digitalization.
- CO2 Students can find the solution space of homogeneous equations using Null space
- CO3 Students can map Vector Spaces through order preserving linear transformations.
- CO4 Students can find the rank of matrices, which has many applications in solving system of equations
- CO5 Students can understand the relation between Coordinates when basis are changed.
- CO6 Students can find Eigenvalues and Eigenvectors of matrices, which has many applications
- CO7 Students can understand the Diagonalization process, which reduces huge computing tasks and has Applications in real time calculations.
- CO8 Students can learn properties of inner product spaces and determine orthogonality in inner product Space.
- CO9 Students can realize the power of matrices and their role in digitalization.

DSE-VI(A) SEMESTER-6: NUMERICAL ANALYSIS-5 CREDITS

- CO1 Students will be able to find the solutions of all algebraic and transcendental equations in one variable with desired accuracy using various methods.
- CO2 Students will be able to convert the data in to polynomials using various methods.
- CO3 Students will be able to interpolate the data with in the given intervals.

- CO4 Students will be able to understand various methods of Numerical Differentiation
- CO5 Students will be able to understand various methods of Numerical Integration
- CO6 Students can apply various numerical methods to get results in numerical form which are useful in real life problems.

DSE-VI(B) SEMESTER-6: INTEGRAL TRANSFORMS -5 CREDITS

- CO1 In this course, Students learn various methods to find the Laplace transform of a function.
- CO2 Students will learn various methods to find inverse Laplace transforms.
- CO3 Students will get to know the application of Laplace transform in solving ordinary and partial differential Equations.

DSE-VI(C) SEMESTER-5: ANALYTICAL SOLID GEOMETRY-5 CREDITS

- CO1 Students learn to describe some of the surfaces by using analytical geometry.
- CO2 Students understand the beautiful interplay between algebra and geometry.
- CO3 Students can understand and visualize three dimensional objects like plane ,sphere, cone, Cylinder and conicoids. Students can do solutions for problems involving these shapes.

SEC-I SEMESTER-III (THEORY OF EQUATIONS) -2 CREDITS

- CO1 Students can use various tools to solve quadratic, cubic, biquadratic and quintic equations.
- CO2 Students can able to identify the number of possible positive, negative roots of a polynomial equation using Descartes Rule of Signs.
- CO3 Students can learn the relation between roots and coefficients of a polynomial equation
- CO4 Students can understand the symmetric functions of roots

SEC-II SEMESTER-III(LOGIC AND SETS) -2 CREDITS

- CO1 Students learn some concepts of set theory and logic
- CO2 Students are able to learn truth tables
- CO3 Student will get knowledge on axiomatic approach of probability
- CO4 With the laws learned in this , student can do proof of theorems in scientifical manner
- CO5 Main out come of the course is students appreciates its importance in the development of computer science.

SEC-III SEMESTER-IV(NUMBER THEORY) -2 CREDITS

CO1 Students will be exposed to some of the important theorems like Fermat's theorem, Euler's theorem

and they can apply these theorems in doing some problems in number theory

- CO2 Students will learn What is Goldbach conjecture and Mobius inversion formula
- CO3 Students can understand Basic properties of Congruences and can apply these properties to solve problems like when divided by then what will be the remainder?
- CO4 Students will learn about phi function and its importance.
- CO5 Student can apply the knowledge acquired to solve divisor problems

SEC-IV SEMESTER-IV: VECTOR CALCULUS-2 CREDITS

- CO1 Concepts like gradient, divergence, curl and their physical relevance will be taught
- CO1 Students can realize the way vector calculus is used to addresses some of the problems of physics
- CO2 Students can evaluate Line integrals
- CO3 Students can evaluate Surface integrals
- CO4 Students can evaluate Volume integrals
- CO5 Students can find Gradient of a scalar field
- CO6 Students can find Divergence of a vector field
- CO7 Students can find curl of a vector field
- CO8 Students can understand the concepts of rotational and irrotational vectors, which have importance in meteorological centers.

GENERIC ELECTIVE-V-A (BASIC MATHEMATICS)-4 CREDITS

CO1	By learning this course, students can understand the basic concepts of cartesian coordinate system like distance formula, section formula, centroid of a triangle and area of a triangles
CO2 CO3	Students will learn about straight lines in analytical form and formulas related to them Students can understand about matrices and different types of matrices
CO4	Students will learn invertibility of matrices and they can find inverse of given matrices using determinant and adjoint

CO5 Students can solve system of linear equations which arising in real time situation. Knowledge gained here is helpful in writing computer program in solving system

OPTIONAL (MATHEMATICAL MODELLING)-4 CREDITS

- CO1 The focus will be on those mathematical techniques that are applicable models involving differential equations
- CO2 Student can understand population growth models, microbial growth and radioactive decay models Through differential equations.
- CO3 Students will learn different types heat transfers and laws involved in heat transfers, like Fourier's law of heat conduction
- CO4 Students can understand influenza outbreaks models' and prey predator models
- CO5 This course will give a knowledge how partial differential equations can be used to study heat conduction in objects.
- CO6 This course will impart knowledge of lake pollution mod

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B.Sc. Microbiology Course Outcomes

SEMESTER	Ι
CODE	BS, DSC-1A
COURSE TITLE	GENERAL MICROBIOLOGY
HPW (T+P)	4+2
CREDITS (T+P)	4+1

B.Sc. (MICROBIOLOGY)

- CO1: Understand nature of science and scientific enquiries, and have mastered a set of fundamental skills and effect of microorganisms on everyday life, health, food, sanitation, genetic engineering.
- CO2: Gain thorough knowledge on concept of microscopy, methods of staining and measurement Understand general characters of prokaryotes and viruses.
- CO3: Develop and have thorough knowledge of developing pure cultures and methods of preservation techniques.
- CO4: Identify the various physiological groups of bacteria and describe the nutrients required for cell synthesis and growth as well as explain the various transport systems involved in the uptake of nutrients by bacteria.
- > CO5: Devise and prepare media for isolation and growth of microorganisms.

CO6: Explain the principles of the energy-yielding and energy-consuming reactions, the various catabolic pathways and the mechanisms of energy conservation in microbial metabolism.

SEMESTER	II
CODE	BS, DSC-1B
COURSE TITLE	MICROBIAL DIVERSITY
	4+2
CREDITS (T+P)	4+1

- CO1: Understand the concept of Biodiversity & its Conservation as well as describe the elements of Biodiversity.
- CO2: Bacteria as per the second edition of Bergey's manual of Systemic Bacteriology and understand the Haeckel's, Whittaker's & Carl Woese system of classification of Living Organisms.
- > CO3: Analyze the comparative characteristics of prokaryotes and eukaryotes.
- CO4: Develop a good understanding of the characteristics of different types of microorganisms.
- CO5: the Ecology, physiology and Metabolic diversity of Archaea bacteria (Extremophiles) Understand the physiology & Diversity of Gram Negatives (Cyanobacteria & Proteobacteria) & Gram Positives (Actinobacteria, Firmicutes, Bacteriodetes, and Acidobacteria).

- CO6: Describe the structural, physiological & metabolic characteristics of Eukaryotic Organisms. (Algae, Fungi, Protozoa).
- CO7: Classify the microbial interactions like Symbiosis, Neutralism, Commensalism, Antagonism, Synergism & Parasitism.
- CO8: Explain the diversity of cultivated & uncultivated microorganisms & also understand the Great Plate Count Anomaly.
- CO9: Learn the different techniques used to study Microbial Diversity. Gain Knowledge and also assess the different microorganisms present in the preserved and perturbed microbial ecosystems.

SEMESTER	III
CODE	BS, DSC-1C
COURSE TITLE	FOOD & ENVIRONMENTAL MICROBIOLOGY
HPW (T+P)	4+2
CREDITS (T+P)	4+1

- CO1: The beneficial role of microorganisms in food processing and the microbiology of different types of fermented foods – pickles, sauerkraut, Kimchi, Idli, etc.
- CO2: Explain the different types of microorganisms in milk and their activities fermented dairy products (cheese, yogurt, Bulgarian milk) and their applications as probiotics and prebiotics
- CO3: Understand the significance and activities of microorganisms in different foods.
- CO4: Explain the role of intrinsic and extrinsic factors of microbial growth in foods leading to spoilage,
- CO5: understand the principles underlying the preservation methods & apply them in daily lives.

- CO6: Understand of the basis of food safety regulations and discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food.
- CO7: Understand the role of microorganisms in water, air and safety standards to protect the environment.
- CO8: Study the soil environment and microbes harboring and influencing soil ecosystem and their participation in biogeochemical cycle and learn in detail the types and mechanisms of nitrogen fixation.

SEMESTER	IV
CODE	BS, DSC-1D
COURSE TITLE	MEDICAL MICROBIOLOGY & IMMUNOLOGY
HPW (T+P)	4+2
CREDITS (T+P)	4+1

- CO1: Know the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body & their transmission.
- CO2: Provides opportunities to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases and use of lab animals in medical field.
- CO3: To understand the importance of pathogenic bacteria in human disease with respect to infections of the food born, Insect born, Zoonotic mode and viral infections.
- CO4: Demonstrate and understanding of key concepts in immunology along with overall organization of the immune system.
- CO5: Begin to appreciate the significance of maintaining a state of immune tolerance sufficient to prevent the emergence of autoimmunity.

CO6: To understand the salient features of antigen antibody reaction & its uses in diagnostics and various other studies.

SEMESTER	V
CODE	BS, DSE- 1A
COURSE TITLE	MOLECULAR BIOLOGY & MICROBIAL GENETICS
HPW (T+P)	4+2
CREDITS (T+P)	4+1

By the conclusion of this course, the students should be able to:

- > CO1: Understand basic concepts of microbial genetics, terminology.
- CO2: Demonstrate DNA model & understand DNA replication.
- CO3: Understand various gene transfer mechanisms in bacteria.
- > CO4: Describe transcription, translation & mutations in bacteria.
- > CO5: Demonstrate LAC OPERON concept.
- CO6: Understand concept of Genetic engineering & demonstrate its applications.

SEMESTER	VI
CODE	BS, DSE-2A
COURSE TITLE	INDUSTRIAL MICROBIOLOGY
HPW (T+P)	4+2
CREDITS (T+P)	4+1

By the end of the course, the student will be able to:

- > CO1: Learn about various industrially important microorganisms.
- ➢ CO2: Demonstrate the fermentor.
- CO3: Differentiate types of fermentations.
- CO4: Apply knowledge of fermentation in producing various industrially important products like organic acids, antibiotics, enzymes etc.
- > CO5: Solve problems related to fermentation types & kinetics.
- > CO6: Apply the knowledge of waste disposal in day today life.

SEMESTER	VI
CODE	BS
COURSE TITLE	APPLIED MICROBIOLOGY
HPW (T+P)	3+2
CREDITS (T+P)	4

By the end of the course, the student will be able to:

- > CO1: Learn about various microbial products for small scale enterpreneurs.
- > CO2: Demonstrate mass production of biofertilizers, microbial pigments.
- CO3: Differentiate various microorganisms by staining procedures in diagnosis of diseases.
- CO4: Apply knowledge of fermentation in producing various industrially important products like biofertilizers, biopesticides.

- CO5: Solve problems related to fermentation types & kinetics.(metabolic engineering for microbial products)
- > CO6: Apply the knowledge of biohazard disposal in day today life.

ZOOLOGY- COURSE OUTCOMES

Semester: Animal Diversity - Invertebrates

- LO1: To know the Kingdom Animalia, Brief History of Invertebrates.
- LO2: To learn the General Characters Classification of Non- Chordates Protozoa to Echinodermate and Hemichordate.
- LO3: To understand the type study of Elphidium and Sycon.
- LO4: To get the Knowledge on type study of Hirudinaira granulose (leech) and prawn and schistosoma.
- LO5: To analyse the type study of Pila and Starfish.
- LO6: To identify the affinities of Balanoglossus (Hemi-Chordata).

II Semester: VERTEBRATES (Chordata)

- LO1: To evaluate the Ecosystem Structure and function.
- LO2: To understand the Biogeochemical Cycles and Animal Associations.
- LO3: To know about the Environmental Pollution and Wildlife Conservation.
- LO4: To get knowledge on Zoogeographical regions Wallace ling Discontinuous distribution and Continental Drift.
- LO5: To analyse the Animal Behaviour.

Semester III: ANIMAL DIVERSITY, VERTEBRATES AND DEVELOPM ENTAL BIOLOGY

- LO1: To understand the General Characters, Classification and Morphology of Protochordata and Chordataphylum.
- LO2: To learn about parental case in Amphibia, Flight Adaptation in Birds/Aves and Dentition in Mammals.
- LO3: To evaluate the process of Gametogenesis in Male and Female.
- LO4: To analyse the different types of Eggs and also different types of Cleavages.
- LO5: To get the Knowledge on Total Membranes and Placenta.

Semester IV: CELL AND MOLECULAR BIOLOGY, GENETICS AND EVOLUTION

- LO1: To learn the structure and functions of cell Organelles.
- LO2: To know the differences in between Mitosis and Meiosis.
- LO3: To analyse about the DNA & RNA.
- LO4: To understand the Cloning Process.
- LO5: demonstrate the basic principles of genetics and Mendel's Law.
- LO6: gain knowledge of human evolution.

III YEAR: Paper -III: ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTION

- LO1: To compare the differences Among the Proteins, Carbohydrates and Lipids Digestion and to learn the Digestion process in ruminants.
- LO2: To understand the Human Respiratory System and Nervous System, Propagation of Nerve Impulse.
- LO3: To learn the Process of Formation of urine in Human along with structure and Function of Kidney.
- LO4: To indentify the different types of Muscles and to know the Knowledge on Muscle Contraction.
- LO5: To know the basic Principles of Genetics, Mendel's Law Epitasis, and Incomplete dominance & Co-Dominance.
- LO6: To understand the Impact of Hormones on different Metabolisms like Reproductive Systemetc.
- LO7: To get the Knowledge of Human Evolution along with Horse Evolution.

Paper- IV: AQUA CULTURE

- LO1: know about Fisheries and Aqua Culture.
- LO2: understand different elements of Haematology, Immunology, and Human Parallels.
- LO3: analyse different aspects of Animal Biotechnology Cloning, Diabetes and Parkinson's disease.

CHEMISTRY - COURSE OUTCOMES

Semester-I

- LO1: Learn about P-Block elements, Structure of atom, Chemical bonds & Gaseous and liquid states.
- LO2: Know the characteristics of group elements, different type of chemical bonds.
- ✤ LO3: understand about the inductive effect, acyclic and salicylic Hydrocarbons.
- ✤ LO4: analyse the difference between gaseous and liquid state.
- ✤ LO5: apply use of the scientific method of solving problems.
- ✤ LO6: respond can tell shapes of atomic orbital.

Semester-II

- ✤ LO1: Learn P-Block elements, Halogen Compounds, Solutions, Material Science.
- ✤ LO2: Know Transition elements, concept of aromaticity.
- ✤ LO3: Understand Theories of bonding in metals, Laws of Crystallography.
- ✤ LO4: Analyse can classify the materials types of Titrations.
- LO5: Respond explanation of conductors, semiconductors, strong weak acids and bases.

Semester-III

- LO1: acquire the knowledge of chemistry of f-block elements, symmetry of molecules and non- aqueous solvents.
- LO2: understand the preparation of alcohols, phenols, ethers and epoxides and carbonyl compounds.
- LO3: analyse the Phase Rule, Colloids and surface chemistry.
- ✤ LO4: learn the applications of nanomaterials.
- LO5: know the stereochemistry of carbon compounds and conformational analysis.

Semester -IV

- LO1: acquire the knowledge of Coordination Compounds-I, organometallic chemistry and metal carbonyls and related compounds.
- LO2: understand the carboxylic acids and derivatives, synthesis based on carbanions, Nitro hydrocarbons.
- ✤ LO3: analyse the elements of electrochemistry and EMF.
- ✤ LO4: learn the pericyclic reactions and synthetic strategies.
- ◆ LO5: get the overall understanding of asymmetric synthesis.

III YEAR PAPER III INORGANIC, ORGANIC& PHYSICAL CHEMISTRY

- LO1: Learn Werner theory, Magnetic Properties.
- LO2: Know Hard and Soft bases.
- LO3: Understand Bio inorganic chemistry, essential and trace elements, bio logical significance of NA, K, MG, CU, ZN, CR & Toxicity of AS, HG&PB.
- LO4: Analyse first order, second order of reaction, pseudo first order, half use determination of order of reaction.
- LO5: know NMR Spectroscopy, Number of signals, splitting of signals & applications.
- LO6: Apply state & path functions, concept of head & work first law of thermodynamics & second law of thermodynamics.

PAPER IV CHEMISTRY & INDUSTRY

- ✤ LO1: Learn paper chromatography TLC column Chromatography.
- ✤ LO2: Know Lambert Law, beer-Lambert Law & its applications.
- LO3: Understand drug chemistry drug, disease Historical evolution, Terminology, Nomenclature.
- ✤ LO4: Analyse needs or green chemistry green synthesis, green catalysis.
- LO5: Respond classifications of polymers & chemistry or polymerization, PVC, Teflon, Biodegradability.
- LO6: Apply need of conversion of drugs into medicine, different type of formulation



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Department of Physics

Course Outcomes

Semester I

Course: Mechanics and Oscillations

Credits: 4

CO1: Understand scalar and vector quantities, scalar field , vector field and integration of vectors.

CO2: Derive Stokes, Green's and Gauss theorems.

CO3: Understand laws of motion, collisions in two and three dimensions and study relation between scattering cross-section and impact parameter.

CO4: Gain knowledge on central forces-conservative nature of central force, Conservative force as negative gradient of potential energy, Equation of motion under central force.

CO5: Derive Kepler's laws, Coriolis force and its applications.

CO6: Understand physical characteristics of SHM and obtain solutions of oscillators using differential equations and different types of oscillations.

CO7: Use Lissajous figures to understand simple harmonic vibrations of same frequency and different frequencies.

Semester II

Course: Thermal Physics

Credits: 4

- CO1: Gain knowledge about Kinetic theory of gases.
- CO2: Understand Transport phenomena- thermal conductivity, viscosity and diffusion in gases.
- CO3: Understand thermodynamic properties like pressure, volume, temperature, internal energy, enthalpy, entropy, specific heats etc.
- CO4: Understand first law and second law of thermodynamics, change of entropy in reversible and irreversible processes.
- CO5: Gain knowledge about low temperature physics and liquefaction of gases by different methods.
- CO6: Understand concept of black body and Planck's radiation law. Learn about different pyrometers.

CO7: Gain knowledge about classical and quantum statistical mechanics including Maxwell-Boltzmann's, Bose-Einstein and Fermi-Dirac distribution laws.

Semester III

Course: Electromagnetic Theory

Credits: 4

CO1: Gain knowledge about the basic concepts of electric and magnetic fields.

CO2: Acquire knowledge on the concepts of magnetostatics- magnetic field, magnetic flux etc.

CO3: Learn different laws of Magnetostatics - Biot-Savart's law and Ampere's law.

CO4: Understand the concept of electromagnetic induction and its applications.

CO5: Acquire knowledge how to apply electromagnetic induction laws to solenoid, toroid etc.

CO6: Gain knowledge about Electromagnetic waves propagation and nature of Electromagnetic waves.

CO7. Understand the concept of network elements and network theorems.

Semester IV

Course: Waves and Optics

Credits: 4

CO1: Gain knowledge about the fundamentals of vibrations-transverse and longitudinal vibrations and also propagation of vibrations in strings and bars under different boundary conditions.

CO2: Acquire knowledge about theories of light and basic concepts like principle of superposition, coherence and interference.

CO3: Learn about Fresnel's Biprism experiment and Lloyd's experiment.

CO4: Understand the concept of diffraction, diffraction due to single slit, double slit, grating etc.

CO5: Acquire knowledge about Newton's ring formation and Michelson interferometer.

CO6: Gain knowledge about polarization and polarization methods, Brewster's law, Malus law.

CO7. Learn about Quarter wave plate, Halfwave plate, Nicol's prism as analyzer and polarizer and Laurent's half shade polarimeter.

Semester V

Course: Modern Physics

Credits: 4

CO1: Understand the various atomic models, difference between atomic spectroscopy and molecular spectroscopy, Raman effect and its applications.

CO2: Understand the ideas of Quantum physics -matter waves and uncertainty principle.

CO3: Derive Schrodinger time dependent and time independent wave equations.

CO4: Gain Knowledge about Nuclear Physics - Basic properties of nucleus, nuclear forces and nuclear models.

CO5: Acquire knowledge about radioactivity, alpha and beta decays, particle detectors etc.

CO6: Understand the basics of crystallography- crystal structure, crystal systems, X-Ray diffraction.

CO7. Learn about Bonding in crystals-Types of bonding in crystals, lattice energy of ionic crystals and Born-Haber cycle.

Semester VI

Course: Electronics

Credits: 4

CO1: Gain knowledge about the band theory of PN junction, semiconductor and types of semiconductor, diodes and rectifiers.

CO2: Acquire knowledge about Bipolar Junction Transistor, current components in transistor, RC coupled amplifier etc.

CO3: Learn about Feedback concept and oscillators, Phase shift oscillator.

CO4: Gain knowledge about Special Devices- construction and working of photodiode, solar cell, FET, UJT, SCR etc.

CO5: Acquire knowledge about digital electronics-number systems like binary, decimal, hexa-decimal etc

CO6: Gain knowledge about basic logic gates- AND, OR and NOT gates and truth tables.

CO7. Acquire knowledge about universal gates, Exclusive OR gate and De-Morgan's laws.

Semester VI

Course: Nano Science (Optional Paper)

Credits: 4

CO1: Gain knowledge about the Nanostructures, size effects in nanosystems and Quantum confinement in nanostructures

CO2: Acquire knowledge about various methods followed in the synthesis of nanostructure materials.

CO3: Learn about characterization of nanostructures by various methods like X-Ray diffraction, Transmission Electron Microscopy, Atomic Force Microscopy etc.

CO4: Understand the optical properties of nanostructures, Quasi particles and Excitons , and the band gap in semiconductor nanocrystals.

CO5: Acquire knowledge about Electron Transport in nanostructures, defects and impurities etc.

CO6: Gain knowledge about applications of nanoparticles and single electron devices.

CO7. Learn about CNT based transistors, Nano material devices and their applications.

Semester III

Course: Electrical Circuit Networking

Credits:

CO1: Understand basic electricity principles like voltage, current, resistance, power, Ohms law, AC and DC electricity.

CO2: Understand the electrical circuits and their combinations, rules to analyze AC and DC sourced electrical circuits.

CO3: Gain knowledge about drawing electrical symbol, blueprints, reading schematics.

CO4: Understand about generators, transformers, electric motors and solid state devices.

CO5: Acquire knowledge about electrical protection devices, electrical wiring and extension board.

Semester IV

Course: Basic Instrumentation

Credits:

CO1: Acquire knowledge basics of measurement, errors in measurements and multimeter.

CO2: Understand the electronic voltmeter and its advantage over conventional multimeter , CRO -block diagram, construction and uses.

CO3: Learn about signal generators and analysis instruments, idea for testing and specifications.

CO4: Gain Knowledge about Impedance bridges and Q-meters, comparison of analog and digital instruments.

CO5: Acquire knowledge about -digital multimeter - block diagram, working principle and uses.



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COURSE OUTCOMES OF THE DEPARTMENT OF POLITICAL SCIENCE

SEMESTER-I Understanding Political Theory

This course gives knowledge about the meaning of political theory, its evolution and its nature such as empirical and positive. It enables the student to understand the origin of the state and its evolution by analysing various theories and can estimate the challengesto the present sovereign state system. Political institutions and their functions and the relationship between the individual and state can be understood and an individual canbecome a good citizen and can participate in government affairs in a better way and acquire leadership qualities by this knowledge.

- CO1: It explains the various theories for the origin of the state and analyses the concept of authority and its allocation.
- CO2: One can assess the challenges of the sovereign state and can Evaluate the theory of liberalism, nationalism and multiculturalism
- CO3: It elaborates on the political institutions. Explains various organs of government legislature, executive, and judiciary their composition, types and functions which enables us to know about the different governments existing in the world and their way of functioning.
- CO4: Explains political party meaning, types, the way of functioning and the significance of political parties
- CO5: Explains the role of pressure groups and describes the types of pressure groups. It gives an understanding of the role of mass media and political theory. It enables the student to think critically about the political institutions developed over some time by studying different approaches, and concepts related to the relationship between the individual and state can be analysed.

Semester -II

WESTERN POLITICAL THOUGHT(DSC)

- CO1: The course gives an introduction to Political Thought processes and Theory-making in the West.
- CO2: From the Greek Political thinkers to down the ages including Utilitarians, this course introduces the student to the richness and variations in the political perceptions of Western Thinkers.
- CO3: It provides a foundation to students of Political Science in familiarizing themselves with the Thought & Theory of Western Philosophy.
- CO4: It particularly focuses on the evolution of the idea and institution of the State in

the West.CO5: It covers ancient, medieval and early modern thinkers

SEMESTER-III INDIAN POLITICAL THOUGHT (DSC)

- CO1: Tracing the evolution of Indian political thought from ancient India to modern India.
- CO2: The course gives an introduction to Political Thought processes and Theory-making in India. From the ancient Political thinkers to the modern political thinkers inIndia.
- CO3: This course introduces the student to the richness and variations in the political perceptions of Indian Thinkers.
- CO4: It provides a foundation to students of Political Science in familiarizing themselves to the Thought & Theory of Indian Philosophy.

CO5: It particularly focuses on the relationship between the state and society in ancient India. and evolution of ideas on society and state. It covers ancient, medieval and modern thinkers which gives the knowledge for the student to understand the Indian state and society from the past to the present.

SEMESTER-IV

CONSTITUTION AND POLITICS IN INDIA

- CO1: This course Introduces the Indian Constitution with a focus on the evolution, the role of the Constituent Assembly and the essence of the Preamble.
- CO2: It gives knowledge about the nature of Indian Federalism with a focus on Union-State Relations. Critically analyses the important institutions of the Indian Union: the Executive: President; Prime Minister, Council of Ministers; Governor, Chief Minister and Council of Ministers; The legislature: Rajya Sabha, Lok Sabha, Speaker, Committee System, State Legislature, The Judiciary: Supreme Court and the High Courts: composition and functions- Judicial Activism.
- CO3: Explains the Indian Party system its development and looking at the ideology of dominant national parties and state parties and trends in party systems.
- CO4: Gives knowledge about Election Commission, Electoral Reforms.
- CO5: Gives knowledge about the Electoral Process in India with a focus on the Election Commission: Composition, Functions and Role
- CO6: Gives knowledge about the Indian Politics: Seculaism, Caste, Gender in Indian Politics, Issues of Minorities.

SEMESTER -V

INTERNATIONAL RELATIONS (DSE)

- CO1: Explains the scope and subject matter of International Relations as an autonomous academic discipline.
- CO2: One can explore Approaches and methods to study the discipline through Politicalrealism, Pluralism and Worlds system's Model.

- CO3: Explains about colonialism causes and the process of decolonisation. Describes the Cold War phases and understanding the post-Cold War era and Non-Alignment.
- CO4: Examines the issues of Underdevelopment, Terrorism, Regionalism and Integration that characterize the post-second world war order.
- CO5: Studies the features of Indian foreign policy and its relationship with USA, Pakistan, Sri Lanka and China. This course gives knowledge about world affairs in a very systematic way.

Vth Semester- Generic Elective

POLITICS OF DEVELOPMENT

- **CO1:** The purpose of this module is to examine the effects of political factors on economic development in India. It aims to familiarise students with various theories of economic development, specifically the role of the state and government intervention in development.
- **CO2:** It will thereby enable students to acquire a nuanced and empirically grounded perspective on the reasons for wide variations in economic development.
- CO3: Acquire a basis for critical and independent analysis of issues of governance and power in the post-colonial world Planning, Mixed Economy, Socialistic Pattern of Society Sectors of Development: Industry, Agriculture, Irrigation enhance their knowledge about theories of how power and governance is related to problems of development in the post-colonial world.
- CO4: Acquire a basis for critical and independent analysis of issues of governance and power in the post-colonial world Planning, Mixed Economy, Socialistic Pattern of Society Sectors of Development: Industry, Agriculture, Irrigation. Be able to recall and compare the major theories and concepts of power and governance
- CO5: Be able to understand Issues of Development in the Post-Economic Reforms period Economic Reforms: Liberalisation, Privatisation, Globalisation, Development and Displacement, Development and Environment

Semester VI

GLOBAL POLITICS (DSE)

- CO1: It allows students to develop an understanding of the local, national, international and global dimensions of political activity, as well as allowing them the opportunity to explore political issues affecting their own lives.
- CO2: Global politics draws on a variety of disciplines in the social sciences and humanities.
- CO3: It helps students to understand abstract political concepts such as Power, Elements of Power, Balance of Power, Growing importance of Soft Power, Security, Collective Security, Bipolarity, Multipolarity, Unipolarity by grounding them in real world examples and case studies.
- CO4: Developing international mindedness and an awareness of multiple perspectives is at the heart of this course.
- CO5: It encourages dialogue and debate, nurturing the capacity to interpret competing and contestable claims.

Semester-VI

CONTEMPORARY POLITICAL THEORY

This course will examine the main theoretical voices in contemporary political thoughtspecifically ideas and beliefs. Its goal is to introduce students to the major political belief systems, or political ideologies, that have shaped the world. It will examine a range of these ideologies to understand what they believe, what they want to accomplish, and whattheir strengths and weaknesses are. By studying these different ideologies, and comparing them to one another, the course intends to help students clarify and better understand their political ideology and how it shapes their view of the world

- CO1: Explain the essential elements of all the Contemporary political theoretical traditions
- CO2: Understand and identify key concepts in political thought from a historical perspective;

- CO3: Apply gained knowledge of contemporary political thought to the real politics of today.
- CO4: Use critical and analytical skills in assessing main sources of political thought.
- CO5: Assess the main works of leading political thought thinkers.





COURSE OUTCOMES OF STATISTICS

SEMESTER: ONE

<u>SUBJECT:</u> DESCRIPTIVE STATISTICS AND PROBABILITY <u>GROUP:</u> MSCS

COURSE OUTCOMES:

After successful completion of this course, students can learn to

- 1. Calculate the expectation and moments of random variables.
- 2. Identify the applications of various moment inequalities.
- 3. Find the expressions for the characteristics function of a random variable and verify its properties.
- 4 .Apply the various laws of large numbers to sequences of random variable.

SEMESTER: TWO

SUBJECT: PROBABILITY AND DISTIBUTIONSGROUP: MSCSCOURSEOUTCOMES:COURSECOURSE

After successful completion of this course, students will learn to

1 .Understand various specifications such as probability density functions and cumulative. Distribution functions etc, of the probability distribution of a random variable.

2. Derive various generating functions of random variables such as probability generating functions, moment generating functions, characteristic functions, etc.

3. Find out characteristics of random variables like moments from either probability density (mass) functions or the generating functions.

4. Understand the probability distribution of bi variate random variables and the terms marginal distributions, conditional distributions, marginal, joint and conditional moment.

SEMESTER: THREE

SUBJECT: STATISTICAL METHODS & ESTIMATION

GROUP:MSCS

COURSE OUTCOMES:

After successful completion of this course, students will learn to

- 1. Appreciate its interdisciplinary nature.
- 2. be able to organize, manage and present data.

3. Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.

SEMESTER: FOUR

SUBJECT: STATISTICAL INFERENCE

GROUP: MSCS

COURSE OUTCOMES:

After successful completion of this course, students can learn to

- 1. Identify the sample data by using statistical methods and hypothesis.
- 2. Rectify the errors.
- 3. Apply chi-square test in real life for square matrix.
- 4. Apply non parametric test in interval and ratio test.

SEMESTER: FIVE

SUBJECT: APPLIED STASTISTICS 1

GROUP: MSCS

COURSE OUTCOMES:

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

- 1. Students will collect the samples of different populations& draw the samples by using different types sampling methods.
- 2. To understand the identify the variations of data; also expect the future behavior of long and short term variations.
- 3. To recognize the good quality levels of different products by using control charts.
- 4. Students will learn about concepts of to collect the sample and sample size, sampling methods and population and estimate the variances of random samplings.

SEMESTER: SIX

SUBJECT: APPLIED STASTISTICS 2

GROUP: MSCS

COURSE OUTCOMES:

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

- 1. Identify the various index numbers and compute them for data sets
- 2. Explain the concepts of base shifting, slicing and deflating of index numbers
- 3. Illustrate the applications of index numbers
- 4. Understand the need, use, relevance and limitations of official statistics
- 5. Explain the roles and responsibilities like NSSO, CSO etc.
- 6. Explain the methods of data collection and dissemination in population census

SEMESTER: ONE

SUBJECT: DESCRIPTIVE STATISTICS AND PROBABILITY

GROUP: MSDS

COURSE OUTCOMES:

After successful completion of this course, students can learn to

- 1. Calculate the expectation and moments of random variables.
- 2. Identify the applications of various moment inequalities.
- 3. Find the expressions for the characteristics function of a random variable and verify its properties.
- 4 .Apply the various laws of large numbers to sequences of random variable.

SEMESTER: TWO

SUBJECT: PROBABILITY AND DISTIBUTIONS

GROUP: MSDS

COURSE OUTCOMES:

After successful completion of this course, students will learn to

1 .Understand various specifications such as probability density functions and cumulative. Distribution functions etc, of the probability distribution of a random variable.

2. Derive various generating functions of random variables such as probability generating functions, moment generating functions, characteristic functions, etc.

3. Find out characteristics of random variables like moments from either probability density (mass) functions or the generating functions.

4. Understand the probability distribution of bi variate random variables and the terms marginal distributions, conditional distributions, marginal, joint and conditional moment.

SEMESTER: THREE

SUBJECT: STATISTICAL METHODS & ESTIMATION

GROUP: MSDS

COURSE OUTCOMES:

After successful completion of this course, students will learn to

1. Appreciate its interdisciplinary nature.

- 2. be able to organize, manage and present data.
- 3. Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.

SEMESTER: FOUR

SUBJECT: STATISTICAL INFERENCE

GROUP: MSDS

COURSE OUTCOMES:

After successful completion of this course, students can learn to

- 1. Identify the sample data by using statistical methods and hypothesis.
- 2. Rectify the errors.
- 3. Apply chi-square test in real life for square matrix.
- 4. Apply non parametric test in interval and ratio test.

SEMESTER: FIVE

SUBJECT: ANALYTICAL STATISTICS 1

GROUP: MSDS

COURSE OUTCOMES:

After successful completion of this course students will learn to

- 1. About concepts to collect the sample and sample size, sampling methods and population and also estimate the variances of random samplings.
- 2. To know how to apply statistical tools in business and economics by using time series.

SEMESTER: SIX

SUBJECT: ANALYTICAL STASTISTICS 2

GROUP: MSDS

COURSE OUTCOMES:

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

- 1. Identify the various index numbers and compute them for data sets.
- 2. Explain the concepts of base shifting, slicing and deflating of index numbers.
- 3. Illustrate the applications of index numbers.





	DEPARTMENT OF TELUGU		
SEMESTER-1: PAPER 1 (Sahiti Manjeera)- 4 CREDITS			
CO1	Students can enjoy all the essays and improves literary skills		
Co2	Students can learn all the grammar skills		
Co3	Differentiate the methods of old and modern poetry thoughts.		
CO4	Understand the culture of oldØ society and comparison with modern trends.		
SEMESTER-2: PAPER 2 (Sahiti Manjeera)- 4 CREDITS			
CO1	Students will be able to improve comprehensive skills as well as advanced grammar skills		
CO2	Students can understand the values of literature		
CO3	Differentiate the methods of old and modern poetry thoughts.		
CO4	Understand the culture of old society and comparison with modern trends		
	SEMESTER-3: PAPER 3 (Sahiti Kinnera) - 4 CREDITS		
CO1	The anthology contains selected literary pieces offering glimpses of life and world from different perspectives		
CO2	Students will be able to make use of Ø grammar skills when they face competitive exams		
CO3	Differentiate the methods of old and modern poetry thoughts.		
CO4	Understand the culture of old society and comparison with modern trends		

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SEMESTER-4: PAPER 4(Sahiti Kinnera)- 4 CREDITS		
CO1	Students will be able to improve human values by following the given anthology.	
CO2	Students can improve prosody and grammar skills	
CO3	Differentiate the methods of old and modern poetry thoughts.	
CO4	Understand the culture of old society and comparison with modern trends.	
	SEMESTER-5: PAPER 5 (Sahiti Dundubhi) - 3 CREDITS	
CO1	Understands structural elements in literary genres such as poem, song, textual poetry, short poetry forms - mini poetry, haiku, naany, ghazal, rubai. Discover the depths of these genres.	
CO2	Understands the literary genre of Essay. This knowledge of Essay genre will helps to become great essay writers to excel in the future.	
CO3	Adopts a culture of study. Awareness of Literary study benefits, foreword, book review, folklore and makes them good creators. Makes Literary creators in these genres.	
	SEMESTER-6 : PAPER 6 (Sahiti Dundubhi) - 3 CREDIT6	
CO 1	Literary genres such as drama, novel, short story, biography, the art of discourse etc. are the impetus for the all-round personality development of the student.	
CO2	This course explains about news, news writing, news structure, news article, interview, translation etc. and will help to become a good news reporter. Extensive employment opportunities can be found in the field of journalism.	
CO3	Awareness of project, study, hypothesis, reports will help to excel in research, sustain and get many employment opportunities.	



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DEPARTMENT OF ZOOLOGY

B.Sc. (ZOOLOGY) COURSE OUTCOMES (COs) SEMESTER-I

PAPER-I

Animal Diversity-Invertebrates

CO1 : Students will learn about the General Characters and classification of various Invertebrate Phyla. Structureand functional biology of various animals belong to Invertebrates will be known.

CO2 : Understand the various life cycle of parasites

CO3: Students will learn Pathology, Symptoms, diagnosis and treatment of helminthes parasites.

SEMESTER - II

Animal Diversity-vertebrates

CO1: Students will learn about the General Characters, Classification, structure, function and biology of Vertebrates

CO2: Parental care in Amphibia, Poisonous and non-poisonous snake's differences, Migration and Flight adaptation in Birds, Dentition and Aquatic adaptationin Mammals.

SEMESTER -- III

ANIMAL PHYSIOLOGY & ANIMAL BEHAVIOUR

CO1: Physiology of Digestion, Respiration, Circulation, Excretion, Muscles, Nerves is understood.

CO2: Structure and function of Heart. Irregularities of Heartbeat and blood clotting mechanism is known.

CO3: Endocrinology and functions of various hormonesproduced in the body is understood.

CO4: The knowledge of Learning and Imprinting with respect to behaviour of animals is imparted to the students.

SEMESTER –IV

CELL BIOLOGY, GENETICS & DEVELOPMENTAL BIOLOGY

CO1: Students will learn about the structure and function of various cell organelles.

CO2 : Knowledge about genetic material-gene, chromosomeis imparted to the students.

CO3: Types of cell division understand the students

CO4: Structure of genetic material-DNA, RNA

CO5: Knowledge about replication, transcription, translationand gene regulation is given to the students.

CO6: Sex linked inheritance. Study of inheritance of Haemophilia, Colour blindness, Sickle cell

anaemia.

CO7: Hormonal and environmental influence on the sexdetermination of animals.

SEMESTER -- V

IMMUNOLOGY & ANIMAL BIOTECHNOLOGY

CO1: Students will know about the structure and function of Immune cells, Natural and acquired immunity.

CO2:Structure of antigens, antibodies. Function of antibodies.

CO3:Antigen-antibody interactions.

CO4:Hypersensitivity reactions.

CO5:Immunodeficiency diseases

CO6:AIDS

CO7:Plasmids, Cosmids.

CO8:Transgenic animals

CO9:Stem cells and applications

SEMESTER –VI ECOLOGY ,ZOOGEOGRAPHY &EVOLUTION

CO1 Students will understand various features and aspectsof ecology.
CO2:Types of pollution and influence on health.
CO3:Biogeochemical cycles.
CO4:Changes in the habitat- Hydrosere, Xerosere.
CO5:Distribution of animals in different continents.
CO6:Different theories of Evolution, Concept of Origin ofspecies.
of the result
CO7: Evidences of Evolution.
CO8:Types of speciation.
CO9:Natural selection