

INDIAN ACADEMY

Degree College - Autonomous

BBA

M21DC 1.1: MANAGEMENT PRINCIPLES AND PRACTICE

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the functions and responsibilities of managers.
CObj_2	To familiarize students with the tools and techniques to be used in the performance of the managerial job.
CObj_3	To enhance students understanding to develop cognizance of the importance of management principles.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Able to demonstrate their understanding of various concepts, principles, and functions of business management.
CO2	Able to Demonstrate the roles, skills and functions of management
CO3	The ability to create organization structures based on authority, task and responsibilities.
CO4	The ability to understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.
CO5	The ability to understand the requirement of good control system and control techniques

M21DC 1.2: FUNDAMENTALS OF BUSINESS ACCOUNTING**Total Teaching Hours: 60****No. of Hours / Week: 04****(04 Credit)**

CObj	Course Objectives
CObj_1	To acquaint students with the accounting concepts, tools and techniques influencing business organizations.
CObj_2	To make the students understand the basic accounting concepts and conventions
CObj_3	To familiarize the students to work with ratio analysis and bank reconciliation statement

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Acquires the knowledge in accounting, system of maintenance of accounts, journal, ledger, bill of exchange, and account current, average due date and bank reconciliation statement. The Ability to pass journal entries and prepare ledger accounts.
CO2	Understand the basic accounting concepts and conventions, preparation of subsidiary books and final accounts, account of Consignment, Joint venture and non-trading concerns.
CO3	Develops the analytical skills in accounting equation, preparation of trial balance and suspense account, normal loss in consignment. Analysing the reasons for differences between pass book and cash book transactions in the Bank Reconciliation Statement.
CO4	Prepare the vertical and Horizontal Analysis and Ratio Analysis.
CO5	Analyse and interpret published financial information.

M21DC 1.3: BUSINESS ECONOMICS**Total Teaching Hours: 60****No. of Hours / Week: 04****(04 Credit)**

CObj	Course Objectives
CObj_1	To impart the fundamentals of economics with an objective to develop the application based knowledge
CObj_2	To apply micro economics concepts techniques in evaluating the business decisions taken by the firms
CObj_3	To develop basic knowledge on production cost and revenue.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand fundamental concepts in Economics and relate it to business
CO2	Analyze Consumer Behavior and understand how he behaves at different levels of satisfaction and to know indifferent behavior of the consumer
CO3	Analyze Law of demand, concepts and determinants of demand Computation of demand forecasting
CO4	Analyze the decisions made by the firm using different production techniques with element of time involved it
CO5	Explore the macroeconomic concepts like NI, Business Cycle, Fiscal and Monetary Policy

M21OE 1.1: BUSINESS ORGANISATION**Total Teaching Hours: 45****No. of Hours / Week: 03****(3 Credit)**

CObj	Course Objectives
CObj_1	To impart the fundamentals of Business Organisation with an objective to develop the basic knowledge of operations and functions of organisation
CObj_2	To enable the use of basic concepts of management in business organization
CObj_3	To have a proper understanding of social responsibility towards business and principles of management

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	An understanding of the nature, objectives and social responsibilities of business
CO2	An ability to describe the different forms of organisations
CO3	An understanding of the basic concepts of management
CO4	An understanding of functions of management
CO5	An understanding of different types of business combinations

21SBC 1 .1: DIGITAL FLUENCY

Total Teaching Hours: 30

No. of Hours 2

(2 Credits)

CObj_ID	Course Objectives
CObj_1	To learn about advanced formulas for business administration
CObj_2	To equip participants with the knowledge to debug and audit the advanced formulas
CObj_3	To explore and analyze data using advanced excel.

CO_ID	Course Outcomes
	After completion of this module, students should be able to:
CO_1	Understands to apply basic principles of laying out excel models for decision making..
CO_2	Examines spread sheet concepts and explore the Microsoft office Excel environment
CO_3	Use excel functions to summarize quantitative data graphically, including pivot table and charts.
CO_4	Gains ability to apply formulas to lay data in readiness for analysis.
CO_5	Explores the best practices by troubleshooting complex models.

M21 DC 2.1: FUNCTIONS OF MANAGEMENT

Total Teaching Hours: 60

No. of Hours / Week: 04

(04 Credit)

CObj	Course Objectives
CObj_1	To provide an idea on various types of management.
CObj_2	To improve the overall employability skills of students.
CObj_3	To provide an understanding to students in choosing their specialization course of their interest.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Improved knowledge on various types of management.
CO2	Strong basics of all the different types of management.

CO3	Ease in choosing their specialization course of their interest.
CO4	Improved management skills and employability skills.
CO5	Improved skills in marketing, human resource, finance, events and service management.

M21 DC 2.2: COST ACCOUNTING

Total Teaching Hours: 60

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	The objective of this subject is to familiarize students with the various concepts and element of cost.
CObj_2	To enable students to reconcile results as per Cost and Financial Accounts
CObj_3	To enable students to discuss the concepts related to Process Costing and enable them to make Process Accounts and Statements of joint products and by-products.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand the concepts of preparation of cost sheet.
CO2	Apply techniques used to find the pricing of materials.
CO3	Gain ability to analyze the wage rates.
CO4	Prepare the machine hour rate and allocation of overhead distribution.
CO5	Preparation of Reconciling the cost and financial accounts.

M21DC 2.3: BUSINESS MATHEMATICS

Total Teaching Hours: 60

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	To provide basic knowledge of mathematics and their application to Commercial situations.
CObj_2	To make students equipped with the concepts of interest, rate of interest, annuity and instalments
CObj_3	To make students familiar with the concepts of ratio, proportion, variation and percentage.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands the basic concepts of business maths and apply them to create solve and interpret application problems in business
CO2	Solves problems on various types of equation.
CO3	Solves problems on Matrices and execute the laws of indices, law of logarithm and evaluate them.
CO4	Apply the concept of simple interest and compound interest bills discounted etc. and apply them in day-to-day life.
CO5	Solves problems on Arithmetic progression, Geometric progression and construct logical application of these concepts.

M21OE 2.1: PEOPLE MANAGEMENT

Total Teaching Hours: 45

No. of Hours / Week: 03

(3 Credit)

CObj	Course Objectives
CObj_1	Examine individuals' personality and behaviours to resulting in better management of people in the organisation
CObj_2	Resolve and manage conflicts quickly.
CObj_3	Understand the process of goal setting.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands diversity at the workplace.
CO2	Apply personal effectiveness through goal setting and time management.
CO3	Design the process of performance appraisal
CO4	Develop the interpersonal relationship and networking.
CO5	Develop the functions and importance of communication.

M 21 DC 3.1: ORGANISATIONAL BEHAVIOUR

Total Teaching Hours: 60

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	To enable the students to understand the organisational behaviour and organizational change and dynamics of group.
CObj_2	To enable the students to understand the importance of attitude and personality
CObj_3	To enable the students to understand the principles of learning.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Identify behavioral issues in an Organization
CO2	Apply the concept of Perception, attitudes and personality to understand the behavior of people in the organization.
CO3	Analyze different types of learning followed by each individual.

CO4	Design different types of groups in an organization and how it influences the behavior of the individuals.
CO5	Demonstrates the resistance for change, its causes and how to overcome.

M21DC 3.2: STATISTICS FOR BUSINESS

Total Teaching Hours: 60 Hours

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	To develop the students ability to deal with numerical and quantitative issues in business
CObj_2	To enable the use of statistical, graphical and algebraic techniques wherever relevant.
CObj_3	To have a proper understanding of Statistical applications in Economics and Management.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Acquire the conceptual skill and working knowledge of tabulation of data and different types of samples
CO2	Apply methods of solving problems on central tendency, measures of dispersion, skewness and kurtosis.
CO3	Develop the knowledge of correlation and Regression analysis and interpretation of results.
CO4	Solve and interpret application problems in business.
CO5	Interpret the statistical tools to perform analysis of data through descriptive methods

M21DC 3.3: FINANCIAL MANAGEMENT

Total Teaching Hours: 60 Hours

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	To offer the students relevant, systematic, efficient and actual knowledge of financial management
CObj_2	Develop knowledge on the allocation, management and funding of financial resources.
CObj_3	Improving students' understanding of the time value of money concept and the role of a financial manager in the current competitive business scenario.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	To familiarize students with the concept of fundamental financial concepts, especially time value of money.
CO2	To create an awareness about capital structure
CO3	To make them understand the cost of capital in wide aspects
CO4	To provide knowledge about dividend policies
CO5	To enable them to understand working capital management

M21OE 3.1: FINANCIAL LITERACY

Total Teaching Hours: 45 Hours

No. of Hours / Week: 03

(03 credit)

CObj	Course Objectives
CObj_1	To familiarize non-finance students with the essentials of finance and investments
CObj_2	To enable the students to use financial data in planning, and decision making
CObj_3	To equip students with general knowledge, basic tools, and techniques for managing their personal finance and investment decisions

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand and interpret the financial statements of a company
CO2	Identifies the role and importance of the finance function in business
CO3	Take investment decisions for their personal portfolio
CO4	Develop an attitude towards investments and be able to assess risk and returns
CO5	Analyze and develop budget control techniques for an organization

21SBC 3 .1: DIGITAL FLUENCY II

(Artificial Intelligence-IoT-Cloud Computing-Cyber Security)

Total Teaching Hours: 30 Hours

No. of Hours / Week: 3 Hrs/week

(2 Credits)

CObj	Course Objectives
CObj_1	To provide a basic understanding of Artificial Intelligence and its importance in today's world
CObj_2	To provide an understanding of cyber security and its importance in protecting internet-connected systems against malicious cyber-attacks
CObj_3	To provide a basic understanding of cloud computing and other related services over networks

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand the machine languages and learning such as visual perception in decision making.
CO2	Apply appropriate tools and techniques to protect systems, networks, programs, worms and malicious cyber-attacks.
CO3	Apply and familiarize with services such as Dropbox, resource pooling, using the storage facilities, etc.
CO4	Demonstrate an understanding of IoT, create information about the connected objects, analyze it and make decisions.
CO5	Interpret and apply strong data storage and privacy of data in storage and transit.

M 21 DC 4.1: INTERNATIONAL BUSINESS

Total Teaching Hours: 60

No. of Hours / Week: 4

(04 credit)

CObj	Course Objectives
CObj_1	To provide an understanding of the importance of international business has on the modern world.
CObj_2	To enable students to identify the factors that must be considered by a multinational corporation before entering a different country.
CObj_3	To provide an understanding of how international trade affects economic growth of a country.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands the stages of internationalization
CO2	Applies concepts to choose the companies strategies on mode of entry into another rcountry
CO3	Analyze the strategies adopted by companies to expand globally
CO4	Apply and adopt the procedures followed in India's import and export trade
CO5	Demonstrate market fluctuations in foreign exchange that affect trade

M21DC 4.2: PRODUCTION & OPERATIONS MANAGEMENT

Total Teaching Hours: 60

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	To analyze the basics of production and operations management and the responsible factors.
CObj_2	To facilitate the various activities relating to scheduling and measuring of production take place and how control can be obtained on both product and quality.
CObj_3	To create supply and logistics, distribution networks, and their management.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Apply the concept of operations management in manufacturing and service sector and will be able to plan and implement production and service-related decisions.
CO2	Plan production schedules and plan resources (material and machine) required for production.
CO3	Explore employment opportunities in sales and operations positions with transportation providers in the region.
CO4	Apply logistics and supply chain strategies can create value generation and utilize it with applications.
CO5	Develop an understanding of the importance of logistics in the formulation of the business strategy.

M21DC 4.3: MANAGEMENT ACCOUNTING

Total Teaching Hours: 60

No. of Hours per Week: 04

(04 credits)

CObj	Course Objectives
CObj_1	Understand management accounting and various tools of financial analysis
CObj_2	Analyse profitability and financial status of a business based on ratios calculated and Understand the preparation of Cash flow statement
CObj_3	Apply marginal costing technique in managerial decision making problems and evaluate different proposals and Understand and further analyze different types of budgets

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Recognize the relationship between Cost, Financial and Management Accounting
CO2	Draw conclusion about the liquidity, solvency and profitability of business entities based on ratio analysis
CO3	Prepare Cash flow statement based on Revised Accounting Standard and make inferences
CO4	Prepare marginal cost statement and calculate breakeven point
CO5	Compare different proposals based on marginal costing technique and draw conclusion Understand the concepts of budgeting and budgetary control and its role in management decision making

M210E 4.1: EVENT MANAGEMENT

Total Teaching Hours: 45 Hours

No. of Hours / Week: 03

(03 credit)

CObj	Course Objectives
CObj_1	To provide the means to compare actual performance in an IT environment against desired performance.
CObj_2	To Provide the entry point for many process and activities of Service Operation
CObj_3	To provide a basis for service assurance, reporting and service improvement.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Identify the key characteristics of an event.
CO2	Recognize the key management competencies required in the events industry and to use interpersonal and communications skills to pursue career in events industry.
CO3	Apply the conceptual framework of Event Management, Event Services, Conducting Event and Managing Public Relations.
CO4	Identify the importance of communication for leadership & decision making.
CO5	Acquire competencies to: Plan a proposal on management of an event

SEMESTER V

M21DC 5.1: BANKING & INSURANCE

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

Cob_j	Course Objectives
CObj_1	Introduce the students to the basic concept of banking as a financial intermediation service and bank as a financial institution.
CObj_2	To Familiarize students with crucial banking operations and fundamentals of bank lending.
CObj_3	To enlighten the students with the Introduction of insurance concepts.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	After this course the students would have the fundamental knowledge of banking as a service and bank as an institution.
CO2	Understand the working and functioning of the Insurance Sector and study the inter-relationship between Insurance & Risk Management.
CO3	Students will be updated with the latest technology and innovation that are currently being used in banks.
CO4	Students will be able to express opinions about banking in written and oral form, based on the basic knowledge and skills acquired.
CO5	Obtain an overview of the Regulatory Framework of the Insurance Sector.

M21DC 5.2: INCOME TAX

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To enable the students to identify the basic concepts, definitions and terms related to Income Tax and to determine the residential status of an individual and scope of total income.
CObj_2	To enable the students to compute income under various heads namely income from salaries, house property, business/ profession, and income from other sources and also to discuss the various deductions under the Income tax act, 1961.
CObj_3	To enable the students to compute the net total taxable income of an individual.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Identify the technical terms related to Income Tax.
CO2	Determine the residential status of an individual and scope of total income.
CO3	Compute income from salaries, house property, business/profession, and income from other sources.
CO4	Analyse various benefits/ deductions under the Income Tax Act, 1961.
CO5	Compute the net total income of an individual.

M21DC 5.3: BUSINESS POLICY AND STRATEGY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To gain knowledge about the business policy, vision, mission and strategic management
CObj_2	To analyze the environment in which businesses operate and assess their significance for strategic planning and implementation
CObj_3	To foster the understanding levels of strategy, strategy formulation and implementation processes at corporate and business level.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Apply understanding about business policy and strategic management in organizations.
CO2	Analyses the environment in which businesses operate and assess their significance for strategic planning.
CO3	Determine functional level strategies
CO4	Apply strategic alternatives at business and corporate level
CO5	Apply tactics and frameworks for strategic implementation

M21DEF 5.4 FINANCIAL MARKET & SERVICES

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide students with a solid foundation in understanding the structure, functions, and operations of financial markets such as money markets and capital markets.
CObj_2	To give in-depth understanding of the Indian stock market's trading and settlement procedures, and update the students with various innovations in financial markets.
CObj_3	To familiarize students with various concepts of mutual funds and the roles played by various market participants. Equip them with knowledge and skills necessary to become employable in the financial service industry.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand how shares are issued in the primary market and listed in the secondary market. And will have an overall understanding of various functions of the primary and secondary market.
CO2	Gain a thorough understanding of how financial markets operate, including the roles and functions of market participants, the trading mechanisms, and the impact of market forces on asset prices.
CO3	Demonstrate their understanding on various financial instruments traded in financial markets.
CO4	Identify the regulatory framework governing the stock market, including securities laws in India.

M21DEH 5.4: EMPLOYEE WELFARE AND INDUSTRIAL RELATIONS

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	The course aims at providing fundamental knowledge and exposure to the industrial relations and related aspects prevailing in industries and to familiarize the students with various Labour Legislations applicable to businesses
CObj_2	To learn the salient features of welfare and wage Legislations
CObj_3	To learn the laws relating to Industrial Relations, Social Security and Working conditions

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Describe fundamental concepts and nature of Industrial Relations
CO2	Identify the nature and role of trade unions for workers and industries
CO3	Apply collective bargaining concepts and understands its impact on employee-management relations
CO4	Identify ways to resolve industrial disputes
CO5	To apply various industrial legislations in business

M21DEM 5.4: ADVERTISING AND SALES PROMOTION

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

Cob_j	Course Objectives
CObj_1	To familiarize the students about the history, purpose, functions of advertising and ad agencies.
CObj_2	To understand the role of media and functioning of advertising agency
CObj_3	To know the important function and tools of Sales Promotion

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand the history of advertising and the operations of advertising agencies
CO2	Analyses the role of media, media research and how ratings are conducted and knowing about the cost of media.
CO3	Illustrates the skills about the creative strategies implemented by the advertisers and the advertising budget for future transactions.
CO4	Develop the knowledge about the forms and contents of sales promotion.

21 SBC 5.1: SOFT SKILLS FOR BUSINESS

Total Teaching Hours: 30

No. of Hours per Week: 2

(2 credits)

CObj	Course Objectives
CObj_1	Become familiar with the types and forms of communication skills
CObj_2	To understand the importance of public speaking
CObj_3	To identify the business communication skills required in the workplace

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	understand and develop communication skills
CO2	deliver lectures publicly
CO3	Can make effective business communication oral and written

21 VOC 5.1: IT FOR MANAGERS

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the concept of Information Systems used in Business
CObj_2	To understand the basic concepts of ERP Systems and steps in the ERP Life Cycle.
CObj_3	To know E-Governance as an effective tool to manage citizen and resources.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gains understanding of Information System and its types
CO2	Apply the Business Modules of ERP in business organization
CO3	Analyze the E-Commerce applications and methodologies.
CO4	Explore the E-Governance and it's technologies for application

CO5	Demonstrates the requirement of the latest technology and its advantages.
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VI SEMESTER

M21DC 6.1 – ENTREPRENEURSHIP & START-UP MANAGEMENT

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To familiarize the students with the prerequisites to become an entrepreneur and start a business enterprise.
CObj_2	To understand the concepts related to Start up and to know the support extended by the Government of India.
CObj_3	To make the students understand the significance of business plans and to bring awareness regarding financial aspects of new ventures.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	
CO2	Develop a start-up business plan and examine the elements.
CO3	Analyze various funding opportunities for new ventures.
CO4	Develop a business plan and conduct feasibility study.
CO5	Explore the support of central level institutions.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	On successful completion of the course, the students will be able to Understand types of analytics and data models.
CO2	Understand the role of data in decision making, sources and types of Data
CO3	Apply knowledge using different data analytics tools and draw inferences.
CO4	Analyze and apply statistics for business problems.
CO5	Demonstrate visualization of data.

M21DC 6.3: CORPORATE ACCOUNTING

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj_ID	Course Objectives
CObj_1	To understand the concept of underwriting under the regulation of SEBI and assess underwriting commissions, differentiate between marked and unmarked applications, determine underwriters' liability.
CObj_2	To provide a foundational understanding of goodwill and share valuation, emphasizing the essential concepts and practical applications.
CObj_3	To provide comprehensive understanding of mergers and acquisitions, covering types of amalgamations, determining purchase considerations, preparation of post amalgamation balance sheet. Also to update students on recent developments in corporate accounting.

CO_ID	Course Outcomes
	After completion of this module, students should be able to:
CO1	An understanding of the fundamental concepts, regulations, and practices associated with underwriting in financial markets.
CO2	Able to apply various methods for valuation of shares, goodwill.
CO3	Analyzes the factors affecting valuation goodwill and shares.
CO4	Acquires the skills to understand the concepts of mergers and acquisitions and prepare post-merger balance sheets in accordance with Schedule III to the Companies Act 2013.
CO5	Gains insight of recent developments in accounting including Human Resource Accounting and Social Responsibility Accounting.

M21DEF 6.4: INTERNATIONAL FINANCE

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	Aims to knowledge of global financial markets, including foreign exchange markets
CObj_2	To analyze the factors that influence foreign exchange rates and know about foreign exchange risks
CObj_3	To identify the operations of International Financial operations

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands about the global financial markets, including foreign exchange markets, including the international monetary system, methods of payment, and exchange rates.
CO2	Apply theoretical knowledge to identify the instruments of International Financial markets.
CO3	Analyze the functioning of Foreign exchange.
CO4	Contrast and compare the foreign exchange risks
CO5	Demonstrates an understanding about International Financial Institutions and Liquidity

M21DEH 6.4: HUMAN RESOURCE DEVELOPMENT

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To understand the human resource development process, outcomes interventions in improving the knowledge, skills, and competencies of employees
CObj_2	To know the concepts related to organizational development and change process
CObj_3	To learn about the HRD application and trends in improving productivity in workplaces in businesses.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Learn about the HRD process, skills and competencies required to perform a task.
CO2	Understand the HRD programs, such as training and development initiatives that can enhance the knowledge, skills, and abilities of employees.
CO3	Apply the HRD activities in developing training and development programs.
CO4	Analyse HRD role in the organization development and change.
CO5	Demonstrate knowledge on HRD trends in the business place for improved performance.

M21DEM 6.4: CONSUMER BEHAVIOUR

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To understand the basic concepts related to consumer behaviour, consumer decision making process and its applications in the marketing function of firms.
CObj_2	To familiarise the students about the theories and factors influencing consumer behaviour
CObj_3	To acquaint students with the consumer models, customer satisfaction and consumerism

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Able to understand the basic concepts related to consumer behavior
CO2	Understands the theories that determine consumer behaviour
CO3	Able to analyze the influence of psychological, socio-cultural and demographic factors on the consumer decision process
CO4	Able to develop consumer decision making ability to apply in business
CO5	Demonstrate the knowledge on identifying customer satisfaction and gains knowledge about consumerism

21VOC 6.1: DIGITAL MARKETING

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the important concepts related to digital marketing and SEO
CObj_2	To learn the use of display advertising
CObj_3	To be aware of social media marketing and mobile marketing.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gain insights to digital marketing
CO2	Learns about the application of display advertising
CO3	Can apply search engine optimization for business
CO4	Apply social media strategies to solve business problems
CO5	Ability to develop Mobile Marketing in business

21SEC 6.1: INTERNSHIP

Total Teaching

Hours: 30 No. of

Hours per Week: 2

(2 credits)

CObj	Course Objectives
CObj_1	To analyse whether the companies' visions, missions, core values and strategies are in proper alignment
CObj_2	To understand various processes and systems within the company and their related area of operations such as Marketing, Finance, H.R
CObj_3	To learn and familiarize of organizational structure, product and services

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands the companies Visions, missions, core values and strategies. Infer the organization size, structure, product and service and their current state.
CO2	Identifies the various processes and systems within the company and their related area of operations.
CO3	Learns about the core functions of the organizations and develops executive networks by performing the assigned tasks in the organization.
CO4	Analyses the SWOC related to an organization
CO5	Develops interpersonal skills, softskills and leadership skills

T23DC 1.1: MANAGEMENT PRINCIPLES AND PRACTICE

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the functions and responsibilities of managers

CObj_2	To familiarize students with the tools and techniques to be used in the performance of the managerial job.
CObj_3	To enhance students understanding to develop cognizance of the importance of management principles.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Able to demonstrate their understanding of various concepts, principles, and functions of business management.
CO2	Able to Demonstrate the roles, skills and functions of management
CO3	The ability to create organization structures based on authority, task and responsibilities.
CO4	The ability to understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.
CO5	The ability to understand the requirement of good control system and control techniques

T23DC 1.2: FUNDAMENTALS OF BUSINESS ACCOUNTING**Total Teaching Hours: 60****No. of Hours / Week: 04****(04 Credit)**

CObj	Course Objectives
CObj_1	To acquaint students with the accounting concepts, tools and techniques influencing business organizations.
CObj_2	To make the students understand the basic accounting concepts and conventions
CObj_3	To familiarize the students to work with ratio analysis and bank reconciliation statement

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Acquires the knowledge in accounting, system of maintenance of accounts, journal, ledger, bill of exchange, and account current, average due date and bank reconciliation statement. The Ability to pass journal entries and prepare ledger accounts.
CO2	Understand the basic accounting concepts and conventions, preparation of subsidiary books and final accounts, account of Consignment, Joint venture and non-trading concerns.
CO3	Develops the analytical skills in accounting equation, preparation of trial balance and suspense account, normal loss in consignment. Analysing the reasons for differences between pass book and cash book transactions in the Bank Reconciliation Statement.
CO4	Prepare the vertical and Horizontal Analysis and Ratio Analysis.
CO5	Analyse and interpret published financial information.

T23DC 1.3: FUNDAMENTALS OF BUSINESS ANALYTICS

Total Teaching Hours: 60

No. of Hours per week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To achieve and establish vital understanding of big data application in business intelligence.
CObj_2	To institute the concept of systematic transformation of process-oriented data into information of the underlying business process.
CObj_3	To exhibit knowledge of data analysis techniques and to apply principles of data sciences integrating enterprise reporting.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Outline the business analytics role
CO2	Examine the business view of information technology application
CO3	Explain the concepts of OLTP, OLAP and BI
CO4	Demonstrate the data integration and data modelling concepts
CO5	Analyze the concepts of Enterprise reporting and BI in real world also learn to use excel

M210E 1.1: BUSINESS ORGANISATION

Total Teaching Hours: 45

No. of Hours / Week: 03

(3 Credit)

CObj	Course Objectives
CObj_1	To impart the fundamentals of Business Organisation with an objective to develop the basic knowledge of operations and functions of organisation
CObj_2	To enable the use of basic concepts of management in business organization
CObj_3	To have a proper understanding of social responsibility towards business and principles of management

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	An understanding of the nature, objectives and social responsibilities of business
CO2	An ability to describe the different forms of organisations
CO3	An understanding of the basic concepts of management
CO4	An understanding of functions of management
CO5	An understanding of different types of business combinations

21SBC 1.1: DIGITAL FLUENCY

Total Teaching Hours: 30 No. of

Hours 2

(2 Credits)

CObj_ID	Course Objectives
CObj_1	To learn about advanced formulas for business administration
CObj_2	To equip participants with the knowledge to debug and audit the advanced formulas
CObj_3	To explore and analyze data using advanced excel.

CO_ID	Course Outcomes
	After completion of this module, students should be able to:
CO_1	Understands to apply basic principles of laying out excel models for decision making..
CO_2	Examines spread sheet concepts and explore the Microsoft office Excel environment
CO_3	Use excel functions to summarize quantitative data graphically, including pivot table and charts.
CO_4	Gains ability to apply formulas to lay data in readiness for analysis.
CO_5	Explores the best practices by troubleshooting complex models.

T23DC 2.1: BUSINESS ENVIRONMENT

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To familiarise the students with aspects of Business Organization and its Environment.
CObj_2	To identify the definable aspects of business environment within which a business organisation
CObj_3	To develop an insight so as to adapt to the changing trends of the business environment.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand the nature, objectives and forms of business
CO2	Acquire the ability to describe the government and legal environment
CO3	Analyze and Understand the economic and globalisation concepts
CO4	Analyze and understand the technological and natural environment
CO5	Identify the trends in business

T23DC 2.2: POWER BUSINESS INTELLIGENCE

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To become familiar with the Power BI workspace
CObj_2	To import, transform and cleanse data using Power Query Editor
CObj_3	To identify the primary components of the Power BI interface: reports, data, and model views

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Create and share compelling data visualizations.
CO2	Find and integrate data from multiple data sources.
CO3	Enrich data with calculations and other features available in Power BI.
CO4	Review Data Analysis Expressions (DAX) business logic and calculations.
CO5	Explore data acquisition and modeling.

T23DC 2.3: BUSINESS MATHEMATICS

Total Teaching Hours: 60

No. of Hours / Week: 04

(04 credit)

CObj	Course Objectives
CObj_1	To provide basic knowledge of mathematics and their application to Commercial situations.
CObj_2	To make students equipped with the concepts of interest, rate of interest, annuity and instalments
CObj_3	To make students familiar with the concepts of ratio, proportion, variation and percentage.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands the basic concepts of business maths and apply them to create solve and interpret application problems in business
CO2	Solves problems on various types of equation.
CO3	Solves problems on Matrices and execute the laws of indices, law of logarithm and evaluate them.
CO4	Apply the concept of simple interest and compound interest bills discounted etc. and apply them in day-to-day life.
CO5	Solves problems on Arithmetic progression, Geometric progression and construct logical application of these concepts.

M21OE 2.1: PEOPLE MANAGEMENT

Total Teaching Hours: 45

**No. of Hours / Week: 03(3
Credit)**

CObj	Course Objectives
CObj_1	Examine individuals' personality and behaviours to resulting in better management of people in the organisation
CObj_2	Resolve and manage conflicts quickly.
CObj_3	Understand the process of goal setting.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understands diversity at the workplace.
CO2	Apply personal effectiveness through goal setting and time management.
CO3	Design the process of performance appraisal
CO4	Develop the interpersonal relationship and networking.
CO5	Develop the functions and importance of communication.

M21 OE 4.1: Event Management**Total Teaching Hours: 45 Hours****No. of Hours / Week: 03****[03 credit]**

CObj	Course Objectives
CObj_1	To provide the means to compare actual performance in an IT environment against desired performance.
CObj_2	To Provide the entry point for many process and activities of Service Operation
CObj_3	To provide a basis for service assurance, reporting and service improvement.

CO	Course Outcomes
CO1	Students will have the Capability to identify the key characteristics of an event.
CO2	Students can learn to recognize the key management competencies required in the events industry and to use interpersonal and communications skills to pursue career in events industry.
CO3	Students can learn the conceptual framework of Event Management, Event Services, Conducting Event and Managing Public Relations.
CO4	The students will understand: The importance of communication for leadership & decision making.
CO5	The students will acquire competencies to: Plan a proposal on management of an event

M21OE 3.1: Financial Literacy**Total Teaching Hours: 45 Hours****No. of Hours / Week:03****[03 credit]**

CObj	Course Objectives
CObj_1	To familiarize non finance students with the essentials of finance and investments.
CObj_2	To enable the students to use financial data in planning, and decision making
CObj_3	To equip students with general knowledge, basic tools, and techniques for managing their personal finance and investment decisions.

CO	Course Outcomes
CO1	Be able to read, understand and interpret the financial statements of a company.
CO2	Demonstrate an understanding of role and importance of the finance function in business.
CO3	Be able to take investment decisions for their personal portfolio.
CO4	Develop an attitude towards investments and be able to assess risk and returns.
CO5	Be able to apply basic skills in understanding and interpreting....

M21OE 2.1: People Management

Total Teaching Hours: 45 Hours

No. of Hours / Week: 03

CObj	Course Objectives
CObj_1	Examine individuals' personality and behaviours to resulting in better management of people in the organisation
CObj_2	Resolve and manage conflicts quickly.
CObj_3	Understand the process of goal setting.

CO	Course Outcomes
CO1	The students will understand diversity at the workplace.
CO2	Develop personal effectiveness through goal setting and time management.
CO3	Understand the process of performance appraisal
CO4	Develop the interpersonal relationship and networking.
CO5	Understand the functions and importance of communication.

M21OE 1.1: Business Organisation

Total Teaching Hours: 45

No. of Hours / Week: 03

[03 Credit]

CObj	Course Objectives
CObj_1	To impart the fundamentals of Business Organisation with an objective to develop the basic knowledge of operations and functions of organisation
CObj_2	To enable the use of basic concepts of management in business organization
CObj_3	To have a proper understanding of social responsibility towards business and principles of management

CO	Course Outcomes
CO1	An understanding of the nature, objectives and social responsibilities of business
CO2	An ability to describe the different forms of organisations
CO3	An understanding of the basic concepts of management
CO4	An understanding of functions of management.
CO5	An understanding of different types of business combinations

C21DC 1.1: FINANCIAL ACCOUNTING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To acquaint students with the accounting concepts, tools, and techniques influencing Business Organizations.
CObj_2	To Prepare organization's financial accounts (statements) for a specific period of time.
CObj_3	To improve clarity, consistency, and comparability of the communication of financial information.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Develop the skill of recording financial transactions and preparation of reports in accordance with Ind AS.
CO2	Understand and prepare the financial statements required for today's business.
CO3	Understand the concepts and theoretical knowledge of Financial Accounting
CO4	Understand the accounting treatment required for converting a Partnership firm into a Limited company.
CO5	Apply the concept of accounting to find out the profitability at different activity/departmental levels and analyse the same for decision making in business.

C21 DC 1.2 CORPORATE ADMINISTRATION

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To enable students to get familiarized with the existing Company Law and Secretarial Procedure.
CObj_2	To understand the various roles played by top executives.
CObj_3	To familiarize students about the different types of meetings conducted by the company.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Be able to understand the framework of Companies Act of 2013 and different types of companies.
CO2	Be able to identify the stages and documents involved in the formation of companies in India.
CO3	Be able discuss the role, responsibilities and functions of key Management Personnel in Corporate Administration.
CO4	Be able to recognize the procedure involved in the corporate meetings and the role of company secretary in the meeting.
CO5	Be able to draw the role of liquidator in the process of winding up of the company.

C21 DC 1.3: PRINCIPLES OF MANAGEMENT

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To familiarize the students to the concepts and principles of organization management.
CObj_2	To create awareness of the principles to be followed in an organisation
CObj_3	To study the system and process of effective controlling in the organization

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Be able to understand the framework of Companies Act of 2013 and different types of companies.
CO2	Be able to identify the stages and documents involved in the formation of companies in India.
CO3	Be able discuss the role, responsibilities and functions of key Management Personnel in Corporate Administration.
CO4	Be able to recognize the procedure involved in the corporate meetings and the role of company secretary in the meeting.
CO5	Be able to draw the role of liquidator in the process of winding up of the company.

21SBC 1.1: DIGITAL FLUENCY

THEORY

Total Teaching Hours: 30

No. of Hours per Week: 2

(2 credits)

CObj	Course Objectives
CObj_1	To teach participants the advanced formulas as well as how to use which formula for which occasion.
CObj_2	To equip participants with the knowledge on how to debug and audit the advanced formulas
CObj_3	To explore the magic of analyzing data using Advanced Excel.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Examine spread sheet concepts and explore the Microsoft office Excel environment.
CO2	Understand and apply basic principles of laying out excel models for decision making.
CO3	Use excels functions to summarize quantitative data graphically, including pivot table and charts.
CO4	Apply formulas to lay data in readiness for analysis.
CO5	Apply the best practices by troubleshooting complex models.

C210E 1.1 FINANCIAL LITERACY

THEORY

Total Teaching Hours: 42

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the knowledge of financial literacy and to create awareness of the same.
CObj_2	To familiarize with the basic concepts of banking, accounting and insurance sectors.
CObj_3	To provide an awareness on managing personal finance in day-to- day life.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Understand the importance of financial literacy and its implementation of day-to day life.
CO2	Learn the basic accounting, banking and insurance concepts and their usage in daily life transactions.
CO3	Demonstrate an understanding of the different types of banking operations available for customers.
CO4	Recognize and understand the procedure involved in managing personal finance.
CO5	Explain the role of insurance and its importance including benefits.

C21DC2.1: ADVANCED FINANCIAL ACCOUNTING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide students conceptual knowledge of accounting.
CObj_2	To review and understand the accounting tools and techniques influencing business organizations.
CObj_3	To effectively analyze, interpret and use financial statements.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Acquire conceptual knowledge of basics of fire insurance claims.
CO2	Develop the skill of recording the Consignment transactions in the books of Consignor and Consignee and ascertain Profit.
CO3	Identify and analyze the concepts of Joint Venture and prepare different sets of accounts on Joint Venture.
CO4	Familiarize the concept of Branch account and its system.
CO5	Equip with the knowledge of the accounting process and preparation of final accounts.

C21DC 2.2: QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj_ID	Course Objectives
CObj_1	To understand the basic concepts of Mathematics.
CObj_2	To have a proper understanding of mathematical applications in commerce.
CObj_3	To Develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Describe, classify and summarize in commerce and business.
CO2	Apply appropriate descriptive and inferential statistical tools to analyze data and interpret the results.
CO3	Comprehend their understanding and apply sampling techniques to solve business problems in appropriate contexts.
CO4	Apprehend the basics of data analysis and forecasting techniques used in economics and business decisions.
CO5	Draw statistical inferences and communicate the same in quantitative and qualitative terms that aid in decision-making.

C21 DC 2.3: COST ACCOUNTING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To Provide an understanding of basic techniques of cost accounting and to develop the skills necessary to apply those techniques
CObj_2	To provide an understanding of the use of cost accounting techniques in planning, control & decision making.
CObj_3	To provide an understanding of proper recording, presentation of cost data to management for measuring efficiency in cost control & cost reduction.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	To explain relevant cost concepts & classification of costs used in the manufacturing / service sector.
CO2	To explain the purposes of cost accounting
CO3	To apply costing principles in the decision-making process.
CO4	To prepare the production cost statement & cost of goods sold statement.
CO5	To explain the relationship between cost & financial accounting.

C21OE2.1 INVESTING IN STOCK MARKET

THEORY

Total Teaching Hours: 42

No. of Hours per Week: 03

(3 credits)

CObj	Course Objectives
CObj_1	Introduce students to monetary and financial markets in India and examine their structure, operations and products.
CObj_2	Enable the students with a conceptual framework of stock markets and commodity markets.
CObj_3	Develop an understanding of the principles of Investments in securities markets and provide the knowledge and skills required to undertake investments in stock market

CO	Course Outcomes After completion of this course, students should be able to:
CO1	To identify and compare different investment options available for individual investors and to effectively manage their personal finances/investments.
CO2	Understand & interpret the mechanism of investing, investment process and market indices.
CO3	Explain role and nature of stock market and range of services provided by these for individual investors.
CO4	Demonstrate an understanding of mutual fund investments, advantages and disadvantages.
CO5	Understand & interpret the mechanism of investing, investment process and market indices.

C21DC3.1: CORPORATE ACCOUNTING

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To develop analytical skills requires in preparation of consolidated financial statements of a Joint Stock Company and various methods of valuation of shares, liquidators' final statement.
CObj_2	To provide an understanding of the provisions of the Companies Act,2013 including the updated provisions with reference to corporate mergers, acquisitions and other Accounting Standards.
CObj_3	To provide conceptual understanding of corporate accounting and the framework within which the accounting standards underlying the accounting procedures are used to measure business performance.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Able to demonstrate knowledge and skills in preparation of Financial Statements of a company according to the latest provisions.
CO2	Be able to apply various methods for valuation of shares and identify factors affecting it and apply the relevant provisions followed during the liquidation of companies and prepare the liquidator's final statement.

CO3	Apply various standards and principles in a given scenario with the detailed concepts of internal reconstructions, Financial situation and results of operations in an organization.
CO4	Able to develop an ability to apply appropriate standards with reference to corporate mergers and acquisitions for any given situation.
CO5	Be able to apply various methods of purchase consideration for corporate mergers, acquisitions and incorporate in the books of new company.

CO-PO Mapping

C21DC 3.2: QUANTITATE ANALYSIS FOR BUSINESS DECISIONS-II THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of statistics to describe, classify and summarize the data in commerce and business.
CObj_2	To provide the knowledge and skills that are required in the application and analysis of descriptive and inferential statistics and interpret the results in the context of business decisions.
CObj_3	To introduce the basic concepts of probability and sampling techniques and its importance in business decisions.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Describe, classify, and summarize the data for commerce and business purposes.
CO2	Apply appropriate descriptive and inferential statistical tools to analyze data and interpret the results.
CO3	Comprehend their understanding and apply probability laws and sampling techniques to solve business problems in appropriate contexts.
CO4	Apprehend the basics of data analysis and forecasting techniques in economics and business decisions.

C21DC3.3 E-COMMERCE AND DIGITAL MARKETING

Total Teaching Hours: 60

No. of Hours per Week: 04

(4 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of E-commerce framework including emerging technologies used in various Business Models
CObj_2	To familiarize students` with the knowledge of common ethical and legal issues involved in E-commerce
CObj_3	To provide an exposure to various Digital Marketing tools, theories and frameworks

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Be able to understand the basic concepts and technologies used in E-commerce and Business Models.
CO2	Be able to develop and awareness of Ethical, legal and other issues in Ecommerce and their implications on Business
CO3	Demonstrate an understanding of various Digital Marketing tools used in E commerce.
CO4	Demonstrate an understanding of designing various revenue models for efficient E-Business operations.
CO5	Be able to apply various tools and techniques of digital marketing, e payment and other delivery mechanisms necessary to integrate IT Based solutions into the user environment.

21SBC 3 .1: DIGITAL FLUENCY II

(ARTIFICIAL INTELLIGENCE-IOT-CLOUD COMPUTING-CYBER SECURITY)

Theory

Total Teaching Hours: 30

No. Of Hours Per Week: 2

(2 Credits)

CObj	Course Objectives
CObj_1	To provide a basic understanding of Artificial Intelligence and its importance in today's world.
CObj_2	To provide an understanding of cyber security and its importance in protecting internet-connected systems against malicious cyber-attacks.
CObj_3	To provide a basic understanding of cloud computing and other related services over networks.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Demonstrate an understanding of machine languages and learning such as visual perception in decision making.
CO2	To develop a thorough knowledge of cyber security and apply appropriate tools and techniques to protect systems, networks, programs, worms and malicious cyber-attacks.
CO3	Apply and familiarize with services such as Dropbox, resource pooling, using the storage facilities, etc.
CO4	Demonstrate an understanding of IoT, create information about the connected objects, analyse it and make decisions.
CO5	Interpret and apply strong data storage and privacy of data in storage and transit.

C21OE 3.1: MANAGING PERSONAL FINANCE

Total Teaching Hours: 45

No. of Hours per Week: 3

3 credits

CObj	Course Objectives
CObj_1	To Provide an understanding of basic principles of investments, its importance in managing personal finance.
CObj_2	To Provide the knowledge and skills that are required in financial planning and decision making.
CObj_3	To Provide an understanding on various options available for Investing, Creating and Managing personal portfolios.

CO	Course Outcomes
	After completing the course students must be able to:
CO1	Compare and evaluate various options available for investments in terms of their risk and returns.
CO2	Develop appropriate financial decisions in terms of planning personnel budgets, retirement, real estate and insurance plans.
CO3	Apply financial principles to demonstrate practical decision making and understand, manage and plan for personnel saving, expenditure and tax planning.
CO4	Analyze basic economic information in terms of various types of borrowings and examine the risk associated with them
CO5	Plan for the retirement and creating provisions to meet personal contingencies, such as health and other risks.

**Total Teaching Hours:
60 No. of Hours per
Week:04 [4 Credits]**

CObj	Course Objectives
CObj_1	To provide an understanding of the key elements of financial statements, importance, and types of analysis of financial statements.
CObj_2	To provide different Tools and Techniques used for analysis and evaluation of financial statements of listed Companies, predict corporate bankruptcy and prepare reports for decision making.
CObj_3	To familiarize students with various models for assessing credit risk, cash flow statements, off-balance sheet analysis and reporting for business decisions.

CO_ID	Course Outcomes
	After completion of the course students should be able to
CO1	Demonstrate their understanding on various items of financial statements, their importance and types of analysis used in evaluating financial performance of a company.
CO2	Apply, interpret, and analyze the published financial statements, in various decision- making contexts using common size statement analysis, trend analysis, ratio analysis, Du-pont analysis and be able to communicate the results to appropriate authorities.
CO3	Prepare and interpret segmental analysis and inter-firm comparisons through application of appropriate ratios and clearly interpret the result.
CO4	Apply various models such as Altman Z score, credit risk assessment models and predict probable corporate bankruptcy and report the same for further decision making.
CO5	Interpret annual reports and accompany notes in addition to management discussion and analysis to assess the financial performance and efficiency of operations of a company.

Total Teaching Hours: 60

No. of Hours per Week:04

[4 Credits]

CObj	Course Objectives
CObj_1	To develop conceptual understanding of financial management, objective, functions, goals and structure of organization
CObj_2	To provide in depth knowledge of capital structure, investment and dividend decision and familiarize with the required tools to evaluate the same.
CObj_3	To provide an understanding of working capital management, analytical skills to compute the working capital requirements of an organization.
CObj_1	To develop conceptual understanding of financial management, objective, functions, goals and structure of organization

CO	Course Outcomes
	After completion of the course students should be able to
CO 1	To be able to demonstrate the conceptual understanding of capital structure and analyze its impact on earnings of the company
CO 2	Be able to identify various source of short-term finance and apply different techniques in managing working capital requirements.
CO 3	Be able to demonstrate their understanding on dividends decisions and its impact on earning of their company
CO 4	Be able to evaluate the different methods of working capital management
CO 5	Be able to compare and contrast different valuation methods and strategies for corporate restructuring of the organization

C21DC 4.3 – FINANCIAL SYSTEMS AND SERVICES**Total Teaching Hours: 60****No. of Hours per Week: - 04****(4 credits)**

CObj	Course Objectives
CObj_1	To provide an understanding of various products & services offered by banks and financial institutions
CObj_2	To create an awareness of regulatory frameworks with reference to financial sector in India
CObj_3	To provide an understanding of capital market operations in India

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Demonstrate an understanding of the dynamics and framework within which the financial institutions operate in India.
CO2	Recognize the importance and functions of regulatory framework with reference to financial institutions in India.
CO3	Demonstrate an understanding of capital markets and their operations in the Indian context.
CO4	Compare and contrast various financial services available in Indian Financial System.
CO5	Appreciate the role played by technology in financial systems and services in India.

C21OE4.1: BUSINESS ENTREPRENEURSHIP (OPEN ELECTIVE)

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide basic knowledge & skills required to encourage entrepreneurial success in a variety of settings and explain concepts of entrepreneurship in situations in which entrepreneurs act.
CObj_2	To familiarize students with various concepts used in understanding processes involved in entrepreneurship and business formation and to develop a positive attitude towards starting up new business ventures.
CObj_3	To provide an understanding of startups and the stage of the entrepreneurial process, opportunities and the resources needed for the successful development of entrepreneurial ventures and Government initiatives in India.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Identify risks & rewards associated with entrepreneurship and the types of entrepreneurs and the steps involved in an entrepreneurial venture.
CO2	Apply basic knowledge & skills required in starting a venture, running startups, planning & executing new and creative startups including the marketing strategies.
CO3	Identify key factors and apply the entrepreneurial process, command and control, calculated risk-taking and opportunity recognition for business development and tackle the Financial Issues of Startups.
CO4	Demonstrate their understanding of the legal and financial conditions for starting a business venture, and Government Initiatives for Startups in India.
CO5	Develop their personal creativity and entrepreneurial initiative and take up Entrepreneurship as a Profession.

C21 DC 5.1 – ENTREPRENEURSHIP DEVELOPMENT AND SMALL BUSINESS MANAGEMENT**Total Teaching Hours: 60****No. of Hours per Week: - 04****(4 credits)**

CObj	Course Objectives
CObj_1	To provide understanding of the basic concepts of entrepreneurship and small business enterprise.
CObj_2	Knowledge about the functions on entrepreneurial activities and their prerequisites under practical conditions.
CObj_3	An understanding of the value of mentorship and the success of an entrepreneur and their ventures.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Develop awareness about entrepreneurship and successful entrepreneurs.
CO2	Summarize the creative problem-solving technique and types of innovation.
CO3	Build their competence to identify the different sources of finance available for start-ups and relate their role in different stages of business.
CO4	Explore the entrepreneurial skills and management function of a company with special reference to SME sector.
CO5	Develop and entrepreneurial mindset by learning key skills and to explore marketing methods and new trends in entrepreneurship.

C21DC5.2 MANAGEMENT ACCOUNTING

Total Teaching Hours: 60

No. of Hours per Week: - 04

(04 credits)

Cobj	Course Objectives
CObj_1	A rational and critical approach to current Management Accounting practices.
CObj_2	Management Accounting techniques in the areas of planning, control, and decision-making.
CObj_3	An understanding of the use, interpretation, and analyze Management Accounting information, while critically appraising the use of such information.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Assess the impact of an accounting control system within organizations.
CO2	Demonstrate an understanding of the role of management accounting in planning and decision making.
CO3	Apply relevant quantitative and qualitative information requirements and appropriate techniques for decision-making in various scenarios.
CO4	Examine, analyze and interpret the data for planning and cost control using Budgeting, CVP, and other techniques.
CO5	Understand the various recent trends, emerging areas, and contemporary issues in Management Accounting.

C21 DC 5.3: Income Tax Law & Practice - I

THEORY

Total Teaching Hours: 60

No. of Hours per Week: - 4

(4 credits)

CObj	Course Objectives
CObj_1	Provide students to gain knowledge about the provisions of Indian Income Tax Act, 1961.
CObj_2	Familiarize students about Powers and Functions of Central Board of Direct taxes.
CObj_3	Provide an understanding of deductions under the Head Salary U/S 16 and House Property U/S 24.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	After completion of the course, the students will have a complete understanding of rules to gross up the securities.
CO2	Understand the provisions relating to the heads Income of salary, house property and other sources incomes.

CO3	Demonstrate their understanding in terms for computing Residential Status of an Individual.
CO4	Enable them to understand various exemptions U/S 10 of Income Tax Act, 1961.
CO5	Develop the understanding of TDS rate for calculating casual incomes and Interest on securities.

C21DCA5.4 (ACCOUNTS ELECTIVE) - COST MANAGEMENT

Total Teaching Hours:

No. of Hours per Week: - 04

[04 credits)

CObj	Course Objectives
CObj_1	Skills relevant to cost management techniques in the areas of planning, controlling, and decision-making.

CObj_2	Information to use, interpret and analyze the cost reduction techniques, while critically appraising the use of such information.
CObj_3	Awareness of the recent trends in the field of cost.

CO	Course Outcomes After completion of this module, students should be able to
CO1	Understand some of the important techniques of costing methods applicable to services and the construction industry
CO2	Assess the impact of cost management/ cost reduction techniques in profit maximization within the organizations.

CO3	Demonstrate and apply relevant quantitative information requirements and appropriate cost reduction techniques to decision-making scenarios using ABC, Standard Costing, and JIT.
CO4	Analyze and interpret the equilibrium cost of the product using cost-reduction techniques.
CO5	Understand the various recent trends, emerging areas, and contemporary issues in cost management.

Total Teaching Hours: 45

No. of Hours per week: 3

(3 credits)

CObj	Course Objectives
CObj_1	Develop an understanding of the nature and significance of security analysis and portfolio management.
CObj_2	Expose students to contemporary approaches to security analysis and portfolio management.
CObj_3	Enable students to evaluate the risk and return associated with investments and select the right mix to construct optimal portfolios.

CO	Course Outcomes After completion of this course, students should be able to:
CO1	Demonstrate an understanding of relevant theories, concepts and frameworks of investment management, stock trading mechanics and asset allocation that will equip students with skills of analysis, evaluation and synthesis to develop various investment decisions.
CO2	Apply and analyze bond valuation models and predict the present value of various types of bonds.
CO3	Apply and examine the relevant concepts and models to analyze the historical behavior of various stocks in the market and investigate the risk-return profile of individual securities.
CO4	Compare the intrinsic value of securities with that of the market value for taking investment decisions.
CO5	Evaluate the risk and return associated with investments, use relevant theories, and select the right mix to construct an optimal portfolio.

**21VOC5.1 GOODS AND SERVICES TAX
THEORY
Total Teaching Hours: 45
No. of Hours per Week: - 3
(3 credits)**

CObj	Course Objectives
CObj_1	Analyze and evaluate the effect of indirect taxes on consumers, producers, and government.

CObj_2	Acquaint students with principles underlying the provisions of indirect tax laws
CObj_3	Enhance capability to apply theoretical knowledge in practical situation.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Acquire conceptual knowledge of indirect tax
CO2	Enable students to compute transaction value and tax liability
CO3	Enable students to understand the procedure to compute the tax liability of assesses
CO4	Apportion input tax with CGST, SGST, UTGST & IGST.
CO5	Enable students to assess GST Returns

21SBC5.1: TALLY PRIME

Total Teaching Hours: 30

No. of Hours per week:03

(3 credits)

CObj	Course Objectives
CObj_1	Expose students to digitally apply the accounting techniques and prepare financial statements using tally prime.

CObj_2	The knowledge regarding concepts of financial accounting and their preparations in terms of creating vouchers, payments in the tally prime.
CObj_3	The student's ability to use tally in order to equip them with required employable and transferable skills.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Master tally prime in terms of creating, recording classifying all the accounting transactions of business concerns.
CO2	Develop competency in terms of handling all the accounting work including finalization of company accounts.
CO3	Demonstrate their understanding in terms of generating and filing GST returns for various business organizations.
CO4	Develop students' ability to operate to accounting package in the entire accounting process
CO5	Master tally prime for making E- payments and generating reports.

C21 DC 6.1 ADVANCED MANAGEMENT ACCOUNTING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide a rational and critical approach to current management accounting practices.
CObj_2	To impart management accounting techniques in the areas of planning, control, and decision-making.
CObj_3	To create an understanding of the management accounting information and thus to interpret and analyze the information and while critically appraising the benefits of such information.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Demonstrate an understanding of the strategic role of the Management Accountant in the control system of organizations.
CO2	Examine, analyze, and interpret the data for planning and evaluating risk and uncertainty using sensitivity analysis, decision tree analysis and other techniques.
CO3	Apply relevant quantitative and qualitative information requirements and appropriate techniques for pricing strategies in various scenarios of an organization
CO4	Evaluate and forecast the cost of the product/order and able to take decision for cost reduction & profit maximization.
CO5	Analyze the various recent trends, emerging areas, and contemporary issues in performance measurement.

C21 DC 6.2 – PRINCIPLES AND PRACTICE OF AUDITING

Total Teaching Hours: 60
No. of Hours per Week: - 04
(4 credits)

CObj	Course Objectives
CObj_1	To develop an appreciation of the need for and requirement of auditing to categories of stakeholders in Indian context.
CObj_2	To impart knowledge of the various techniques of auditing and auditing standards used by professional auditors.
CObj_3	To provide an understanding of the entire process of external auditing and the duties, responsibilities, and liabilities of a company auditor.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Assess consistency and appropriateness of auditing concepts used in financial statements within the context of local and national regulatory environment.
CO2	Develop audit procedures for key items in financial statements based on underlying principles and practices.
CO3	Appraise the professional provisions (auditing standards and ethical guidelines) that constitute the regulatory framework for the conduct of external auditing.
CO4	Analyze the contents of audit report and relevance of their inclusion primarily to the shareholders.
CO5	Familiarize the students of the audit procedure of different types of undertakings.

C21 DC 6.3 INCOME TAX LAW & PRACTICE - II

Total Teaching Hours: 60 No. of

Hours per Week: - 04

(04 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the various provisions related to income from Business and Profession and Capital Gains as per Indian Income Tax Act, 1961.
CObj_2	To create an understanding about Powers and Functions of the Central Board of Direct Taxes.
CObj_3	To provide an understanding of various deductions that are available u/s 80 C to 80 U including setting off and carrying forward of losses as per the new regime.

CO	Course outcomes
	After completion of this module, students should be able to:
CO1	Apply appropriate provisions related to computation of tax liability under the heads of Income from Business and Profession and Income from Capital Gains.
CO2	Develop an understanding of the functions and powers of CBDT, Appellate Tribunal and understand the duties and responsibilities of various Authorities under CBDT.
CO3	Develop an understanding of various provisions, exemptions u/s 54 to 54F of the Assessment procedure.
CO4	Apply appropriate procedures in computation of various deductions u/s 80C to 80U of Income Tax Act 1961.
CO5	Develop an understanding to apply provisions of set off and carry forward of the losses with respect to individual Assessee.

C21 DCA 6.4 – Indian Accounting Standards-1

Total Teaching Hours: 45

No. of Hours per Week: - 03

(3 credits)

CObj	Course Objectives
CObj_1	To develop an understanding of the nature and significance of Indian Accounting Standards
CObj_2	To expose students to contemporary approaches to the various standards being adopted in accounting
CObj_3	To enable students to evaluate the various provisions available in the Indian Accounting Standards.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Demonstrate the need and benefits of accounting standards.
CO2	Prepare the financial statements as per Indian Accounting standards
CO3	Comprehend the requirements of Indian Accounting Standards for recognition, measurement and disclosures of certain items appear in financial statement
CO4	Analyze the Accounting Standards for Items that do not Appear in Financial Statements
CO5	Interpret the provisions of various liabilities according to the accounting standards

C21 DCF 6.4 INVESTMENT MANAGEMENT

Total Teaching Hours: 45

No of Hours per Week: - 03

(3 credits)

CObj	Course Objectives
CObj_1	To develop an understanding of the nature and significance of investments
CObj_2	To expose students to contemporary approaches to risk and returns
CObj_3	To enable students to evaluate the valuation of various securities and interpret the various techniques adopted

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Demonstrate the concept of investments, its features and various instruments.
CO2	Comprehend the functioning of secondary market in India
CO3	Analyze the concept of risk and return and their relevance in purchasing and selling of securities.
CO4	Interpret the valuation of securities and finding out the values for purchase and sale of securities.
CO5	Demonstrate the fundamental analysis to analyze the company for purchase and sale of securities and technical analysis for trading in the share market.

C21 SBC 6.1 – CYBER SECURITY

Total Teaching Hours: 45

No. of Hours per Week: - 03

(3 credits)

CObj	Course Objectives
CObj_1	To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.
CObj_2	To systematically educate the necessity to understand the impact of cyber-crimes and threats with solutions in a global and societal context.
CObj_3	To expose students to governance, regulatory, legal, economic, environmental, social and ethical contexts of cyber security.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Develop a deeper understanding and familiarity with various types of cyber-attacks, cyber-crimes, vulnerabilities and remedies thereto.
CO2	Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
CO3	Analyse and evaluate existing legal framework and laws on cyber security.
CO4	Analyse and evaluate the security aspects of social media platforms and ethical aspects associated with use of social media.
CO5	Increase awareness about cyber-attack vectors and safety against cyber-frauds.

B21DC 1.1: DISCRETE STRUCTURES**THEORY****Total Teaching Hours: 45****No. of Hours per Week: 3****(3 credits)**

CObj	Course Objectives
CObj_1	To provide a strong understanding of the concepts of sets, relations and functions.
CObj_2	To provide good foundation of probabilities and statistical analysis
CObj_3	To distinguish between discrete and continuous random variables and to compute probabilities using discrete and continuous distribution.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate the basic principles of sets and operations, relations and functions, mathematical induction.
CO2	Implement propositional and counting principles.
CO3	Apply the recurrence relations in computer science specific problem domains.
CO4	Compute probabilities using discrete and continuous distribution and apply in real world problems.
CO5	Implement practical solutions using graph theory.

**B21DC 1.2: PROBLEM SOLVING TECHNIQUES USING C
THEORY**

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To inculcate necessary skills, design algorithms and flowcharts for developing applications to solve real world problems.
CObj_2	To provide appropriate knowledge of structured programming concepts using C.
CObj_3	To inculcate the ability to develop modular programs and small projects in C.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Devise algorithms and draw flow charts to provide solutions to problems.
CO2	Develop C programs by using the program constructs efficiently.
CO3	Apply proper data structure to efficiently store and retrieve data in memory.
CO4	Design modular programs to solve real world problems.
CO5	Create mini projects in C

**B21DC 1.3: DATA STRUCTURES
THEORY**

**Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge on storing and managing data in various structures
CObj_2	To emphasize the importance of data structures in developing and implementing efficient algorithms
CObj_3	To provide an understanding of the operations on different data structures and their applications

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the concepts, types and operations of data structures
CO2	Sort, search and implement higher order data structure using arrays.
CO3	Apply concepts of dynamic memory allocation, linked list in developing solutions to real world problems
CO4	Apply the concept of Stacks and Queues in real world applications
CO5	Identify and apply appropriate graph and tree data structure to solve a given problem.

**21SBC 1.1: OFFICE MANAGEMENT TOOLS
PRACTICALS
Total Teaching Hours: 30
No. of Hours per Week: 2
(2 credits)**

CObj	Course Objectives
CObj_1	To provide hands-on experience on word processing
CObj_2	To impart the skills to work on data using spreadsheets
CObj_3	To equip the skills to design presentations

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of creating formatted documents
CO2	Acquire skills to analyze data using spreadsheets
CO3	Design attractive presentations
CO4	Create charts in spreadsheets and visualize the data
CO5	Demonstrate an understanding of the usage of common shortcut keys in the office management tools

COMPUTER SCIENCE OPEN ELECTIVE FOR FIRST SEMESTER

B21OE1.1: OFFICE AUTOMATION AND DESIGNING

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide hands-on experience on word processing
CObj_2	To impart skills to work on data using spreadsheets
CObj_3	To instill skills to design presentations

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Create formatted documents.
CO2	Analyze and interpret data using spreadsheets.
CO3	Design attractive presentations.
CO4	Create charts in spreadsheets and visualize the data.
CO5	Demonstrate the usage of common shortcut keys in the office management tools.

**B21DC 2.1: COMPUTER ARCHITECTURE
THEORY**
Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the basic concepts and structure of computers and concepts of Instruction code and computer register.
CObj_2	To instill knowledge of different types of addressing modes and data transfer techniques.
CObj_3	To provide knowledge of the memory hierarchy and types in computer architecture and concepts of parallel computing.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the fundamental concepts of electronics.
CO2	Demonstrate an understanding of the functional units of a processor.
CO3	Develop an understanding on the addressing modes, instruction formats and program control statements.
CO4	Demonstrate a good understanding of system memory hierarchy.
CO5	Apply the basic concept of parallel computing.

**B21DC 2.2: OBJECT ORIENTED PROGRAMMING USING JAVA
THEORY**

**Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge of object-oriented programming concepts using Java
CObj_2	To instill the skills to create graphical user interface using graphical tools
CObj_3	To provide knowledge for designing and implementing console based and GUI based Java applications.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate a good understanding of object oriented concepts using java.
CO2	Design, write, and test Java programs to provide solutions to a given problem.
CO3	Design and implement console based and GUI based Java applications
CO4	Create multithreaded applications and animations in Java
CO5	Apply the acquired skills to implement object-oriented projects using Java

**B21DC 2.3: DATABASE MANAGEMENT SYSTEMS
THEORY**

**Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)**

CObj	Course Objectives
CObj_1	To provide knowledge on organizing and maintaining data in a database.
CObj_2	To provide an understanding of the mathematical principles and concepts implemented in DBMS.
CObj_3	To impart knowledge on storing, manipulating and retrieving data efficiently and effectively using DBMS.

CO	Course Outcomes
	After completion of this module, students should be able to:

CO1	Demonstrate an understanding of the fundamental elements of relational database management systems.
CO2	Apply the concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	Design ER-models to represent database applications effectively to solve societal problems.
CO4	Formulate SQL queries to handle data in relational databases and apply the acquired skills to solve research problems.
CO5	Create database designs, applying normalization and familiarize with transaction processing.

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COMPUTER SCIENCE OPEN ELECTIVE FOR SECOND SEMESTER

B21OE2.1: CYBER SPACE

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of cyberspace and role of social media in cyberspace.
CObj_2	To create an awareness on IT Act 2000/2008 including their pros and cons.
CObj_3	To provide basic understanding of concepts such as Digital Signature, Electronic Signature, e-commerce, and e-governance.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the various cyber laws and the importance of the current cyber law in force.
CO2	Develop an awareness on cyber rules and regulations and security issues
CO3	Develop an understanding of the concepts of Digital Signature, Electronic Signature, e-commerce, and e-governance and the associated benefits and drawbacks.
CO4	Develop an insight into accountability in the governance process.
CO5	Effectively apply the knowledge of search engines and social media platforms.

**B21DC 3.1 : OPERATING SYSTEM
THEORY**

Total Teaching Hours: 45

**No. of Hours per Week: 3
(3 credits)**

CObj	Course Objectives
CObj_1	To provide knowledge of basic concepts and functions of operating systems
CObj_2	To instill an understanding of the different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system
CObj_3	To familiarize the concepts of file management and secondary storage management.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Analyze different types of Operating Systems
CO2	Analyze process scheduling algorithms and synchronization techniques to achieve better performance of a computer system
CO3	Demonstrate an understanding of the Mutual exclusion concept, Deadlock detection and agreement protocols of an operating system
CO4	Develop an understanding of various memory management techniques in Operating system
CO5	Demonstrate an understanding of the various techniques of file management and secondary storage management

B21DC 3.2: COMPUTER NETWORKS**THEORY****Total Teaching Hours: 45****No. of Hours per Week: 3****(3 credits)**

CObj	Course Objectives
CObj_1	To provide an understanding of the fundamental concepts of computer networking
CObj_2	To impart knowledge of the basic concepts of layered models and fundamental protocols
CObj_3	To instill knowledge of implementation concepts in congestion control, error detection and routing

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Assimilate the features of computer networks, protocols, and network design models
CO2	Comprehend the fundamental characteristics of the physical layer and analyze the design issues of data link layer, link layer protocols, bridges and switches
CO3	Evaluate different error detection and correction methods required for error control
CO4	Apply appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for designing a network
CO5	Demonstrate an understanding of network topologies, functions and protocols of the OSI layers in order to design networks for given situations

B21DC 3.3: PYTHON PROGRAMMING**THEORY****Total Teaching Hours: 45****No. of Hours per Week: 3****(3 credits)**

CObj	Course Objectives
CObj_1	To provide an Understanding of the features of Python Programming language
CObj_2	To instill the ability to implement file handling and database handling in python
CObj_3	To impart the knowledge to create projects using Python

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Apply the concepts of lists, tuples, functions, and classes for various python applications
CO2	Analyze different python built in libraries and implement aspects like exceptions, regular expressions and functions.
CO3	Demonstrate an understanding of the database and file handling in python
CO4	Evaluate mathematical operations using NumPy and Pandas in python
CO5	Create file and database accessing applications using python.

21SBC 3.1: PC ASSEMBLING AND TROUBLESHOOTING

Total Teaching Hours: 30

No. of Hours per Week: 2

(2 credits)

CObj	Course Objectives
CObj_1	To impart basic knowledge in computer hardware and peripherals installation and PC assembly
CObj_2	To provide the skills in troubleshooting and maintenance
CObj_3	To impart knowledge in system management, backup and disaster prevention

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Acquire hands-on experience in PC assembling
CO2	Demonstrate an understanding of Linux and Windows Operating systems installation
CO3	Comprehend PC maintenance and troubleshooting
CO4	Perform backup and recovery of files
CO5	Demonstrate an understanding of system management and disaster prevention

B21DC 4.1: SOFTWARE ENGINEERING

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases.
CObj_2	To provide an idea of using various process models in the software industry according to given circumstances
CObj_3	To provide an Understanding of the role of project management including planning, scheduling, risk management, etc.

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the process models of the Software Development Life Cycle (SDLC) and implement appropriate models to develop projects to solve real world problems.
CO2	Analyze the concept of Design architecture, Design principles, Design quality and software prototyping.
CO3	Develop applications using Object Oriented and Function oriented approach
CO4	Gain expertise in designing User Interfaces, adopting reuse-driven approaches in software development, and ensuring software reliability.
CO5	Apply the knowledge gained on testing process to test software products

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**B21DC 4.2: ARTIFICIAL INTELLIGENCE
THEORY**

**Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge about Artificial Intelligence and understand the basic principles of Artificial Intelligence in various applications
CObj_2	To understand the various approaches of knowledge representations and to enable computers to perform such intellectual tasks as decision making, problem solving
CObj_3	To provide knowledge on Expert systems and to implement the AI concepts using prolog

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of Artificial intelligence concepts and techniques
CO2	Apply basic principles of AI in solutions that require problem solving
CO3	Apply knowledge on representing simple facts by predicate logic
CO4	Design and implement expert systems to solve real world problems
CO5	Comprehend Prolog for implementation of Artificial intelligence concepts

**B21DC 4.3: INTERNET AND WEB TECHNOLOGIES
THEORY**

**Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge on Web & Internet technologies
CObj_2	To provide an understanding of the fundamental tools and technologies for web design
CObj_3	To instill knowledge on client/server relationships in the context of the Internet

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the technological foundations of the Internet and core Internet protocols
CO2	Demonstrate an understanding of the basic working scheme of the Internet and World Wide Web
CO3	Integrate suitable JavaScript functions and develop real time web application
CO4	Apply CSS and design attractive web applications
CO5	Create XML documents and Schemas

**B21DC 5.1: DESIGN AND ANALYSIS OF ALGORITHMS
THEORY**

**Total Teaching Hours: 60
No. of Hours per Week: 4
(4 credits)**

CObj	Course Objectives
CObj_1	To gain ability to compute the time and space complexity of algorithms
CObj_2	To identify most suitable algorithm for a given task by comparing the time and space complexities of various algorithms
CObj_3	To impart knowledge on various algorithm design techniques and applications

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the computation of time and space complexities of algorithms.
CO2	Demonstrate an understanding of various designing paradigms in formulating algorithms.
CO3	Analyze various sorting, searching and traversal techniques.
CO4	Solve graph related problems using design techniques and also apply design techniques to solve real world problems
CO5	Create effective algorithms based on different design techniques

**B21DC 5.2 DATA ANALYTICS
THEORY**

**Total Teaching Hours: 60
No. of Hours per Week: 4
(4 credits)**

CObj	Course Objectives
CObj_1	To provide a strong understanding of techniques used for data analysis
CObj_2	To impart knowledge on statistical tools and techniques
CObj_3	To instill the capability to collect, transform, and organise data in order to make informed business decisions

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the basics of data and the statistical knowledge required in the field of data analytics
CO2	APPLY various inferential statistical analysis techniques to describe data sets and make useful predictions
CO3	Analyze the data analytics techniques using various tools
CO4	Perform prediction using regression analysis
CO5	Competently identify advanced techniques to perform insightful analysis and interpret the results

1.

**B21DC 5.3: WEB PROGRAMMING
THEORY**

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide a strong foundation of the concepts used in creating an effective web page including an in-depth knowledge of web application architecture
CObj_2	To impart knowledge on server-side scripting language, PHP
CObj_3	To create a strong base in web application development with Database connectivity

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the web application architecture and its components
CO2	Analyze the different data types and control structures in PHP and use them appropriately while designing web applications
CO3	Apply the knowledge of object oriented programming concepts on server side scripting languages
CO4	Design and develop web applications with database connectivity

CO5	Create dynamic web pages using server side scripting languages
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21VOC5.1: ACCOUNTING AND FINANCIAL MANAGEMENT**THEORY****Total Teaching Hours: 45****No. of Hours per Week: 3****(3 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge on the basics of accounting concepts and its functions.
CObj_2	To provide knowledge on the Financial Accounting process.
CObj_3	To instill skills on working on trading, profit and loss, balance sheets.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Comprehend accounting concepts and its functions.
CO2	Demonstrate an understanding of the financial accounting process.
CO3	Develop an understanding of the preparation of Final accounts and apply it.
CO4	Prepare trial balance.
CO5	Apply the accounting process in accounting packages.

B21DCE5.6: DATA MINING

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide a strong understanding of data mining and preprocessing techniques
CObj_2	To impart knowledge on various classification and clustering techniques
CObj_3	To instill the capability to collect, transform, and organize data in order to make informed business decisions

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the concepts of data mining and gain the ability to extract interesting patterns from large amounts of data
CO2	Apply preprocessing methods for any given dataset.
CO3	Explore various clustering techniques and employ appropriate method to group the unknown data.
CO4	Compare classification techniques and apply in classification of real time datasets.
CO5	Comprehend the kinds of patterns that can be discovered by association rule mining

1.

B21DCE5.7 : COMPUTER GRAPHICS

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To impart knowledge on the fundamental concepts and theory of computer graphics
CObj_2	To provide a good understanding of graphics input techniques and output primitives
CObj_3	To introduce to students the concept of 2D and 3D transformations

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the graphics system and applications of computer graphics
CO2	Apply and compare the algorithms for drawing 2D images.
CO3	Apply 2D transformations to solve problems.
CO4	Analyze and apply clipping algorithms and transformation on 2D images
CO5	Apply 3D transformations to design applications.

21SBC5.1: CYBER CRIME AND CYBER LAW

THEORY

Total Teaching Hours: 30

No. of Hours per Week: 2

(2 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the cyber world and cyber law in general
CObj_2	To provide an understanding about the various dimensions/aspects of cyber crimes and cyber laws
CObj_3	To create an awareness on IT Act 2000/2008

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of the various types of cyber crimes.
CO2	Comprehend the various types of cyber-attack.
CO3	Demonstrate an understanding of types and techniques of credit frauds and attacks on mobile devices.
CO4	Develop an understanding of the cyber laws and IT Act 2000/2008.
CO5	Demonstrate an understanding of the procedure and investigation of cyber crimes.

B21DC 6.1: THEORY OF COMPUTATION

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To impart knowledge of the concept of machines: finite automata, pushdown automata, and Turing machines.
CObj_2	To provide a strong foundation on the formal languages and grammars
CObj_3	To instill the ability to design Turing machines for any computational problem.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the central concepts of Automata theory and design different finite automata models for Regular languages.
CO2	Define regular languages, apply regular expressions, and demonstrate the ability to prove non-regular languages using the Pumping Lemma.
CO3	Apply different grammar rules to derive required strings and design parse trees to check ambiguity in grammar.
CO4	Design pushdown automata for context free languages and demonstrate the ability to prove non-context-free languages using the Pumping Lemma.
CO5	Create Turing machines, develop an understanding of the programming techniques for Turing Machines and limitations of computational problems that have no solutions.

B21DC 6.2: MACHINE LEARNING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide a strong concepts of different types of learning
CObj_2	To impart critical understanding of classification and regression models
CObj_3	To provide strong knowledge of dimensionality reduction techniques

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend supervised, unsupervised and reinforcement learning.
CO2	Apply the appropriate machine learning strategy for any given problem.
CO3	Design machine learning algorithms to improve classification efficiency.
CO4	Create Ensemble models to improve performance of the classifier.
CO5	Apply dimensionality reduction on high dimensional datasets.

1.

B21DC 6.3: MOBILE APPLICATION DEVELOPMENT

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	Focuses on developing applications for modern Smartphone operating systems such as Google's Android and Microsoft's Windows.
CObj_2	Provide rapid application development techniques are covered, as well as setup of the development environment, real-world testing, and deployment.
CObj_3	Provide a practical approach to Android mobile application development and theoretical knowledge.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the concepts in mobile applications development
CO2	Build user interface for mobile applications.
CO3	Design mobile applications with different views and build apps useful for society.
CO4	Implement the knowledge gained to access and store data in files from a mobile application in providing solutions to real world problems.
CO5	Apply the acquired knowledge on database access to create mobile applications accessing databases.

21VBC6.1 : COMPUTER ANIMATION

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To instill the principles and fundamentals of Animation
CObj_2	To provide an understanding of motion and 2D animation.

CObj_3	To impart knowledge on 3D modeling
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CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the fundamentals of animation and roles of an animator.
CO2	Demonstrate an understanding of the principles and tools of animation.
CO3	Develop an understanding of motion studies and 2D animations.
CO4	Create various 3D models.
CO5	Become proficient to create 2D and 3D animations.

1.

**B21DCE6.5 : OPERATIONS RESEARCH
THEORY**
Total Teaching Hours: 45
No. of Hours per Week: 3
(3 credits)

CObj	Course Objectives
CObj_1	To provide knowledge of Linear Programming and Assignment problems
CObj_2	To impart knowledge on different transportation problems
CObj_3	To instill skills on applying strategies used in game theory and perform project evaluation

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Become competent in solving linear programming problems.
CO2	Analyze and apply transportation problems in real world scenarios.
CO3	Analyze and apply assignment problems in real world scenarios.
CO4	Become proficient in project evaluation and review techniques.
CO5	Apply strategies used in game theory to solve real world problems.

1.

**B21DCE6.6 : IMAGE PROCESSING
THEORY**

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide knowledge of image processing fundamentals
CObj_2	To impart knowledge on various image enhancement techniques
CObj_3	To instill skills on different image restoration techniques and methods used in digital image processing

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Demonstrate an understanding of sensing, acquisition, and storage of digital images
CO2	Develop an understanding of the image processing fundamentals and mathematical transforms necessary for it.
CO3	Apply image enhancement techniques wisely.
CO4	Demonstrate an understanding of the noise and filters in image processing and implement the filters wisely on images.
CO5	Demonstrate an understanding of the image segmentation concepts.

B.Sc. (Electronics & Computer Science)

SEMESTER – I

S21CS 1.1 : PROBLEM SOLVING TECHNIQUES USING C

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To inculcate necessary skills to design algorithms and flowcharts for developing applications in order to solve real world problems
CObj_2	To provide good knowledge of structured programming concepts using C apply the concepts wisely
CObj_3	To possess the ability to develop modular programs in C and subsequently develop small projects in C

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gain knowledge to devise algorithms and draw flow charts in order to design solutions to problems
CO2	Develop efficient C programs by using the program constructs wisely
CO3	Apply proper data structure to efficiently store and retrieve data in memory
CO4	Gain ability to design modular programs to solve real world problems
CO5	Capability to create C programs for real world applications by applying suitable constructs and modularity

1.

S21CS 1.2 : C PROGRAMMING LAB**PRACTICAL****Total Teaching Hours: 60****No. of Hours per Week: 4****(2 credits)**

CObj	Course Objectives
CObj_1	To impart practical knowledge of structured programming concepts using C
CObj_2	To provide the ability to implement the derived data types using C language
CObj_3	To inculcate the ability to develop modular programs in C

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Become competent to develop C programs by gaining a thorough understanding of control structures.
CO2	Capability to wisely use the program constructs and develop efficient C programs
CO3	Acquire practical knowledge of efficiently storing data in memory and retrieving it through a careful analysis of suitable data structures.
CO4	Capability to design modular programs to solve real world problems
CO5	Capability to develop C programs for real world applications by applying suitable constructs and modularity

SEMESTER – II**S21CS 2.1 : DATA STRUCTURES****THEORY****Total Teaching Hours: 60****No. of Hours per Week: 4****(4 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge on storing and managing data in various structures
CObj_2	To emphasize the importance of data structures in developing and implementing efficient algorithms
CObj_3	To understand the operations on different data structures and their applications

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Gain good understanding of the concepts, types and operations of data structures
CO2	Acquire skills to implement sorting, searching and implementation of higher order data structure using arrays
CO3	Understand the concept of dynamic memory allocation, types of linked lists and gain the ability to use linked list in developing solutions to real world problems
CO4	Apply the concept of Stacks and Queues in real world applications
CO5	Analyze and apply graph and tree data structure in the problems where non-linear data structures are required

S21CS 2.2 : DATA STRUCTURES LAB

PRACTICAL

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
CObj_1	To provide practical knowledge of storing and managing data in various structures
CObj_2	To understand the importance of data structures and practically implementing efficient algorithms
CObj_3	To instill the ability to practically implement the operations on different data structures and their applications

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Implement memory-efficient data structures.
CO2	Apply recursion to solve problems related to data structures.
CO3	Develop problem-solving skills by applying data structures to solve algorithmic challenges.
CO4	Apply appropriate data structures to solve real-world problems and algorithms
CO5	Analyze and apply graph and tree data structure in the problems where non-linear data structures are required

SEMESTER – III

S21CS 3.1: OBJECT ORIENTED PROGRAMMING USING JAVA

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To impart knowledge of object-oriented programming concepts using Java
CObj_2	To instill the skills to create graphical user interface using graphical tools
CObj_3	To provide the knowledge to design and implement both console based and GUI based Java applications

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gain good knowledge of object oriented concepts using java
CO2	Acquire skills to design, write, and test Java programs to implement solutions to the given problem specifications
CO3	Ability to design and implement both console based and GUI based Java applications
CO4	Gain capability to develop multithreaded applications and animations in Java
CO5	Acquire skills to implement object-oriented projects using Java

S21CS 3.2 : JAVA LAB

PRACTICAL

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
CObj_1	To provide clarity on fundamentals of Java programming
CObj_2	To impart good knowledge of object-oriented concepts through programming
CObj_3	To instill the skills to design and implement GUI based Java applications

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Attain a solid understanding of object-oriented concepts through the use of Java.
CO2	Analyze the real-world problem and solve it by implementing appropriate java constructs
CO3	Proficiency in implementing console-oriented and GUI-oriented designs and develop suitable java applications
CO4	Gain capability to develop multithreaded applications and animations in Java
CO5	Develop the competence to effectively manage and complete object-oriented projects using Java.

SEMESTER – IV
S21CS 4.1: OPERATING SYSTEM
THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide strong knowledge of basic concepts and functions of operating systems
CObj_2	To instill an understanding of the different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system
CObj_3	To comprehend file management and secondary storage management

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Assimilate knowledge of the structure of OS and basic architectural components involved in OS design
CO2	Analyze different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
CO3	Acquire Knowledge in Mutual exclusion, Deadlock detection and agreement protocols of an operating system
CO4	Acquire skills in file management and secondary storage management
CO5	Conceptualize the components involved in designing a contemporary OS

S21CS 4.2 : UNIX LAB**PRACTICAL****Total Teaching Hours: 60****No. of Hours per Week: 4****(2 credits)**

CObj	Course Objectives
CObj_1	To impart knowledge on the features and functions of Unix operating system and shell commands
CObj_2	To instil the skills to develop Unix shell scripts
CObj_3	To provide the knowledges to perform backup and recovery and gain familiarity with system administrator's privileges

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the features of Unix operating system and become proficient in internal and external commands of Unix
CO2	Gain good knowledge of the Unix File system
CO3	Develop strong skills to create Unix shell scripts
CO4	Acquire skills to handle file operations in Unix
CO5	Gain knowledge of the role of system administrator and apply in personal PCs to perform system management

SEMESTER – V**S21CS 5.1: DATABASE MANAGEMENT SYSTEMS****THEORY****Total Teaching Hours: 60****No. of Hours per Week: 4****(4 credits)**

CObj	Course Objectives
CObj_1	To provide knowledge on how to organize and maintain data in a database
CObj_2	To instill an understanding of the underlying mathematical principles and concepts implemented in DBMS
CObj_3	To impart knowledge on storing, manipulating and retrieving efficiently and effectively the data using DBMS

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Gain good understanding of the fundamental elements of relational database management systems
CO2	Apply the knowledge gained on the concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
CO3	Design ER-models to represent database applications to effectively solve societal problems
CO4	Be competent to formulate SQL queries to handle data in relational databases and apply the acquired skills to solve research problems
CO5	Create database designs by applying normalization and familiarize with transaction processing

S21CS 5.2 : DATABASE MANAGEMENT SYSTEMS LAB**PRACTICAL****Total Teaching Hours: 60****No. of Hours per Week: 4****(2 credits)**

CObj	Course Objectives
CObj_1	To provide hands-on experience on how to organize and maintain data in a database
CObj_2	To instill the skills to implement relational algebra concepts while creating a database
CObj_3	To impart knowledge on how to store , manipulate and retrieve efficiently and effectively the data using DBMS

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gain hands on experience of designing relational database management system applications
CO2	Implement the relational algebra concepts and SQL
CO3	Capability to implement relationships in simple database application scenarios
CO4	Ability to convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
CO5	Acquire skills to improve the database design by normalization and familiarize themselves with transaction processing

S21CS 6.1 : ARTIFICIAL INTELLIGENCE

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To impart knowledge about Artificial Intelligence and understand the basic principles of Artificial Intelligence in various applications
CObj_2	To understand the various approaches of knowledge representations and to enable computers to perform such intellectual tasks as decision making, problem solving
CObj_3	To provide knowledge on Expert systems and to implement the AI concepts using prolog

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gain knowledge on Artificial intelligence concepts and techniques
CO2	Apply basic principles of AI in solutions that require problem solving
CO3	Understand and Apply knowledge on representing simple facts by predicate logic
CO4	Ability to understand, design and implement expert systems to solve complex problems and understand the case studies
CO5	Comprehend Prolog for implementation of Artificial intelligence concepts

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ARTIFICIAL INTELLIGENCE LAB

PRACTICALS

Total Teaching Hours: 60

No. of Hours per

Week: 4 (2 credits)

CObj	Course Objectives
CObj_1	To instill skills to design and analyze AI based algorithms.
CObj_2	To enable students to solve problems using heuristic search techniques
CObj_3	To provide skills to implement predicate logic

CO	CO3	Apply AI techniques in real world problems
	Course Outcomes	
	After completion of this module, students should be able to:	
	CO4	Analyze and Implement basic AI algorithms for the given problems
CO1	CO5	Ability to implement various heuristic search techniques. Acquire skills to develop AI applications
CO2	Gain knowledge on Artificial intelligence concepts and techniques	

SEMESTER – VI

S21CS 7.1: PYTHON PROGRAMMING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide an Understanding of the features of Python Programming language
CObj_2	To instill the ability to implement file handling and database handling in python
CObj_3	To impart the knowledge to create projects using Python

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Apply the concepts of lists, tuples, functions, and classes for various python applications
CO2	Analyse different python built in libraries and implement in aspects like exception, file, regular expression, and database applications
CO3	Understand database application in python using MySql and other libraries
CO4	Evaluate mathematical operations using NumPy and Pandas in python
CO5	Create a real time application using python with a suitable database.

B21DC 7.2: PYTHON PROGRAMMING LAB

PRACTICAL

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
CObj_1	To provide a practical Understanding of the features of Python Programming language
CObj_2	To instill the ability to implement file handling and database handling in python
CObj_3	To impart the practical knowledge to create projects using Python

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand the usage of functions, list, dictionaries
CO2	Remember the creation and usage of Python libraries
CO3	Create file handling programs in Python with the application of exception handling
CO4	Analyze the database access through Python program
CO5	Become competent to evaluate and create projects using python

S21CS 8.1: COMPUTER NETWORKS

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide an understanding of the fundamental concepts of computer networking
CObj_2	To impart knowledge of the basic concepts of layered models and fundamental protocols
CObj_3	To instill knowledge of implementation concepts in congestion control, error detection and routing

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Assimilate the features of computer networks, protocols, and network design models
CO2	Comprehend the fundamental characteristics of the physical layer and analyze the design issues of data link layer, link layer protocols, bridges and switches
CO3	Evaluate different error detection and correction methods required for error control
CO4	Select and apply appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for designing a network
CO5	Gain the knowledge of network topologies, functions and protocols of the OSI layers in order to design networks for given situations

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S21CS 8.2 : PROJECT LAB

PRACTICAL

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
CObj_1	To understand and select the task based on the individual's core skills
CObj_2	To acquire the knowledge about analytical skills for solving the selected task
CObj_3	To gain confidence for implementing the task and solving the real time problems

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Understand the System development lifecycle and implement it phase by phase
CO2	Gain ability to analyze the requirements of a new system or modification required in case of existing system
CO3	Gain ability to implement the right software model for the project
CO4	Acquire skills to design a system using the system designing techniques
CO5	Acquire skills to efficiently code and test a system

B.Sc. Data Science

FIRST SEMESTER

BDC1.1: Fundamentals of Descriptive Statistics

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To impart knowledge on the significance and computational aspects of statistical analysis
CObj_2	To create an understanding of the patterns of distribution of data
CObj_3	To familiarise the concepts of predictive analytics

CO	Course Outcomes
CO1	Understand the scope and necessity of Statistics and the representation of data
CO2	Tabulate and represent the data in diagrams and graphs
CO3	Apply the formula and calculate descriptive measures of statistics
CO4	Analyze the nature of data and interpret the measures
CO5	Analyze the data and predict the future values using regression

BDS1.2: FUNDAMENTALS OF DATA SCIENCE

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide in-depth knowledge of principles of Data Science, techniques and applications
CObj_2	To understand the applications of Data Science

CObj_3	To gain an insight into data driven programming
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CO	Course Outcomes
CO1	Gain ability to explore data and prepare the data for analysis
CO2	Gain knowledge to apply Data-Driven Insights to Business and Industry
CO3	Acquire ability to analyze Data through Visualizations
CO4	Acquire knowledge to build Models that operate on Internet-of-Things Devices
CO5	Acquire skills to use tools to analyze and solve real world problems

BDC1.3 : Python Programming

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To provide an Understanding of the features of Python Programming language
CObj_2	To instill the ability to implement file handling and database handling in python
CObj_3	To impart the knowledge to create projects using Python
CO1	Comprehend the concepts of functions, list, dictionaries
CO2	Analyze the usage of Python libraries and apply them appropriately
CO3	Become competent in file handling using Python
CO4	Create Python programs to access databases

CO5	Become competent to create projects using python
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BDC1.4 : DATA ANALYSIS AND VISUALIZATION LAB

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj_ID	Course Objectives
CObj_1	To provide hands-on experience on how to organize and maintain data in a worksheet
CObj_2	To instill the skills to analyze data in a worksheet

CObj_3	To impart knowledge on how to visualize data efficiently and effectively

CO_ID	Course Outcomes
CO_1	Gain hands on experience of performing functions of descriptive statistics
CO_2	Acquire practical knowledge of conditional formatting, sorting and filtering data
CO_3	Capability to plot graphs to effectively visualize data
CO_4	Ability to analyze and summarise data
CO_5	Acquire skills to create interactive dashboards

BDC1.5 : Python Programming Lab

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
CObj_1	To provide a practical Understanding of the features of Python Programming language
CObj_2	To instill the ability to implement file handling and database handling in python
CObj_3	To impart the practical knowledge to create projects using Python
CO	Course Outcomes
CO1	Gain knowledge of the concepts of functions, list, dictionaries
CO2	Analyze the usage of Python libraries and apply them appropriately
CO3	Comprehend file handling in Python
CO4	Gain skills to access database from Python program

SEC1.1: OFFICE MANAGEMENT TOOLS

Total Teaching Hours: 30

No. of Hours per Week: 2

(2 credits)

CObj_ID	Course Objectives
CObj_1	To provide hands-on experience on word processing
CObj_2	To impart the skills to work on data using spreadsheets
CObj_3	To equip the skills to design presentations
CO_ID	Course Outcomes
CO_1	Gain ability to create formatted documents
CO_2	Acquire skills to analyze data using spread sheets
CO_3	Gain the capability to design attractive presentations
CO_4	Acquire Skills to create charts in spreadsheets and visualize the data
CO_5	Gain knowledge of the usage of common shortcut keys in the office management tools

Second Semester

BDC2.1: MATHEMATICAL FOUNDATION IN DATA SCIENCE-I

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
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CObj_1	To introduce students to the fundamental Mathematical concepts required for Data Science
CObj_2	To understand the concept of sets, relations, functions, Mathematical logic and concept of matrices
CObj_3	A brief course in linear algebra familiarizes students with some basic techniques in matrix theory which are essential for analyzing linear system of equations.

CO	Course Outcomes
CO1	Gain ability to solve problems in sets and foundations in logic
CO2	Comprehend problems in relations and functions in sets
CO3	Apply the matrix concept to solve problems
CO4	To understand the determinant concept and solve the system of linear equations
CO5	Gain reasonable understanding of Linear Algebra

BDC2.2: DATABASE MANAGEMENT SYSTEM

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj_ID	Course Objectives
CObj_1	To provide knowledge on how to organize and maintain data in a database
CObj_2	To instill an understanding of the underlying mathematical principles and concepts implemented in DBMS
CObj_3	To impart knowledge on storing, manipulating and retrieving efficiently and effectively the data using DBMS

CO_ID	Course Outcomes
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CO_1	Gain good knowledge of the fundamental elements of relational database management systems
CO_2	Acquire knowledge of the concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
CO_3	Capability to design ER-models to represent simple database application scenarios
CO_4	Ability to convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
CO_5	Acquire skills to improve the database design by normalization and familiarize themselves with transaction processing

BDC 2.3: DATA STRUCTURES

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj_ID	Course Objectives
CObj_1	To impart knowledge on storing and managing data in various structures

CObj_2	To emphasize the importance of data structures in developing and implementing efficient algorithms
CObj_3	To understand the operations on different data structures and their applications

CO_ID	Course Outcomes
CO_1	Gain good understanding of the concepts, types and operations of data structures
CO_2	Acquire skills to implement sorting, searching and implementation of higher order data structure using arrays
CO_3	Understand the concept of dynamic memory allocation, types of linked lists and gain the ability to use linked list in developing solutions to real world problems
CO_4	Apply the concept of Stacks and Queues in real world applications
CO_5	Analyze and apply graph and tree data structure in the problems where non-linear data structures are required

BDC2.4: DATABASE MANAGEMENT SYSTEMS LAB

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj_ID	Course Objectives
CObj_1	To provide hands-on experience on how to organize and maintain data in a database
CObj_2	To instill the skills to implement relational algebra concepts while creating a database
CObj_3	To impart knowledge on how to store , manipulate and retrieve efficiently and effectively the data using DBMS

CO_ID	Course Outcomes
CO_1	Gain hands on experience of designing relational database management system applications

CO_2	Acquire practical knowledge of implementing the concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
CO_3	Capability to implement relationships in simple database application scenarios
CO_4	Ability to convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
CO_5	Acquire skills to improve the database design by normalization and familiarize themselves with transaction processing

BDC2.5: DATA STRUCTURES LAB

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj_ID	Course Objectives
CObj_1	To provide practical knowledge of storing and managing data in various structures
CObj_2	To understand the importance of data structures and practically implementing efficient algorithms
CObj_3	To instill the ability to practically implement the operations on different data structures and their applications

CO_ID	Course Outcomes
CO_1	Gain good understanding of the concepts, types and operations of data structures by practically implementing them
CO_2	Acquire programming skills to implement sorting, searching and higher order data structure using arrays
CO_3	Gain ability to create programs using linked list to develop real world applications
CO_4	Capability to apply the concept of Stacks and Queues in real world applications

CO_5	Capability to analyze and apply graph and tree data structure in the problems where non-linear data structures are required
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M.Sc. DATA SCIENCE

MDS101 – INTRODUCTION TO DATA SCIENCE

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To understand the applications of Data Science
CObj_2	To provide in-depth knowledge of principles of Data Science, techniques and applications
CObj_3	To gain an insight into data driven programming

Course Outcomes:

CO_ID	Course Outcomes
CO_1	Explore data science and data engineering
CO_2	Apply Data-Driven Insights to Business and Industry
CO_3	Create and analyze Data through Visualizations
CO_4	Build Models that Operate Internet-of-Things Devices
CO_5	Apply Domain Expertise to Solve Real World Problems Using Data Science

MDS102 – MATHEMATICAL AND STATISTICAL FOUNDATION FOR DATA SCIENCE

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To introduce students to the fundamental mathematical concepts required for Data Science

CObj_2	To enable students in applying the fundamentals of statistics to assess descriptive measures and probability for data analysis
CObj_3	Able to apply mathematics and statistics in Data Science applications

Course Outcomes:

Upon completion of the course, students will be able to:

CO1	Apply Linear algebra and graph theory to develop applications in Data Science
CO2	Demonstrate the use of Eigenvalues, Eigenvectors and Inner Product Space in data processing
CO3	Apply the concept of correlation, linear and non-linear regressions to analyze data science problems
CO4	Become competent to analyze data using descriptive statistics
CO5	Apply the knowledge of probability distribution for various events

MDS103 - PYTHON PROGRAMMING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	Understand the concept of functions, list, dictionaries
CObj_2	Acquire skills to create object oriented programs in Python
CObj_3	Gain ability to access database and handle files from python programs

Course Outcomes:

CO_ID	Course Outcomes
CO_1	Gain knowledge of the concepts of list, dictionaries, tuples and sets
CO_2	Create and use functions, user defined modules functions and apply regular expressions in appropriate situations.

CO_3	Gain ability to perform file handling and database operations using Python.
CO_4	Become competent in using numpy and pandas and apply in project development
CO_5	Become proficient in object oriented programming using python

MDS104 – BIG DATA ANALYTICS

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives

CObj_ID	Course Objectives
CObj_1	To provide an overview of fundamental concepts of big data and analytics
CObj_2	To gain knowledge of the tools required for working with big data like Hadoop, NoSql MongoDB
CObj_3	To gain ability to integrate large amounts of data

Course Outcomes

CO_ID	Course Outcomes
CO_1	Understand the fundamentals of various big data analytics techniques
CO_2	Work with big data analysis techniques and develop Big Data Solutions using Hadoop Eco System
CO_3	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
CO_4	Become competent to create databases using mongodb and apply appropriate operations in real world applications
CO_5	Become proficient to create projects using spark

MDS105: PYTHON PROGRAMMING LAB

PRACTICALS

Total Teaching Hours: 60

No. of Hours per Week: 8

CObj	Course Objectives
CObj_1	To provide practical knowledge of the concept of functions, list, dictionaries
CObj_2	To instill skills to create object oriented programs in Python
CObj_3	To enable easy understanding of accessing database and handling files from python programs

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Gain practical knowledge of the concepts of functions, list, dictionaries

CO2	Analyze the usage of Python libraries and apply them appropriately
CO3	Become competent in file handling using Python
CO4	Create Python programs to access databases
CO5	Create object oriented programs in Python

MDS106 – BIG DATA ANALYTICS LAB

Total Teaching Hours: 60

No. of Hours per Week: 8

Course Objectives

CObj_ID	Course Objectives
CObj_1	To provide an overview of fundamental concepts of big data and analytics
CObj_2	To gain knowledge of the tools required for working with big data like Hadoop, NoSql MongoDB
CObj_3	To gain ability to integrate large amounts of data

Course Outcomes

CO_ID	Course Outcomes
CO_1	Solve Big Data problems using HADOOP
CO_2	Gain ability to use Spark
CO_3	Ability to Comprehend query processing using map-reduce
CO_4	Become competent in CRUD operations on MongoDB
CO_5	Acquire skills to handle big data projects

MDS201 – ADVANCED ALGORITHMS

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

Course Outcome:	
CObj_ID	Course Objectives
CO_ID	Course Outcomes
CO_1	Gain knowledge of various design paradigms in formulating algorithms. Analyze variety of algorithms with practical applications emphasizing optimal Solution of each algorithm
CO_2	Understand approximation algorithms and implement in solving the problems
CO_3	Explore various scheduling algorithms for a given task algorithm to identify and use machine learning
CO_4	Gain exposure to parallel algorithms, parallel time and processors time complexity
CO_5	To be aware of complex problems such as NP Hard and NP-complete problems
CO_5	Acquire knowledge and implement probabilistic and randomized algorithms

MDS202 – MACHINE LEARNING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course objectives:

CObj_ID	Course Objectives
CObj_1	To understand the concepts and techniques of Machine Learning
CObj_2	To gain knowledge of classification and regression models
CObj_3	To apply the various dimensionality reduction techniques

Course outcomes: Upon completion of the course, the students will be able to:

CO_ID	Course Outcomes
CO_1	Gain ability to comprehend supervised, unsupervised and reinforcement learning
CO_2	Acquire skills to apply the appropriate machine learning strategy for any given problem

CO_3	Modify existing machine learning algorithms to improve classification efficiency
CO_4	Create Ensemble models to improve performance of the classifier
CO_5	Competency to apply dimensionality reduction on high dimensional datasets

MDS203 – CLOUD COMPUTING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To make students to be aware of various cloud computing models, strength and weakness of cloud
CObj_2	Enabling students to understand security, privacy and interoperability
CObj_3	To help and motivate students to undertake projects in cloud environment

Course Outcome:

CO_ID	Course Outcomes
CO_1	Analyze various cloud programming models and apply them to solve problems on the cloud
CO_2	Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
CO_3	Explain the core issues of cloud computing such as security, privacy, and interoperability
CO_4	Acquire knowledge of system, network and storage virtualization and outline their role in enabling the cloud computing system model

MDS204 - ADVANCED ALGORITHMS LAB

Total Teaching Hours: 60

No. of Hours per Week: 8

Course Objectives:

CObj _1	To research a specific algorithm with different set of values and to plot graph to understand its behavioral patterns with respect to input size n
CObj _2	To handle string matching problems using naïve Bayes classification and KMP problems in order to compare performance
CObj _3	To make the students to find out optimized solution in algorithms using research statistics

Course Outcome:

CO _1	Gain knowledge of different design techniques and their implementation.
CO _2	Understand algorithm efficiency computation and write effective algorithms
CO _3	Implement pattern matching algorithm
CO _4	Apply sorting algorithms to improve program performance
CO _5	Implement Parallel algorithm to improve efficiency

Total Teaching Hours: 60

No. of Hours per Week: 8

Course objectives:

CObj_ID	Course Objectives
CObj_1	To understand practically the concepts and techniques of Machine Learning
CObj_2	To gain practical knowledge of classification and regression models
CObj_3	To apply the various dimensionality reduction techniques and ensemble models in ML Projects

Course outcomes:

CO_ID	Course Outcomes
CO_1	Gain practical knowledge of fundamental concepts and methods of machine learning, statistical pattern recognition and its applications.
CO_2	Gain ability to analyze and evaluate algorithms for pattern classification
CO_3	Gain ability to comprehend simple models and Ensemble models
CO_4	Acquire skills to design ML algorithms for classification in Python and test them with benchmark data sets
CO_5	Become competent to develop ML projects

MDS206 – Non Core: PROFESSIONAL ETHICS AND CORPORATE GOVERNANCE

Total Teaching Hours: 30

No. of Hours per Week: 2

CObj	Course Objectives
CObj_1	To instill Moral, Social Values and Loyalty in a professional environment
CObj_2	To create an awareness on Professional Ethics, Human Values and the impact of unethical practices

CObj_3	To understand organizational culture and to adapt to changing cultures without compromising ethical values
CO	Course Outcomes After completion of this module, students should be able to:
CO1	Recognize the significance of human values and practice the same
CO2	Understand and control the excessive desires of the mind
CO3	Interpret and apply professional code of ethics in real world
CO4	Assess the benefits of restraining from unethical practices while designing software solutions to problems
CO5	Critically examine ethical dilemmas and to understand the importance of governance mechanisms in a globalized economy

MDS301 – DEEP LEARNING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To understand and gain knowledge of Deep learning techniques.
CObj_2	To create Deep Learning Applications.
CObj_3	To learn and design RNN applications.

Course Outcomes:

CO_ID	Course Outcomes
CO_1	Gain knowledge of Deep learning techniques.
CO_2	Familiarize with TensorFlow/Keras in Deep Learning Applications.
CO_3	Design and implement RNN applications.
CO_4	Gain knowledge of optimization in Deep Learning.
CO_5	Design and implement Convolutional Neural Networks.

MDS302 – RESEARCH METHODOLOGY

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To motivate students to do research in computer science by understanding research process and methodologies
CObj_2	To prepare students to writing articles with originality in content
CObj_3	To provide an awareness on IPR and copyrights

Course Outcomes:

CO_ID	Course Outcomes
CO_1	Explore research types, objectives and techniques of defining research problem
CO_2	Gain Good knowledge of types of reasoning, hypothesis and research designs
CO_3	Gain awareness of IPR and ethics to be practiced in research
CO_4	Implement report writing in order to publish a research/review paper
CO_5	Become competent in scientific writing

MDSE31 - WEB SCRAPING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To understand the concept of web scraping using Python
CObj_2	Gain knowledge on data extraction and processing
CObj_3	Gain ability to handle data with NLTK

Course Outcomes:

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

CO_ID	Course Outcomes
CO_1	To comprehend the concept of web scraping using Python
CO_2	Gain Knowledge of the legalities of Web scraping
CO_3	Acquire skills on data extraction from web pages and processing the data
CO_4	Acquire skills to process CAPTCHA using python
CO_5	Gain ability to scrape dynamic websites

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MDSE32 - NATURAL LANGUAGE PROCESSING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course objectives:

CObj_ID	Course Objectives
CObj_1	To learn about NLP techniques and key issues
CObj_2	To gain knowledge about the data structures and algorithms used in NLP
CObj_3	To understand how key concepts from NLP and linguistics are used to describe and analyze language

Course Outcomes:

Upon completion of the course, students will be able to

CO_ID	Course Outcomes
CO_1	Gain good understanding of the NLP techniques and NL interfaces
CO_2	Gain ability to analyze data stored in standard formats.
CO_3	Acquire skills to understand the methods and algorithms used to process different types of textual data
CO_4	Gain ability to understand semantics and pragmatics of English language for processing
CO_5	Demonstrate the Extraction of information from text and classification of text

MDSE33 – FORECASTING AND OPTIMIZATION

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To provide a comprehensive introduction of the forecasting methods
CObj_2	To study the various regression models and perform forecasting
CObj_3	To understand the autoregressive models and its variants for forecasting
CObj_4	To get an overview of various numerical methods of optimization
CObj_5	To get an insight into advanced optimization techniques.

Course Outcomes:

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

MDSOPE- OPEN ELECTIVE

Total Teaching Hours: 30

No. of Hours / Week: 02

Open elective course is chosen from the list of courses offered by the Institution for all PG courses.

MDS303 – DEEP LEARNING LAB

Course Objectives:

CObj_ID	Course Objectives
CObj_1	To understand and gain practical knowledge of Deep learning techniques
CObj_2	To create Deep Learning Applications
CObj_3	To design RNN applications

Course Outcomes:

CO_ID	Course Outcomes
CO_1	On completion of the course, the students will be able to:
CO_2	Gain practical knowledge of Deep learning techniques.
CO_3	Familiarize with TensorFlow/Keras in Deep Learning Applications
CO_4	Design and implement RNN applications
CO_5	Gain knowledge of optimization in Deep Learning.
CO_6	Design and implement Convolutional Neural Networks

MDS401 - DATA STORYTELLING

Total Teaching Hours: 52

No. of Hours / Week: 04

Course Objectives

CObj_ID	Course Objectives
CObj_1	To focus on how to tell stories with data to create social change with tools and technologies
CObj_2	To introduce basic methods for research, cleaning and analyzing datasets, but the focus is on creative methods and media for data presentation and storytelling
CObj_3	To consider the emotional, aesthetic and practical effects of different presentation methods as well as how to develop metrics for assessing impact

Course Outcomes:

CO_ID	Course Outcomes
CO_1	CO1: Learn techniques for finding a story in data, building a basic set of tool-assisted data analysis skills.

CO_2	CO2: Think like a designer
CO_3	CO3: Build things that tell data-driven stories with a rich set of digital and non-digital tools, online and offline.
CO_4	CO4: Learn to connect data stories to meaningful, situated social action.
CO_5	CO5: Understand basic techniques for measuring the impact of data-driven storytelling.

MDS402 - JULIA PROGRAMMING LAB

No. of Hours / Week: 08

Course Objectives:

CObj_ID	Course Objectives
CObj_1	<ul style="list-style-type: none"> ○ To understand and gain practical knowledge of Julia Programming
CObj_2	<ul style="list-style-type: none"> ○ To solve math problems using Julia Programming
CObj_3	<ul style="list-style-type: none"> ○ To understand recipes and implement them

Course Outcomes:

CO_ID	Course Outcomes
CO_1	Gain practical knowledge of Julia Programming
CO_2	Familiarize with Clustering.jl
CO_3	Implement dimensionality reduction in Julia

CO_4	Gain knowledge of animation of plots.
CO_5	Familiarize with recipes

**B. Sc. Biochemistry
SEMESTER – I**

S21 BC 1.1: Chemical Foundation of Biochemistry – 1

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	To understand chemical basis of bioprocesses, organization of organisms, fundamental properties of elements and units of measurements.
CObj_2	To revisit the fundamentals concepts of chemical bonds, electronic configuration, concepts of acids/ bases/ buffers and their importance in biological systems.
CObj_3	To familiarize with thermodynamic concepts as applicable to biological processes.

CO_ID	Course Outcomes
CO_1	To appreciate Biochemistry as a discipline by understanding the chemical basis of biological systems.
CO_2	To understand the concepts of mole, mole fraction, molarity and to apply them in biochemical research.
CO_3	To know the significance of chemical bonding, electronic configuration and theories of bond formation
CO_4	To understand the concepts of acids, bases, indicators, buffers and realize the importance of water as a universal solvent.
CO_5	To recognize the fundamentals of electrochemistry and the thermodynamic basis of biochemical reactions.

S21 BC 1.2: Volumetric Analysis – Practical 1

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
	<i>This course aims to</i>

CObj_1	Familiarize students with the principles of analytical chemistry and basic analytical techniques such as volumetric analysis.
CObj_2	Provide experimental practice of quantitative volumetric analysis.
CObj_3	Enable students to prepare standard solutions and perform chemical analysis.

CO_ID	Course Outcomes
CO_1	Understanding Good laboratory practices in a chemistry/biochemistry laboratory
CO_2	Learn safety and precautionary measures for working in a laboratory.
CO_3	Develop skill and proficiency in preparation of laboratory reagents
CO_4	Use of handling of glass wares, minor equipment for conducting experiments
CO_5	Develop skills to prepare standard chemical solutions and secondary standards

SEMESTER I – Open Elective
OPE 1.1: Biochemistry in Health and Disease

Total Teaching Hours: 45

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	To provide knowledge about health and various terminologies used in health and disease conditions
CObj_2	To promote information about communicable & non-communicable diseases and their diagnosis, treatments and prevention
CObj_3	To analyze concepts of mental health and hygiene and requisite guidance and counseling

CO_ID	Course Outcomes <i>After studying this course, student will be able</i>
CO_1	To categorize terminologies related to health and world patterns of disease
CO_2	To outline the indications and diagnostic used in the identification and management of disease.
CO_3	To relate health and disease conditions with their treatment as well as prevention methods

CO_4	To appreciate the concepts of mental health and hygiene, their basis and possible remedies
CO_5	To appraise health promotion in infections and available defences against them

SEMESTER – II

S21 BC 2.1: Chemical Foundation of Biochemistry – 2

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	To understand reaction kinetics, concepts of colloids and their biological applications.
CObj_2	To revisit concepts of organic chemistry and learn the role of stereochemistry in biological systems.
CObj_3	To familiarize with types of organometallic compounds and their biological effects.

CO_ID	Course Outcomes
CO_1	To understand the principles of chemical kinetics and their interpretation for biological systems
CO_2	To comprehend about types of colloids, their properties, examples and biological applications
CO_3	To analyze the concepts of stereochemistry of organic compounds and their importance in biomolecules
CO_4	To appreciate the roles of metals, non-metals, transition metals and organometallic compounds in biological systems.
CO_5	To study the properties of inorganic molecules and coordination compounds and understand the toxic effects of heavy metals.

S21 BC 2.2: Qualitative and Quantitative Analysis – Practical 2

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
	<i>This course aims to</i>
CObj_1	Provide experimental practice of quantitative and qualitative inorganic analysis
CObj_2	Train students in basic physical chemistry laboratory techniques
CObj_3	Develop skills in handling instruments and understand its application in research work.

CO_ID	<p style="text-align: center;">Course Outcomes</p> <p style="text-align: center;"><i>After the course, students will be able to</i></p>
CO_1	Perform competently qualitative analysis of inorganic salt mixtures
CO_2	Determine physical properties of liquids such as density, viscosity and surface tension
CO_3	Separate components from mixtures of organic compounds and determine distribution coefficients.
CO_4	Estimate concentration of a biomolecule by using colorimeter and then principles of Beer's Law
CO_5	Calibrate pH meter and determine pH of common daily life substances.

**SEMESTER II – Open Elective
OPE 2.1: Nutrition and Dietetics**

Total Teaching Hours: 45

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	To introduce the students to the fundamentals of Nutrition, food and health and to familiarize them with importance of nutrition during various stages of life
CObj_2	To understand the functions and role of macronutrients, their requirements and the effect of deficiency and excess.
CObj_3	To impart knowledge regarding nutritional disorders ranging from nutritional deficiencies to life style disorders and the importance of functional foods

CO_ID	Course Outcomes <i>After studying this course, student will be able</i>
CO_1	The gain knowledge about energy requirements, energy content of foods and Recommended Dietary Allowances.
CO_2	To understand the functions and role of micro and macronutrients, their requirements and the effect of deficiency and excess.
CO_3	To analyze the impact of various functional foods on our health.
CO_4	To apply basic nutrition knowledge in making food choices and obtaining an adequate diet.
CO_5	To gain competence in connecting the role of various nutrients in maintaining health and learn to enhance traditional recipes.

SEMESTER – III

S21 BC 3.1: Bioorganic chemistry

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj	Course Objectives
CObj_1	To understand general reaction mechanisms of organic compounds and the concepts of aldehydes, alcohols and carbonyl compounds.
CObj_2	To revisit the fundamental concepts of primary and secondary metabolites of cells.
CObj_3	To familiarize with bioorganic compounds like nutrients, proteins, vitamins and drugs.

CO	Course Outcomes
CO1	To appreciate the concepts of reaction mechanisms of hydrocarbons.
CO2	To understand the properties and importance of allides, alcohols and carbonyl compounds.
CO3	To know the significance of primary metabolites in living organisms such as carboxylic acids, amines and heterocyclic compounds.
CO4	To understand the significance of secondary metabolites in living organisms, such as terpenes and alkaloids.
CO5	To recognize the fundamentals of nutrition, nutrients and understand about drugs and antibiotics.

S21 BC 3.2: Bioorganic Chemistry – Practical 3

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
	<i>This course aims to</i>
CObj_1	Familiarize students with the principles of qualitative analysis of organic compounds.
CObj_2	Provide experimental practice of preparations of important organic compounds.
CObj_3	Enable students to isolate and analyze biological macromolecules.

CO_ID	Course Outcomes
CO_1	Understanding good laboratory practices in a chemistry/biochemistry laboratory.
CO_2	Develop skill and proficiency in preparation of laboratory reagents.
CO_3	Perform systematic qualitative analysis of organic compounds.
CO_4	Synthesize and evaluate biologically useful organic compounds like aspirin.
CO_5	Develop skills to isolate, characterize and analyze biomolecules like cholesterol, starch and nucleic acids.

S21 OE 3.1: Health and Hygiene

Total Teaching Hours: 45

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	To impart knowledge on the importance of nutrition, health and hygiene in life
CObj_2	To provide awareness to student about community and personal health and different health care programmes available
CObj_3	To enrich knowledge on personal and community hygiene, and awareness about health and hygiene policies and apps

CO_ID	Course Outcomes <i>After studying this course, student will be able</i>
CO_1	Understand the importance of nutrition in healthy life and use available information to optimize daily nutrition
CO_2	Comprehend the significance of healthful living for promotion and maintenance of personal and public health
CO_3	Assess personal, community and government roles in disease management
CO_4	Develop the ability to utilize knowledge of public health and health policies for promoting positive health practices
CO_5	Create awareness in public about government measures and digital media

SEMESTER – IV

S21 BC 4.1: Analytical Biochemistry

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	To understand the strategies in biochemical investigations employing various basic biochemical techniques.
CObj_2	To understand the principles and applications of various techniques employed for separation and analysis of biomolecules.

CObj_3	To familiarize with basic culture techniques in microbiology.
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CO_ID	Course Outcomes
CO_1	To understand the principles of biochemical analysis employing various bioanalytical techniques.
CO_2	To comprehend about general principles of various chromatographic techniques useful for bioanalysis.
CO_3	To analyze biomolecules using electrophoretic methods.
CO_4	To appreciate the importance of spectroscopic techniques in molecular analysis.
CO_5	To study the properties of microorganisms and their handling techniques.

S21 BC 4.2: BIOCHEMICAL TECHNIQUES – Practical 4

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
	<i>This course aims to</i>
CObj_1	Enable students to develop familiarity with advanced laboratory biochemical techniques.
CObj_2	Enable students to investigate the biomolecules using their physico chemical properties.
CObj_3	Develop <i>hands-on</i> experience of handling analytical instruments.

CO_ID	Course Outcomes
	<i>After the course, students will be able to</i>
CO_1	Learn various techniques useful for separation of biomolecules
CO_2	Perform chromatography methods for separation of amino acids and carbohydrates
CO_3	Separate and purify proteins by various chromatographic methods
CO_4	Analyze proteins and nucleic acids by electrophoresis and spectrophotometry.
CO_5	Isolate, culture and study microorganisms in laboratory.

SEMESTER IV – Open Elective

OPE 4.1: Nutraceuticals and functional foods

Total Teaching Hours: 45

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	To provide students with an overview of the field of functional foods, nutraceuticals and natural health products
CObj_2	To enable students to understand the functional food concept as related to ingredient efficacy and safety and bioactive ingredient-disease relationships
CObj_3	To impart knowledge about regulatory aspects of functional foods; and requirements for standards for health claims

CO_ID	Course Outcomes <i>After studying this course, student will be able</i>
CO_1	Understand the basic concepts of Nutraceuticals and functional foods, their chemical nature and importance
CO_2	Understand the role of Nutraceuticals and functional foods in health and disease
CO_3	Identify the role of Nutraceuticals in health and disease and apply it to real time scenarios
CO_4	Understand the safety issues, health claims and the safety issues about Nutraceuticals
CO_5	Comprehend the associated regulations for Nutraceuticals and functional foods

SEMESTER – V

S21 BC 5.1: Biochemistry of Macromolecules

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand chemical basis of biological process.
CObj_2	To revisit the fundamental concepts of correlation of macromolecules and its chemical reactions.
CObj_3	To familiarize with understanding of significance of macromolecular structures in understanding the life process.

CO	Course Outcomes
CO_1	To appreciate Biochemistry as a discipline by understanding the chemical basis of biological systems.
CO_2	To understand the basic concepts of carbohydrate structures and biological roles relevant to living cell growth and division.

CO_3	To know the significance of coordination of lipid molecules and their properties in a living cell structure.
CO_4	To understand the structural and chemical properties of amino acids and proteins in living systems.
CO_5	To understand the composition and structure of RNA and DNA those regulate the biological process.

S21 BC 5.2: Macromolecules Lab – Practical 5

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
CObj_1	Familiarize students with the principles of basic macromolecular analysis.
CObj_2	Provide experimental practice of quantitative identification of various biomolecules.
CObj_3	Enable students to prepare biological samples for analysis.

CO	Course Outcomes
CO_1	Perform systematic analysis of biomolecules like carbohydrates, amino acids, lipids, vitamins and proteins
CO_2	Perform qualitative analysis of carbohydrates, amino acids and lipids
CO_3	Perform quantitative analysis of carbohydrates, amino acids and lipids
CO_4	To analyze the content of biomolecules like vitamins.
CO_5	To prepare biological samples for analysis and perform qualitative and quantitative analyses

S21 BC 6.1 Human Physiology and Cell Biology

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
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CObj_1	To understand the structures and purposes of basic components of cells, especially membranes and organelles
CObj_2	To revisit the fundamentals concepts of cells and tissues, organ systems and their working
CObj_3	To familiarize with physiology and biochemistry of processes and organization of various organ systems

CO	Course Outcomes
CO1	To appreciate the concepts of cell biology, tissue organization, organ systems and physiological processes
CO2	To comprehend the structural organization, functioning and important cellular events of cells and cell organelles
CO3	To understand importance of tissues, and organization, dynamics and role of organs in circulatory and skeletal systems
CO4	To understand the biochemistry and physiology of digestive, excretory and respiratory systems
CO5	To recognize the fundamentals of biochemistry and physiology of muscular, nervous and endocrine systems

S21 BC 6.2: Physiology and Cell Biology Lab – Practical 6

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
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	This course aims to
CObj_1	Familiarize students with cell biology and physiological experimentation on cells and tissues
CObj_2	Provide experimental practice of cellular techniques including microscopy, cell counting and organelle analysis
CObj_3	Enable students to be able to perform analysis and interpret physiological data.

CO	Course Outcomes
CO_1	Evaluate and apply knowledge of techniques in cellular biology and physiology and interpret, analyse, describe and present experimental data
CO_2	Develop skill and proficiency in preparation of slides and identifying structures in permanent slides
CO_3	Evaluate cytological techniques including microscopy and cell counting
CO_4	Perform systematic analysis of cell components like organelles and DNA
CO_5	Understanding simple physiological functions such as sensory perception, heart rates and blood clotting

SEMESTER – VI

S21 BC 7.1: Enzymology

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
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CObj_1	To provide detailed knowledge about enzymes, the biological catalysts with remarkable properties.
CObj_2	To outline the diverse applications of enzymes in disease diagnosis and therapy as well as in industry
CObj_3	To develop an understanding of enzyme kinetics, mechanism of enzyme action, enzyme inhibition and their regulation.

CO	Course Outcomes
CO_1	To understand the nature and importance of enzymes in living systems.
CO_2	To gain insight into the molecular basis of catalysis by enzymes and the underlying basis of their specificity
CO_3	To comprehend the applications of enzymes in research and medicine as well as in industry, which will bolster their foray into industrial and biomedical research.
CO_4	To analyze the concepts of kinetics of enzyme catalyzed reactions, their mechanisms of enzyme action and clinical importance of enzyme inhibitors
CO_5	To appreciate how enzymes are regulated and the physiological importance of enzyme regulation in the cell

S21 BC 7.2: Enzymology Lab – Practical VII
Total Teaching Hours: 60
No. of Hours per Week: 4
(2 credits)

CObj	Course Objectives
	<i>This course aims to</i>
CObj_1	Enable students to develop basic laboratory skills, implement experimental protocols and carryout investigations of enzymes.
CObj_2	Enable students to understand and learn the methods involved in enzyme isolation, purification and analysis.
CObj_3	Develop skills of performing specific enzyme assays and reporting their activity.

CO	Course Outcomes
CO_1	Learn fractionation and purification of enzymes from different sources
CO_2	Understand the isolation of enzymes from various sources.

CO_3	Learn methods of enzyme assays and their activity assessment.
CO_4	Understand and learn kinetic and inhibition study of enzymes.

CO_5	Evaluate various physical and chemical factors affecting enzyme activity.
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S21 BC 8.1: Intermediary Metabolism

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the concepts of biochemical reactions in cells.
CObj_2	To familiarize with understanding of metabolic pathways both catabolism and anabolism, and energy production.
CObj_3	To revisit the fundamental concepts of correlation of macromolecules and their chemical reactions.

CO	Course Outcomes
CO_1	To appreciate the basics of biochemical reactions and its molecular and functional connection to the organization of a cell and sub-cellular components
CO_2	To know the fates of different types of carbohydrates and its regulation that can influence the growth and existence of living organism.
CO_3	To analyze the significance of lipid metabolic pathways
CO_4	To understand degradative and biosynthetic reactions of amino acids and nucleotides and associated metabolic disorders.
CO_5	To evaluate the biochemistry behind photosynthesis process and nitrogen fixation.

S21 BC 8.2: Bioenergetics and Metabolism Lab - Practical VIII

Total Teaching Hours: 60

No. of Hours per Week: 4

(2 credits)

CObj	Course Objectives
	This course aims to
CObj_1	Familiarize students with the principles of basic analytical skills.
CObj_2	Provide experimental practice of qualitative estimations of various biomolecules and metabolites.
CObj_3	Enable students to prepare standard solutions and perform colorimetric estimations

CO	Course Outcomes
CO_1	Carry out independent and systematic analysis of biomolecules and report the result.
CO_2	Evaluate important metabolites of various metabolic pathways.
CO_3	Perform different methods of estimating metabolites such as colorimetric and
	titrimetric methods.
CO_4	Analyze the basic principles in each estimation and develop analytical skills.
CO_5	Evaluate the presence as well as the concentration of metabolites in different samples

FIRST SEMESTER M. Sc. BIOCHEMISTRY**MBC – 101: Biophysical and Bioorganic Chemistry****(52 hrs)**

Course Objectives	
1	Enable students to learn basic biophysical concepts such as pH and thermodynamics
2	Educate students about the chemical basis of biological systems and the reaction kinetic phenomenon
3	Enable students to understand the role and relevance of different organic compounds in life sciences

Course Outcomes (COs)	
CO1	Understand the physiochemical properties of water, pH, p Ka and biological buffers and their importance.
CO2	Get familiarised with basic concepts of thermodynamics laws, red-ox reactions in biological systems and know the concepts of Stereochemistry
CO3	Learn the mechanism of Bio-organic reactions, rearrangement reactions and Free radicals, their sources, chain reactions, effects on biological molecules and membranes.
CO4	Know the structure and properties of Heterocyclic compounds, their occurrence in biological systems.
CO5	Define Ligand field theory of complexes, kinetics and mechanism of reactions of organometallic moieties of biological molecules like chlorophyll and hemoglobin.

MBC– 102: Biomolecules**(52 hrs)**

Course Objectives	
1	To train students to appreciate the salient features, basic structure of all biomolecules in the organization of life
2	To acquaint students with the significance of biomolecules and methodology involved in characterizing major biomolecules
3	To familiarize students with the classification, functions and application aspects of biomolecules

Course Outcomes (COs)	
CO1	To appreciate the structures of carbohydrates that exist in the biological system, their importance in blood groupings, bacterial cell wall and cell surfaces
CO2	To comprehend the classification and structure of amino acids and their properties and mechanisms of peptide synthesis
CO3	To summarize the concepts of levels of protein organization, denaturation and renaturation of proteins and protein folding pathways
CO4	To relate to the structure and importance of lipids as storage molecules and as structural component of biomembranes

CO5	To describe the structures of nitrogenous bases, properties of nucleic acids, their isolation, characterization and sequencing
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MBC- 103: Analytical Biochemistry – I

(52 hrs)

Course Objectives	
1	To comprehend the strategies and principles of biochemical investigations employing whole animal studies, isolated organs, tissues, and cell cultures and model organisms
2	To acquaint students with basic instrumentation, principle and procedure of various sophisticated instruments like phase contrast, fluorescence, electron microscopy, Geiger-Muller counter, Liquid scintillation counter, autoradiography and learn about centrifugation & biocalorimetry
3	To understand about biological data collection and the application of various biostatistical methods and tools in research

Course Outcomes (COs)	
CO1	To understand the strategies in biochemical investigations employing whole animal studies, isolated organs, tissues, and cell cultures and model organisms
CO2	To discuss the theory and applications of different types of microscopic techniques such as optical, phase contrast, confocal, fluorescence and electron microscopy and preparation of specimens for these microscopic techniques
CO3	To articulate the principle and applications of different separation techniques utilizing different types of centrifugation as well as biocalorimetry in the studies of thermodynamics and kinetics of biochemical reactions
CO4	To apply the principles of radiochemistry to analytical determination of biomolecules and life processes
CO5	To relate the principles of collection of data to biological experiments and the proper statistical analysis of biological data and its presentation

MBC – 104: General Physiology

(52 hrs)

Course Objectives	
1	To enable the students with general concepts related to tissues and cytoskeleton filaments and proteins.
2	To educate in depth about the physiology of nervous and muscular systems.

3	To educate about the complete physiology related to respiratory, digestive, excretory, circulatory systems along with basics of endocrinology.
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Course Outcomes (COs)	
CO1	Understand the general formation of the tissues, its types, junctions and components involved in it and gain knowledge about cytoskeleton filaments and proteins, its organization, dynamics and role in maintaining the integrity of the cell.
CO2	Get familiarized with the detailed knowledge about the nerve signaling, membrane potential, neurotransmitters, its receptors and mechanism of action potential. And also patch clamp technique and understand the structure of different types of muscle tissues, its energetic, mechanism of muscle contraction and its regulation.
CO3	Learn different types of digestive juices, enzymes present and its action. In detail the mechanism of absorption of different nutrients. They also studied detoxification mechanisms and liver function tests and understand different types of circulation, cardiac activity, its regulation, blood composition, clotting, CSF, Lymph and its analysis in diagnosis, was learnt by the students.
CO4	Learn mechanism of respiration and acid base regulation by respiration and understand about the structure of nephron, formation of urine, tubular function test, acid base balance and hormonal regulation.
CO5	Learnt hormones types, synthesis, storage, circulation, functions, mechanism, regulation and its disorders were learnt by the students. Measurement of hormones and receptors and degradation were also studied by the students.

MBC – 105: Microbiology

39 hrs

Course Objectives	
1	To gain knowledge about bacteriology, eukaryotic microorganisms, food and dairy microorganisms
2	In depth understanding on microbial staining and pure culture techniques
3	Comprehensive theoretical and foundational concept about bacterial and viral pathogenesis and their interventions

Course Outcomes (COs)	
CO1	Learn about the conventional and molecular methods of classification, identification, cultivation and morphology of eukaryotic microorganisms
CO2	Know the basic structure, visualization techniques and function of different components of the bacterial cell.
CO3	Understand the principles of microbial nutrition and know the various Physical and Chemical growth requirements of bacteria and their growth measurement.
CO4	Learn the mechanisms of Bacterial Pathogenesis and know various intervention strategies such as antibiotics.
CO5	Know about viruses classification and discern the replication strategies of few representative viruses.

MBC – 106: General Biochemistry Lab (4 Credits)

Course Objectives	
1	Enable students to develop basic laboratory skills, implement experimental protocols and carryout investigations on biomolecules
2	Enable students to understand and learn operating pH meter and learn buffer preparation
3	Enable students to utilize various biochemical techniques for biomolecular analysis

Course Outcomes (COs)	
CO1	Prepare standard solutions and different buffer solutions
CO2	Perform analysis and estimation of carbohydrates and fats by different methods
CO3	Analyze amino acids, proteins, DNA and RNA by colorimetry and spectrophotometry
CO4	Analyze and estimate molecules like lipids and vitamins and ions like calcium and phosphate
CO5	Extract biomolecules from natural sources and analyse them

**MBC – 107: Clinical Biochemistry and Microbiology Lab
(4 Credits)**

Course Objectives	
1	Enable students to develop basic laboratory skills, implement experimental protocols and carryout investigations on biomolecules.
2	Enable students to understand and learn human blood and urine sample handling.
3	Develop skills of performing basic biochemical tests important in clinical investigations.

Course Outcomes (COs)	
CO1	Understand the importance of biochemical techniques in clinical laboratory setup.
CO2	Perform biochemical laboratory analysis on blood samples to assess the levels of normal and abnormal constituents.
CO3	Perform biochemical laboratory analysis on urine samples to assess the levels of normal and abnormal constituents.

C04	Learn basic microbiology techniques to apply for microbiological investigations.
C05	Learn the skill of growing microorganisms.

Second Semester M. Sc. Biochemistry

MBC – 201: Enzymology

52hrs

Course Objectives	
1	To provide students with the concepts and principles of biochemical catalysts.
2	To survey the methodologies involved in assessing the enzyme activity and mechanism of enzyme action.
3	To illustrate the enzyme catalysis, kinetics and regulatory aspects

Course Outcomes (COs)	
CO1	To discuss the basic characteristics, classification, purification and applications of enzymes
CO2	To evaluate the 3D structure of an enzyme active site and the techniques used to investigate the active site structure
CO3	To become familiarized with types of enzyme catalysis and the mechanism of important enzymes
CO4	To describe the various theories behind enzyme action, factors affecting enzyme action and enzyme kinetics
CO5	To acquaint with the kinetics of enzymatic reactions and sigmoidal kinetics of allosteric enzymes, along with their various regulation

MBC – 202: Analytical Biochemistry – II

(52 hrs)

Course Objectives	
1	To learn the fundamental principles behind chromatography and electrophoresis and choose and apply suitable separation techniques to different biomolecules
2	To discuss the principle and applications of spectroscopic techniques and to implement the use of instruments like UV-VIS spectroscopy, NMR, CD, ORD, MS, X-Ray diffraction in biological research
3	To describe large-scale analysis of proteins and metabolites in biological samples and to define their concentrations, molecular states, structures, functions and connections

Course Outcomes (COs)	
CO1	To appraise the handling of various biochemical techniques and apply them in isolating and characterizing different biological molecules
CO2	To discuss the theory of purification of biomolecules by advanced techniques like affinity chromatography, HPLC, FPLC and Gas chromatography
CO3	To comprehend the principles of different types of Electrophoresis and their applications in biological investigations and experiments
CO4	To apply the fundamental laws of different types of spectroscopy and applications in analytical determination and characterization of biomolecules
CO5	To understand about techniques used in proteomics and metabolomics, and their significance and applications

MBC – 203: Metabolism – I

(52 hrs)

Course Objectives	
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1	Enable students to learn and understand the concepts of carbohydrate metabolism and related disorders.
2	Enable students to learn and understand the concepts of lipid metabolism and related disorders.
3	Educate students about the biochemistry related to Photosynthesis.

Course Outcomes (COs)	
CO1	Learn about glucose oxidative metabolic pathways in living things.
CO2	Understand the detailed metabolism of glycogen molecule.
CO3	Understand the important metabolic disorders in detail.
CO4	Understand in detail about the metabolism of lipids.
CO5	Learn the photosynthetic reaction mechanism, phases, adaptations of C4 & CAM plants and also bacterial photosynthesis.

CO – PO Mapping

PO	CO
PO1	CO1, CO2, CO3, CO4, CO5
PO2	CO1, CO3, CO4
PO3	CO1, CO3, CO4
PO4	CO1, CO3, CO4
PO5	CO1, CO3, CO4

MBC – 204: Membrane Biochemistry**(52 hrs)**

Course Objectives	
1	Enable students to understand the concept of biomembrane physiology and biochemistry
2	Educate students about the role of biomolecules in membrane associated physiological processes
3	Make students understand the concepts of protein targeting and membrane transport mechanisms

Course Outcomes (COs)	
CO1	Understand structures of membrane lipids their dynamics and techniques involved in membrane structure determination.
CO2	Understand concept of membrane topology, role of membrane proteins, and their structures.
CO3	Understand protein targeting, signal sequence, its functions and mechanism of targeting.
CO4	Know the detailed mechanisms of membrane transportation and bacterial transport systems.
CO5	Know about nuclear transport mechanism and protein targeting in various subcellular organelles.

MBC-205: Bioinformatics and Toxicology**(39 hrs)**

Course Objectives	
1	To gain knowledge about Computers and computer programming languages.
2	In depth understanding on Databases; Biological databases; and tools to analyse sequences.
3	Comprehensive theoretical and practical foundation concept about protein structure prediction, Molecular interaction and Toxicology studies.

	Course Outcomes (COs)
CO1	Know about the fundamental operation of computer, C programming, PERL, Bioperl, Database management system and biological databases.
CO2	Understand the algorithms to analyse DNA and protein sequences by alignment and phylogenetic analysis.
CO3	Learn about various computational methods and tools used for protein secondary and tertiary structure prediction
CO4	Gain knowledge about molecular docking concepts employed in

	drug discovery and its applications.
CO5	Understand in detail about the core concepts of toxicology, and its effect at multiple levels of biological organization.

**MBC – 206: Enzymology Lab
(4 credits)**

Course Objectives	
1	Enable students to develop basic laboratory skills, implement experimental protocols and carryout investigations of enzymes.
2	Enable students to understand and learn the methods involved in enzyme isolation , purification and analysis.
3	Develop skills of performing specific enzyme assays and reporting their activity.

Course Outcomes (COs)	
CO1	Learn fractionation and purification of enzymes from different sources
CO2	Have a hands on experience of protein analytical method like electro-phoresis
CO3	Learn methods of enzyme assays and their activity assessment.
CO4	Understand and learn kinetic and inhibition study of enzymes.
CO5	Know the different physical and chemical factors affecting enzyme activity.

**MBC – 207: Biochemical Techniques Lab
(4 credits)**

Course Objectives	
1	Enable students to develop familiarity with advanced laboratory biochemical techniques. .
2	Enable students to investigate the biomolecules using their physico chemical properties .
3	Develop hands-on experience of handling analytical instruments.

Course Outcomes (COs)	
CO1	Learn various techniques useful for seperation of biomolecules
CO2	Perform chromatography methods for seperation of aminoacids and carbohydrates
CO3	Separate and purify proteins by various chromatographic methods
CO4	Analyze proteins and nucleic acids by spectrophotometry
CO5	Separate and analyze nucleic acids and proteins by electrohoresis.

Third Semester M. Sc. Biochemistry

MBC – 301: Molecular Biology – I

(52 hrs)

	Course Objectives
1	To learn and understand the fundamentals of molecular biology like

	nature of genetic material, features of genomes, damage and repair
2	To categorize possible modes of replication and its regulation, and roles of enzymes in replication of both prokaryotes and eukaryotes
3	To sketch the intricate levels of molecular mechanisms underlying the process of transcription and its regulation and post translational modifications

Course Outcomes (COs)	
CO1	To describe the characteristics of DNA as genetic material and acquire basic concepts of genome, its composition and organization
CO2	To comprehend the basic steps involved in DNA replication in prokaryotes and eukaryotes, emphasizing the enzymes involved in different types of replication, including plasmids and viruses
CO3	To assess the molecular mechanisms behind DNA damage and repair in both prokaryotes and eukaryotes
CO4	To analyze the basic steps involved in transcription in prokaryotes and eukaryotes, emphasizing the enzymes involved in transcription and the techniques used to understand transcription
CO5	Understand the post transcriptional modifications of the eukaryotic mRNA and their significance and functions

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MBC – 302: Molecular Physiology

(52 hrs)

Course Objectives	
1	To gain knowledge about Nerve signalling and Endocrine signalling mechanisms.
2	In depth understanding on Cell cycle regulations; apoptosis mechanisms and stem cells
3	Comprehensive theoretical and foundational concept about Cancer, important signalling pathways in humans and plants.

Course Outcomes (COs)	
CO1	Learn in detail about different types of neurotransmitters, its receptor structure and subclasses, mechanism of action and its termination. Important understanding of agonists

	and antagonists functions.
CO2	Complete understand about different classes of hormone molecules, its signal transduction pathways, its proteins, nuclear signaling and its biochemistry of vision.
CO3	Learn in detail about cell cycle checkpoints, stem cells and its properties. Also in this unit, apoptosis and its pathways has been understood.
CO4	Know about cancer signs, symptoms, pathophysiology, diagnosis and treatment and its signalling cascades.
CO5	Understand the general mechanism of action of plant hormones and pheromones signalling mechanism in plants.

MBC -303: Metabolism – II

(52 hrs)

Course Objectives	
1	Educate the students about the concepts of metabolic energy capture and transfer mechanisms.
2	Enable the students to understand the different stages of nitrogen cycle and its importance in life.
3	Educate the students about the metabolism of various nitrogen molecules and discuss about its significance.

Course Outcomes (COs)	
CO1	To understand the basic concepts of metabolic energy capture and transfer, biological oxidation, oxidative phosphorylation, ATP synthesis in mitochondria, plants and bacte-

	ria.
CO2	To understand nitrogen cycle with detailed mechanism of nitrogen fixation and its importance in the assimilation of atmospheric nitrogen
CO3	To learn the synthesis and degradation of purines and pyrimidines by salvage and denovo pathways, disorders related to the nucleotide metabolism.
CO4	To understand the mechanism of degradation of essential and non essential amino acids in plants ,microbes and animals.
CO5	To learn how amino acids are synthesized in living things along with inborn errors of amino acid metabolism and synthesis, degradation and regulation of heme along with related disorders of heme.

MBC – 304: Molecular Biology Lab
(4 credits)

Course Objectives	
1	Enable students to develop familiarity with basic molecular techniques useful

	for advanced research.
2	Enable students to isolate and investigate nucleic acids.
3	Develop hands-on experience of handling analytical instruments.

Course Outcomes (COs)	
CO1	Perform isolation of genomic DNA from plant, bacteria and yeast.
CO2	Perform basic molecular characterization techniques on the isolated DNA
CO3	Separate plasmid DNA and RNA from biological samples.
CO4	Experience handling PCR instrument for DNA amplification.
CO5	Perform blotting techniques for nucleic acid detection.

**MBC – 305: Genetic Engineering and Bioinformatics Lab
(4 Credits)**

Course Objectives	
1	Enable students to develop familiarity with advanced molecular techniques useful for research.
2	Enable students to perform experiments with vectors and plasmid DNA.
3	Develop acquaintance with the modern <i>insilico</i> tools of biological research.

Course Outcomes (COs)	
CO1	Perform advanced molecular biology experiments like transformation, primer design, ligation and screening.
CO2	Perform expression experiments in microbial vectors.
CO3	Perform restriction digestion and mapping of plasmid DNA.
CO4	Understand the basic concepts of Bioinformatics, online resource (software) utilization and their applications in Biochemical research.
CO5	Understand the basic biostatistical parameters useful for inference drawing in biochemical research.

Fourth Semester M. Sc. Biochemistry

MBC – 401: Molecular Biology – II

52 hrs

Course Objectives	
1	To illustrate the concepts of gene regulation in prokaryotes, eukaryotes and viruses and discuss the role of chromatin organization in gene regulation
2	To analyze the principles of regulation of gene expression by transcriptional modulators and RNA regulators
3	To categorize the process of translation in prokaryotes and eukaryotes along with comprehension of the genetic code

Course Outcomes (COs)	
CO1	To summarize the basic steps in gene regulation that includes positive and negative regulation in prokaryotes and viruses
CO2	To describe the role of chromatin organization, modification and chromatin remodeling in gene expression regulation in eukaryotes
CO3	To analyze the structure and mechanism of gene expression regulation eu-

	karyotic transcription activators, repressors and coactivators, regulation of gene expression by mRNA stability, siRNA and miRNA
CO4	To comprehend the mechanism of protein translation in both prokaryotes and eukaryotes and understand the basic structure and function of the ribosome and enzymes involved in translation
CO5	To interpret how the genetic code was deciphered, wobble hypothesis and properties of the genetic code and its deviation

MBC – 402: Biochemical Genetics

52 hrs

Course Objectives	
1	To gain knowledge about Nature of genetic material, chromosomes, genes and mutations.
2	In depth understanding on Classical genetics; Quantitative genetics; and Human genetics
3	Comprehensive theoretical and foundational concept about Bacterial genetics and Viral genetics.

Course Outcomes (COs)	
CO1	Know about the gene, organization in chromosomes, mutation and its types and the beneficial and harmful effects of mutations.
CO2	Learn about the history of genetics through the study of various experimental organisms and understand quantitative genetics mechanisms and population genetics including methods such as Hardy Weinberg equilibrium.
CO3	Understand about the biochemical events occurring in mitosis and meiosis, higher orders of organization of chromosomes in humans, transposition in humans and chromosomal abnormalities that cause diseases.
CO4	Know about construction of a genome map of the microorganisms through the methods of gene transfer.
CO5	Learn about the life cycle of bacteriophages, fine structure of T-phage and how Benzer used bacteriophages to learn about concept of cistrons and the process of transduction.

MBC – 403: Biotechnology

52 hrs

Course Objectives	
1	Educate the basic concepts related to the field of Biotechnology
2	Learn the methodologies involved in Biotechnology.
3	Understand the overview of transgenic strategies.

Course Outcomes (COs)	
CO1	To learn and understand the basic concepts related to the field of Biotechnology such as cloning strategies, characteristics of enzymes and vectors involved in genetic engineering.
CO2	To outline of methodology for genomic and cDNA libraries construction
CO3	To describe the principle, types and applications of PCR and Learn various advanced gene sequencing methods for the identification of gene products.
CO4	To illustrate the over view of transfection strategies involved in gene transfer to animals cells.
CO5	To illustrate the over view of gene transfer strategies involved in plant cells.

MBC – 404: Immunology

(52 hrs)

Course Objectives	
1	To provide knowledge and understanding of immunology and the way it is applied in diagnosis and therapy
2	To familiarize students with the essential molecules, cells, tissues, and organs involved in body defense mechanism concepts at molecular and genetic level
3	To facilitate the learning of techniques involved in understanding the immunological aspects of physiological and biological samples

Course Outcomes (COs)	
CO1	To explain the nature of various infective agents and the mechanism of defense
CO2	To interpret the roles of various cells and organs involved in immune response
CO3	To comprehend the defensive mechanism against antigens and study of antigens by various immunochemical techniques
CO4	To assess natural and acquired immunity and self recognition of the immune system
CO5	To describe types of antibodies, antibody production and purification and immunotherapy, TCR gene organization and combination

**MBC – 405: Immunology and Toxicology Lab
(4 Credits)**

Course Objectives	
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1	Enable students to develop familiarity with immuno assays.
2	Enable students to perform various antigen / antibody detection techniques.
3	Develop acquaintance with the basic phenomenon of toxicology and investigation of toxicants.

Course Outcomes (COs)	
CO1	Perform immunochemical methods for assessment of antibodies
CO2	Know the different methods of assessing the presence and absence of antigen in biological samples.
CO3	Perform immunosorbent assays for analyzing the antibody or antigen titre values.
CO4	Perform immunodetection techniques for analyzing the antigens.
CO5	Detect the presence of toxicants and their estimation.

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MBC – 406: Project Work (4 Credits)

Course Objectives	
1	Enable students to understand the basic research methodology tools, their significance and applications.
2	Enable students to perform experiments and learn team management skills.
3	Enable students to learn safe laboratory practices understand the ethics of doing good research.

Course Outcomes (COs)	
CO1	Define problem for a group project, formulate an experimental design to analyze the problem, learn about review of literature, analyze current published literature and rationalize the research gap in their project problem
CO2	Execute the experiments to solve and analyze the formulated problem, work independently as well as in small groups, show self-direction and motivation, trouble shoot failures in any experiments and contribute to group project
CO3	Able to analyze the data obtained from experiments, perform statistical analysis, visual representation of the data as graphs and power point presentations
CO4	Learn how to prepare a dissertation including different sections such as introduction, review of literature, methodology, results, conclusions and discussion.
CO5	Learn to present the results of their project to an audience of peers and faculty and external examiners and defend their results.

Open elective for Non-Biochemistry PG students

MBC – 304: Biochemistry in Daily Life

(52 hrs)

	Course Objectives
1	Educate about the basic phenomenon of Biochemistry related to Nutrition , Health and Disease for a non Biochemistry PG student.
2	Make the student get aware about the functions and uses of Food additives and functional foods.
3	Make the students understand the applications of enzymes in food industry and principles of food processing.

	Course Outcomes (COs)
CO1	Understand the basics of nutrition, health and associated diseases
CO2	Define functional foods, their health benefits
CO3	Know additives used in processed food products and their health effects.
CO4	Understand the importance of enzymes in food and allied industries.
CO5	Know the principles of food processing and about fortified food products.

B.Sc Biotechnology

S23 BT 1.1: CELL BIOLOGY

THEORY

Total Teaching Hours: 60

No. of Hours per week: 4

(4 Credits)

CObj	Course Objectives
CObj_1	To introduce the fundamentals of Cell Biology.
CObj_2	To educate the students about the origin and reproduction of cells.
CObj_3	To impart the knowledge of cell to cell interactions and their functions.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the knowledge of structure and functions of various cell organelles.
CO2	Apply the general principles of cell to cell communication.
CO3	Describe the fundamentals of cell growth and reproduction.
CO4	Compare the mechanism of cell aging and cell death.
CO5	Elucidate and interpret the cellular responses.

S210E: BIOTECHNOLOGY FOR HUMAN WELFARE

THEORY

Total Teaching Hours: 45

No. of Hours per week: 3

(3 Credits)

CObj	Course Objectives
CObj_1	To impart basic knowledge and understanding of industrial biotechnology and imparting resource information.
CObj_2	To educate and familiarize with the applications in environmental biotechnology.
CObj_3	To impart deeper understanding in forensic biotechnology and prepare for the expert qualities.

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Grasp and understand the types of biotechnological applications in diverse fields with standard examples in the day to day context.
CO2	Comprehend the industrial applications of biotechnology in production of alcoholic beverage, enzyme, protein, antibiotic, detergent and pharmaceutical products.
CO3	Competitively utilize the application of biotechnology in support to environmental aspects for degradation of pollutants, agricultural wastes, PHB production and its varied uses.
CO4	Familiarize with the wide forensic applications of biotechnology related solving the complex problems faced by public.
CO5	In depth understanding of health applications of biotechnology in the use of recombinant insulin, recombinant vaccine, gene therapy, diagnostic technique using ELISA and PCR and their uses in turning down cancer and human genome project.

S23 BT 2.1: MICROBIOLOGY THEORY

Total Teaching Hours: 60

No. of Hours per week: 4

(4 Credits)

CObj	Course Objectives
CObj_1	To impart basic knowledge and understanding modern microbiology and the technologies involved in it.
CObj_2	To assist with hands on laboratory experience in fundamental techniques like culturing and maintaining the microorganisms related to biotechnology.
CObj_3	To familiarize and educate the students with the antimicrobial strategies, modalities in applying for research area.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Comprehend the basic understanding about the technologies involved in modern microbiology.
CO2	Apply the knowledge about the fundamental techniques involved in culture and maintenance of microorganisms pertaining to biotechnology.
CO3	Analyze the lifecycle of microbial growth and the parameters that can influence it.
CO4	Interpret on the antimicrobial strategies associated in maintenance of sterility.
CO5	Evaluate the various antimicrobial modalities available in natural and pharmaceutical domain and their applications in present day research arena.

**S210E: APPLICATIONS OF BIOTECHNOLOGY IN AGRICULTURE
THEORY**

Total Teaching Hours: 45

No. of Hours per week: 3

(3 Credits)

CObj	Course Objectives
CObj_1	To impart basic knowledge and understanding of scope and concepts in Agriculture Biotechnology.
CObj_2	To detail and weigh the pros and cons of the case studies/practical topics/issues handled in the field of Agriculture Biotechnology.
CObj_3	To make clear understanding about the Bt based products usage and update technologically.

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Understand the scope, significance and importance of plant tissue culture and its techniques related to entrepreneurship.
CO2	Imbibe the fundamental concepts, terminologies and commercial setup with available classical examples on small scale bio enterprises.
CO3	Analyze the pros and cons of the genetically modified crop in the diversified sectors and improvising the decision making ability in terms of safety, acceptance, and perception of GM crops.
CO4	Familiarize with the GM crops and their applications in various industries viz., bio factories, molecular pharming, edible vaccines, plantibodies and nutraceuticals.
CO5	Comment on the Bt based pesticides, applications of antisense RNA technology, utilization of genetic engineering in value addition, and quality improvement traits.

B.Sc GENETICS

S21 GN 1.1: PRINCIPLES OF GENETICS

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide comprehensive understanding of the historical development of Genetics as a scientific discipline and its significance in modern biology and to introduce students to Mendel's laws of inheritance and their applications in understanding genetic patterns and traits in various organisms.
CObj_2	To familiarize with the concept of gene interaction and how multiple genes can influence the expression of a trait.
CObj_3	To understand the structure and organization of chromosomes in prokaryotic and eukaryotic cells and their roles in inheritance and genetic stability and to comprehend the mechanisms and factors involved in sex determination in different organisms.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Explain the historical milestones in the field of genetics, the contributions of key scientists to its development and to apply Mendel's laws to predict and analyze patterns of inheritance for single gene traits in various organisms.
CO2	Describe different types of gene interactions (e.g., dominance, co-dominance, epistasis) and their impact on phenotype and analyze and interpret genetic data involving multiple alleles at a gene locus.
CO3	Compare and contrast the structure of prokaryotic and eukaryotic chromosomes, understanding their differences and functions and describe karyotype and ideogram.
CO4	Elucidate the features of polytene chromosomes, lampbrush chromosomes and B chromosomes.
CO5	Analyze the mechanisms of sex determination in different organisms, including the role of sex chromosomes and environmental factors.

S21OE1: GENES AND DISEASES

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To understand the basics of genetics and heredity without technical jargon.
CObj_2	To recognize the genetic basis of various common diseases and conditions and make informed decisions regarding their own health and genetic testing.
CObj_3	To appreciate the ethical and societal implications of genetic research and healthcare.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Elucidate the role of genes in determining traits and characteristics.
CO2	Identify genetic factors contributing to common health issues and diseases.
CO3	Discuss the societal and ethical aspects of genetic testing and research.
CO4	Critically evaluate health-related information from a genetic perspective.
CO5	Engage in informed discussions and make well-reasoned decisions about genetic health topics.

S21 GN 2.1: BIOINSTRUMENTATION AND ANIMAL CELL CULTURE

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide students with a comprehensive understanding of the principles underlying bioinstrumentation, including the design and application of instruments used in biological research and analysis.
CObj_2	To equip students with the skills and knowledge necessary for successful cultivation and maintenance of animal cells in <i>in vitro</i> .
CObj_3	To foster an interdisciplinary approach by teaching students how to integrate bioinstrumentation techniques with animal cell culture processes, enabling them to design experiments and analyze biological samples using appropriate instruments.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Explain the principles and applications of various bioinstruments used in biological research and industry. Demonstrate proficiency in bioinstrumentation showcasing adeptness in experimental setup and data acquisition.
CO2	Apply cell culture techniques in ensuring the successful cultivation and manipulation of animal cells in a laboratory setting.
CO3	Design and execute experiments that involve the integration of bioinstrumentation and animal cell culture.
CO4	Analyze data obtained from bioinstrumentation and cell culture experiments, demonstrating the ability to interpret results critically.
CO5	Apply critical thinking skills to troubleshoot issues that may arise during bioinstrumentation experiments or cell culture processes.

S23OE-2: HEALTH AND LIFESTYLES

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To build the knowledge on health & lifestyle management and help to better manage their social and psychological dimensions of life.
CObj_2	To evaluate nutrition and meal planning principles in selection, planning, preparation and serving of meals that meet specific nutritional needs and analyses the results of a fitness assessment to create and implement a personal fitness plan
CObj_3	To acquire knowledge and comprehension of topics related to health, nutrition, and various aspects of lifestyle, encompassing mental and emotional well-being, as well as the diseases associated with these areas.

CO	Course Outcomes
	After completion of this course, students should be able to:
CO1	Describe dimensions of health and concepts of wellness and identify the major physical and psychological health concerns.
CO2	Analyze the basic principles of nutrition and ways to obtain and maintain a healthy body composition.
CO3	Evaluate the nutritional habits with lifestyle management and be able to design, implement, and self-assess a personal nutrition and fitness plan.
CO4	Prepare to interconnect the mental, emotional, and physical well-being, and explore strategies for a holistic approach to health.
CO5	Develop an own thinking, opinions and attitudes to global health issues.

SEMESTER – III

Course Code: S21 BT 3.1

Course Name: Biomolecules

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj	Course Objectives
CObj_1	To familiarize the students with the principal biomolecules.
CObj_2	To familiarize the students with the basic knowledge about the functioning of specialized molecules like enzymes and hormones.
CObj_3	To provide the students with the basic concept of biophysics and familiarize them with methodologies employed to detect and quantitate different biomolecules.

CO	Course Outcomes
CO1	The students will gain fundamental knowledge about the structure and chemistry of the principal biomolecules like carbohydrates, proteins and lipids as well as the importance of these biomolecules in living organisms.
CO2	Students will develop an understanding regarding the diversity of the biomolecules, and their roles in organisms.
CO3	The students will develop a basic understanding about the diversity, structure, and importance of specialized molecules like enzymes and hormones in living organisms.
CO4	The students will develop fundamental concepts like—pH and chemical bonding— that are crucial for the functioning of the biomolecules.
CO5	The students will become familiar with basic detection and separation techniques like spectroscopy, chromatography, centrifugation etc.

SEMESTER – IV

Course Code: S21 BT 4.1

Course Name: Molecular biology

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj	Course Objectives
CObj_1	To have basic knowledge of transmission genetics, hereditary mechanism and mutations.
CObj_2	To know the complex organization of the genetic material of prokaryotes and eukaryotes and gene expression studies.
CObj_3	To understand the significance of central dogma of Molecular Biology.

CO	Course Outcomes
CO1	To have a firm foundation in the fundamentals of Molecular Biology.
CO2	To develop an understanding of the cells, Cell organelles and its various cellular mechanisms.
CO3	To analyze the mechanisms associated with Gene Expression at the level of Transcription and Translation.
CO4	To explore the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes.
CO5	To analyze the genotypic and phenotypic relationship of normal and mutant types.

S21 GN 5.1: GENETIC ENGINEERING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To provide adequate knowledge on salient features and applications of tools used in RDT.
CObj_2	To enable students to understand the methodology involved and the various techniques used in construction of recombinant DNA.
CObj_3	To enable students to comprehend the various applications of RDT.

CO	Course Outcomes
	After completion of this module, students should be able to:
CO1	Elucidate the features of various tools used in genetic engineering.
CO2	Understand the steps involved in recombinant DNA technology.
CO3	Analyze and implement the PCR and DNA sequencing techniques in molecular biology and recombinant DNA technology.
CO4	Understand the applications of recombinant DNA technology.
CO5	Execute laboratory experiments using the standard methods and techniques in molecular biology, with the appropriate analysis and interpretation of results obtained.

S21 GN 6.1 ADVANCED PLANT AND ANIMAL TISSUE CULTURE**TECHNOLOGY THEORY****Total Teaching Hours: 60****No. of Hours per Week: 4
(4 credits)**

CObj	Course Objectives
CObj_1	To enable students to demonstrate a sound knowledge of the fundamentals principles of plant and animal tissue culture.
CObj_2	To widen the knowledge of classical and modern plant and animal biotechnology processes, including breeding of healthy breeds, breeds with improved characteristics and breeds for biomolecule production.
CObj_3	To facilitate the students to obtain skills on biotechnological processes such as cell tissue and organ culture, gene transfer with its applicative value in agriculture, pharmaceutical and food industry, and in ecology.

	Course Outcomes
CO1	Comprehend and describe various protocols of plant and animal cell, tissue, and organ culture as well as the scientific principles underlying the protocols.
CO2	To apply tissue culture technology for clonal propagation, assisting plant breeding and improvement, recovering cellines from transformed cells, and production of valuable biochemical molecules.
CO3	To Initiate, analyze and identify concepts and strategies for molecular plant secondary metabolite engineering.
CO4	Acquired awareness of regulations and laws pertaining to ethical concerns using animals for genetic testing.
CO5	Apply knowledge acquired to explore the various applications of organ culture in biomedical research.

**S21 GN 7.1: DEVELOPMENTAL GENETICS &
PHARMACOGENETICS THEORY**

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	COURSE OBJECTIVES
CObj_1	To provide the fundamental understanding of the process that controls embryonic development, analyze Cell fate and pattern formation, molecular analysis of basic body plan.
CObj_2	To enable students to comprehend how basic pharmacokinetic processes are defined, expressed and affected; how pharmacokinetics together with pharmacodynamics determine the effect intensity and effect duration of a drug.
CObj_3	To familiarize students with the basic concepts of toxicology and pharmacogenetics, applications of pharmacogenetics and the process of drug development.

CO	COURSE OUTCOMES
	After completion of this module, students should be able to:
CO1	Provide an in-depth account of molecular events of fertilization and genetics of multicellularity cleavage in early development.
CO2	Give an account of early vertebrate development and morphogenetic and cell movement, analyze cell fate and pattern formation in different organisms and illustrate the role of environment in development.
CO3	Understand and correlate the relationship between pharmacokinetics and pharmacodynamics, and also comprehend toxicology to prevent adverse medication implications in patients and to relate the concepts with the best and advanced clinical practice to augment drug delivery care.

CO4	Understand the basic principles underlying pharmacogenetics and evaluate how genetic variations in drug-metabolizing enzymes, drug transporters, and drug targets can influence individual responses to medications.
CO5	Outline the process of drug development and account for critical factors and decision points in drug development process.

S21 GN 8.1 POPULATION AND EVOLUTIONARY**GENETICS THEORY****Total Teaching Hours: 60****No. of Hours per Week: 4****(4 credits)**

CObj	COURSE OBJECTIVES
CObj_1	To provide a comprehensive overview of the concept of Evolution.
CObj_2	To explain the origin of life and explore salient features of various theories and mechanisms of evolution and speciation.
CObj_3	To impart detailed key concepts of population Genetics in terms of Hardy Weinberg law.

CO	COURSE OUTCOMES
	After completion of this module, students should be able to
CO1	Obtain an academic specialty besides evolutionary trends.
CO2	Acquire in-depth understanding on theories of evolution.
CO3	Gain a glimpse of phylogenetic trees and highlight their construction along with interpretation.
CO4	Earn knowledge on mechanism of speciation.
CO5	Receive adequate information on concepts of population Genetics.

B.Sc -Microbiology
SEMESTER – I
S21 MB 1.1 : General Microbiology

Total Teaching Hours: 60 Hours

No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	The objective of the course is to Know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.
CObj_2	To Master aseptic techniques and be able to identify the unknown microorganisms.
CObj_3	To understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes.

CO_ID	Course Outcomes
CO_1	Comprehend the various methods for identification of unknown microorganisms.
CO_2	Apply practical skills in microscopy handling and staining techniques.
CO_3	Understand about the various physical and chemical means of sterilization.
CO_4	Understand the microbial transport systems and the modes and mechanisms of energy conservation in microbial metabolism.
CO_5	Knowledge about the microbial nutrition - Autotrophy and heterotrophy mode of nutrition.

Course 2 : Theory: OE 1T, MBL 301, Microbial Technology for Human Welfare

Total Teaching Hours : 42

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	The major objective of the course is to teach the strategies to develop fermented products
CObj_2	To know the importance of biofertilizers, biopesticides and Mushroom Cultivation.
CObj_3	To understand the strategies for development of microbial strains, process optimization, large scale production and product recovery by industrially relevant microbial products

CO_ID	Course Outcomes
CO_1	Create the knowledge about the microbial food products and agencies
CO_2	Make use of microorganisms in the production of bio fertilizer and biopesticide
CO_3	Learn techniques in commercial cultivation of mushroom and biogas production
CO_4	Get hands-on knowledge of disinfection, sterilization, microbial assays, pharmacopoeia standards and antimicrobial agents.
CO_5	Determine the recovery and purification of microbial products such as microbial drugs and antibiotic therapy vaccine

SEMESTER – II

S21 MB 2.1: Microbial Biochemistry and Physiology

Total Teaching Hours: 60 Hours

No. of Hours / Week: 4

CObj_ID	Course Objectives
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CObj_1	The major objective of the course is to develop a clear understanding of various aspects of microbial physiology along with diverse metabolic pathways existing in bacteria in relation to its survival and propagation.
CObj_2	To provide the core principles and specialized knowledge of Carbohydrates, Lipids, Proteins, Vitamins, Porphyrin, cellular transport, law of thermodynamics, Lipid and Nitrogen metabolism.
CObj_3	To acquaint various life processes like photosynthesis, respiration, fermentation and anaerobic respiration.

CO_ID	Course Outcomes
CO_1	Evaluate the metabolic process of microbial system
CO_2	Apply the knowledge of biomolecules in biochemistry
CO_3	Analysis of the mechanism of bioenergetics and photosynthesis.
CO_4	Analysis of the mechanism of fermentation and anaerobic respiration.
CO_5	Able to predict the intermediate product which can be used for industrial production processes.

Course 2 : Theory: OE 1T, OE- 2T, MBL 302, Environmental and Health Microbiology

Total Teaching Hours : 42

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	The major objective of the course is to give hands- on experience on isolation and characterization of microbes environmental samples(air water and soil).
CObj_2	To analyze the microbial assessment of water and potability test for water Microbiology
CObj_3	To survey and surveillance of microbial infections.

CO_ID	Course Outcomes
CO_1	Analyze the characteristics of microbes in air, water and soil
CO_2	Understand the role of microorganisms in soil
CO_3	Know the microbial analysis of drinking water
CO_4	Aware about airborne, waterborne and foodborne microbial infections
CO_5	Elaborate the epidemiology of microbial infections, their detection and control.

CO-PO Mapping

SEMESTER – III

Course code & Title: S21 MB 3.1 - Microbial diversity

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj	Course Objectives
CObj_1	To expand knowledge on evolution and microbial diversity.
CObj_2	To understand bacterial taxonomy.
CObj_3	To study various classes of fungi in terms of their characteristic features.

CO	Course Outcomes
CO1	To demonstrate an understanding of bacterial, fungal, cyanobacterial, viral and rickettsial classifications, culturing, reproduction and significance.
CO2	The student will learn the techniques of studying bacterial growth curve and factors affecting growth curve.
CO3	The students will gain knowledge about role of macronutrients and micronutrients in growth of microbes.
CO4	Develop an understanding of physiological and molecular diversity within a community of microbes.
CO5	Understand the principles and methods behind studying and identifying cultured and uncultured microorganisms.

Practical: S21 MB 3.2 - Microbial diversity

Total Teaching Hours: 45

No. of Hours / Week: 3

CObj	Course Objectives
CObj_1	To know various culture media and their applications.
CObj_2	To understand, learn and gain skills of isolation, culturing and maintenance of pure culture.
CObj_3	To train the students in advance microbial techniques.

CO	Course Outcomes
CO1	Student will be able to use the knowledge for isolation and identification of microorganisms from variety of sources.
CO2	Student will be able to understand evolution of microbial species.
CO3	Student will be able to classify the microorganisms based on classical and advanced methods.
CO4	Student will be able to understand microbial diversity, species and estimation of various microbial species from different sources.
CO5	Students gain knowledge of analytical methods in biological sciences.

Open Elective: OEC MB 3.1 Cosmetic Microbiology

Total Teaching Hours: 42

No. of Hours / Week: 3

CObj	Course Objectives
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CObj_1	To know scope and applications of microorganisms producing cosmetic products.
CObj_2	To understand, learn and gain skills of isolation, culturing and maintenance of microbial cultures producing cosmetic products.
CObj_3	To train students in techniques of cosmetic and anti- microbial importance.

CO	Course Outcomes
CO1	Student will be able to use the knowledge for isolation and identification of cosmetic products from microorganisms.
CO2	Student will be able to understand the microbial quality control measures used in cosmetology
CO3	Student will be able to relate and synthesize microbial products used in cosmetics
CO4	Student will be able to understand the mode of action of natural cosmetic products
CO5	Students gain knowledge of analytical methods in cosmetic sciences.

SEMESTER – IV

S21 MB 4.1: Microbial Enzymology and Metabolism

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj	Course Objectives
CObj_1	To understand the mechanism of enzyme kinetics
CObj_2	To develop clear understanding of various aspects of microbial physiology along with diverse metabolic pathways existing in bacteria in relation to its survival and propagation
CObj_3	To provide the core principles and specialized knowledge of Carbohydrates, Lipids, Proteins metabolism
CO	Course Outcomes
CO1	The students will be able to make qualitative and quantitative description of the basic enzymatic phenomena and processes
CO2	Understand the importance of mathematical and statistical methods required for the description, interpretation of enzymatic phenomena and processes
CO3	Knows the basic concepts, terms and techniques used in enzymology
CO4	Understand the regulation of biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis.
CO5	Concepts of lipid and nitrogen metabolism, oxidation of fatty acid

SEMESTER IV

Practical: S21 MB 4.2 Microbial Enzymology and Metabolism

Total Teaching Hours: 45

No. of Hours / Week: 3

CObj	Course Objectives
CObj_1	To learn and understand the fundamentals of cellular metabolism of carbohydrates, lipids, aminoacids, and nucleic acids
CObj_2	To learn the detection and estimation of biomolecules
CObj_3	To Study of enzyme kinetics, Km and Vmax

CO	Course Outcomes
CO1	The student will be able to learn Carbohydrate catabolism by fermentation
CO2	Learn about enzyme kinetics, effect of enzymes concentration, pH and temperature on kinetics of enzyme reactions
CO3	The students will learn to perform assay of clinically important enzyme
CO4	Learn different immobilization techniques and Industrial scope of enzymes
CO5	The expertise gained by the student in this course can be useful in food industries, pharma industries, clinical and microbiological labs

OE MB 4.1: Microbial Biotechnology

Total Teaching Hours : 42

No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	To upraise the components and units of a bioprocess industry
CObj_2	To impart the knowledge on the various industrial bioproducts
CObj_3	To give an insight on the role of microorganism in food industries
CO_ID	Course Outcomes
CO_1	Students understand the microbial biotechnology through handling the microorganisms
CO_2	Creates knowledge about the Production of various industrial bioproducts from industrially relevant microbes in students

CO_3	Potential applications of bioprocessing in various fields involving microorganism are understood by students
CO_4	Students can explain the importance of different types of food in balanced diet and planning
CO_5	Students will be able to evaluate the microbial food products and their role in processing and consumption

SEMESTER V

Content of Course 5: Theory: S21 MB 5.1 – Microbial Genetics and Molecular Biology

CObj_ID	Course Objectives
CObj_1	The major objective of the course is to understand how microorganisms can be used as tools to understand various biological phenomena.
CObj_2	To acquaint types of mutation, gene regulation and transposable element
CObj_3	To acquire in-depth study on structure and organization of chromosome, replication process, transcription process, translation process and mutagenesis.

CO_ID	Course Outcomes
CO_1	Outline the structure of the prokaryotic and eukaryotic genome and discuss the types mutation and DNA repair mechanism.
CO_2	Analyze the genetic recombination and the overview of bacterial genetic maps and interpret the gene transfer mechanism in bacteria.
CO_3	Understand the central dogma and regulation of gene expression.
CO_4	Evaluate the operon model and molecular techniques with different samples.
CO_5	Apply the recombinant DNA technology in the agricultural, medical and industrial and environmental field.

B.Sc. (Basic and Honors Degree in Microbiology)
(Choice Based Credit System – 2021 scheme)
As per NEP 2020 guidelines
SEMESTER V

Content of Course 6: Theory: S21 MB 5.3 – Immunology and Medical Microbiology

	Objective
CObj_1	To develop students' understanding of medical microbiology with hand on experience in the isolation and identification of the microorganisms from different clinical samples
CObj_2	To strengthen the knowledge of students in immunology and immunodiagnosics
CObj_3	To explain the various pathological events during the progression of an infectious disease caused by common pathogenic microorganisms

	Outcome
CO1	Illustrate the cells, tissues, organs of the immune system and types of immunity.
CO2	Understand the properties, functions of Antigens, antibodies and complement system and antigen and antibody reactions
CO3	Analyze the symptoms, pathogenesis, laboratory diagnosis and control measures of bacterial, fungal, viral and protozoa
CO4	Elaborate the antimicrobial agents to handle microorganism in risk groups
CO5	Apply the immuno and molecular techniques for the diagnosis of disease.

B.Sc (Basic and Honors Degree in Microbiology)
(Choice Based Credit System – 2021 scheme)
As per NEP 2020 guidelines
SEMESTER VI

Content of Course 7: Theory: S21 MB 6.1 – Food and Dairy Microbiology

	Objective
CObj_1	To understand microbiology of fermented food commodities.
CObj_2	To describe the role of microorganisms in food spoilage and principles of food preservation.
CObj_3	To analyze the microbiological quality control, and quality schemes.

	Outcome
CO1	Analyze the character of microbes in food spoilage using various examination and evaluation of preservation techniques for food.
CO2	Evaluate the microbiology of fermented milk products.
CO3	Discuss the government regulatory practices and policies in food quality and safety.
CO4	Apply the techniques to assay the food borne infections and intoxication.
CO5	Create the knowledge about the microbial food products and determine the role of various agencies in food sanitation and control.

B.Sc (Basic and Honors Degree in Microbiology)
(Choice Based Credit System – 2021 scheme)
As per NEP 2020 guidelines

SEMESTER VI

Content of Course 8: Theory: S21 MB 6.3 – Industrial Microbiology and Bioprocess Technology

CObj_ID	Course Objectives
CObj_1	The major objective of the course is to provide the design of bioreactors, media formulations and factors affecting the industrial production of biochemicals along with approaches that can be used for enhanced production.
CObj_2	To analyze the role of micro-organism in production of organic acids, alcohols, wine, vinegar, enzymes, vitamins, antibiotics, amino-acids and steroids
CObj_3	To understand the strategies for development of microbial strains, process optimization, large scale production and product recovery will be covered for industrially relevant microbial products and therapeutic proteins

CO_ID	Course Outcomes
CO_1	General design of fermenter, media and the process of fermentation and optimization of fermentation process
CO_2	Isolation of industrially important microbial strains and fermentation media
CO_3	Students will be able to select industrially important microbes for economical use including protein products.

CO_4	Types of fermentation processes, bio-reactors and measurement of fermentation parameters
CO_5	Microbial production of industrial products (microorganisms involved, media, fermentation conditions, downstream processing and uses)

B.Sc V Semester Zoology

Non-chordates and Economic Zoology

Course Code: S21ZO5.1

Total Hours: 60

Credits: 4

CObj	Course objective
CObj_1	To understand the taxonomic position of non-chordate
CObj_2	To understand the body organization and general characteristics of animals belonging to different phyla
CObj_3	To understand the experiential learning on the methodology and economic aspects of culturing animals

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Develop appreciation on diversity of life on earth.
CO2	Recognize different levels of biological diversity through the systematic classification of non-chordates
CO3	Comprehend the evolutionary significance of non-chordates
CO4	Understand the economic aspects of culturing animals
CO5	Acquire knowledge on various useful and harmful organisms

Chordates and Comparative Anatomy

Course Code: S21ZO6.1

Total Hours: 60

Credits: 4

CObj	Course objective
CObj_1	To understand different categories of chordates and the general characters of chordates
CObj_2	To understand the level of organization in chordate subphylum and their origin and evolutionary relationship
CObj_3	To find differences and similarities between the body structure of species to predict whether they are related to a common ancestor or not.

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Describe unique characters of chordates
CO2	Recognize the life functions of chordates.
CO3	Understand the ecological role of different groups of chordates.
CO4	Identify the major organs common in organisms
CO5	Compare and contrast the anatomical systems of different organisms

S21ZO7.1: EVOLUTIONARY AND DEVELOPMENTAL BIOLOGY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course objectives
CObj_1	To demonstrate understanding of ecological and evolutionary processes
CObj_2	To describe the theory of natural selection and to understand how species evolve
CObj_3	To understand the complete process of development in organisms

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Describe evolutionary history of man.
CO2	Describe origin of species on earth.
CO3	List the types of characteristics that make an organism ideal for the study of developmental biology.
CO4	Recognize the events that lead to fertilization
CO5	Distinguish between evolutionary and developmental biology

B.Sc Chemistry
SEMESTER-I

S21CH1.1: Analytical and Organic Chemistry-I

Total Teaching Hours: 60 No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	The main objective is to provide to the students an in depth understanding of the basic concepts of chemical sciences.
CObj_2	To enable them with tools needed for the practice of chemistry, which remains a discipline with much stress on experimentation.
CObj_3	To provide a detailed knowledge of the terms, concepts, methods, principles and experimental techniques of chemistry.

CO_ID	Course Outcomes
CO_1	Learn the concepts of chemical analysis, accuracy, precision and statistical data treatment
CO_2	Prepare the solutions after calculating the required quantity of salts in preparing the reagents/solutions and dilution of stock solution.
CO_3	Know the concept of volumetric and gravimetric analysis and deducing the conversion factor for determination
CO_4	Handle toxic chemicals, concentrated acids and organic solvents and practice safety procedures.
CO_5	Understand the concepts of Organic reactions and techniques of writing the movement of electrons, bond breaking, bond forming

SEMESTER-I

S21CH1.2: Analytical and Organic Practicals-1

Total Teaching Hours: 60 No. of Hours / Week: 4

CObj_ID	Course Objectives
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CObj_1	To understand the uses of analytical methods in chemistry.
CObj_2	To establish an appreciation of the role of chemistry in qualitative and quantitative analysis.
CObj_3	To introduce different experiments to develop the skills and strategic approaches for organic synthesis and its purifications.

CO_ID	Course Outcomes
CO_1	Aware of methods of calibration of various glasswares.
CO_2	They will know the importance of purification of different chemicals
CO_3	Apply the organic synthetic strategies in multi-step synthesis
CO_4	Prepare organic compounds in an environmental friendly way
CO_5	Learn the qualitative and quantitative analysis of different chemicals

SEMESTER-I
S21OE1.3: CHEMISTRY IN DAILY LIFE

Total Teaching Hours: 45 No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	Visualize the importance of Chemistry in daily life.
CObj_2	Know about artificial sweetening agents and food preservatives.
CObj_3	Make students more aware of the chemical found in all aspects of daily life.

CO_ID	Course Outcomes
CO_1	Learn the constituents of milk and milk products and their analysis
CO_2	Students will learn about food adulterants and food additives and their analysis.
CO_3	Students will learn the concepts of manufacturing of soaps and detergents
CO_4	Students will learn the checking the purity of edible oils and will understand the importance of vitamins
CO_5	Students will learn about batteries and basic concepts of polymers

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SEMESTER-II

S21CH2.1: Inorganic and Physical Chemistry-I

Total Teaching Hours: 60 No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	To understand the structure of the atom, shapes of different orbital's and properties of periodic table

CObj_2	To develop the ability to correlate the chemical and physical properties of elements and their compounds in the periodic table
CObj_3	An overview of close packing of metallic crystals, unit cell and crystal lattice, determination of surface tension, viscosity and refractive index of liquids. Colligative properties

CO_ID	Course Outcomes
CO_1	Students will learn the structure of an atom, electronic configuration. Schrodinger wave equation, Heisenberg's uncertainty principle, quantum numbers.
CO_2	Students will understand periodic properties of elements and their compounds.
CO_3	Students should be able to determine the difference between solids, liquids and gases.
CO_4	Students will be able to understand gas laws, theories and its application.
CO_5	Students will learn the physical properties of liquids and Colligative properties

Course Content

SEMESTER-II S21CH2.2: Inorganic and Physical Practicals

Total Teaching Hours: 60

No. of Hours / Week: 4

CObj_ID	Course Objectives
CObj_1	To educate the methods of preparation of solutions different concentrations.
CObj_2	To measure different physical parameter like viscosity, surface tension.
CObj_3	To confidently make use of different apparatus in the laboratory

CO_ID	Course Outcomes
CO_1	Students will be confident in preparing various concentration of different solution.
CO_2	They will get expertise in analysis of real time samples.
CO_3	Students will understand acid- base, redox and precipitation reactions
CO_4	Students will be able to determine the molecular weight of unknown compounds by using walker –Lumsden and cryoscopic methods.
CO_5	Students will be aware of determining physical constants of different chemicals.

SEMESTER-II S21OE2.3: Molecules of Life

Total Teaching Hours: 45 No. of Hours / Week: 3

CObj_ID	Course Objectives
CObj_1	Draw the basic structures and classification of biomolecules.
CObj_2	The physiological action of biomolecules in the body.

CObj_3	Concepts of bioenergetics
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CO_ID	Course Outcomes
CO_1	The students will learn about the chemical structures of carbohydrate, and their structural and metabolic role in cellular system
CO_2	The students will learn about structure and function of lipids.
CO_3	They will also learn about primary, secondary, tertiary, quaternary structure of proteins, and composition, functions.
CO_4	The students will understand about the structure and function of nucleosides and nucleotides.
CO_5	They will also learn energy transformation in biological system.

BSc Semester III –Chemistry (Hons)

S21CH3.1: Analytical and Organic Chemistry-II

Contact Hours: 60

Work load: 4 Hours/Week.

Credit Points :4

Evaluation: Continuous Internal Assesment-40 MarksSemester End

Examination -60 Marks

CObj_ID	Course Objectives
CObj_1	Interrelationship among frequency, wavelength and wave number and importance of validation parameters of an instrumental method will be taught .
CObj_2	Principle, instrumentation and applications of spectrophotometry, nephelometry and turbidometry will be taught .
CObj_3	Fundamentals of separation methods and principles of paper, thin layer and column chromatography will be taught
CO_ID	Course Outcomes
CO_1	Understand the importance of fundamental law and validation parameters in chemical analysis
CO_2	Know how different analytes in different matrices (water and real samples) can be determined by spectrophotometric, nephelometric and turbidimetric methods.
CO_3	Fundamentals of separation methods and principles of paper, thin layer and column chromatography will be taught
CO_4	Principle and mechanism of ion-exchange, types of resins and domestic and industrial applications of ion-exchange chromatography will be taught
CO_5	Apply solvent extraction method for quantitative determination of metal ions in different samples

B.Sc Semester III
S21CH3.2-Analytical & Organic Chemistry Practicals
Credit Points: 2 **Teaching Hours:4 hrs**

Course Objectives

CObj_ID	Course Objectives
CObj_1	To impart skills related to preparation of stock and working solutions and handling of instrumental methods.
CObj_2	To know the principle of colorimetric analysis and construction of calibration plot.
CObj_3	To understand the chemistry involved in colorimetric determination of metal ions and anion.

CO_ID	Course Outcomes
CO_1	Understand the importance of instrumental methods for quantitative applications.
CO_2	Apply colorimetric methods for accurate determination of metal ions and anions in water or real samples (real samples) can be determined by spectrophotometric, nephelometric and turbidimetric methods.
CO_3	Learn the importance of qualitative tests in identifying functional groups
CO_4	Learn how to prepare a derivative for particular functional groups and how to purify it.
CO_5	Understand how functional groups in a compound are responsible for its characteristic property.

Semester III

Open Elective-3:S21OE3.3

Title of the Course :ATOMIC STRUCTURE, BONDING AND CONCEPTS IN ORGANIC CHEMISTRY

Contact Hours: 45
week

Workload: 3 hours per

Credit Points: 3

CObj_ID	Course Objectives
CObj_1	To develop an understanding of principles of atomic structure.
CObj_2	To know the importance of quantum numbers, writing of electronic configurations and representation of orbitals.
CObj_3	To develop an understanding of the periodic trends.

CO_ID	Course Outcomes
CO_1	The concept of atomic structure, significance of quantum numbers, filling of electrons of atoms/ions in various orbitals as per rules the trends in periodic properties .The formation of sigma and pi bonds and the bond strength.
CO_2	Tthe structures of ionic solids, applications of B-H cycle, solubility of compounds and consequences of polarization of ions.
CO_3	The construction of MO energy level diagrams and prediction of properties of molecules/ions like bond order, bond energies, bond lengths and magnetic properties.
CO_4	The shapes of molecules/ions based on VSEPR theory.
CO_5	To develop an understanding of the periodic trends.

S21CH4.1-: Inorganic and Physical Chemistry-II

Contact Hours: 60

Work load: 4 Hours/Week.

Credit Points: 4

Evaluation: Continuous Internal Assessment-40 Marks Semester End Examination -60 Marks

CObj_ID	Course Objectives
CObj_1	Different types of bonding in molecules/compounds/ions Properties of compounds based on bonding and structure
CObj_2	Electrochemistry dealing with electrolytes in solution.
CObj_3	Properties of compounds based on bonding and structure.

CO_ID	Course Outcomes
CO_1	Predict the nature of the bond formed between different elements
CO_2	Identify the possible type of arrangements of ions in ionic compounds
CO_3	Relate different energy parameters like, lattice energy, entropy, enthalpy and solvation energy in the dissolution of ionic solids
CO_4	Explain covalent nature in ionic compounds
CO_5	To develop an understanding of the periodic trends

B.Sc-CHEMISTRY IV SEM

S21CH4.2: Inorganic and Physical Chemistry Practicals -II

Credit Points: 2

Teaching Hours: 4Hrs

Evaluation: Continuous Internal Assessment-20 marks Semester End

Examination: 30 marks

Course objectives:

CObj_ID	Course Objectives
CObj_1	Analytical skills in detecting the constituents present in unknown samples by systematically carrying out the qualitative analysis.
CObj_2	The methods of determining rates of chemical reactions.
CObj_3	Designing electrochemical cells and making measurements related to it.

CO_ID	Course Outcomes
CO_1	Understand the chemical reactions involved in the detection of cations and anions.
CO_2	Explain basic principles involved in classification of ions into groups in semi-microqualitative analysis of salt mixture
CO_3	Carryout the separation of cations into groups and understand the concept of commonion effect.
CO_4	Understand the choice of group reagents used in the analysis
CO_5	Analyse a simple inorganic salt mixture containing two anions and cations

B.Sc. Semester IV – B Sc / B. Sc. (Honors)

S21OE4.3: Electrochemistry, Corrosion and Metallurgy

Contact Hours: 42

Workload: 3 hours per week

Credit Points: 3

Course objective:

CObj_ID	Course Objectives
CObj_1	Types of conductance, concept of electrolytes, electrolysis, redox reactions and EMF
CObj_2	Concept of different types of electrochemical cells, Types of electrodes and electrodepotential. Application of electrochemical series.
CObj_3	Basic principles and applications of conductometric, potentiometric and pH titrations.

CO_ID	Course Outcomes
CO_1	Understand the concept of conductance in electrolytic solutions, electrolysis and redoxreactions involved in electrode reactions.
CO_2	Learn the different types of electrochemical cells, their symbolical representation and application of electrochemical series.
CO_3	Apply conductometric, potentiometric and pH titrations.
CO_4	Know the principle, construction and working of batteries.
CO_5	Understand different types of corrosion and its prevention by different methods.

B.Sc V Semester

S21CH5.1- (Selected topics in Inorganic chemistry)

Total teaching hours: 45

No. of hours/Week: 3

CObj_ID	Course Objectives
CObj_1	To explore in depth specialized areas of chemistry of materials, including ores, metals, acids and bases and to understand how metals are extracted from their ores.
CObj_2	Understand the trends in properties and reactivity of the s, p-block elements and noble gases
CObj_3	To become familiar with some of the roles of inorganic polymer and its applications in day to day life.
CO_ID	Course Outcomes
CO_1	Analyze fundamental aspects of main group chemistry, including trends in oxidation states, periodic properties and complex formation tendency.
CO_2	The resulting knowledge primarily serves the success of students pursuing research in the field of chemical metallurgy.
CO_3	To familiar with a variety of different methods for synthesizing inorganic materials and principles of inorganic polymer synthesis.
CO_4	Deduce the shape (geometry) of molecules using radius ratio rules & VSEPR theory.
CO_5	Draw MO diagrams for a few homo- & hetero-nuclear diatomic molecules and to calculate the bond order

SEMESTER-V**S21 CHE.5.2 -Lab-5: Inorganic Chemistry practicals****Total teaching hours: 60****Credits :2**

CObj_ID	Course Objectives
CObj_1	After completion of this course students will be able to analyze the inorganic sample qualitatively. This will help students to work in some laboratory and find the chemical composition of an unknown inorganic compound or mixture
CObj_2	This course teach student to separate the inorganic ions from a mixture and analyze them quantitatively. The basic principle of chromatographic separating techniques is provided in this course and student will learn how to separate metal ions by paper chromatography
CObj_3	To expose students on radical analysis in inorganic mixtures; Determination of surface tension and viscosity of liquids.
CO_ID	Course Outcomes
CO_1	After successfully completing this course, students will be able to prepare the exact solutions for quantitative analysis of metal ions.
CO_2	Apply the knowledge of quantitative analysis for the determination of metals from ores/alloys
CO_3	Synthesize Inorganic complexes and also find their purity.
CO_4	Understand Ion-exchange chromatography for separation.
CO_5	Understand the principle and working of different instruments like colorimeter, conduct meter, spectrophotometer, etc

B.Sc-V semester**S21 CHE.6.1- (Selected topics in Organic Chemistry)****Total teaching hours: 60 hrs****No. of hours/Week: 4****Credits : 4**

CObj_ID	Course Objectives
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CObj_1	Differentiate chiral and achiral molecules.
CObj_2	Identify the stereo centers in a molecule and assign the configuration as R or S
CObj_3	Know about the most important simple heterocyclic ring systems containing heteroatom and their systems of nomenclature and numbering.

CO_ID	Course Outcomes
CO_1	Elucidate structure of organic compounds with specific examples of terpenes and alkaloids by practical approach.
CO_2	Understand the applications of these compounds including their medicinal applications through their reaction chemistry.
CO_3	Learn about basic principles of UV, IR and NMR spectroscopic techniques to interpret the spectra to determine structure and stereochemistry of known and unknown compounds
CO_4	Develop a sound understanding of the fundamental concepts of stereochemistry
CO_5	Understand thoroughly the chemistry of compounds having nitrogen containing functional groups, heterocyclic, polynuclear hydrocarbons, alkaloids and terpenes which includes various methods for synthesis .

B.Sc V Semester

S21 CHE.6.2: Organic Chemistry practicals

Total teaching hours: 60

No. of hours/Week: 4

Credits : 2

CObj_ID	Course Objectives
CObj_1	To understand the mechanisms of important organic rearrangements.
CObj_2	To demonstrate the basic laboratory techniques and application oriented physical constants.
CObj_3	To identify the functional groups of unknown organic compounds.

O_ID	Course Outcomes
CO_1	The students will develop skills in distillation, solvent extraction, TLC and column chromatography.
CO_2	Learn Oxidation and reduction of organic compounds using variety of reagents.
CO_3	Summarize the purification technique, separation and identification technique i.e. Recrystallization, distillation fractional distillation, chromatography and solvent extraction are used for all types of organic compound.
CO_4	Preparation of organic compounds and derivatives, their purifications and run TLC
CO_5	Determination of physical constant: Melting point, Boiling point.

VI-Semester

S21CHE7.1 (Selected topics in Physical Chemistry)

No. of hrs : 60

Credits : 4

CObj_ID	Course Objectives
CObj_1	To understand the importance of Chemical Thermodynamics.
CObj_2	Understand the concept of Chemical Equilibrium.
CObj_3	To become familiar with Solutions and Colligative Properties

CO_ID	Course Outcomes
CO_1	The students will develop skills in distillation, solvent extraction, TLC and column chromatography.
CO_2	They should know different chemical equilibriums and relationship between them.
CO_3	They should able to know why there is lowering in vapour pressure , Rault's law , Henry's law and their applications
CO_4	They should have a general idea about elevation in boiling point and depression in freezing point, their conditions of occurrence and effects.

CO_5	They will know how to determination of basicity / proticity of a polyprotic acid by the thermo chemical method.
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VI-Semester

S21CHE7.2 (Physical Chemistry practicals)

Total teaching hours: 60

No. of hours/Week: 4

Credits : 2

CObj_ID	Course Objectives
CObj_1	To expose students to instrumental methods of analysis.
CObj_2	To teach students the titrimetric and instrumental methods for analytical studies.
CObj_3	To study classical methods of analysis

CO_ID	Course Outcomes
CO_1	Study kinetics of reaction between acetone and iodine and the hydrolysis acetates
CO_2	Separate binary organic mixture and identification of its components.
CO_3	Learners will be able to study chemical kinetics to find the rate constant and determine molecular weight of polymers by viscosity measurements.
CO_4	Students will learn commercial analysis, ion exchange methods and also get hands on training in use of spectrophotometry, potentiometry and pH metry
CO_5	Students will be able independently use potentiometry, conductometry and colorimetry for quantitative determinations.

B.Sc VI Semester

S21 CHE8.1 (Spectroscopy)

Total teaching hours: 60

No. of hours/Week: 4

Credits : 4

CObj_ID	Course Objectives
CObj_1	To impart the knowledge of electronic, rotation, vibration. NMR, FTIR, ESR, spectroscopy and their applications.
CObj_2	The course will provide an introduction to modern optical spectroscopic and imaging techniques and their applications to biology and chemistry.
CObj_3	To understand the role of symmetry in electronic spectroscopy,

CO_ID	Course Outcomes
CO_1	Recognize spectroscopy in microwave, Rotational spectra of rigid diatomic molecules, selection rules, interaction of spectral lines
CO_2	Learn Electronic spectra of diatomic molecules Born-oppenheimer approximation
CO_3	Make Students aware of the fine structure of ESR absorption, Hyperfine structure, Double resonance in ESR, Techniques of ESR spectroscopy.
CO_4	Understand Principles and Applications of Mossbauer spectroscopy
CO_5	Make Students aware of the fine structure of ESR absorption, Hyperfine structure, Double resonance in ESR, Techniques of ESR spectroscopy.

B.Sc VI Semester

S21CHE8.2 (Analytical & Industrial Chemistry practicals)

Total teaching hours: 60

No. of hours/Week: 4

Credits: 2

CObj_ID	Course Objectives
CObj_1	To develop an understanding of the range and uses of analytical methods in chemistry.
CObj_2	To provide an understanding of chemical methods employed for elemental and compound analysis.
CObj_3	To develop some understanding of the professional and safety responsibilities residing in working on chemical analysis.

CO_ID	Course Outcomes
CO_1	Describe and compare a range of analytical chemistry methods and explain the underlying theoretical principles;
CO_2	Employ a variety of analytical methods to prepare, separate and characterize samples from various matrices;
CO_3	As part of a team or individually, conduct, analyse and interpret results of a chemical analysis and effectively communicate these in written reports and other formats;
CO_4	Explain the broad role of analysts in quality control and assessment of experimental measurements from various application context
CO_5	To establish an appreciation of the role of chemistry in quantitative analysis

S21 EL 1.1: ELECTRONIC DEVICES AND CIRCUITS

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand various fundamental principles of network analysis
CObj_2	To understand number systems and Boolean algebra and become familiar with the basic operation of electronic devices
CObj_3	To design electronic circuits, devices and gadgets

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understand the elementary aspects of Electronic devices.
CO_2	Apply on the choice and selection of semiconductor devices.
CO_3	Analyze the electric circuits using network theorems.
CO_4	Evaluate the working of transistors, transistor-based amplifiers and IC's leading towards digital electronic devices.
CO_5	Design the Analog and Digital electronic circuit devices.

S21 OE 1.1: DOMESTIC EQUIPMENT MAINTAINENCE

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To understand the working and parts of Geyser and cooker
CObj_2	To gain the knowledge on micro oven and refrigerator
CObj_3	To know about the working process of AC and general faults

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Gain the knowledge on Geyser, induction cooktop, micro oven, AC and refrigerator
CO_2	Able to understand the common faults and their troubleshooting in cooker, refrigerator, Geyser and micro oven,
CO_3	Able to understand the manufacturing process and working of air conditioner, refrigerator, Geyser, induction cooktop and microwave oven
CO_4	Able to understand the electrical wiring diagram
CO_5	Ability to repair/replace the components of Geyser, micro oven, induction cooktop, AC and refrigerator

S21 EL 2.1: ANALOG AND DIGITAL ELECTRONICS

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To recognize the various working principles of widely used electronic devices, linear and digital ICs
CObj_2	The students will learn the design and working of BJT, JFET, MOSFET
CObj_3	The students will learn arithmetic circuits, multiplexing and demultiplexing operations and a few logic families,

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understanding of the fundamental concepts and techniques used in analog and digital electronics.
CO_2	Apply various combinational circuits, sequential circuits and Analog circuits.
CO_3	Analyze various combinational circuits, sequential circuits and Analog circuits.
CO_4	Evaluate the application potential, pre-requisites for a circuit design and solve timing problems in a digital design.
CO_5	Design and Analyze circuits using Analog and Digital Electronics.

S21 OE 2.1: CONSUMER ELECTRONICS**THEORY****Total Teaching Hours: 45****No. of Hours per Week: 3****(3 credits)**

CObj	Course Objectives
CObj_1	To understand the audio systems of Microphones, Amplifier, Loudspeakers, Radio Receivers, AM/FM, Audio Recording, and reproduction, Installation of Audio/Video systems – site preparation, electrical requirements, cables and connectors.
CObj_2	To know functions of set top box, CATV and Dish TV, LCD, Plasma, LED, OLED, QDLED and LED TV, Projectors: DLP, Home Theatres, Remote controls
CObj_3	To get the knowledge on landline and mobile telephony, electronic gadgets

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Gain the knowledge on the audio systems of Microphones, Amplifier, Loudspeakers and their installation
CO_2	Able to understand functions of TV, TV displays
CO_3	Able to analysis the process of projectors: DLP, Home Theatres, Remote controls
CO_4	Able to understand the design of Basic landline equipment, CL1, cordless intercom/EPABX system, mobile phones and also understand the working process of Scanners, Barcode / flat bed, printers, Xerox, Multifunction UNITs (Print, Scan, and copy)
CO_5	Able to recognize process of the digital clock, digital camera, handcam, home security system, CCTV,

S21 EL 3.1: DIGITAL DESIGN USING VERILOG AND VHDL PROGRAMMING

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To familiarize with the concepts of programming using Verilog and VHDL
CObj_2	To identify language elements and keywords used in Verilog and VHDL
CObj_3	To write the Verilog programs in structural and dataflow modelling levels of Abstraction

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understand of the fundamental concepts and techniques of hardware description languages Verilog HDL and VHDL.
CO_2	Apply fundamental programming skills to write Verilog/VHDL
CO_3	Analyze any basic building block and simulate any digital function in Verilog HDL and VHDL.
CO_4	Evaluate and Construct Verilog programs in structural and dataflow modelling levels of Abstraction
CO_5	Design and Develop Verilog programs in behavioural modelling levels of Abstraction

S21 OE 3.5: MEDICAL ELECTRONICS

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To understand the electro-physiology and bio-potential recording
CObj_2	To describe the bio-chemical and non-electrical parameter measurement
CObj_3	To discuss the various recent trends in medical instrumentation

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understand the electro-physiology and bio-potential recording
CO_2	Able to describe the bio-chemical and non-electrical parameter measurement
CO_3	Able to outline the different types of assist devices
CO_4	Able to describe the concepts of physical medicine and biotelemetry.
CO_5	Able to discuss the various recent trends in medical instrumentation

S21 EL 4.1: ELECTRONICS COMMUNICATION - I

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the analog communication system and its applications.
CObj_2	To demonstrate analog modulation techniques-AM & FM
CObj_3	To illustrate the concept of resonant and non-resonant antennas

CO	Course Outcomes
	After completion of this module, students should be able to
CO_1	Understand the basic concepts of the analog communication systems.
CO_2	Apply elementary concepts for the Analog communication devices.
CO_3	Analyze various analog continuous wave modulation and demodulation techniques including AM, FM and PM.
CO_4	Compute modulation index, bandwidth and power requirements for various analog modulation schemes including AM, FM and evaluate the performance of the communication system in the presence of noise.
CO_5	Design and Analyze a project using Analog modulation techniques.

S21 OE 4.5: MOBILE APPLICATION DEVELOPMENT

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 03

(3 credits)

CObj	Course Objectives
CObj_1	To learn the characteristics of mobile applications
CObj_2	To learn the characteristics of mobile applications
CObj_3	To study about the design aspects of mobile application

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understand the characteristics of mobile applications
CO_2	Design and implement the user interfaces for mobile applications
CO_3	Design the mobile applications that is aware of the resource constraints of mobile devices
CO_4	Develop advanced mobile applications that accesses the databases and the web
CO_5	Develop useful mobile applications in the current scenario using Google Android Studio

S21 EL 5.1: MICROCONTROLLER 8051 AND PIC

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To familiarize with the concepts of programming using Microcontroller
CObj_2	To Gain knowledge of programming of 8051 with C
CObj_3	To Gain knowledge to interface LCD, Keyboard, ADC ,DAC etc

CO	Course Outcomes
	After completion of this module, students should be able to
CO_1	Understand extensively on interfacing the external devices to the controllers and PICs.
CO_2	Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microcontroller.
CO_3	Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of microcontroller.
CO_4	Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.
CO_5	Design electrical circuitry to the Microcontroller I/O ports in order to interface the processor to external deviceswith the help of the interfacing devices.

S21 EL 6.1: ELECTRONICS COMMUNICATION – II

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the Digital communication system and its applications.
CObj_2	To demonstrate Microwave and Optical fibre communication
CObj_3	To illustrate the concept of cellular communication and wireless LANs

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understand the basic concepts of the digital and wireless communication systems.
CO_2	Apply fundamental aspects of digital and wireless communication devices
CO_3	Analyze various digital wave modulation and demodulation techniques, Applegate diagram, OFCs and wireless communication devices
CO_4	Evaluate the fibre loss, handoff rate and selection of microwave or opto-electronic devices for an appropriate application
CO_5	Design and fabricate communication devices.

S21 EL 7.1: ELECTRONICS INSTRUMENTATION

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the Electronics Instrumentation and applications.
CObj_2	To demonstrate Power devices, PLC & Transducers
CObj_3	To illustrate the concept measurement of various parameters

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understanding-depth on electronic instrumentation in various Control systems.
CO_2	Apply the circuitry skills in development of power electronic devices.
CO_3	Analyze various parameters that are required for control systems.
CO_4	Evaluate various parameters in electronic instrumentation and arrive at solutions for real-time problems involving power electronics and control systems.
CO_5	Design and develop electronic instruments and control systems.

S21 EL 8.1: INTERNET OF THINGS (IOT)

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To understand the Internet of Things (IOT)
CObj_2	To demonstrate of sensors, Actuators, IOT methodology, Physical devices and Endpoints
CObj_3	To illustrate the security of IOT

CO	Course Outcomes
	After completion of this subject, students should be able to:
CO_1	Understand the fundamental concepts of Internet of Things.
CO_2	Apply the core skills in development of various electronic gadgets.
CO_3	Analyze circuitry skills on various sensors, actuators, security devices.
CO_4	Evaluate the application potential of IoT devices using Arduino and Raspberry Pi
CO_5	Implement and fabricateIoT devices through interfacing of sensors with Arduino/Raspberry Pi.

S21 MA1.1: ALGEBRA-I AND CALCULUS-I

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To equip students with knowledge and insight in Algebra-I, Calculus-I and related fields.
CObj_2	To develop the ability to utilize the Mathematical problem-solving methods and software applications in addressing practical issues
CObj_3	To apply Mathematical problems and solutions in a variety of contexts related to science, technology, business, and industry

CO	Course Outcomes
	After completing the course students will be able to
CO_1	Understand the concepts of Matrices, Polar Co-ordinates, Limits, Continuity, Differentiability, Mean Value Theorem and Successive Differentiation.
CO_2	Apply the concepts of matrices, Polar Co-ordinates, limits and successive differentiation in solving the problems.
CO_3	Analyse the intermediate value theorems and evaluate limit of a function using L'Hospital rule.
CO_4	Evaluate system of linear equations, the system of homogeneous and non-homogeneous linear m equations in n variables by using the concept of rank, eigen values and eigen vectors.
CO_5	Acquire the techniques of differentiation of function with real variables and sketch curves in Cartesian, polar and pedal equations.

S21 OE: MATHEMATICS FOR ALL-I**THEORY****Total Teaching Hours: 45****No. of Hours per Week: 3****(3 credits)**

CObj	Course Objectives
CObj_1	To equip students with knowledge and insight in Algebra, Percentages, Ratio & Proportions.
CObj_2	To develop the ability to utilize the Mathematical problem-solving methods to solve related real world problems.
CObj_3	To apply Mathematical model and solve problems in a variety of contexts related to science, technology, business and industry.

CO	Course Outcomes
	After completion of the course, students will be able to
CO_1	Gain a knowledge of basic concepts of algebra, matrices and percentages, ratio and proportions.
CO_2	Demonstrate a working knowledge of set notation, matrices, percentage, ratio and proportions
CO_3	Apply the concepts of algebra, matrices, percentages, ratio and proportions to real world problems.
CO_4	The ability to analyze the real world problems.
CO_5	Solve the problems related to algebra, matrices, percentages, ratio and proportions.

S21 OE: BUSINESS STATISTICS

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	Introduce basics of statistics within a financial context.
CObj_2	To enable students to use statistical techniques for analysis and interpretation of business data.
CObj_3	To apply Statistical methods and solve problems in a variety of contexts related to business and industry

CO	Course Outcomes
	After completion of the course, students will be able to
CO_1	Acquire knowledge to Frame and formulate management decision problems
CO_2	Understand the basic concepts of underlying quantitative analysis
CO_3	Identify types of data, visualization, analysis and interpretation
CO_4	Apply suitable Statistical methods for the real world problems
CO_5	Evaluate suitable test procedures for the given data set

S21 MA 2.1: ALGEBRA-II AND CALCULUS-II

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To equip students with knowledge and insight in Algebra-II, Calculus-II and related fields.
CObj_2	To develop the ability to utilize the Mathematical problem solving methods and software applications in addressing practical issues
CObj_3	To apply Mathematical problems and solutions in a variety of contexts related to science, technology, business and industry

CO	Course Outcomes
	After completing the course students will be able to
CO_1	Understand the concepts of mathematical objects called Groups, partial differentiation, Jacobian, Taylor's series, integral calculus, line integral, double integral, triple integral.
CO_2	Acquire skills of problem-solving techniques in Groups, partial differentiation, Jacobian, Taylor's series, integral calculus.
CO_3	Apply the concepts of integral calculus, partial differentiation and the extreme values of functions of two variables to solve the problems.
CO_4	Analyse fundamental concepts of groups, the significance of the notions of Cosets, normal subgroups and factor groups.
CO_5	Evaluate partial differentiation, Taylor's series and the extreme values of functions of two variables, area, volume and surface area.

S21 OE: MATHEMATICS FOR ALL-II

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj_ID	Course Objectives
CObj_1	To equip students with knowledge and insight in Mathematical Logic, Commercial Arithmetic's and Measures of Central Tendency.
CObj_2	To develop the ability to utilize the Mathematical problem solving methods to solve related real world problems
CObj_3	To apply Mathematical model and solve problems in a variety of contexts related to science, technology, business and industry

CO_ID	Course Outcomes
	After completion of the course, students will be able to
CO_1	Understand the concept in science, technology, business and industry.
CO_2	Evaluate the legal, social and economic environment of science, technology, business and industry.
CO_3	Apply decision-support tools to science, technology, business and industry in decision making.
CO_4	Analyse and apply the knowledge of business concepts and functions in an integrated manner.
CO_5	Do analysis, presentation and interpretation of numerical data in real world problems.

S21 OE: BIOSTATISTICS

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To enable the students to identify the variables of biological studies and explore the tools of classification and presentation.
CObj_2	To study the probability notion, models and their applications in the study of biological phenomenon.
CObj_3	To acquire knowledge on sampling distribution and testing of hypotheses.

CO	Course Outcomes After completion of the course, students will be able to
CO_1	Acquire knowledge to Frame and formulate Biological decision problems
CO_2	Understand the basic concepts underlying quantitative analysis of Biological data
CO_3	Identify types of Biological data, visualization, analysis and interpretation
CO_4	Employ suitable test procedures for the given Biological data set
CO_5	Apply suitable Statistical methods for the real world problems of Biological data

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S21 OE: QUANTITATIVE MATHEMATICS

THEORY

Total Teaching Hours: 45

No. of Hours per Week: 3

(3 credits)

CObj	Course Objectives
CObj_1	To equip students with knowledge and insight in Number system.
CObj_2	To provide basic knowledge of Time and work for competitive exams.
CObj_3	To develop the ability solving problems related to data interpretation.

CO	Course Outcomes Students will be able to
CO1	Understand the basic concepts of number system, time and work , data interpretation.
CO2	Demonstrate a working knowledge of number system, time and work , data interpretation.
CO3	Apply the concepts of number system, time and work , data interpretation. to real world problems.
CO4	The ability to analyze the real world problems
CO5	Solve the problems related to number system, time and work , data interpretation.

**S21 MA7.1: LINEAR ALGEBRA AND VECTOR CALCULUS
THEORY**

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To acquire knowledge of Vector space, subspace, basis, dimension and to verify Rank nullity theorem, linear transformations on vector spaces.
CObj_2	To motivate the students to gain knowledge about gradient, curl, Laplacian, directional derivatives, orthogonal curvilinear coordinates and vector integration.
CObj_3	To develop the ability to utilize the mathematical problem solving methods through FOSS tools in addressing practical issues.

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Remember and understand various concepts of Vector spaces, linear transforms, Vector calculus, Orthogonal curvilinear coordinates and Integral theorems.
CO2	Analyse and use the relevant concepts to solve problems on Vector spaces, linear transforms, Vector calculus, Orthogonal curvilinear coordinates and Integral theorems.
CO3	Apply appropriate methods to solve problems on Vector spaces, linear transforms, Vector calculus, Orthogonal curvilinear coordinates and Integral theorems.
CO4	Evaluating the problems on Vector spaces, linear transforms, Vector calculus, Orthogonal curvilinear coordinates and Integral theorems.
CO5	Give an appropriate conclusion and create programs using FOSS tools for the given problem on Vector spaces, linear transforms, Vector calculus, Orthogonal curvilinear coordinates and Integral theorems.

S21 MA8.1: NUMERICAL ANALYSIS

THEORY

Total Teaching Hours: 60

No. of Hours per Week: 4

(4 credits)

CObj	Course Objectives
CObj_1	To develop Mathematical skills of the students in the areas of Numerical methods in finite differences, interpolation, numerical integration and to solve Algebraic, transcendental and simultaneous equations.
CObj_2	To design and analyses of techniques to give Numerical differentiation, Numerical integration and ordinary differential equations.
CObj_3	To develop the ability to utilize the mathematical problem solving methods through FOSS tools in addressing practical issues.

CO	Course outcomes
	After completion of this module, students should be able to
CO1	Understanding of various numerical techniques used for solving mathematical problems.
CO2	Apply numerical algorithms for finding an optimal solution.
CO3	Analyze numerical techniques for solving real world problems.
CO4	Evaluate the real world problems using numerical methods.
CO5	Appraise real world engineering and scientific problem using numerical methods.