DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE (Autonomous)
College with Potential for Excellence, Linguistic Minority Institution
Affiliated to University to Madras
Arumbakkam, Chennai-106

POST GRADUATE

PROGRAMME OUTCOMES [POS] FOR POST GRADUATE

At the end of the PG programme, the student will be able:

PO1	To attain suitable scientific knowledge and technical skills to realize, calibrate and develop innovative processes / skills for creation of inventive products which are beneficial to society.
PO2	To implement discipline, professionalism, team spirit, communication skills, social and ethical commitment in the post graduates in order to embellish leadership roles expediting perfection in different sector with a categorical professional distinctiveness, business savvy, international recognition and imperishable expansion.
PO3	To be habituated with the emerging expanses of erudition and their applications in several domains of biological sciences and to enlighten the students of its relevance in forthcoming studies.
PO4	To enhance the insight of research-oriented knowledge in conjunction with literature survey, design of experimental methodology, analysis and interpretation of results and draw valid conclusions.
PO5	To provoke entrepreneurship among the students along with strong ethics and communication skills.
PO6	To engage in Lifelong learning and enduring proficient progress.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

DEPARTMENT OF ECONOMICS

MICRO ECONOMIC THEORY-1

Course Outcomes

CO1	Understanding the various aspects of consumer behaviour and elasticity of demand
CO2	Evaluate the working of production process in the long run and the short run
CO3	Understand the theories of cost in long run and short run period
CO4	Analyse the theory of firms under perfect competition
CO5	Understand monopoly and monopolistic competition of markets

STATISTICAL METHODS-I

Course Outcomes

CO1	To explain and apply the statistical methods involved in conducting a statistical enquiry
CO2	To distinguish and apply the various methods of presentation of data.
CO3	To apply and evaluate the various measures of central tendency.
CO4	To apply and evaluate the various measures of dispersion and skewness
CO5	To illustrate the application of index numbers through different methods.

RESEARCH METHODOLOGY

Course Outcomes

CO1	To explain the meaning of research, its aims, principles and types.
CO2	To be able to select a research problem after careful review of literature and formulate the design for the study.
CO3	To distinguish between the various methods of data collection.
CO4	To outline the steps involved in the analysis of data.
CO5	To illustrate the general organization of a research thesis with thorough understanding of the rules and ethics.

HEALTH ECONOMICS

Course Outcomes

CO1	To explain the role of health and its indicators in human and economic development
CO2	To assess the market for health services in terms of demand and supply
CO3	To evaluate health care programmes
CO4	To demonstrate the role of medical tourism and assess the health insurance mechanism in India.
CO5	To analyse the health policy in India and Tamilnadu.

ORGANISATION & BEHAVIOURAL ECONOMICS

Course Outcomes

CO1	To identify and develop communication techniques to resolve organizational conflicts
CO2	To evaluate motivational techniques and its relationship with individual behaviour
CO3	To identify various leadership styles and the role of leaders in decision making process
CO4	To explain group dynamics and the role of employees in the group.
CO5	To understand organizational culture and implementation of organizationalchange.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

P.G
SEM-II

MICRO ECONOMICS THEORY II

Course Outcomes

CO1	understanding various market structures and their functions
CO2	Analysing the various managerial theories and its applicability.
CO3	Analysing product and factor pricing under perfect and imperfect competition
CO4	Evaluating General equilibrium and the allocation of resources
CO5	Understanding various welfare functions and its relevance.

STATISTICAL METHODS- II

Course Outcomes

CO1	To classify the different methods of data collection and evaluate its applicability
CO2	To understand and apply the chi square test to social science research
CO3	To evaluate the applicability of various methods of estimating correlation
CO4	To examine the utility of regression analysis through its varied applications
CO5	To demonstrate the utility of time series in forecasting and assess the applicability of its various methods.

INDIAN ECONOMIC DEVELOPMENT AND POLICY

Course Outcomes

CO1	To be able to explain the objectives and achievements of planning and evaluate the impact of reforms like LPG and demonetisation.
CO2	To analyse the methods of measurement of poverty and assess the impact of government policies relating to poverty and unemployment.
CO3	To measure the significance of agriculture ,allied sectors and agro based industries on India's economic development.
CO4	To estimate the role of the industrial sector to India's economic development in terms of regulations,mordernisation and globalisation.
CO5	To assess the recent trends in India's service sector.

MONETARY ECONOMICS

Course Outcomes

CO1	Paraphrase concepts related to money and monetary practises currently practiced in India
CO2	Enumerate various approaches related to monetary schools of evolution
CO3	To appraise the approaches given by economists like Keynes, Baumol, Tobin and Friedman
CO4	Analyze the role of monetary policy and the role of financial institution in India
CO5	Compare the monetary systems in India with that of European monetary systems

MANAGERIAL ECONOMICS

Course Outcomes

CO1	To apply the various economics concepts to understand competitive outcomes
CO2	To compare and evaluate pricing strategies for profit maximization
CO3	To identify & apply right decisions for optimal use of resources
CO4	To evaluate the types of market structures.
CO5	To examine the implications of government intervention in economic development

P.G
SEM-III

MACRO ECONOMICS THEORY- I

Course Outcomes

CO1	To have knowledge on National Income and its concept
CO2	Students familiar with the classical concept
CO3	Students study about Keynesian Macro Economics
CO4	This model examines the three sector using IS LM curve are thought to the students
CO5	To learn about the quantity theory of money

PUBLIC ECONOMICS – I

Course Outcomes

CO1	To understand the role & pricing policies of public enterprises.
CO2	Analyse the welfare foundation of public economics.
CO3	To identify the causes for market failure.
CO4	To analyse the theories, structure, growth & appraisal of public expenditure policy.
CO5	Explains cost benefit analysis, performance budgeting & zero base budgeting.

INTERNATIONAL ECONOMICS-I

Course Outcomes

CO1	To understand the nature of international economics through various concepts and tools.
CO2	To compare and evaluate the classical and neo classical theories of international trade.
CO3	To understand and apprise the modern theories of international trade.
CO4	To analyse the effect of trade on growth..
CO5	To understand and evaluate the need for collusion and integration in international trade.

FINANCIAL MARKETS AND SERVICES- I

Course Outcomes

CO1	Demonstrate comprehensive knowledge of Indian Financial Markets and Services.
CO2	Possess knowledge of legal and Regulatory frame work governing Financial Markets and Services.
CO3	Ability to analyze and interpret the working, Organization, and Functions of SEBI, and online trading
CO4	To understand the benefits and impact of International Financial and Capital Market in India.
CO5	Competence to excel in competitive Civil Services and SET, NET, Ph.D examinations

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ENTREPRENEURIAL DEVELOPMENT

Course Outcomes

CO1	To understand the basic concept of entrepreneurship
CO2	To assess the role of entrepreneur in public and private sector
CO3	To outline the various entrepreneurial development programmes in India with special reference to women
CO4	To analyze the role and effectiveness of banks in promoting entrepreneurship
CO5	To understand the various concepts related to pricing and distribution

MACRO ECONOMICS THEORY – II

Course Outcomes

CO1	They can have clear idea on investment, multiplier,accelerator & super multiplier.
CO2	They can gain a full knowledge about liquidity aspects of money supply in the open economy
CO3	They can differentiate a normal versesgalloping price level in the economy and also familiar with controlling techniques of inflation
CO4	To understand volatilities in the business
CO5	They can easily differentiate monetary verses fiscal policy& they have clear idea about macroeconomics goals

PUBLIC ECONOMICS-II

Course Outcomes

CO1	Understand the tax structure & policies in India
CO2	Identify the growth & composition of public debt in India.
CO3	Analyse & understand the instruments of fiscal policy.
CO4	Understand the principles of federal finance.
CO5	Discuss the problems of state indebtedness & recommendations of latest finance commission.

INTERNATIONAL ECONOMICS-II

Course Outcomes

CO1	To understand the trade relationship between India and the world economy.
CO2	To explain how exchange rates are determined between the rupee and other currencies and factors causing changes in them..
CO3	To outline the tools that are adopted by a country for external equilibrium.
CO4	To analyze the effectiveness of the tools for achieving external equilibrium.
CO5	To compare the role of international economic organizations in solving problems of international debt and liquidity.

FINANCIAL MARKETS AND SERVICES- II

Course Outcomes

CO1	To demonstrate and recall comprehensive knowledge of Banking system in India.
CO2	To apply the principles and features of consumer finance in real life.
CO3	To analyze the operations, and significance of derivative markets in India.
CO4	To possess comprehensive knowledge of various financial services, and understand its growing importance in increasing investments for economic development.
CO5	To understand the need for Venture Capital finance, in promoting investments in large investment projects.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

HUMAN RESOURCES MANAGEMENT

Course Outcomes

CO1	To duplicate the concepts related to HRM
CO2	To compare the concepts given by Adam Smith and Marshall
CO3	To examine the role of private and social investment with respect to HRM
CO4	To demonstrate the use of various model related to recruitment and training
CO5	To associate with various concepts of wage salary administration, demotion & grievance handling and promises employability at both private and public sector enterprises

Economics of Education

Course Outcomes

CO1	To understand the scope and importance of education and its impact on economic development
CO2	To analyze the different dimensions of education and role of government in promoting education
CO3	To evaluate the issues and challenges of new education policy
CO4	To explain the reasons behind educated unemployment
CO5	To describe the importance of educational training

CONTEMPORARY ECONOMIC ISSUES

Course Outcomes

CO1	To understand the nature and magnitude of poverty and unemployment and evaluate the measures for its alleviation.
CO2	To assess the role, progress and policies of agriculture in the Indian Economy.
CO3	To evaluate the role, developments and regulation relating to industries in the Indian economy.
CO4	To analyse the fiscal system in India with respect to taxes, centre state financial relations and recent budget.
CO5	To apprise the impact of LPG in India.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M.Com

PROGRAM SPECIFIC OUTCOMES

PSO-1: To enable the students to undertake teaching as a career after completion of the course
PSO-2: To cater to the industry expectations in the field of Accounting, Auditing, Legal Compliance, Marketing, Banking and financial Services, Taxation, Logistics & Supply Chain Management, Services Marketing, Security Analysis and Portfolio Management at Managerial Level.
PSO-3: To inculcate Research Skills and pursue Ph.D in commerce and/ or to engage in the field of Research Analyst, Investment Manager and Portfolio Analyst

SEMESTER I CORE - I
Course Title: ADVANCED CORPORATE ACCOUNTING – I

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Acquire Knowledge in Understanding Problems relating to issues and forfeiture of share and Underwriting of shares in situations of capital issue to public at premium, at discount and forfeiture of shares etc.	K1& K2
CO2	Analyze Company final accounts and value the shares and goodwill of the company in preparing Statements.	K4& K5
CO3	Employ critical skills in Preparing problems of Amalgamation, Absorption and Reduction of Share Capital	K3& K6
CO4	Evaluate an understanding about Liquidation Problems of the company and the Legal issues inhibiting its Preparation.	K1 & K6
CO5	Identify and Implement various methods of Inflation accounting and also get a conceptual knowledge on HRM and Social responsibility accounting.	K1, K2& K3
CO6	To help the student acquire the techniques of restructuring and liquidating the corporate entities.	K5

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE- II FINANCIAL MANAGEMENT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Explain the functions and role of a finance manager in an organisations • Categorise various sources of raising fund	K2 & K4
CO2	• Demonstrate understanding of capital structure, its source and leverage concepts. • Explain the concept of dividend policy, its relevance and various models associated with dividend policy.	K3& K4
CO3	• Compute cost of individual source of capital and also their overall averages based on specific information. • Compare various Long term sources of raising funds and compute the WACC.	K4& K5
CO4	• solve the given problems on capital budgeting and investment decision • Evaluate investment proposals by using capital budgeting techniques	K5 & K6
CO5	• Determine factors affecting working capital & • Prepare an estimate of working capital requirements	K4, K5 & K6
CO6	• Analyse the Corporate Financial needs by understanding the Components of the Financial Markets and Manage funds effectively	K5

CORE III CONSUMER BEHAVIOUR

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Understand the definition of consumer behaviour; factors influencing it; its evolution ; economic model; learning model; psychoanalytical model; stages in the field of consumer behaviour; consumer research process; theories of buyers behavior	K2 & K3
CO2	• Explain the importance of understanding consumer behaviour; consumer decision making process; levels of consumer decision making models	K3 & K4
CO3	• Identify psychological influence on consumer behaviour, motivation, personality, consumer learning, concept and self image, perception ,attitude, beliefs, consumer communication	K1 & K5
CO4	• Identify consumer group , reference group , social class, lifestyle analysis, culture, subculture, cross culture, interpersonal communication, opinion leadership	K2 & K3
CO5	• Define consumer orientation, diffusion process, adoption decision- its stages, barriers to adoption , innovators • Prepare profile of consumer innovators; multiplicative innovation adoption(MIA) model	K1 & K4
CO6	• Recognise social and ethical implication of marketing actions on Consumer behaviour. Use most appropriate techniques to apply market solutions.	K5

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SPECIALISED COURSE-I
LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Define various concepts in Logistics management; it gives the wider idea about the logistics.	K1
CO2	• Discuss the inventory control, demand forecasting, distribution management, and logistics in 21st century.	K3
CO3	• Analyse supply chain management and its global applications	K4 & K5
CO4	• Explain the role of manager, drivers, and key enablers in supply chain management.	K2
CO5	• Generate ideas about aligning the supply chain with business strategy and compare and contrast about SCOR Model, 3PLS, Fourth Party Logistics.	K6
CO6	• Develop and apply analytical techniques to design and operate integrated supply chains. Analyse and improve supply chain processers.	K5

Course Title: Elective Paper I– ADVANCED STATISTICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Illustrate and describe sample spaces and events for random experiments • Calculate probabilities of events in discrete sample spaces and conditional Probabilities of events using Baye's theorem. • Sketch the concept of probability distribution to real world problems involving various distributions like Binomial, Poisson and Normal distributions.	**K2, K3**
CO2	• Describe the testing hypothesis for large samples • Produce a significant test of hypothesis concerning the value of population means and proportion based on Normal distribution	K2,**K3,K6**
CO3	• Describe the testing hypothesis for small samples • Produce a significant test of hypothesis concerning the value of population mean based on t-distribution, F-test, χ^2-test. • Discuss about goodness of fit for given data	**K2, K3**
CO4	• Explain the concept of analysis of variance and use them to investigate factorial dependence • Demonstrate pay-off table, Maximin and Minimax principle and Baye's principle • Explore how problem solving and decision tree making interrelate.	**K2,K3,K4**
CO5	• Measure and analyse the strength of the relationship between two or three variable using a correlation analysis. • Predict the value of any independent variable to the value of dependent variable using linear regression analysis	**K4,K5**

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE V
ADVANCED CORPORATE ACCOUNTING II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Define and understand the concepts relating to Preparing Holding and Subsidiary companies Accounts and Evaluate Legal issues concerning them.	K1& K6
CO2	• Analyse the Final Accounts of Banking and Insurance Companies and have efficiency in preparation of schedules and accounting Statements.	K4 & K5
CO3	• Knowledge on IRDA and its regulations regarding Fire, Marine and Life Insurance Companies.	K2 & K3
CO4	• Equip with knowledge in Preparing problems relating to Profits before Incorporation and understand its various legal issues.	K1 & K2
CO5	• Develop the skill of recording financial transactions and preparation of reports in accordance with ICAI Accounting Standards and IFRS reports.	K4 & K5
CO6	• Prepare Corporate Accounting Statements to meet the Corporate Reporting requirements	K5

CORE VI
SERVICES MARKETING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Understand the concepts of service marketing. • Analyse the reasons for the growth of service sector. • Acquire knowledge about the various classifications of services.	K1 , K2 & K6
CO2	• Identify employee's role in service delivery. • Acquire the knowledge of Product Decisions, Pricing strategies and tactics • Understand the various Dimensions in Service Marketing.	K2& K3
CO3	• Acquire the skill of Strategic Marketing Management for services. • Understand the concept of pricing of services.	K3
CO4	• Analyse how to deliver quality services. • Understand the concept of Service quality gaps.	K4 & K5
CO5	• Acquire knowledge of Customer Relationship Management. • Understand the concept of Customer Satisfaction and Marketing of services.	K1& K2
CO6	• Understand the Unique requirements of each class of customers and offer value oriented state of the art service	K6

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Core Paper VII– CORPORATE LAWS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Acquire knowledge on SEBI guidelines on Capital Market operations & its powers and functions.	K1 & K6
CO2	• Discuss the provisions relating to the Competition Act 2002 in correspondence with the duties, powers and functions of the competition commission. • Elaborate the Foreign Exchange Management Act, 1999 contraventions and penalties.	K4& K5
CO3	• Identify the important role played by Information Technology Act, 2000 • Critically appraise and make use of Intellectual Property Rights Act.	K5 & K6
CO4	• Compare and contrast the formulation of Environment Protection Act, 1986 and the Rights to Information Act, 2005.	K2& K3
CO5	• Demonstrate the purpose of Consumer Protection Act, 1986. • Understand the rights of a Customer	K3
CO6	• Apply appropriate Economic and Corporate Laws to meet the corporate governance and Ethics	K5

SPECIALISED COURSE II

CORPORATE GOVERNANCE, ETHICS AND SOCIAL RESPONSIBILITY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Deliberate the details of the concept of ethics and related terms or connotations, business values, business ethics and its various approaches, theories, Social responsibilities and corporate ethics.	K1& K3
CO2	• Learn the frame work of corporate governance: Evolution and development in India, Regulatory frame work of corporate governance in India. SEBI guidelines and Clause 49.	K1&K2
CO3	• Understand in details about Management vs. Governance ;Internal constitutes of the corporate governance ; key managerial personnel; chairman , chief executive officer, company secretary.	K3& K4
CO4	• Identify the concept of Whistle Blowing; whistle blower policy in India.	K5& K6
CO5	• Explain Corporate social responsibilities; Corporate sustainability, Reporting, CSR and Business ethics ; Corporate Governance ;environmental aspects of CSR, Models, drivers of CSR; CSR initiatives in India.	K6
CO6	• Demonstrate an enhanced application for the relevance and practical application of ethics in management of business	K5

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Elective Paper II– RESOURCE MANAGEMENT TECHNIQUES

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Summarize the transportation model • Distinguish initial basic feasible solution under the methods of northwest corner rule, row minima, column minima, least cost method and Vogel's approximation method. • Solve the transportation model using Modi method.	**K2, K3, K4**
CO2	• Distinguish the assignment problem of types balanced and unbalanced problem and also minimization and maximization problems. • Solve restricted assignment problem and travelling salesman problem • Summarize the sequencing problem of processing of n jobs through m=2 or 3 machines.	**K2, K3, K4**
CO3	• Define the game theory problems. • Solve the problems based on pure and mixed strategies, dominance method and graphical method.	**K1, K3**
CO4	• Distinguish the 4 models of replacement problems. • Produce the solution for replacement of an item whose maintenance cost increases with time and money value is not changed(Model-1) • Produce the solution for replacement of an item whose maintenance cost increases with time and money value is changed with time(Model-2). • Produce the solution of replacement of items due to sudden failure(Model-3) • Solve the staff replacement problem(Model-4)	**K3, K4**
CO5	• Judge the network problems. • Produce the solution for Critical Path Method and PERT computations	**K5**

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SEMESTER – III

CORE VIII ACCOUNTING FOR MANAGERS – I

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Define the cost, installation of costing system and various records maintained by the Cost Accountant as per Companies Act.	K2&K3
CO2	• Differentiate Normal Loss from Abnormal Loss • Assimilate the importance of documenting Wastages, Spoilages, Scrap and Defective items	K3
CO3	• Know the preparation of Process costing used by various types of industries and treatment of abnormal loss and gain.	K1&K2
CO4	• Prepare statements showing Reconciliation of cost and financial accounts and procedures adopted by cost accountant for reconciliation differences and profit.	K3&K4
CO5	• Classify the operating costing in connection with Transport, Power/Boiler house, Cinema theaters, Lodging house and Activity based costing under the Companies Act.	K4&K5
CO6	• Prepare problems under the system of Contract costing and to know the differences between Job costing and Contract costing.	K5

CORE IX RESEARCH METHODOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Define the meaning of research, its objectives, characteristics, concepts or topics for a study, steps in research process and presentation of literature review	K1&K2
CO2	• Discuss different types of research, research design, its importance, features of good research design	K3&K4
CO3	• Analyze research hypothesis, steps in research hypothesis, types of hypothesis, methods of collection of data, sampling testing, characteristics of good sampling design, sampling techniques	K4&K5
CO4	• Explain the levels of measurement, problems in measurement, pilot study, processing and analysis of data, uses of computer software and application of statistical software for data analysis- SPSS	K2&K3
CO5	• Identify and elucidate the different types of reports, format of Research Report, Content of Report, Title Page, Abstract, Discussion, Reference Appendices, Annexure.	K3&K4
CO6	• Develop Skills in Quantitative and Qualitative Data Analysis and Presentation of Information	K6

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE X FUNDAMENTALS OF INFORMATION

Practical Paper: No theory Exam

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• **construct** the mail merged documents using Microsoft Word and **use** data from MS-Access toe-Mail and Microsoft Word	**K5 & K3**
CO2	• **prepare** the chart, table and letter using Microsoft	**K3**
CO3	• **solve** the Flexible and Cash budget and to **construct** the graph for break-even analysis using Microsoft Excel	**K3& K5**
CO4	• **Design** the slides with the help of clip art and image files using Microsoft Power Point	**K5**
CO5	• **prepare** the Ledger Accounts, Trial balance and Final Accounts using Tally	**K2**
CO6	• **Evaluate** the Means, Standard deviation, Correlation and Regression and to **prepare** the chart and graphs using SPSS	**K5& K3**

Elective Paper III – TAX MANAGEMENT – DIRECT TAXES

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Identify the Direct taxes and its provisions relating to the Five Heads of Income as per IT Act • Discuss practical issues related to calculation of heads of income	K1
CO2	• Know the various deductions available from total income for various Assesses including individuals, HUF, Firms and Companies • Summarise of exempted incomes and use the methods of set-off and carry forward of losses • Understand the rules relating to clubbing of income	K2
CO3	• Prepare the assessment of HUF, Firm, Companies with usage of special provisions relating to Minimum Alternate Tax (MAT)	K3
CO4	• Analyse provisions relating to Tax Deducted at Source (TDS), Advance Taxes, Avoidance and Tax Evasion • Give an outline on Tax Holidays for setting up of new business	K4
CO5	• Construct an idea about tax planning in management decisions such as Merger and Takeover, Financial Decisions such as Borrowing or Investments, Employees Remunerations and Voluntary Retirement	K5
CO6	• Prepare Form16 and File Income Tax returns for Individuals	K6

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SPECIALISED COURSE– II

INDIA'S FOREIGN TRADE AND INVESTMENT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Identify the basic difference between inter-regional and international trade • Understand pattern and structure of India's Foreign Trade • Describe India's Foreign Investment Policy	K2
CO2	• Understand regulatory framework and India's Trade and Economic relations with other regions	K2
CO3	• Compare and Contrast various Export Promotion measures and Schemes • Describe the sources and schemes of foreign trade finance	K3
CO4	• Comprehend Exchange Rate Mechanism and related Regulatory Framework	K3
CO5	• Understand Balance of Payment and importance of maintaining equilibrium in the balance of payments and suggest suitable measures to correct disequilibrium	K4
CO6	• Apply the current business phenomenon & Evaluate the global business environment in terms of Economic, Social and Legal aspects.	K5

SEMESTER – IV

CORE XI ACCOUNTING FOR MANAGERS – II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Deliberate the importance of financial statement analysis and the inherent limitations of financial statements • Apply appropriate Techniques to Evaluate the financial statements based on various users	K2 & K3
CO2	• Apply Ratio Analysis to evaluate the Liquidity, Solvency and Profitability of various companies • Prepare Accounting Statements based on given ratios	K4
CO3	• Prepare Fund Flow and Cash Flow Statements as per AS3 • Distinguish the relevance of Cash Flow and Fund flow Statements	K4
CO4	• Apply Marginal Costing to take Business Decisions Relating to Identifying the BEP, fixing the Selling Price, Accepting Additional or Foreign Orders at a lesser price, Make or Buy, Deciding the Sales Mix or Production Mix, Sell or Scrap and Shut Down • Analyse the Responsibility Accounting and Transfer Pricing to Measure Performance	K5
CO5	• Discuss the difference between Forecast, budget and an Estimate & Discuss the importance of Budgeting • Prepare Various Functional Budgets	K5
CO6	• Learn the need for Variance Analysis • Apply Variance analysis to Material, Labour, Overhead and Sales	K6

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE XII ADVERTISING AND SALESMANSHIP

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Communicate their ideas and messages about the product or service to the potential Consumers	K1& K2
CO2	• Create creative advertisements for various products and choose the correct media for advertising	K2 & K3
CO3	• Appraise the Advertising Agencies and their services	K4
CO4	• Follow the ethics in selling their products or services • Recruit the right people for Marketing and Advertising jobs • Use Information technology effectively to sell their brand	K2&K4
CO5	• Develop the qualities required for a Marketing Manager • Start their own Advertising Agency with the acquired knowledge	K6
CO6	• Evaluate the role of a Salesman, understand selling process and apply various selling theories • Discuss the need for hiring right salesman, recruitment sources for hiring potential sales team, unique methods of fixing compensation and Incentivizing sales team and Evaluating their Performance	K4& K5

CORE XIII ORGANISATIONAL BEHAVIOUR

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Get a good insight into the basic concepts, conceptual foundations and importance of organisational behaviour	K2
CO2	• Explain the concepts of perception and attributes, attitude, personality and study the types and theories of personality shaping	K2
CO3	• Understand the stages of group development, group cohesiveness and motivational, leadership concepts, styles and theories of leadership	K2&K3
CO4	• Analyse the difference between power and authority and learn the process of knowledge management of emotional intelligence in contemporary business organisation.	K4&K5
CO5	• Evaluate the nature of conflicts and types of functionality and dysfunctionality in handling grievances and managing stress.	K5&K6
CO6	• Demonstrate a critical understanding of organisational behaviour and apply concepts, models & theories to manage real life situations	K5

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE PAPER V INDIRECT TAXES

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Compare Tax vs Duty, Direct tax vs Indirect tax, explain powers of union/states indirect taxes.	K1
CO2	Explain first principles of valuation, procedure for assessment and payment of Customs duty, types of Customs duty and warehousing.	K2
CO3	Discuss an overview of Goods and Service Tax (GST).	K1
CO4	Describe CGST Act 2017.	K2& K3
CO5	Apply IGST Act.	K3
CO6	Ensures students to study the challenges in implementation of GST and ways to overcome them.	K6

M.C.A – III Semester ACCOUNTING & FINANCIAL MANAGEMENT

At the end of the Course, the Student will be able to :

CO1	• Explain accounting concepts and conventions • Distinguish Book-Keeping from Accounting • Record the Journal Entries, Prepare Ledger Accounts and Prepare Trail Balance • Prepare single, double and triple column cash book • Prepare final accounts of a sole trading concern and also formulate trading a/c, profit and loss a/c and balance sheet of a business.	K1&K2
CO2	• Define the basic concepts of management accounting • Read and understand corporate financial Statement from various users point of view • Analyse corporate financial statements using Common Size Statements, Comparative Statement and Trend Percentages	K4&K5
	• Analyse the financial statements by using the tool of ratio analysis and interpret the ratios	
CO3	• Define Variable and Fixed cost and prepare Marginal Cost Statement. • Apply the basic concepts of Marginal Costing, Absorption Costing and CVP Analysis and identify Break Even Point	K3
CO4	• Prepare Fund Flow and Cash Flow statement as per AS3 • Differentiate Fund Flow from Cash flow and analyse the implication of Non-Operating incomes and Gains on the computation of Profit.	K5
CO5	• Analyse Investment Proposals by using Capital Budgeting Techniques	K3&K4
CO6	• Prepare various functional budgets such as Production, Material Purchase, Material Consumption, Cash and Flexible Budget	K5

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Semester-IV ORGANISATIONAL BEHAVIOUR

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	• Get a good insight into the basic concepts, conceptual foundations and importance of organisational behaviour	K2
CO2	• Explain the concepts of perception and attributes, attitude, personality and study the types and theories of personality shaping	K2
CO3	• Understand the stages of group development, group cohesiveness and motivational, leadership concepts, styles and theories of leadership	K2&K3
CO4	• Analyse the difference between power and authority and learn the process of knowledge management of emotional intelligence in contemporary business organisation.	K4&K5
CO5	• Evaluate the nature of conflicts and types of functionality and dysfunctionality in handling grievances and managing stress.	K5&K6
CO6	• Demonstrate a critical understanding of organisational behaviour and apply concepts, models & theories to manage real life situations	K5

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

DEPARTMENT OF SOCIAL WORK

PROGRAMME SPECIFIC OUTCOMES (PSO):

PSO1:
Demonstrate the knowledge, skills and attitude upholding the ethics and values of the social work profession in the various fields of social work specifically in the Industrial sector in the domain of Human Resource Management.

PSO2:
Practice the methods of social work with individuals, groups, communities and organisations through critical thinking and reflexive/ informed social work interventions.

PSO3:
Apply knowledge of human behaviour and the social environment during the engagement with diverse population groups.

PSO4:
Engage in critical/ challenging roles in the domain of Human Resource Management and the allied/ support services such as Industrial Relations and Labour Welfare.

PSO5:
Utilize, analyse and synthesise the knowledge of Human Resource Management and Development, Labour Legislations, Organisational Behaviour, Organisational Development to strategically develop leadership competencies in the organisations/ and to evolve as entrepreneurs.

COURSE OUTCOMES (CO):

I MSW
SEMESTER I

Course Code: 1933101	**Course: Social Work Profession**	
Course Instructor: Ms. Aruna Kumari M	**Contact Hours /Week:**	**No. of Credits: 4**
CIA: 40	**ESE : 60**	**Exam Hours:** 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Recognize the historical background of social work to assess the developments in Social work education.
CO2	Identify the key social work values, principles, code of ethics and ethical frame work.
CO3	Acquaint with the basic concepts and related concepts in social work like social welfare, social service, social development and social policy etc.
CO4	Become socially responsible and value driven social workers and committed to sustainable development in the society.
CO5	Gain skills in social work and analyze the developments in the society.
CO6	Demonstrate the knowledge on religion, social and political movements for the practice of social work.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code: 1933102	Course: Working with Individuals	
Course Instructor: Ms. Vijayalakshmi S	**Contact Hours /Week:**	**No. of Credits: 4**
CIA: 40	**ESE : 60**	**Exam Hours:** 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Describe the meaning of social case work, its goal, historical development, importance of case work relationship and the subsequent problems arising during the process of case work.
CO2	Explain different tools and techniques of case work including genogram and eco maps, case work documentation and its uses in practice.
CO3	Prepare an outline on the different phases of case work helping process.
CO4	Distinguish different models of case work where the problems of individuals can be solved using its principles and methods.
CO5	Practically apply case work method in different settings like schools, industries, with aged people, disabled and the LGBTQIA community to make best use of this method of social work.

Course Code: 1933103	**Course: Working with Groups**	
Course Instructor: Ms. Sindhu M K	**Contact Hours /Week:**	**No. of Credits: 4**
CIA: 40	**ESE : 60**	**Exam Hours:** 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify with the basic concepts of Social Group Work.
CO2	Explicate group dynamics.
CO3	Outline the process of Social Group Work.
CO4	Classify the different types of recording in relation to groups.
CO5	Apply Group Work in various settings.

Course Code: 15-19/33104	**Course: Human Behaviour**	
Course Instructor: Ms. Sulupriya B	**Contact Hours /Week:**	**No. of Credits: 3**
CIA: 40	**ESE : 60**	**Exam Hours:** 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Apply the concepts, models and theories human behavior in real situations through social work practice.
CO2	Demonstrate knowledge of various stages of human development.
CO3	Develop an insight into the theories of personality.
CO4	Critically analyze the existing theories of society through the basic concepts of culture, social stratification, socialization & social institutions.
CO5	Apply sociological theories to conceptualise social problems.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Field Work Practicum I	
Course Instructor: All Faculty	Contact Hours /Week:	No. of Credits: 6
CIA: 50	ESE : 50	Exam Hours: -

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify through Observation Visits to various fields in social work, the functioning of the organisation, projects and role of Social worker in different specializations.
CO2	Apply and integrate social work theories and methods in the fieldwork service setting - in line with the generalist orientation and in relation to the specific practice setting of their fieldwork placement.
CO3	Identify the agency administration and functions of the organisation.
CO4	Analyse and assess the various Government and Non-government welfare programmes in a specific field work setting.
CO5	Develop the personal and professional skills in Social Work Profession.
CO6	Work with self-awareness, apply self-assessment and uphold professional social work standards, values and ethics and face challenges in the current society.

SEMESTER II

Course Code:	Course: Social Work Research	
Course Instructor: Dr. Akileswari S	Contact Hours /Week:	No. of Credits: 4
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Demonstrate a scientific temperament in social work research with knowledge in the basics of research methodology.
CO2	Formulate and design systematically and scientifically social work research studies in definition and solution to social problems.
CO3	Apply quantitative and qualitative research methods and combine these methods to present a complete analysis of the problem situation.
CO4	Analyse/ process research data using statistical tools and modern statistical techniques using Information Technology competence.
CO5	Use computer applications in the presentation of data and prepare social work research reports with skills in thesis writing.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Working with Communities	
Course Instructor: Ms. Aruna Kumari M	Contact Hours /Week:	No. of Credits: 4
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify the types of community - Rural, Urban, Tribal and social systems in the society.
CO2	Analyse the power structure and dynamics in the community.
CO3	Outline the process and principles of Community Organisation and Social Action.
CO4	Demonstrate the skills in community organisation and Social Action like Communication, Advocacy, Networking, Assessment etc.
CO5	Apply the theoretical knowledge to a rapidly changing environment with learned and applied skills.
CO6	Compare and contrast community development and community organisation and identify the methods for the development of the community.

Course Code:	Course: Social Welfare Administration and Social Legislation	
Course Instructor: Ms. Vijayalakshmi S	Contact Hours /Week:	No. of Credits: 4
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Explain the meaning, characteristics of social welfare administration, relate to the functions and classification of Trust, Society and Company.
CO2	Describe programme management, write project proposal, evaluate and understand the importance of public relations in the organisation.
CO3	Establish a clear outline of social work with respect to social policy related to women, children, youth, disabled, aged and under privileged including social planning.
CO4	Examine social legislation as an instrument of social control and social justice with respect to fundamental rights and directive principles.
CO5	Interpret and appraise legislation related to Hindu, Christian and Mohammedan law pertaining to marriage, divorce and maintenance. Apply critical thinking on Indian social problems related to social, women and disability Acts in Indian society.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Entrepreneurship	
Course Instructor: Ms. Sindhu M K	Contact Hours /Week:	No. of Credits: 3
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify the feasibility of entrepreneurship in India.
CO2	Diagnose entrepreneurial environment in promoting entrepreneurship.
CO3	Explicate the small scale industries/ small units planning.
CO4	Examine the capital structure and working capital for starting a new business.
CO5	Determine the marketing feasibility to sell the products.
CO6	Develop himself/ herself to be a successful entrepreneur.

Course Code:	Course: Field Work Practicum II	
Course Instructor: All Faculty	Contact Hours /Week:	No. of Credits: 6
CIA: 50	ESE : 50	Exam Hours: -

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Apply social work theories and methods to real life practice in line with the generalist orientation and in relation to the practice setting.
CO2	Evaluate and select from their knowledge base for application in practice - in making assessment, planning intervention, and formulating programmatic design.
CO3	Develop the skills required for the professional development.
CO4	Demonstrate the capacity for self-direction.
CO5	Demonstrate appropriate record maintenance and reporting.
CO6	Assess the overall service delivery system and its administration in the greater society.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Summer Placement	
Course Instructor: All Faculty	Contact Hours /Week:	No. of Credits: -
CIA: -	ESE : -	Exam Hours: -

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Demonstrate familiarity with the industrial setting and the role/ functions of human resource management.
CO2	Prepare for transition from the generic social work to the specialization of human resource management.
CO3	Analyze the personnel policies and functions, labour welfare measures and the industrial relations functions.
CO4	Demonstrate the knowledge of labour legislations related to working conditions, wage, social security and industrial relations.
CO5	Utilize the field work experience in the acquisition and strengthening of the theoretical knowledge of human resource management.

II MSW
SEMESTER III

Course Code:	Course: Labour Legislation	
Course Instructor: Dr. Akileswari S	Contact Hours /Week:	No. of Credits: 4
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify the significance of labour legislations in the management of human resources.
CO2	Apply the knowledge of labour legislations to regulate the working conditions in the industrial sector.
CO3	Demonstrate the knowledge of working of the legislations in the state of Tamil Nadu.
CO4	Apply the knowledge and skills of implementing the wage legislations and social security legislations.
CO5	Analyse and apply the legislations pertaining to Industrial Relations.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Human Resource Management	
Course Instructor: Ms. Arunakumari M	Contact Hours /Week:	No. of Credits: 4
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Demonstrate an understanding of key terms, theories/ concepts and practices in the field of HRM.
CO2	Develop the skill set for recruitment, selection, job analysis, job evaluation, induction and placement.
CO3	Design & formulate HR process such as employee compensation systems, models of compensation & performance linked incentive programmes.
CO4	Develop, analyze and apply advanced training & development strategies, methods & techniques for the delivery of training programmes.
CO5	Demonstrate appropriate implementation, monitoring and assessment procedures of performance appraisal & modern management practices.

Course Code:	Course: Industrial Social Work	
Course Instructor: Dr. Akileswari S	Contact Hours /Week:	No. of Credits: 3
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify the scope of social work and the application of social work methods in industries.
CO2	Design and implement strategies for corporate sustainability.
CO3	Demonstrate the knowledge and skills for the organization and management of corporate responsibility practices.
CO4	Utilize the knowledge of corporate social responsibility in designing CSR policies and managing corporate social responsibility programmes.
CO5	Identify the best corporate social responsibility initiatives and evaluate the effectiveness of corporate governance of various organisations.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Workplace Counselling	
Course Instructor: Mr. Ramesh S	Contact Hours /Week:	No. of Credits: 3
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Describe the concept of counselling, its characteristics, history and foundations of counselling.
CO2	Identify the importance of counselling relationship, relationship issues, clarify professional social worker's and social work trainee's attributes in a counselling set up.
CO3	Classify different approaches to counselling and distinguish counselling, case work and psychotherapy as treatment methods.
CO4	Explain and paraphrase the steps in counselling process.
CO5	Apply counselling practice in different settings like counselling with children, counselling with delinquents, counselling with family and in health setting.

Course Code:	Course: Employee Relations Management	
Course Instructor: Ms. Sindhu M K	Contact Hours /Week:	No. of Credits: 3
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Perceive the concept, scope and approaches of employee relations.
CO2	Explain the social security measures for Industrial employees.
CO3	Interpret the causes and prevention of Industrial accidents and need for safety measures to ensure safety in Industries.
CO4	Explicate worker's participation in management in India, employee discipline and grievance redressal mechanism of employees in Industries.
CO5	Recognize the concept, scope, philosophy, principles, history, policies and government programmes of Labour Welfare in India.
CO6	Analyze the impact of ILO on Labour Welfare in India.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Field Work Practicum III (Manufacturing Internship)	
Course Instructor: All Faculty	**Contact Hours /Week:**	**No. of Credits: 6**
CIA: 50	**ESE : 50**	**Exam Hours: -**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Apply the classroom learning and integrate with field work practice - the knowledge related to types of employees, recruitment, selection, induction and placement, time office, bio- metric etc. in the industry.
CO2	Analyse the different types of labour welfare measure and the current trends in HR practices.
CO3	Demonstrate the knowledge and the skills of HRM, CSR, and work as a HR professional in interdisciplinary teams.
CO4	Apply and practice application oriented mini research project in the organisation on employees' motivation, employees' absenteeism, collective bargaining and the role of trade unions.
CO5	Explain the concept of industrial relations and familiarize with labour legislation towards supportive business environment.

SEMESTER IV

Course Code:	Course: Strategic Human Resource Management	
Course Instructor: Mr. Ramesh S	**Contact Hours /Week:**	**No. of Credits: 4**
CIA: 40	**ESE : 60**	**Exam Hours:** 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Develop an understanding of the concept of strategic management and its relevance in organizations.
CO2	Describe the trends in the labor force composition and their impact on human resource management practice.
CO3	Analyse the strategic plan for the human resources needed to meet organizational goals and objectives.
CO4	Analyze the strategies required to identify the Human Resource Management challenges facing multinational corporations, including staffing, training & development, performance management, and compensation.
CO5	Exhibit a global mindset and sensitivity to cultural issues in organizations.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Code:	Course: Trends in Human Resource Development	
Course Instructor: Mr. Ramesh S	Contact Hours /Week:	No. of Credits: 4
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Apply the basic concepts, principles and functions of Human Resource development.
CO2	Demonstrate a basic understanding of different HR Instruments used in forecasting and planning human resource needs.
CO3	Develop an insight into the recent trends in the field of HR & Technology.
CO4	Prepare and analyse HRD Programme Applications.
CO5	Recognize, outline and illustrate the enduring global contexts of International HRM.

Course Code:	Course: Organisational Behaviour and Organisational Development	
Course Instructor: Dr. Sulupriya B	Contact Hours /Week:	No. of Credits: 3
CIA: 40	ESE : 60	Exam Hours: 03

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Recognize the concept, evolution and behavioural sciences of Organizational behavior.
CO2	Perceive the dynamics of Organizational Behaviour.
CO3	Analyze human behaviour at work.
CO4	Explain Organizational Development and organizational change.
CO5	Explicate operations research like network analysis, PERT- CPM and Process Mapping.

Course Code:	Course: Research Project	
Course Instructor: All Faculty	Contact Hours /Week:	No. of Credits: 8
CIA: 100	ESE : 100	Exam Hours: -

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Demonstrate proficiency in writing research proposals on varied areas of social work research.
CO2	Investigate independently in a chosen area of research with a systematic and a scientific approach.
CO3	Review relevant literature and adopt suitable research methods.
CO4	Analyse and interpret data with technical competence through the application of statistical tools.
CO5	Design research reports with relevant findings through tables and diagrammatic presentations, present suggestions for suitable social work interventions.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106

Course Code:	Course: Field Work Practicum (CSR Block Internship)	
Course Instructor: All Faculty	**Contact Hours /Week:**	**No. of Credits: 2**
CIA: -	**ESE : -**	**Exam Hours: -**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Identify the relevance of the CSR policy of the company.
CO2	Interpret the CSR's short-term, mid- term and long-term strategy.
CO3	Analyze when, how and where the CSR programmes can be carried out.
CO4	Apply the theoretical knowledge in practice in the CSR wing.
CO5	Evaluate the CSR programmes.

Course Code:	**Course: Field Work Practicum (Service Sector Block Internship)**	
Course Instructor: All Faculty	**Contact Hours /Week:**	**No. of Credits: 6**
CIA: 50	**ESE : 50**	**Exam Hours: -**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Demonstrate an understanding of the nature, structure and role of organisations of the service sector.
CO2	Analyse the business operations and functions of organisations of the service sector.
CO3	Identify the strategic HR functions of the service sector.
CO4	Demonstrate knowledge, skills, attitude and values required for working in service sector in the areas of personnel management, labour welfare, industrial relations.
CO5	Undertake projects unique to the service sector.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

DEPARTMENT OF M.C.A

PROGRAMME SPECIFIC OUTCOMES [PSOs] FOR MCA

PSO1	Understand, analyze and develop Computer Programs in the areas related to algorithms, process and solutions for specific application development using appropriate data modeling concepts.
PSO2	Design, develop, test and maintain desktop, web, mobile and cross-platform software applications using latest tools, technologies and skills and computing models and thereby enhance the ability to carry out research, experiment, contemporary issues to solve industrial problems.
PSO3	Develop skill set to communicate one's ideas effectively and to demonstrate team, work as a member/leader to solve complex computing problems and design appropriate techniques to enhance ability for life-long learning.
PSO4	Make graduates to understand cross-cultural, societal, profession, legal and ethical issues prevailing in industry.

FIRST SEMESTER

Course Title: CORE THEORY T1-PRINCIPLES OF DATABASE MANAGEMENT SYSTEMS
(For Students admitted from 2020 onwards)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explain difference between file system and database system, the basic concepts of data models and its classification like ER model, relational model, network model, object oriented model and case study as ER model.
CO2	Discuss the relational database terminologies; analyze types of keys in relational database system. Understand the Relational algebra and improve the performance of database by normalization and hence the types of normal forms.
CO3	Implementation of Relational Database in Oracle SQL, analyzing of DDL, DML and DRL statements, Joins, Group functions and Integrity Constraints with syntax and examples.
CO4	Demonstrate the types of PL/SQL statements with examples and hence discuss the purpose of Cursors, Triggers, Procedures and Functions in PL/SQL with its implementation.
CO5	Apply the database tuning methodologies on Indexes, Database Design, and Queries. Explain the Transaction States and properties of Transactions and acquire the basic knowledge about concurrency techniques over databases.

Course Title: CORE THEORY T2-ADVANCED JAVA PROGRAMMING
(For Students admitted from 2020 onwards)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe how servlets fit into Java-based web application architecture
CO2	Explain the concepts and terminologies of JSP
CO3	Build client-server web applications
CO4	Apply the concepts of RMI in an application
CO5	Design and implement dynamic web page with validation using JavaScript objects
CO6	Develop proficiency in creating solutions for web applications

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CORE THEORY T3-ADVANCED DATA STRUCTURES AND ALGORITHMS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the performance of algorithms using asymptotic notations.
CO2	Evaluate and provide suitable techniques for solving a problem using basic properties of Data Structures.
CO3	Illustrate different types of algorithmic approaches to problem solving.
CO4	Understand the nature of problems and to develop prototypes or applications of varying complexities.
CO5	Determine the drawbacks of data structures and algorithms and assess the tradeoffs involved.

Course Title: CORE THEORY T4-OPERATING SYSTEM CONCEPTS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Defining the need of operating system components and evolution, its architecture and different types of system calls
CO2	Introduce the concept of process, operations and scheduling and thereby explain the concept of process scheduling, CPU scheduling criteria and algorithms. .
CO3	Acquire the knowledge of process synchronization and illustrate the critical section problems and ways to handle the dead lock problems with the help of algorithms.
CO4	Explain and discuss the background of memory with segmentation and paging techniques and the virtual memory management with various page replacement algorithms
CO5	Describe file management with file organization, file access methods, B-trees, and File System security.
CO6	Sketch out the various storage structures with different disk scheduling algorithms. Explain how a Linux server can be integrated within a multi-platform environment.

Course Title: NON MAJOR ELECTIVE 1-BASICS OF STATISTICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recall the concepts of sample spaces, events, axiomatic approach, conditional probability, Baye's theorem. Summarize the random variables, expectation and variance. Demonstrate the chebyshev's inequality.
CO2	Distinguish Discrete and continuous distributions. Solve the real time problems involving various distributions like Binomial, Poisson and normal distributions.
CO3	Explain the concept of Bivariate analysis and point out the importance of correlation analysis, Regression analysis and various curves using method of least squares.
CO4	Summarize the concept of sampling and various methods of sampling. Point out the various errors such as standard error, type I error, type II error. Explain the Null Hypothesis and alternative hypothesis. Point the importance of estimation.
CO5	Differentiate large and small samples. Compare the various parametric tests like Z-test, t-test, F test by giving practical examples. Explain the non parametric chi square test with illustrated examples
CO6	Restate the analysis of variance and classify the one way and two classifications. Categorize the computing randomized design and randomized block design. Define time series and list the components of time series. Illustrate the measurement of trend and seasonal variations.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SECOND SEMESTER

Course Title: CORE THEORY T5- PYTHON FOR DATA SCIENCE

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Examine Python syntax and semantics and be fluent in the use of Python input output functions.
CO2	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
CO3	Interpret/Evaluate the concepts of Object-Oriented Programming using Python.
CO4	Demonstrate proficiency in handling Strings and File Systems.
CO5	Discover the capabilities of numpy ,scipy and matplotlib for scientific programming.
CO6	Implement exemplary applications related to Pandas andDataFrames in Python.

Course Title: CORE THEORY T6-MOBILE APPLICATION DEVELOPMENT
(For Students admitted from 2020 onwards)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Define Android applications, download and install Android Studio, work in development environment and to execute the First Android Application.
CO2	Illustrate the use of activities, fragments and intents in Android to invoke Built-in Applications and use of notification in Android.
CO3	Design and implement the user interfaces using basic widgets, views, view groups and layouts of Android.
CO4	Work with user interface to handle pictures and menus and explain data storage options using the internal and external storage using Shared Preferences, files, SQLite database and Content Providers.
CO5	Illustrate the formation of SMS and E-mail in the mobile phones and demonstrate the Location Based Services (LBS) and consumption of Web Services in Android using JSON and Sockets.
CO6	Developing Android Services by establishing communication between a service and an activity and illustrating the steps for publishing Android applications.

Course Title: CORE THEOERY T7-FUNDAMENTALS OF MACHINE LEARNING
(For Students admitted from 2020 onwards)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	The learners shall understand the machine learning techniques like Clustering, Induction. Bayesian, Decision Tree, Analytical and Instance based learning and to apply the techniques in computing.
CO2	The learners shall be able to compare the various machine learning techniques and design issues in machine learning.
CO3	Introduce students to state-of-the-art methods and modern programming tools for data analysis.

Course Title: CORE THEORY T8-MOBILE COMMUNICATIONS
(For Students admitted from 2020 onwards)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explain the basics of mobile telecommunication system
CO2	Illustrate the generations of telecommunication systems in wireless network
CO3	Understand the architecture of Wireless LAN technologies
CO4	Determine the functionality of network layer and Identify a routing protocol for a given Ad hoc networks
CO5	Explain the functionality of Transport and Application layer

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CORE THEORY ELECTIVE 1-PRINCIPLES OF DIGITAL IMAGE PROCESSING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand and analyse the problems in the formation of various types of images
CO2	Analyze the need for image transforms, different types of image transforms and their properties
CO3	Analyze different techniques employed for the enhancement of images using filters
CO4	Implement different segmentation technique.
CO5	Analyzing and extracting suitable features for classification of objects.
CO6	Familiar with the use of Python and OpenCV for Image Analysis

Course Title: CORE THEORY ELECTIVE 1-INTRODUCTION TO MULTIMEDIA

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe the types of media and define multimedia system.
CO2	Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
CO3	Use and apply tools for image processing, video, sound and animation.
CO4	Apply methodology to develop a multimedia system.
CO5	Apply acquired knowledge in the field of multimedia in practice and independently continue to expand knowledge

Course Title: CORE THEORY ELECTIVE 1-COMPUTER ANIMATION

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Provides an overview of the evolution of animation, and how animation came into existence.
CO2	The process of animation techniques developed with various equipments and how the process was performed.
CO3	The animation techniques such as cell animation, classic characters, cut out animation, stop motion effects, puppet stop motion, pixilation, optical printing, vector / key framed animation, sand animation, silhouette animation, pin-screen animation, Chinese shadow puppetry and rot scope techniques are illustrated which would be helpful for creating clear and good animation.
CO4	The information about how animation was developed in India, It also deals with the growth of Indian animation companies and studios, it discusses the emerging trends in Indian animation industry and outsourcing demands. It helps them to understand how great animators helped to improvise animation to Indian directors.
CO5	Develop proficiency in creating solutions for web applications

Course Title: CORE THEORY T9-INTRODUCTION TO BIG DATA ANALYTICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Knows the reason about the evolution of data science and its development. Study the basic of big data analytics and to develop the code. Importance of various kinds of data comparing the other language.
CO2	Develop HDFS environment using NOSQL implementing the queries. Aggregate the data using NOSQL.
CO3	Concept of basic Hadoop, data format and analyzing the data in the HDFS environment. Implementing the concept Hadoop pipes and implementations and java interfaces. Significance of various methods of compression, serialization.
CO4	Apply Mapreduce applications, unit test , MRUnit, Create file using MapReduce sorting and shuffling process. Creating input and output format of Mapreduce.
CO5	Usage of Hadoop related tools. Definition of hbase, Hbase clients, Cassandra, Pig, HiveQL. Life Build data manipulation byHiveQL queries.
CO6	Analyze Life Build data manipulation by HiveQL queries.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

THIRD SEMESTER

Course Title: CORE THEORY T10-DOT NET PROGRAMMING

(For Students admitted from 2020 onwards)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explore Microsoft .NET Integrated Development Environment (IDE)
CO2	Understand the basic concepts of VB.NET framework.
CO3	Developing programs using VB .NET.
CO4	Illustrate and implement the concepts of Class and objects, Inheritance, Overloading, Exceptions and File Handling in VB.NET
CO5	Building ASP.NET Programming through Web Server Controls, Validation Controls and DataList Web Server Controls.
CO6	Apply ADO.NET and OLEDB concepts for establishing connectivity among applications with reduced code complexity and develop network applications

Course Title: CORE THEORY T11-PRINCIPLES OF CLOUD COMPUTING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the core concepts of the cloud computing paradigm: Evolution, characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO2	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
CO3	Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost.
CO4	Analyse and develop multimedia cloud application.
CO5	Implementation of cloud platform using python

Course Title: CORE THEORY ELECTIVE 2-COMPUTER FORENSICS AND BIOINFORMATICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate competency in the collection, processing, analyses, and evaluation of evidence.
CO2	Demonstrate competency in the principles of crime scene investigation, including the recognition, collection, identification, preservation, and documentation of physical evidence. Classify and apply the acquisition tools
CO3	Identify the role of the forensic scientist and physical evidence within the criminal justice system. Identify and examine current and emerging concepts and practices within the forensic science field.
CO4	To get introduced to the basic concepts of Bioinformatics and its significance in Biological data analysis.
CO5	Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics
CO6	Classify different types of Biological Databases. Introduction to the basics of sequence alignment and analysis

Course Title: CORE THEORY ELECTIVE 2-NETWORK SECURITY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Classify the symmetric encryption techniques
CO2	Illustrate various Public key cryptographic techniques
CO3	Evaluate the authentication and hash algorithms.
CO4	Discuss authentication applications
CO5	Summarize the intrusion detection and its solutions to overcome the attacks.
CO6	Basic concepts of system level security

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CORE THEORY ELECTIVE 2-INFORMATION SECURITY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the broad perceptive and need of information security.
CO2	Explain the various encryption techniques and illustrate the master fundamentals of secret and public cryptography.
CO3	Compute the Risk control strategies and Risk Management and compare with Hash Algorithms, Signature and network security designs.
CO4	Describe the policies of Information Security and hence identify network security designs using available secure solutions.
CO5	Illustrate the Intrusion Detection and Prevention Systems and discover the layers of application security
CO6	Identify different threats and suggest fixes in data and cyber security.

Course Title: CORE THEORY ELECTIVE 3-INTRODUCTION TO INTERNET OF THINGS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Interpret the vision of IoT from a global context
CO2	Describe the fundamentals of IoT and M2M
CO3	Analyze applications of IoT in Raspberry PI
CO4	Appreciate the role of big data, cloud computing and data analytics in a typical IoT system
CO5	Determine the market perspective of IoT
CO6	Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints.

Course Title: CORE THEORY ELECTIVE 3-BLOCK CHAIN TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand emerging abstract models for Blockchain Technology.
CO2	Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.
CO3	It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
CO4	Apply hyperledger Fabric and Etherum platform to implement the Block chain Application.

Course Title: CORE THEORY ELECTIVE 3-GREEN COMPUTING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss Green IT with its different dimensions and Strategies
CO2	Describe Green devices and hardware along with its green software methodologies.
CO3	Analyze the various green enterprise activities, functions and their role with IT.
CO4	Describe the concepts of how to manage the green IT with necessary components.
CO5	Discuss the various laws, standards and protocols, key sustainability for regulating green IT.

FOURTH SEMESTER

Course Title: CORE PROJECT T13-PROJECT WORK

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate a sound technical knowledge, skills and attitude of their selected project topic.
CO2	Understand problem identification, formulation and solution.
CO3	Design solutions to complex problems utilizing a systems approach.
CO4	Communicate with engineers and the community at large in written and oral forms.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106

DEPARTMENT OF MATHEMATICS
M Sc Mathematics

Course Title: Algebra I

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recall the concepts of Class Equation for finite groups • Illustrate class equations with suitable examples • Summarise Sylow's Theorem in three cases • Demonstrate Sylow's Theorem in finding Sylow p-subgroups with suitable examples
CO2	• Define Solvable Groups and Direct Products • Demonstrate theorems related to Solvable Groups and illustrate with suitable examples • Explain the concept of Finite Abelian Groups and proving related theorems • Explain the concept of Modules and proving theorems related to them
CO3	• Recall the concepts of Linear Transformations, Triangular and Canonical Forms • Recall the concept of Nilpotent Transformations and explain them with suitable examples • Demonstrate important theorems related to Triangular Forms, Canonical Forms and Nilpotent Transformations
CO4	• Recall the concepts of Jordan form and Rational Canonical form • Explain Jordan and Rational Canonical forms with suitable examples • Demonstrate theorems related to Jordan and Rational Canonical forms
CO5	• Recall the concept of trace and transpose of a matrix corresponding to a linear transformation • Explain Hermitian, Unitary and Normal transformations with suitable examples • Demonstrate theorems corresponding to Hermitian, Unitary and Normal transformations • Explain Quadratic forms with suitable examples and proving related theorems

Course Title: Real Analysis I

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the concepts of Adherent points, Accumulation points • Demonstrate Bolzano – Weierstrass Theorem for R^n. • Explain the concept of open covering and prove important theorems • Define the concept of compactness and prove Heine – Borel Theorem
CO2	• Illustate the concept of connectedness with some some examples • Define Arcwise connectedness and point out the relationship between connectedness and Arcwise connectedness • Recall the concepts of Homeomorphisms and Isometry • Identify contractions and prove fixed point theorem using it.
CO3	• Categorize the concepts of Monotonic functions, functions of Bounded variation and Total variation • Demonstrate theorems regarding functions of bounded and total variations • Establish the equivalence in terms of continuity for a given function and its corresponding total variation.
CO4	• Define the concept of Riemann – Stieltjes (RS) Sum and Riemann – Stieltjes (RS) Integral • Explain linear property, additive property, Integration by parts and know change of variables in RS Integrals • Categorize usage of step functions as integrators, thereby understanding the concept of expressing RS integral as a finite sum. • Establishing Euler's Summation Formula • Define Riemann's condition and prove an equivalence theorem concerning RS integrals
CO5	• Match Upper and Lower RS Integrals and their properties with respect to given partitions • Point out several properties of RS integrals • Demonstrate the necessary and sufficient conditions for existence of RS integrals • Explain the mean value theorems and two fundamental theorems of calculus regarding RS integrals.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106

Course Title: Probability Theory

Course Outcomes: At the end of the Course, the Student will be able

CO1	• Restate the definition of probability on borel fields. • Differentiate between pairwise and complete independence. • Demonstrate the functional concept of random variable by giving examples and classify it also as a function.
CO2	• Distinguish between raw, central and absolute moments. • Solve problems on correlation and regression connected with single and multivariable functions. • Judge the nature and orientation of connected variables using the solution of correlation.
CO3	• Summarize the concept of characteristic functions, semi invariants and probability generating functions. • Prepare a chart of characteristic functions for various discrete and continuous distributions. • Demonstrate the importance of the Inversion theorem in getting the density or mass function of a distribution when its characteristic function is known.
CO4	• Judge and classify the characterization of various discrete and continuous distribution. • Point out the structure of Poisson and Polya distributions as the limiting case of Binomial distributions by using the necessary requirements. • Explain the structure of Polya and Hypergeometric distributions by giving practical examples.
CO5	• Define Stochastic or Probability convergence and illustrate with examples. • Point out the importance of Levy-Cramer theorem by summarizing its applications.

Course Title: Graph Theory

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recall the basic concepts and some fundamental results of Graphs • Describe some standard families of Graphs. • Point out some characterization of trees.
CO2	• Define the connectivity, the measure of connectedness. • Survey and find the vertex and edge connectivity of a Graph. • Summarize the concept of Euler and Hamiltonian Graphs and their characterizations.
CO3	• Establish the relationship between independence number and covering number. • Recall the concept of edge chromatic number of a graph and explain the edge chromatic number of a simple Graphs using Vizing's theorem.
CO4	• Define the Ramsey numbers and establish its lowerbound. • Classify the properties of critical Graphs. • Calculate the chromatic polynomial of Graphs.
CO5	• Summarize the concept and properties of planar Graphs. • Discuss the correspondence between the parameters of a plane Graph and its dual. • Survey the planarity of some graphs using Euler's formula.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Numerical Analysis

Course Outcomes: At the end of the Course, the Student will be able

CO1	• Solve nonlinear equations and system of non linear equations. • Point out the importance of the fixed point iteration theorem in solving non linear equations.
CO2	• Use interpolation for unequal and equal intervals. • Implement numerical differentiation.
CO3	• Develop simple and composite rules for numerical integration. • Solve double integrals with constant limits by numerical methods.
CO4	• Compute numerical solutions to ordinary differential equations
CO5	• Classify second order partial differential equations. • Obtain numerical solutions to elliptic and parabolic partial differential equations

Course Title: Algebra II

Course objectives

- **To introduce the ideas of Extension Fields, Galois Theory, Finite Fields, Wedderburn's Theorem for finite division rings and Four Squares Theorem.**
- **To understand Algebra and Linear Algebra at Advanced level and apply it in various branches of Engineering and Science.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recall the concepts of Fields and Extension Fields. • Point out ideas of Extension Fields through various examples. • Demonstrate important theorems related to Extension Fields • Demonstrate that the number e is transcendental
CO2	• Explain the concepts of roots of polynomials and their properties. • Demonstrate theorems related to roots of polynomials and study about polynomials having integer and rational roots.
CO3	• Point out the concepts of Galois Theory • Demonstrate theorems related to Galois Theory and study the connections between Galois Theory and Extension Fields
CO4	• Point out the concepts of Finite Fields • Demonstrate theorems related to Finite Fields • Explain the concept of Finite Fields through examples • Recall the concepts of division rings and illustrate it with examples. • Demonstrate Wedderburn's Theorem for finite division rings
CO5	• Explain the concepts of Solvability by Radicals • Demonstrate theorems related to deciding when an equation is solvable by Radicals. • Demonstrate Frobenius Theorem • Explain the ideas of Quaternions with examples • Demonstrate an important theorem regarding expressing an positive integer as sum of at most four squares called Four Squares Theorem

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: REAL ANALYSIS II

Course objectives

- **To introduce the ideas of Measure Theory, Lebesgue Integrals, Functions of Several Variables and Fourier Series, Fourier Integrals and their convergence aspects.**
- **The content of this course is viewed as extension of the ideas presented in previous semester in Real Analysis. Overall, the content forms the core of understanding Real Analysis at Advanced Level.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Summarize the concepts of Outer Measure and its various properties. • Explain the general measure and the concept of measurable set. • Demonstrate important theorems regarding measures like measure of any interval is its length and expressing measure in terms of open sets and closed sets.
CO2	• Know the concepts of measurable functions Explain theorems related with measure functions and introduce the concept of simple function. • Discuss theorems concerned with integration of non-negative measurable functions and introducing an example of non-measurable set. • Demonstrate one of the classical result in analysis namely Lebesgue Montone Convergence Theorem
CO3	• Introduce the concepts of positive and negative parts of a function thereby defining Lebesgue Integral • Point out properties related to Lebesgue Integrals and several important theorems like Fatou's Lemma and Dominated convergence theorem. • Illustrate with examples of Lebesgue and Riemann Integrable functions and point out that any Riemann Integrable function is Lebesgue Integrable but the converse is not true. • Solve some problems related to computing important integrals as application of Lebesgue Dominated Convergence Theorem.
CO4	• Recall orthonormal system and demonstrate theorem of best approximation • Derive Fourier series of a function with respect to given orthonormal system and introducing Fourier coefficients. • Prove several important theorems concerned with Fourier Series and their coefficients. • Derive sufficient conditions for a function to possess Fourier series at a given point and cesaro summability of the Fourier Series.
CO5	• Sketch the concepts of directional derivatives, partial derivatives, continuity and total derivatives. Doing problems concerned with computation of directional and partial derivatives. • Recall Jacobian Matrix and derive Chain Rule • Prove Mean Value theorem for functions of several variables and derive theorem forming sufficient conditions for differentiability at a point. • Prove sufficient conditions for equality of mixed partial derivatives and derive Taylor's Formula for functions of several variables and doing problems based on these ideas.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Differential Equations

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• State, prove and illustrate the existence and uniqueness theorem for initial-value problems of higher order. • Define Wronskian and its relation to linear dependence and independence of solutions of differential equations. • Apply the method of variation of parameters to solve the second order differential equations with variable coefficients. • Obtain the general solution of a linear equations with constant coefficients.
CO2	• Summarize the concept of analytic function, ordinary point and regular singular point. • Evaluate a power series solution for Legendre equation, Legendre polynomial and Bessel's equations.
CO3	• State and prove the existence and uniqueness theorem for homogeneous linear differential system with initial conditions. • Apply the concept of fundamental matrix and successive approximations to solve the system of differential equations. • Categorize the non-homogeneous linear systems with constant coefficients.
CO4	• Classify the second order PDE and reduce it to its canonical form. • Apply the method of separation of variables to solve one dimensional heat conduction equation and one dimensional wave equation.
CO5	• Solve the two dimensional Laplace equation in cylindrical and spherical coordinated using method of separation of variables. • Discuss the exterior and interior Dirichlet problem for a circle.

Course Title: Mathematical Statistics

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Differentiate large and small samples • Prepare a list of statistics and point out their importance in application. • Summarize the theoretical aspect of normal and non-normal populations.
CO2	• Subdivide the areas of applications of large and small sample tests. • Match the chi square test with the application area of non-parametric tests. • Survey the independence nature of attributes by chi square illustrations.
CO3	• Categorize various types of estimation. • Explain the bound for defining most efficient estimates derived from Rao Cramer inequality. • Compare the process of finding interval estimation with the process of finding point estimation.
CO4	• Demonstrate theoretically the usage of analysis of variance technique (especially in the field of agriculture). • Point out the existence of most powerful test by summarizing the theoretical aspects of Neymann Pearson result.
CO5	• Explain the importance of sequential probability ratio test applications whenever the situation warrants the variable sample size. • Produce the expected number of elements in sample in SPRT process with illustrations by selecting the appropriate formula.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Fuzzy Sets and Their Applications

Course objectives

- **To apply the concepts of fuzzy sets and fuzzy relations.**
- **Apply analysis of function of fuzzy variable using fuzzy logic.**
- **Construct fuzzy numbers using operations.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Differentiate between crisp sets and fuzzy sets. • Solve problems on simple operations of fuzzy subsets. • Interpret the properties of fuzzy subsets.
CO2	• Demonstrate the concepts of fuzzy relations and their projections • Solve problems on simple operations of fuzzy relations. • Compute composition of two fuzzy relations.
CO3	• Infer the properties of fuzzy binary relation. • Establish decomposition theorems on similitude relation and fuzzy perfect order relations.
CO4	• Simplify fuzzy variables using properties of fuzzy logic. • Demonstrate analysis of a function of fuzzy variable.
CO5	• Distinguish between the law of fuzzy internal and fuzzy external composition. • Construct fuzzy groupoid using internal and external composition. • Construct various types of fuzzy numbers using operations.

Course Title: Complex Analysis I

Course objectives

- **To get deeper insight into the study of functions of a complex variable.**
- **To analyze the behavior of an analytic function and harmonic function in specified domain**

Course outcomes: At the end of the course, students will be able to

CO1	• Recall and explain line integrals, rectifiable arcs, Cauchy's integral Formula. • Use Cauchy's theorem for a rectangle and a disk to evaluate line integrals. • Analyze the concept of index of a point with respect to a closed curve.
CO2	• Explain the concepts of singularities, zeros and poles of a function . • Analyze an analytic function restricted to a neighbourhood of a point as well as its properties in any region.
CO3	• Explore the concept of chains, cycles, simple connectivity, multiple connectivity, homology. • Examine the line integral of an analytic function as a consequence of the general version of Cauchy's theorem.
CO4	• Evaluate definite integrals using suitable contours as an application of the residue theorem. • Explore the concept and properties of harmonic functions.
CO5	• Represent a function as an infinite series and establish the region of convergence.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Topology

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recall the concepts of convergence, completeness and the continuous mappings in metric space. • Summarize the Baire's theorem, Euclidean and Unitary spaces.
CO2	• Define the topological spaces and illustrate with examples • Explain the concept of open base, sub base and weak topologies through examples
CO3	• Distinguish between the open and sub cover. • Summarize the concept compact spaces, product spaces, locally compact spaces, compactness for metric spaces. • Demonstrate the importance of the Heine-Borel theorem, Tychonoff theorem, Lebesgue's covering lemma, Ascoli's theorem.
CO4	• Classify and categorize the T1 space, Hausdorff space, completely regular space and normal space. • Explain the imortance of Uryshon's lemma, Tietze extension theorem, the Urysohn imbedding theorem.
CO5	• Compare the connected spaces, the components of a space, totally disconnected spaces. • The role of Weirestrass Approximation theorem in topological spaces.

Course Title: Mechanics

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• ToReview of Newtonian Mechanics for a system of particles. • To know the importance of concepts of Generalized coordinate constraints of motion, principle of virtual work and De Alembert's principle leads Lagrange equation and variational principle problems. • To categorize and how to impose constraints (holonomic, non-holonomic, Sceleronomic,Rheonomic) on a system inorder to simplify the methods to be used in solving physical problems.
CO2	• To derive Lagrangian equationboth holonomic and non-holonomic using De'Alembert's principle which allows for simplified treatment of many complex problems. • To sketch model mechanical system both in inertial and rotating frames using Lagrangian Equation. • To Use Lagrangian equation and solve problems like spherical pendulum, double pendulum and Kepler problems. • Discuss Ignorable coordinates and its applications and derive Lagrangian using Routhian function
CO3	• To have a comprehensive idea on the Hamiltonian formulation using Lagrangian. • Derive Hamilton's principle for both holonomic and non holonomic system with illustrations. • Solve using the Calculus of Variations in the Hamiltonian problems like Brachistochrone, Geodesic problem to find the stationary value of the Integral.
CO4	• Define Hamilton principal function, characteristic function and discuss about the pfaffian differential form. • Derive Hamilton- Jacobi equation, Modified Hamilton Jacobi equation and solve its applications. • Define Separability, orthogonal system and Restate the conditions of Lioville's system are sufficient for the separability of an orthogonal system. • Discuss about the necessary and sufficient condition of Stackle theorem and also the differences in stackle and liouville's condition

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

	Illustrations: spherical pendulum, kepler laws and other physical problems.
CO5	• Explain Canonical transformation, differential forms and various forms of generating function with an illustration. • By using Lagrange and Poisson Brackets to test whether the given transformation is canonical. • Derive Jacobi's identity,Poisson's theorem and discuss about the relationship between Lagrange and Poisson brackets.

Course Title: Differential Geometry

Course objectives

- **Know and use geometric quantities such as length, curvature, and torsion associated to planar and spatial curves**
- **Understand the technical definition of a smooth surface and its significance**
- **Use the first and second fundamental form for a surface and give formal and informal definitions of it.**
- **To define, use, and articulate the differences between normal curvature, geodesic curvature, Gaussian curvature, and mean curvature**
- **To define a geodesic on a surface and prove the basic properties of geodesics**
- **To prove that a connected compact surface with constant Gaussian curvature is a sphere**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Recognize the concepts of curves and surfaces • Define the equivalance of two curves. • Point out the equivalence of two curves by applying theorems.
CO2	• Survey the concept of tangent, normal and binormal associated with tangent, normal and rectifying plane leading to formulae of Serrate-Frenet • Find the derivative map of an isometry
CO3	• Define surfaces and their properties • Express definition and parametrization of surfaces. • Express tangent spaces of surfaces.
CO4	• Define geodesic on a surface, canonical geodesic equation and its normal property
CO5	• Study geodesic curvature leading to Gauss-Bonnet theorem. • Categorize different class of curves on a surface called line of curvature which are characterised by Rodrique's formula. .

Course Title: Number Theory and Cryptography

Course objectives

- **To restate the number theory concept with reference to numbers in different bases and categorize the Euclidean Algorithm and congruences by analyzing their characteristics and structure.**
- **To demonstrate the application of some simple cryptosystem using matrices.**
- **To prepare a formula for primality test and application of elliptic curves in cryptography.**

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

CO1	• Restate the definition of numbers in different bases, divisors and divisibility. • Categorize the time estimates for doing arithmetic. • Demonstrate the concept of Euclidean algorithm by giving examples and classify it

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

	for Congruences and application to factoring.
CO2	• Distinguish enciphering transformation and deciphering transformation. • Solve problems on shift transformation and affine transformation on single letter and digraph as message units. • Judge the encryption and decryption of diagraph vectors using matrices.
CO3	• Summarize the basic definition and properties of a field. • Prepare a formula for determining the time estimates for arithmetic modulo prime to general finite fields. • Demonstrate the importance of Legendre symbol and generalize it to obtain Jacobi symbol.
CO4	• Compare classical cryptosystem and Public key cryptosystem. • Point out the importance of Authentication, Hash function and key change in cryptography. • Explain several public key cryptosystem that are based on computational difficulty of solving, diserate logarithm in finite field.
CO5	• Define primality test and quadratic sieve factoring method. • Point out use of primality testing.

Course Title: Digital Logic Fundamentals
Extra Disciplinary Paper

Course objectives

- **To learn number system with different bases.**
- **To learn the significance of Boolean algebra with reference to circuit designs.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Produce the equivalent representation of a given denary number in various base form. • Demonstrate the conversion process of a given number with reference to any base to a number with reference to a different base.
CO2	• Sketch the algebraic operations performed on Binary numbers.
CO3	• Summarize and design logical gates like NOT, OR, AND etc.
CO4	• Explain De Morgan's theorem and its uses. • Produce NAND, NOR gates.
CO5	• Classify minimum terms and maximum terms. • Match the relationship between K map and truth table

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title : Complex Analysis II

Course objectives

- **To study the properties of a meromorphic and an entire function.**
- **To appreciate the application of complex analysis to topics like number theory.**
- **To get a strong motivation for further study on applications of complex analysis.**

Course outcomes: At the end of the course students will be able to

CO1	• Point out the existence of a meromorphic function with specified poles by using Mittag Leffler theorem. • Express any meromorphic function as a sum of partial fractions. • Establish the convergence of an infinite product of complex numbers.
CO2	• Point out the existence of an analytic function with specified zeros by Weierstrass's theorem.and use the theorem to obtain an infinite product representation of an analytic function. • Represent an entire function as the canonical product and determine its genus.
CO3	• Determine the infinite product representation of certain special functions like the Riemann zeta function and gamma function.and explore their properties.
CO4	• Recall the concept of conformal mapping • Analyze the boundary behavior and the behavior at an angle of a polygon of a conformal mapping. • Analyze the Riemann mapping theorem for simply connected regions
CO5	• Recall the concept of periodic functions and the complex Fourier transform. • Investigate the properties of an elliptic function and in particular the Weierstrass function.

Course Title: Functional Analysis

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Define Normed linear space, Banach space, continuous Linear transformations with examples. • Point out the difference between function and functional. • Restate the importance of Hahn-Banach theorem,
CO2	• Explain the concept of conjugate space, second conjugate space, natural imbedding, conjugate operator. • Demonstrate the uses of open mapping theorem.
CO3	• Define Hilbert space and conjugate space H* and illustrate with examples. • Distinguish between orthogonal complements and orthonormal sets.
CO4	• Classify and explain the different types of operators namely adjoint, self adjoint, normal and unitary operators. • Explain the importance of projections.
CO5	• Define the Banach algebra and illustrate with examples. • Compare and the uses of regular and singular elements.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Tensor Analysis and Theory of Relativity

Course objectives

- **To formulate and express a physical law in terms of tensors and simplify it by use of the common form which is independent of the reference coordinate system**
- **To learn the basic ideas and equations of Einstein's Special Theory of Relativity, Lorentz contraction, time dilation, the twin paradox and $E = mc^2$**
- **The objective of the course is to study the fundamental concept of special theory of relativity and its applications.**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Explain the concepts of Tensors, Physical Laws and types of tensors with an example. • Demonstrate that laws of physics and physical invariant must be independent of any arbitrary chosen coordinate system.
CO2	• Define metric tensor, conjugate or reciprocal tensor, associated tensor and illustrate with examples. • Explain that the inner product and the metric tensor associated with it is of great importance to nearly all applications of tensor mathematics in non-cartesian coordinate system or curved manifolds. • Introduce christoffel symbols in tensor analysis.
CO3	• Choose study of tensor analysis by learning the properties of christoffel symbols in more detail. • Sketch the transformation laws for christoffel symbols with respect to the general coordinate transformation are also discussed. • Explain the concepts of covariant derivatives, intrinsic or absolute derivatives in detail on Riemannian geometry. • Define permutation symbols, tensors in the form of gradient, divergence curl, relative and absolute tensors are also discussed.
CO4	• Distinguish between inertial and non-inertial frames of reference. • Discuss Galilean and Lorentz transformation by using special theory of relativity. • Discuss about Maxwell's equation, Ether theory, time dilation, Michelson Morley Experiment and Principle of Relativity. • Introduce four vectors into special theory of relativity, Einstein train meant to give a visual understanding of Lorentz transformation, twin paradox, relativistic velocity and relativistic Doppler effect.
CO5	• Explain relativistic Dynamics such as Momentum, Energy, Momentum Energy four vector, conservation of energy with an example. • Learn about Principle of Equivalence, the formulation of Relativistic Lagrange and Relativistic Hamilton. • Explain Accelerated systems and discuss briefly about Rocket with constant acceleration and Rocket with constant thrust.

Course Title: Fluid Dynamics

Course objectives

- **To restate the kinematics of a moving fluid in Vectorial form.**
- **To demonstrate the images and complex variable in three dimension for on incompressible fluid.**
- **To prepare a formula for coefficient of viscosity of a viscous fluid.**

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

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO1	• Restate the definition of kinds of fluids and nature of different types of forces. • Categorize the local and particles rate of changes. • Demonstrate the concept of equation of continuity by giving examples and classify it for incompressible fluids.
CO2	• Distinguish the pressure in fluids at rest and in motion. • Solve problems on measuring fluid velocities by applying Bernoulli's equation of motion. • Judge the case of steady motion under conservative body forces.
CO3	• Summarize the basic definitions of Sources, Sinks and Doublets of an incompressible fluid. • Prepare a formula for the velocity potential of a doublet in uniform stream. • Demonstrate the importance of Stoke's stream function.
CO4	• Compare equipotentials and streamlines of two dimensional flow. • Point out the necessary and sufficient condition for complex velocity potential to be analystic. • Explain the two dimensional image system and application of Milne Thomson circle Theorem.
CO5	• Define stress components and stress matrix of a viscous flow in real fluids. • Point out the relation between stress and rate of strain of viscous fluid.

Course Title: Integral Equations And Calculus Of Variations

Course objectives

- **Recognize and solve initial value problems and boundary value problems through integral equations**
- **Solve integral equations by finding eigen values and eigen functions**
- **Explore methods for finding extreme values of functionals**
- **Apply variational principles to problems of mechanics**

Course Outcomes: At the end of the Course, the Student will be able

CO1	• Recognize difference between Volterra and Fredholm Integral Equations, First kind and Second kind, homogeneous and non homogeneous etc. • Solve linear Volterra and Fredholm integral equations using appropriate methods
CO2	• Formulate and solve initial and boundary value problems • Understand the relationship between integral and differential equations and transform one type into another
CO3	• Solve Fredholm integral equations of the second kind with separable (or degenerate) kernels
CO4	• Understand what functionals are, and their applications get better and deeper understanding of the fundamental concepts of the space of admissible variations and concepts of a weak and a strong relative minimum of an integral. • Describe the brachistochrone problem mathematically and solve it • Apply the formula that determines stationary paths of a functional to deduce the differential equations for stationary paths in simple cases • Use the Euler-Lagrange equation or its first integral to find differential equations for stationary paths.
CO5	• Analyze variational problems with moving boundaries and sufficient condition for an extremum.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: ALGORITHMS

Extra Disciplinary Paper

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Restate the algorithms for exchanging the values. • Demonstrate summation of set of numbers using algorithms • Restate the factorial and sine function using fundamental algorithm
CO2	• Construct Fibonacci sequence using algorithm • Develop an algorithms for reversing the digits • Compute base conversion • Restate characters to numbers conversion
CO3	• Describe an algorithm to find the square root of a number • Formulate algorithm to find the smallest divisor of an integer and greatest common divisor • Develops algorithm to generating prime numbers
CO4	• Computes the prime factors of an integer. • Produce Pseudo random numbers using algorithm. • Calculate a number to large power and computes the nth Fibonacci number.
CO5	• Define Array technique illustrate array counting and array order reversal. • Use binary search to find an array. • Illustrate merging and sorting of arrays.

Course Title: Advanced Statistics

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• Illustrate and describe sample spaces and events for random experiments • Calculate probabilities of events in discrete sample spaces and conditional Probabilities of events using Baye's theorem. • Sketch the concept of probability distribution to real world problems involving various distributions like Binomial, Poisson and Normal distributions.
CO2	• Describe the testing hypothesis for large samples • Produce a significant test of hypothesis concerning the value of population means and proportion based on Normal distribution
CO3	• Describe the testing hypothesis for small samples • Produce a significant test of hypothesis concerning the value of population mean based on t-distribution, F-test, χ^2-test. • Discuss about goodness of fit for given data
CO4	• Explain the concept of analysis of variance and use them to investigate factorial dependence • Demonstrate pay-off table, Maximin and Minimax principle and Baye's principle • Explore how problem solving and decision tree making interrelate.
CO5	• Measure and analyse the strength of the relationship between two or three variable using a correlation analysis. • Predict the value of any independent variable to the value of dependent variable using linear regression analysis

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: M.Com- Resource Management Techniques

Course objectives

- **To summarize the concepts of resource management**
- **To use the resource management techniques to real life problems**
- **To produce solution for the resource management problems**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	• summarize the transportation model • Distinguish initial basic feasible solution under the methods of northwest corner rule, row minima, column minima, least cost method and Vogel's approximation method. • Solve the transportation model using Modi method.
CO2	.Distinguish the assignment problem of types balanced and unbalanced problem and also minimization and maximization problems. • Solve restricted assignment problem and travelling salesman problem • Summarize the sequencing problem of processing of n jobs through m=2 or 3 machines.
CO3	• Define the game theory problems. • Solve the problems based on pure and mixed strategies, dominance method and graphical method.
CO4	• Distinguish the 4 models of replacement problems. • Produce the solution for replacement of an item whose maintenance cost increases with time and money value is not changed (Model-1) • Produce the solution for replacement of an item whose maintenance cost increases with time and money value is changed with time (Model-2). • Produce the solution of replacement of items due to sudden failure (Model-3) • Solve the staff replacement problem (Model-4)
CO5	• Judge the network problems. • Produce the solution for Critical Path Method and PERT computations

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M.Sc Chemistry

COURSE TITLE: CORE I – ORGANIC CHEMISTRY – I

Course Code	**: 1923101**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES:
At the end of the Course, the Student will be able to:

CO1	Visualize and draw the design of atoms in space in 3D orientation.
CO2	Compare the importance of pharmacokinetic profiles of enantiomers especially used in chiral pharmaceuticals.
CO3	Apply conformational analysis for predicting physico-chemical properties and molecular modeling in screening compounds for biological activity.
CO4	Interpret the concept of aromatic electrophilic and nucleophilic substitution and its effective usage in organic synthesis.
CO5	Recall the organic effects like inductive, resonance and steric effects and its influence in reaction rates and derive the Hammett and Taft equations.
CO6	Assess the reaction mechanism involved using Hammett and Taft and helps to derive quantitative structural relationships for organic compounds.

COURSE TITLE: CORE II – INORGANIC CHEMISTRY – I

Course Code	**: 1923102**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able

CO1	utilize the knowledge and usage of catalysts comprising isopoly and heretopolyacids for industrial applications. [K3]
CO2	correlate and compare the properties of carboranes with that of neutral, nido, closo, aracho, hypo and conjucto boranes. [K3]
CO3	predict the geometry, shape, coordination number, magnetic properties and stability of octahedral, square planar and tetrahedral complexes predominantly of d-block elements. [K3]
CO4	know the various donor systems donating sigma and pi bonds involved in the synthesis of organometallic compounds. [K3]
CO5	distinguish the concept of stereoisomerism from structural isomerism pertaining to six and four membered inorganic complexes. [K3]

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CORE PAPER III - PHYSICAL CHEMISTRY – I

Course Code	**:**	**Credits**	**: 04**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	compare the thermodynamics of ideal and non-ideal solutions and gases
CO2	distinguish ideal and non-ideal solutions and the excess thermodynamic functions and apply the concept of activity and activity coefficient for non-ideal non-electrolytic solutions
CO3	explain the postulates of quantum mechanics. And they can demonstrate the application of Schrodinger wave equation for various systems such as particle in a box, particle on a ring and sphere etc. and identify the quantisation of energy in confined and microscopic systems
CO4	apply Schrodinger wave equation to quantum mechanical systems such as one dimensional harmonic oscillator and rigid rotor to deduce the expression for the energy which he can use in molecular spectroscopy. And also the application of Schrodinger wave equation to hydrogen atom and identify the radial and angular probability distribution functions to visualise and grasp the concept of various orbitals and their shapes
CO5	control and manipulate the complex reactions such as reversible, consecutive, parallel and chain reactions including explosion reactions. And also the Fast reactions such as explosions could be studied experimentally by the students using relaxation methods and flash photolysis

SYLLABUS FOR SECOND SEMESTER

COURSE TITLE: CORE IV – ORGANIC CHEMISTRY - II

Course Code	**: 1923204**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Demonstrate the knowledge to understand and generate ideas about addition to carbon – carbon and carbon hetero multiple bond reactions. (K3)
CO2	Develop knowledge about reactions involving carbon –carbon and carbon hetero multiple bonds (K3)
CO3	Illustrate the basic principle and application of elimination reactions (K4)
CO4	Demonstrate the ability to distinguish between different types of molecular rearrangements and apply their importance in organic reaction mechanisms. (K4)
CO5	Assess various oxidation and reduction reactions and appreciate their importance in organic synthesis. (K4)

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

COURSE TITLE: CORE V – INORGANIC CHEMISTRY – II

Course Code	**: 1923205**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able

CO1	To assess the role of metal ions, metallo enzymes and Vitamins in human body and other living organisms (K3, K5)
CO2	To illustrate the role of transport proteins, study of photosynthesis, nitrogen fixation and anti cancer activity (K4)
CO3	Interpret of XPES, UPES and evaluation of ionisation potential and chemical identification of elements. (K3)
CO4	To determine the effect of Magnetic Behavior, magnetic susceptibility and its applications (K3)
CO5	To examine the related applications of X-Ray, Neutron and Electron Diffraction, and solid electrolytes and solid solutions (K4)

COURSE TITLE: CORE VI - PHYSICAL CHEMISTRY – II

Course Code	**: 1923206**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able:

CO1	To paraphrase the fundamentals and applications of Group theory. [K2]
CO2	To articulate group theory to molecules and predict IR and electronic spectra. [K3]
CO3	To compute approximation methods to the atoms of more than one electron. [K3]
CO4	To predict the effect of temperature on the rate of reaction. [K2]
CO5	To employ enzyme catalysis and adsorption for practical situations.[K3]

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

COURSE TITLE: CORE VII - ORGANIC CHEMISTRY PRACTICALS I

Course Code	**: 1923207**	**Credits**	**: 04**
L:T:P:S	**: 0:0:6:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES:
At the end of the Course, the Student will be able to:

CO1	Demonstrate the knowledge to separate a given binary or tertiary organic mixture and analyse the compounds present in it. (K3)
CO2	Design and proceed with single stage and two stage preparation of organic compounds employing the principles which they learnt in the theory during this year of study.(K3)
CO3	Apply the principles of green synthesis and prepare simple organic compounds (K4)

COURSE TITLE: CORE VIII - INORGANIC CHEMISTRY PRACTICALS I

Course Code	**: 1923208**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	To provide an insight into the role of EDTA in complexometric titrations and its significance in the quantitative estimation of Ca, Mg and Zn.
CO2	This technique enables the student to carry out an idea about the technique and mechanism of determination of the presence of dissolved metal salts in water.
CO3	Industrial application of the analysis of water is imparted to the students to excel in industrial and research labs
CO4	The students are taught with the technique and elementary idea of detection of metals as common and rare cations in a mixture.
CO5	The students are able to qualitatively identify several cations based on the knowledge of solubility product, ionic product and precipitating agents.
CO6	Identification of metals using spot reagents is of analytical importance to the students who can apply these techniques in food processing labs and dairy products.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE I
COURSE TITLE: PHYSICAL CHEMISTRY PRACTICALS I

Course Code	**: 1923209**	**Credits**	**: 03**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO 1	To verify the isotherm equation. (exp.1)
CO 2	To interpret the various phases in binary and ternary system. (exp 2,3,4)
CO 3	To determine the equilibrium constant, concentration, molecular weight by partition method. (exp 5,6,7)
CO 4	To assess the zero, first, second order kinetics of the reaction volumetrically(exp 8,9,11,13,17)
CO 5	To assess the first order kinetics of the reaction conductometrically (exp 10 ,12)
CO 6	To understand partial molar properties in binary mixture (exp 15,16)
CO 7	To determine the specific rotation and concentration of the non -electrolyte polarimetrically.(exp 18.19)
CO 8	To verify the Bronsted Bjerum equation or effect of salt in kinetics of the reaction. (exp 17, 20)

ELECTIVE PAPER I

COURSE TITLE : ADVANCED QUANTUM MECHANICS FOR COMPUTAIONAL CHEMISTRY

Course Code	**:**	**Credits**	**: 03**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able:

CO1	To paraphrase the many electron wave functions, spin orbitals and spatial orbitals. [K4]
CO2	To articulate quantum mechanics to the Coulomb and exchange operators, –the Fock Operator. [K4]
CO3	To compute approximation methods to truncated configurational interactions and the Size-Consistency Problem. [K3]
CO4	To predict the Coupled – Pair Theories and Many – Electron Theories with Single particle Hamiltonians [K3]
CO5	To illustrate Rayleigh-Schrodinger Perturbation theory and Orbital perturbation theory [K2]

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ADVANCED COURSE I
COURSE TITLE: ANALYTICAL CHEMISTRY PRACTICALS I

Course Code	**: 1923210**	**Credits**	**: 03**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Prepare solution of any sort of the commonly used parameters. Molarity, molality, normality, w/v, v/v, ppm and ppb.
CO2	Analyze based on the statistical tools like t-test, Q-test etc.
CO3	Demonstrate t-test as hypothesis testing tool, which allows testing of an assumption applicable to a population.
CO4	Analyze on the precision and accuracy of the data obtained from the experiment.
CO5	Demonstrate the principles and working of various instrumentation techniques like UV, Ultrasonic interferometer, flame photometer, cyclic voltammeter through suitable experiments.
CO6	Discuss the importance and advantages of conductometric and potentiometric titrations over volumetric titration for quantitative analysis.
CO7	Apply Beer-Lambert's law to determine unknown concentration of Fe, Cu and Ni using colorimeter by adding suitable colouring agent.
CO8	To determine strength of given KMnO 4 solution potentiometrically and to identify the formal redox potential. To explain the determination of activity coefficient, Liquid Junction Potential (LJP), Transport number by Concentration Cell method.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SYLLABUS FOR THIRD SEMESTER

COURSE TITLE: CORE IX - ORGANIC CHEMISTRY III

Course Code	**: 1923312**	**Credits**	**: 04**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	They can apply woodward Ficher rule in solving organic structures. They can determine the functional groups & predict the structure of molecule using UV, IR & mass data. They can analyse & predict the geometry of biomolecules by applying ORD, CD, GS-MS.- They can apply the concept of ORD &CD in solving the geometry of cis & trans 10 methyl decalone. They can analyse biomolecules using GC-MS.
CO2	They can predict the structure of organic compounds using ^{1}H-NMR/ ^{13}C/UV/ &Mass data. By analysing the spectra, they can also able predict the structure & Stereochemistry of a simple/ complicated molecule..By using data, they can compare the geometry of a molecule.- They can characterize molecules having different functional group using mass spectroscopy .They can able to differentiate enantiomers & diastereoisomers. They can predict various types of carbon (Quartenary) using ^{13}C- NMR spectroscopy.
CO3	By applying Huckels & Craigs rule they can able to classify/ differentiate benzenoid & non-benzenoid compounds. They can predict the product under thermal /photochemical conditions.
CO4	They are able to classify the types of pericyclic reactions.They can predict the product with possible geometry & they can conclude wheather a particular type of reaction is taking place under thermal or photochemical conditions.
CO5	They can draw the structure of some important alkaloids & steroids.They can outline the synthesis of anthocyanins, flavones, isoflavnonones, carotenoids & steroids. They can examine the structure of cholesterol by chemical degradation.

COURSE TITLE: CORE PAPER X - INORGANIC CHEMISTRY – III

Course Code	**: 1923313**	**Credits**	**: 04**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Students will be able to explain the selection rules, predict and identify the IR stretching frequencies of some important functional groups in complexes and bonding in metal carbonyls.
CO2	Students will able to explain the principle and applications of NQR spectroscopy
CO3	Students will be able to predict and identify the ^{19}F, ^{31}P, and ^{15}N NMR spectra of various compounds. Students will use the principle of EPR spectroscopy to calculate or predict the EPR signals of both organic and inorganic compounds.
CO4	Students will use the principle of MÖssbauer spectroscopy to analyse the MÖssbauer spectra of Fe and Sn complexes.
CO5	Students will explain the selection rules for electronic spectroscopy; predict the term symbols, analyse the Orgel and T.S. diagrams.
CO6	Students will able to explain the stability constant, factors affecting stability constant, and methods of determining them.
CO7	Students will use the HSAB concept, theoretical basis of hardness and softness and explain the macrocyclic ligands.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

COURSE TITLE: CORE XI - PHYSICAL CHEMISTRY III

Course Code	**: 1923314**	**Credits**	**: 04**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOME: At the end of the Course, the Student will be able to:

CO1	Apply LCAO-MO theory to diatomic and polyatomic molecules
CO2	Apply Huckle-Molecular orbital theory to molecules such as ethylene, butadiene, cyclobutadiene and benzene
CO3	Explain various models of the double layer and compare them to find the best model which is closure in approximation to the real structure around the electrode.
CO4	Apply the theory of activity coefficient to electrolytic solutions for practical situations
CO5	Use the theories of electrode kinetics to calculate overpotential which finds wider applications in the construction of batteries, fuel cells, electrolysis, prevention of corrosion and electroanalytical techniques such as voltammetry.
CO6	Explain the concepts of Microwave, infrared and electronic spectroscopy to determine microscopic parameters such as energy, bond length etc.
CO7	Explain the principles of nuclear resonance spectroscopy for the following magnetically active nuclei viz. ^{1}H ,^{13}C, ^{19}F, ^{31}P use this for the structural elucidation of simple molecules.

SYLLABUS FOR FOURTH SEMESTER

COURSE TITLE: CORE XII – ORGANIC CHEMISTRY – IV

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate and evaluate the importance and application of biomolecules like DNA, RNA and processes like transcription and translation and the synthetic methodologies for purine and pyrimidine synthesis (K4)
CO2	Develop knowledge about various synthetic routes to synthesize peptides, vitamins and biosynthesis of cholesterol (K3)
CO3	Generate ideas about alkaloid and terpenoids chemistry. (K3)
CO4	Predict and propose the synthetic route of a target molecule using disconnection approach. (K5)
CO5	Design to evaluate the modalities for the protection and deprotection of functional groups, and the usage of various reagents in organic synthesis.(K5)

COURSE TITLE: CORE XIII - INORGANIC CHEMISTRY - IV

Course Code	**: 1923416**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able:

CO1	To assess the Ligand Substitution Reactions mechanism and its limitations, electron transfer reactions (K3)
CO2	To evaluate the Substitution in complexes and theories of Trans effect and its applications (K5)
CO3	To analyse various Nuclear Chemical reactions, examine various types of nuclear reactors, effect of radiation chemistry (K3, K5)
CO4	To evaluate the Photochemical reaction of metal Carbonyls and complexes (K4)

COURSE TITLE: CORE XIV - PHYSICAL CHEMISTRY – IV

Course Code	**: 1923417**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able:

CO1	To enumerate on various distribution of microscopic particles and contemplate on partition function.[K1]
CO2	To articulate partition function for various thermodynamic functions, and discuss heat capacity of solids. [K3]
CO3	To compute Jablonski diagram, establish enhancement and quenching process. [K3]
CO4	To organise Photophysical, Photochemical processes and distinguish Photovoltaic, Photogalvanic cells. [K4]
CO5	To prioritize the properties of solids and persuade the solid state ionics.[K4]

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORESE TITLE: CORE XV - PHYSICAL CHEMISTRY PRACTICALS II

Course Code	**: 1923418**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1.	To verify laws based on electrochemistry, to determine end point of various titrations, to evaluate the solubility product using conductometer.
CO 2	To determine pH, pKa , to determine end point of various titrations, to evaluate the solubility product and stability constant using Potentiometer
CO 3.	To evaluate the endpoint of poly basic acid titration using pH meter.
CO 4.	To lead students to have a comprehensive approach to structural identification of molecules from the spectral data.

ELECTIVE II
COURSE TITLE: ORGANIC CHEMISTRY PRACTICALS-II

Course Code	**: 1923419**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to:

CO1	Structure two stage preparations of organic compounds.
CO2	Estimate the given organic compound titrimetrically
CO3	Extract simple phytochemicals from natural source and detects purity and yield.
CO4	Interpret spectra from the knowledge of spectroscopic tools.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

DISCIPLINE SPECIFIC ELECTIVE COURSE-II (DSE)
COURSE TITLE: RESEARCH METHODOLOGY (90 HOURS)

Course Code	**:**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able:

CO1	To enumerate on scientific awareness and selection of research problem. [K1]
CO2	To articulate thorough literature survey using various resources. [K3]
CO3	To organize the data collection process. [K3]
CO4	To organise the reports and writing the thesis. [K4]
CO5	To enumerate the computer aided applications like chem. Draw, excel , origin etc. [K4]

ELECTIVE – III
COURSE TITLE: INORGANIC CHEMISTRY PRACTICAL – II

Course Code	**: 1923420**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able:

CO1	To estimate the metal ions in the given mixture (K5)
CO2	To prepare various complexes involving , Cu, Cr, Ni, Al (K3)
CO3	To interpret NMR, ESR, IR and MB of various compounds, complexes (K3)

ELECTIVE PAPER III
COURSE TITLE: MODERN INSTRUMENTATION TECHNIQUES (90 Hrs)

Course Code	**:**	**Credits**	**: 04**
L:T:P:S	**: 6:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1.	To enumerate on advanced purification techniques in organic and inorganic preparations. [K1]
CO 2	To prioritize both principles and application of spectroscopy like UV-Visible, NMR, ESR, Mossbauer, Photoelectron and Mass spectrometry [K3]
CO 3.	To identify different decomposition temperature of the samples and thermal stability from TGA/DTA thermogram. To determine the phase transition temperature from DSC. [K3]
CO 4.	To deduce and quantify the presence of metal ions by electro-analytical techniques. [K4]
CO 5.	To analyse the magnetic properties of compounds.[K3]

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ADVANCED COURSE II
COURSE TITLE: ANALYTICAL CHEMISTRY PRACTICALS II

Course Code	**: 1923421**	**Credits**	**: 03**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours	**: 03**	**ESE Marks**	**: 60**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO1	Students will use the Beer-Lambert's law and able to determine the amount of protein, Nickel and manganese by colorimetry.
CO2	Students will estimate the percentage of Sodium and Potassium in a commercial electoral sample and Sodium and Calcium in a mixture using flame photometry.
CO3	Students will use the pH meter for the determination of dissociation constant of weak acid.
CO4	Students will explain the determination of the basicity and dissociation constant of oxalic acid, phosphoric acid and acetic acid and determine the iso electric point of an amino acid by potentiometric titrations.
CO5	Students will determine the stability constant of the complex formed between potassium oxalate and lead nitrate, estimate the amount of Ascorbic acid using and verify the Randel's Sevick equation, using cyclic voltammetry.
CO6	Students will estimate the amount of Zinc by complex formation with EDTA by conductometry.
CO7	Students will verify the Beer's-Lambert's Law and calculation of Molal Extinction Coefficient at different wavelength for $KMnO_4$ and $K_2Cr_2O_7$ using UV-Visible Single beam spectrophotometer.
CO8	Students will identify functional groups in Ethyl alcohol, Acetone, Aniline, Aldehyde and Acetic acid, using Infrared Spectroscopy.
CO9	Students will determine the kinetic parameters for degradation of dye using Photo Catalytic Reactor.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SCHOOL OF MANAGEMENT

M.B.A.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Graduates will have ability to Identify, Formulate and analyze the problems relating to Marketing,Finance, Human Resource and Supply chain Management.

PSO 2: Graduates will have an ability to implement / Use appropriate Techniques, Management Skills,and Analytical Techniques and to solve Management Problems.

MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOUR

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Apply the Principles of Management and effective Decision making and critical thinking and strategy formulation.
CO2	Demonstrate the applicability of the concept of OB to analyze the behavior of people in the Organization.
CO3	Analyze Individual Behavior, Job Satisfaction and the importance of Motivation.
CO4	Exposure on Group Behavior and the need of Leadership and to handle stress
CO5	Evaluate Organization needs, structure and its effectiveness

STATISTICS FOR MANAGEMENT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recall and solving problems based on the addition theorem, multiplication theorem, conditional probability and Bye's theorem. Restate the Discrete distributions such as Binomial and Poisson distribution.
CO2	Differentiate the univariate and bivariate analysis. Explain correlation, rank correlation and regression analysis by numerical example
CO3	Summarize the concept of sampling, Null Hypothesis, alternative Hypothesis, type I and type II errors, sampling errors and standard errors.
CO4	Distinguish between small samples and large samples. Summarize the concept of parametric test z-test, t-test, F-test and non parametric test chi-square test by given examples.
CO5	Demonstrate the analysis of variance of one way classification and two way classification with numerical examples

ECONOMICS FOR MANAGERS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyse Market demand and supply patterns through forecasting techniques.
CO2	Evaluate National Income using techniques and underlying policies.
CO3	Compare market structures and different pricing methods.
CO4	Analyse and evaluate demand pattern using Date software.
CO5	Identify the consequence of globalization and role of Banks in International Trade.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE I

Course Code : 22207 (c)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concept of Microwave Spectroscopy and analyze the spectra of diatomic, Polyatomic Molecules and Symmetric Top molecules
CO2	Infra-Red Spectroscopy and its Instrumentation technique
CO3	Account of Raman activity by Classical and Quantum theory, The structure determination of N_2O and SO_2 Raman Spectroscopy
CO4	UV Spectroscopy, its origin, principle and measurement
CO5	Resonance spectroscopy – NMR, EQR and ESR. Principle behind Mossbauer spectroscopy is discussed

ELECTIVE I
Paper 9 – GENERAL RELATIVITY

Course Code: 2220 (a)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basic principles of four vectors, relativistic particle motion and Lorentz Transformations.
CO2	Explain the main concepts of Tensors such as Line Element, Reciprocal Basis, Change of basis, Transformation Law and Affine Connection.
CO3	Acquire knowledge about Covariant Derivative, the Riemann Curvature Tensor, Second Covariant Derivative, Covariant Differentiation, Symmetry Properties of the Riemann Tensor, Bianchi Identities and the Einstein Tensor.
CO4	Explain the Equivalence Principle, Local Freely Falling Frame, Spherically Symmetric Solution to Field Equations, Motion in Three-Dimensional Euclidian Space.
CO5	Understand the Linearized Theory and Plane-wave solution to the Einstein Field Equations.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE I
Paper 9 – GROUP THEORY

Course Code : 22207(b)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concepts of Discrete Groups such as Multiplication Table, Conjugate Elements and Classes, Direct Product of Group, Isomorphism and Homomorphism, Permutation Groups and Distinct Groups of a Given Order.
CO2	Explain the key points of the Representation Theory of Finite Groups. Learn about the Schur's Lemmas, the Orthogonality Theorem, Symmetrized Basis Functions for Irreducible Representations, Direct Product of Representations and Representations of a Direct Product Group.
CO3	Understand Continuous Groups with examples. Learn about Isomorphism, one parameter groups, Structure Constants, and Linear Representation of Lie Groups.
CO4	Explore the Applications of Group Theory in High Energy physics by learning about the Killing Form, the Structure of Simple Lie Algebras, and Representations of Quark Model.
CO5	Understand the applications of Group Theory in Condensed Matter Physics by learning the problem of Electronic Structure of Crystals, Translation Group and the Reciprocal Lattice. Learn about the Irreducible Representations of a Space Group, Free Electron Energy Bands. .

ADVANCED COURSE I – PAPER 10 – INTRODUCTION TO MICROPROCESSOR

Course Code : 22208

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1	Study the architecture of microprocessor 8085,8086
CO 2	Knowledge of basics of modern computation is evident from the instruction set, addressing modes of the microprocessors (8085, 8086)
CO 3	Design/use microcontroller for new environments can be implemented due to the background knowledge of microcontroller architecture and real time control of 8051.
CO 4	Write programs in assembly language
CO 5	Understand the operation of ADC, Stepper motor

CORE 11 – STATISTICAL MECHANICS

Course Code : 22311

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge and become familiar with various thermodynamic processes.
CO2	Acknowledge Hamiltonian formalism, theory of Probability and Statistics needed to obtain the laws of thermodynamics
CO3	Understand the concepts of ensembles and their connections to thermodynamic quantities
CO4	To learn the classical and quantum statistics which describes the state of a system made of microscopic particles which either obey Fermi-Dirac statistics or Bose-Einstein statistics
CO5	Value of the phase transitions and extend these ideas to quantum world. To understand phase transition arising in Ising model

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106

CORE 12 – QUANTUM MECHANICS II

Course Code : 22312

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Better understanding of the mathematical foundations of angular momentum of a system of particles.
CO2	Apply the perturbation theory to scattering matrix and partial wave analysis. Compare and analyze the different approximation methods
CO3	Applications of various approximation methods in solving the Schrodinger equation.
CO4	Understand the concept of Scattering cross-section, scattering amplitude of Born approximation and partial wave analysis method
CO5	Grasp the central concept and principles of relativistic Quantum Mechanics and solve problems.

ELECTIVE II
Paper 15 – MEDICAL PHYSICS

Course Code : 22313(c)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Learn about Bioelectric Signals, electrodes, needle and micro electrodes, biosensors and pulse sensors.
CO2	Explain the main concepts of Transducers such as thermistors, photo-electric type transducer, photo emissive cells, detectors and optical fibers.
CO3	Understand the basics of Blood Pressure Measurements. Learn about Sphygmomanometer, Measurement of heart rate, Basic Principles of EGC – Basic Principles of Electroneurography (ENG) and basic Principles of MRI.
CO4	Learn the fundamentals, production and applications of X-rays.
CO5	Learn the concepts of Thermography, Liquid Crystal thermography, microwave thermography and the basic principles of ultrasonography. Explore the applications of lasers in Medicine.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE II
Paper 15 – RELATIVISTIC QUANTUM MECHANICS

Course Code : 22313 (a)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the Special Theory of Relativity by learning Lorentz Transformations, Space-time Diagrams, Simultaneity, Causality, Time Dilation Length Contraction, Addition of Velocities and the Geometry of Space-time.
CO2	Explain the main concepts in Relativistic Quantum Mechanics. Understand the Klein-Gordon equation, probability and current densities, equation of continuity, Dirac equation and the solution for the same.
CO3	Understand the covariant form of Dirac Equation, properties of gamma matrices, relativistic invariance of Dirac equation and Feynman's theory of positron.
CO4	Explore the field functions, quantization procedure for particles, Lagrangian density, and Euler-Lagrange equation for classical field to understand the concept of Second Quantization in detail.
CO5	Learn about the Quantization of EM Field, Generation and detection of Fock states of the Radiation field, coherent Photon States, and properties of Coherent States.

ELECTIVE II
Paper 15 – LASERS AND NON-LINEAR OPTICS

Course Code : 22313 (b)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Learn about Conventional Lasers, the differences between Spontaneous and Stimulated Emission, Einstein Coefficients, the different levels of laser action and Solid-State Lasers.
CO2	Explain the main concepts used to develop advanced lasers such as Q-Switching, Electro-optic Shutter, Mechanical and Saturable absorber Shutters and peak power emitted during the pulse.
CO3	Understand the basics of Nonlinear Optics by learning about Wave Propagation in an anisotropic crystal, Polarization Response of materials to light, Harmonic generation, Second harmonic generation, phase matching and third harmonic generation.
CO4	Learn the fundamentals of multi-quantum photoelectric effect, Theory of two photon process, experimental evidences of 2PA materials, stimulated Raman scattering and photorefractive effect.
CO5	Explore the applications of Laser Materials processing with lasers. Learn about the principle of Holography, Laser Range finders and communication by lasers.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ADVANCED COURSE II – PAPER 16
MATERIALS SYNTHESIS AND CHARACTERIZATION

Course Code : 22314

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1	Acquire knowledge of basic approaches to synthesize organic, inorganic, semi organic crystals and characterize them.
CO 2	Demonstrate the stages of thin film formation and can outline the conditions for the formation of amorphous, crystalline and epitaxial films.
CO 3	Acquire an insight into the synthesis of nano materials.
CO 4	Understand the physical and chemical properties of carbon nanotubes.
CO 5	Assimilate the principle, construction and working knowledge of spectroscopic techniques like UV-VIS spectroscopy, luminescence techniques, X-ray, electron and neutron diffraction.

CORE 17 – CONDENSED MATTER PHYSICS

Course Code : 22415

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Arrive at the basic elements of crystal structure of condensed matter.
CO2	Conclude on the accurate description of lattice dynamics and thermal properties of crystalline solids. Derive cohesive energy of ionic crystals.
CO3	Perceive origin of energy bands in solids with focus on semiconductors
CO4	Able to explain various magnetic phenomena and describe the different types of magnetic ordering (Diamagnetism, Paramagnetism, Ferromagnetism) based on the exchange interaction.
CO5	Differentiate between type-I and type-II superconductors and score on the theoretical explanation of super conductivity viz Cooper pairs and BCS theory.

CORE 18 – NUCLEAR AND PARTICLE PHYSICS

Course Code : 22416

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Acquire knowledge of nuclear models along with their defining features and drawbacks.
CO2	Concept and nature of nuclear force. Attain the knowledge in nuclear interactions
CO3	Derive nuclear reaction kinematics, identify types of reactions and conservation laws
CO4	Remember the concepts of nuclear decay
CO5	Understand the nature, interaction etc. of the elementary particles.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE 13 – PRACTICAL III
MICROPROCESSOR 8085 AND MICROCONTROLLER 8051

Course Code : 22418

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Write programs using the assembly language, instruction set of 8085 microprocessors
CO2	Set up programming strategies and select proper mnemonics and run their program on the trainer kits
CO3	Practice different types of programs for the same problem and verify the results
CO4	Analyze the basic concepts and programming of 8051 microcontroller
CO5	Understand the interfacing circuits for various applications of 8051 microcontroller and providing solutions to real world problems.

CORE 14 – PRACTICAL IV – COMPUTATIONAL METHODS AND C PROGRAMMING

Course Code : 22419

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Learn to solve simultaneous linear equations using C program
CO2	Solve differential equations using C program
CO3	Apply computational methods to solve problems in physics, including data analysis such as linear and nonlinear fits to data sets
CO4	Solve interpolation using C program
CO5	Integrate functions using Euler and Runge-Kutta Methods with the help of C program

PAPER 19: Elective III – COMPUTATIONAL METHODS AND C PROGRAMMING

Course Code : 22417 (a)

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1	Evaluate zeros of polynomials and convergence of solutions
CO 2	Acquire knowledge and apply it to solve simultaneous linear equations
CO 3	Formulate an equation to fit a straight line. Enrich a given set of data points using interpolation methods like Newton's divided difference, etc.
CO 4	Demonstrate the methods to solve differential equations
CO 5	Write, Compile, Execute and Troubleshoot programs using C

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M.Sc. APPLIED MICROBIOLOGY

PROGRAM SPECIFIC OUTCOMES

PSO1	To apply critical and contextual knowledge of Microbiology in inventive, energetic and inspiring milieu for design and development of new technology
PSO2	To reclaim, assess and practice microbiological data concerning current issues in thebiosphere and pertinent to their day-to-day lives
PSO3	To comprehend the concepts of microbial infections in animals & plants and to implement the acquired knowledge for prevention and control of microbial diseases
PSO4	To capture knowledge in designing a route for the production of foods, therapeutic agents, metabolites, proteins and other beneficial products through micro-organisms
PSO5	To generate brilliant human resource, entailing with up-to-date requirements of biological sciences

FIRST SEMESTERCORE - I

Course Title: FUNDAMENTALS OF MICROBIOLOGY & MICROBIAL PHYSIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Emphasize the Principles of Classification, rules and its applications in Microbialtaxonomy.
CO2	Be acquainted with knowledge of bacterial cell structure, Staining methods, the nutritional requirements of bacteria and get equipped with various methods of bacterial growth measurement.
CO3	Understand the Principles of sterilization and disinfection, various physical and chemicalmeans of sterilization, and evaluation of disinfectants. Master aseptic techniques and able to perform routine culture handling tasks safely and effectively
CO4	Acquire an in-depth study of the concepts of metabolism, the different pathways ofenergy conservation microbial metabolism and anaerobic respiration.
CO5	Perceive significant knowledge of the nature of photosynthesis — enlisting differencesin photosystem of plants, algae, cyanobacteria.
CO6	Handle basic instruments – Autoclave, laminar air flow, incubator, pH meter,colorimeter used for the cultivation of bacteria.
CO7	Understand the principle and operation of different types of microscopes and theirapplications, with deep knowledge on the sample preparation and staining techniques.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE - II

Course Title: MEDICAL MICROBIOLOGY - I

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the importance of normal flora of human body and acquire knowledge onthe process of infectious disease
CO2	Acquire the basic concepts of medical microbiology and analyze how pathogenicorganisms causes the disease on human beings and animals
CO3	To compile a list of disease causing bacteria and compare their modes of infection,symptoms, diagnosis and treatment
CO4	Evaluate the role of pathogenic bacteria in human infections pertaining to respiratorytract, gastrointestinal tract, urinary tract, skin and soft tissue
CO5	Comprehend human-fungal interaction, which can be applied to obtain in-depthknowledge on fungal diseases and the mechanism behind the disease process
CO6	Review medically important fungi that cause disease and methods of identification for respective fungi from clinical specimens
CO7	Explain types of mycoses caused in humans and demonstrate their modes of infection, pathogenesis, and treatment with introduction to mycotoxins

CORE - III

Course Title: BASICS IN IMMUNOLOGY AND IMMUNOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze various cells involved in Immune system and their response in humoral andcell mediated immunity and discuss ABO &Rh incompatibility.
CO2	Explore different type of foreign bodies and various classes of antibodies involving inantigen antibody reactions. Classify vaccines and approaches to new vaccines.
CO3	Standardize bacterial antigens and elucidate the purification of mono, polyclonalantibodies using recent and modern techniques for diagnostic Immunology.
CO4	Illustrate various mechanisms in tissue and organ transplantation and to regulateimmune response against tumor antigens.
CO5	Exemplify the effect of immune reactions in Hypersensitivity and Immunodeficiency diseases.
CO6	Decode the role of Immunology in Auto immune diseases and disorders.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE - IV

Course Title: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concept of central dogma of molecular biology.
CO2	Describe the structure and function of DNA and RNA in a cell and have a conceptual knowledge about DNA as a genetic material.
CO3	Discuss the molecular mechanisms underlying mutations, DNA damage and repairmechanisms.
CO4	Comprehend the various gene transfer methods and its applications.
CO5	Understand the molecular mechanisms involved in transcription and translation andcompare and contrast the prokaryotic and eukaryotic RNA and protein synthesis.
CO6	Describe the importance of genetic code and concept of gene regulation with referenceto operon.
CO7	Understand and apply the principles and techniques of molecular biology for furthereducation and employment.

ELECTIVE – I-A

Course Title: BIOINFORMATICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Comprehend the basic concepts and the significance of Biological data analysis.Compute Sequence submission and retrieval tools
CO2	Understand the basics of sequence alignment, algorithms and tools used forPhylogenetic Analysis
CO3	Evaluate the computational methods, tools and algorithms employed for BiologicalData Interpretation. High-throughput Gene expression data analysis from microarray
CO4	Effective Implementation of existing software tools to predict and understand theintersection of secondary protein structure and genome
CO5	Retrieve information from available databases and use them for microbialidentifications and drug designing.
CO6	To impart knowledge about various concepts, advanced technical tools in docking,QSAR studies employed in computational drug discovery.
CO7	Analyse ADME response to drug response and its effect

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – I-B

Course Title: CELL BIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyse the basic concepts and theories of cell and reveal the similarities anddifferences of prokaryotic and eukaryotic cell
CO2	Compare and contrast cell wall of bacteria and fungi. Discuss intra and extra plasmiccell inclusions
CO3	Clarify and discuss various cell components and their significance
CO4	Manifest the role of chromosomes and its functions and express the synthesis and regulations of proteins
CO5	Resolve the role and significance of cell cycle and cell divisions in amitosis, mitosisand meiosis. Reveal cancer, aging and stem cells

ELECTIVE – I-C

Course Title: FORENSIC BIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss the history & development of forensic science and predict the scope as well asneed for forensic sciences in the society
CO2	Explain the basic principles of forensic science including definitions used and conceptsin forensic science
CO3	Evaluate the importance of biological evidences including microorganisms, hair andsamples which are biological in nature
CO4	Compile list of toxins and poisonous chemicals, symptoms and antidotes, evaluatealcohol levels in biological samples using immunoassays
CO5	Acquire knowledge on the application of various biological fluids as forensic evidences
CO6	Carry out molecular techniques for forensic analyses to solve crimes and paternaldisputes

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE - V

Course Title: Lab Course – I

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate methods to observe and measure microorganisms by standard microbiological techniques
CO2	Acquainted with various sterilization techniques
CO3	Use various methods to control microbes
CO4	Identify pathogenic microorganisms in the laboratory set-up and interpret theirsensitivity towards commonly administered antibiotics
CO5	Demonstrate clinically important fungi
CO6	Estimate bio-macromolecules and applications of gene transfer mechanism
CO7	Acquire knowledge on proper handling of antibiotic resistant mutants
CO8	Interpret blood grouping and typing for compatibility
CO9	Discuss the interactions between antigens and antibodies in relation to human immunesystem and separate lymphocytes to demonstrate their importance in clinical research

Certificate Course I Title: BIOENERGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss types and forms of energy, nature and principle of energy systems and gain knowledge about green energy and advantages over conventional and currently usedenergy sources
CO2	Explain concept of biomass, its types and characteristics, assess bio-resources forenergy production and the importance of microbes
CO3	Outline the properties of biogas as biofuels, compile the types of biogas plants andprocesses involved and illustrate the major biogas technologies used in India
CO4	Understand the concepts, categories of liquid biofuels, their production, potential inIndia and its environmental impacts
CO5	Improve energy security by effectively using un-used resources like forestry residuesand wastes for improvement of atmospheric and residential environment

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SECOND SEMESTERCORE - VI
Course Title: FOOD, DAIRY AND INDUSTRIAL MICROBIOLOGY

Course Code :		**Credits**	**04**
L:T:P:S	**: 4:0:0:0**	**CIA Marks**	**: 40**
Exam Hours: 03		**ESE Marks**	**: 60**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Know the spoilage mechanisms in foods and thus identify ways to control deteriorationand spoilage.
CO2	Apply principles involving various methods of food preservation and microbiologicalquality control programmes in food production and prevention of food-borne infections
CO3	Understand the beneficial role of microorganisms in fermented foods and in foodprocessing and the microbiology of different types of fermented food products
CO4	Realize the importance of microflora of milk and milk products, and the role of microorganisms in the fermentation and processing of milk
CO5	Be acquainted with fermentation protocols for production of microbial production oforganic acids, vitamins, amino acid
CO6	Build knowledge with the basics of food safety regulations ,food control agencies, , quality assurance programs FDA, HACCP, BIS , FSSAI, Gain knowledge about food adulteration and common food additives

CORE - VII
Course Title: MEDICAL MICROBIOLOGY - II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about host parasite relationship and demonstrate the techniques, whichare used to identify the parasites
CO2	Discuss about various parasitic infections, pathogenicity and diagnosis
CO3	Explain the mode of action of drugs used against parasitic infection
CO4	Revise the general properties and classification of viruses
CO5	Predict viral infections based on serological analysis
CO6	Assess the methods used for enumeration and quantification of virus from clinicalspecimens

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO7	Compare and distinguish the replication strategies of commonly occurring viruses

CORE - VIII

Course Title: RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand basics of research, importance of literature, and constraints before designof a research, re\view or synopsis presentation
CO2	Explain different types of data and outline the techniques of data collection
CO3	Identify the importance of sampling, its types, and variables. Outline of report preparation and ethics of plagiarism
CO4	Assess and understand the basics statistical terminologies used in biostatistics
CO5	Gather knowledge on different type of statistical analyses and tests for analyzingbiological data
CO6	Empirical model building for prediction using biological data

ELECTIVE – II-A

Course Title: ENVIRONMENTAL MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Pronounce major habitats found on Earth's ecosystems and escalate the superiority ofthese ecosystems to humans, animals and plants.
CO2	Designate the associations among predator and prey populations and outline thestructure of food webs and trace the flow of energy through an ecosystem.
CO3	Illustrate the diversity of microorganisms in air and its significance and exemplify the air quality in Indian cities-mapping of the hot spots and explore theimpact of air borne microbes.
CO4	Express the role of indicative microorganisms and to apply knowledge in water qualityanalysis and in designing blueprint for drinking water treatment.
CO5	Interpret waste water and solid waste managementandcommentate the microbiology of xenobiotics in the environment.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO6	Manifest the major environmental changes revealing with Global warming,Greenhouse effect and Ozone depletion and Express the management of e-waste.

ELECTIVE – II-B

Course Title: TISSUE BIOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain fundamental knowledge in principles, practices and application of animal andplant tissue biotechnology.
CO2	Acquire the knowledge about the techniques, laboratory organization and measuresadopted for maintenance of aseptic condition.
CO3	Explain the fundamental scientific principles that underlie cell culture and itsnutritional requirements.
CO4	Share insights in callus culture, cell suspension culture, and organ micro-culture, plantmicro-propagation, and somatic embryogenesis.
CO5	Aware on isolation and maintenance of animal cells culture developed from embryonicorgans, whole embryo and adult organs.
CO6	Discuss the benefits of cloning and hybridoma technology in the field of applied lifescience.
CO7	Explore the various applications of tissue biotechnology pertaining to Drug Designingand Drug Therapy

ELECTIVE – II-C

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concept of marine ecology and diversity and interpret the microbial association with coral and sponge
CO2	Analyze various biogeochemical cycles of marine environment and point out the microbes involved
CO3	Manifest the role of extremophiles in marine environment and reveal about microbial bioluminescence
CO4	Illustrate the microbial indicators of marine pollution and expound microbialcontamination and control in sea food
CO5	Explore bioactive compounds of marine microbes and analyze bioremediation ofheavy metals and oil pollutants

ELECTIVE – III-A

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Relate the phylogeny of different poultry species and describe the design and types ofpoultry houses
CO2	Clarify the various types controlled process to maintain poultry houses
CO3	Compare and contrast the nutrient requirement of poultry species with BIS and NRC ofUSA. Express various essential nutrition and their functions required in poultry

CO4	Manifest the role of bacterial, viral, fungal and parasitic infections involved in poultryand expound metabolic and nutritional deficiency diseases and disorders
CO5	Explicate various sanitation and hygiene management practices in poultry houses
CO6	Point out economic principles and marketing approaches of poultry products for importand exports and decode the role of insurance and finance management in poultry enterprises

ELECTIVE – III-B

Course Title: APICULTURE

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the systematic position and life history of honey bee
CO2	Reveal the different stages and types of bee and discuss about the the cure and management of apiculture
CO3	Describe the practice of bee rearing process and analyse instruments employed in apiary
CO4	Compare and contrast the composition of honey and bee wax and interpret the yield inNational and international markets
CO5	Clarify the proposal for financial assistance and funding agencies and reveal themodern methods employed in artificial bee hives

ELECTIVE – III-C

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the correlation analysis between proteins, carbohydrates, fats and health
CO2	Gain knowledge regarding vitamins and major elements
CO3	To implement strategies for diet preparation for different age groups
CO4	To compare and contrast various nutritional disorders
CO5	To familiarize with various food safety and hygiene practices

CORE - IX

Course Title: LAB COURSE II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate hazardous microbes from various foods using conventional and moderntechniques
CO2	Critique the quality of milk using laboratory test
CO3	Processing of different kinds of food samples for microbial load
CO4	Predict the microbial population of soil using laboratory techniques
CO5	Assess the soil fertility by microbial analysis
CO6	Demonstrate the techniques used to identify human parasites

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO7	Understand experimental tools used to cultivate and characterize clinically importantviruses and bacteriophages
CO8	Identify tolerance level of pathogens to antibiotics for evaluation of the quality of pharmaceuticals
CO9	To screen the pharmaceutical products for microbial contamination and to evaluateantiseptic agents for their efficiency

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Certificate Course II Title: HERBAL TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Acquire good knowledge of the basic and applied facts on medicinally importantplants, as well as concepts of Indian medicinal systems
CO2	Identify medicinally important plants and assess their potentially useful elements
CO3	Understand the useful phytochemical and pharmacological nature of bioactivemolecules and their identification techniques
CO4	Evaluate the toxicological aspects of active ingredients and the finished products onpathogens, organs as well as clinical manifestations
CO5	Discuss and execute established guidelines for commercially sold herbal preparationsin public health

THIRD SEMESTERCORE – X

Course Title: RECOMBINANT DNA TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate expertise with the tools and techniques of genetic engineering- And use of various cloning vectors.
CO2	Understand the principle and the concept of cloning strategies of rDNA technology, Acquire knowledge in gene transfer methods.
CO3	Describe the various applications of PCR, and illustrate screening of genomic and cDNAlibraries. Also learn about the DNA amplification and sequencing methods
CO4	Acquire an in-depth study of different gene cloning systems/Hosts and its manipulation inplant and animal transgenic.
CO5	Understand the use of site directed mutagenesis and the use of DNA in diagnosis of genetic disorder and infectious disease
CO6	Analyze the various advanced techniques in genetic engineering and its applications in biological research

CORE - XI

Course Title: PRINCIPLES OF BIOPROCESS TECHNOLOGY ANDPHARMACEUTICAL MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recognize the history , rudiments and notions of bioprocess technology and illustrate the industrial method of fermentation for various primary andsecondary metabolites
CO2	Execute screening of industrially impor tant microbes, strain improvement,media formulation, sterlization and analyze various parameters to be monitored and controlled during fermentation processes and develop a strategy for fermenter design
CO3	Understand the ethics of major unit operations followed in downstream processingfor various economically important products
CO4	Assess the source of contamination and device safe working practices in pharmaceutical industry and to articulate with antimicrobial preservation of pharmaceutical formulations during production and in products
CO5	Formulate antibiotics , therapeutic enzymes and immunological products and applyStandard protocols in pharmaceutical industry - IP, BP, USP and EP

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – IV-A
Course Title: BIOINSTRUMENTATION

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about the principles, uses, advantages and disadvantages ofinstruments routinely used in biological labs.
CO2	Acquaint with the basic concept of qualitative and quantitative analysis of a givensample
CO3	Critique the importance and applications of advanced biochemical instrumentationtechniques in modern day research.
CO4	Acquire cognitive and technical skills enabling students to gain knowledge aboutseparation concepts and their Control systems.
CO5	Develop skill in carrying out research projects by employing the basic chromatographic purification techniques.
CO6	Comprehend the terms, principle, instrumentation, operation and applications ofMolecular spectroscopic techniques
CO7	Acquire knowledge about the basics and latest developments in gel electrophoresis forthe separation of DNA, proteins and compounds.
CO8	Gain a wide knowledge to use the radioisotopes in life sciences and radioactivelabelling

ELECTIVE – IV-B
Course Title: SOIL & AGRICULTURAL MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the formation, profile and types of soils and to exemplify the distributionof microbes in soil.
CO2	Express the role of Nitrogen fixers and Phosphate solubilizers in soil fertility.
CO3	Explicate the microbial interactions with animals and plants and decode positive andnegative relations and relate biogeochemical cycles.
CO4	Manifest the role of plant pathogens in crop response and reveal the control andpreventive measurements of bacterial, fungal viral pathogens.
CO5	Explore the importance of microbial degradation of agricultural products and organicmatter decomposition.

PRINCIPAL
Dwaraka Doss Govardhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – IV-C

Course Title: BREWING TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concepts of brewing and reveal various raw materials involved
CO2	Interface various technologies for wort production
CO3	Choose the appropriate integrated fermentation techniques for beer production
CO4	Ability to Design and develop innovative design for brewing equipments
CO5	Understand sanitation and quality management concepts and ISO 9000, HACCPservices

ELECTIVE – V-A

Course Title: NANOBIOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the history and basics of nanobiotechnology and classify different types of nanomaterials and be acquainted with the various properties of nanomaterials.
CO2	Gain knowledge of the different methods of synthesis of nanoparticles includingphysical, chemical and biological methods.
CO3	Aware of the interaction between biomolecules and nanoparticle surface and itsapplications.
CO4	Comprehend the principles of various physical and chemical characterization techniques.
CO5	Understand the applications of nanobiotechnology in the fields of biomedical,environment, food and cosmetology.
CO6	Identify the risk assessments involved in bio nano materials synthesis and application.

ELECTIVE – V-B

Course Title: BIODEGRADATION TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Commentate the role of heterotrophic microbes in aquatic, terrestrial and aridecosystems and microbial degradation of various natural polymers
CO2	Express the importance of biotransformation and decode the role of factors involved in biodegradation
CO3	Differentiate the significance of microbial degradation on natural fibres and analyse therole of microbes on leather
CO4	Compare and contrast surface from subsurface degradation process and point out paint,metal and concrete microbial degradation
CO5	Decode about biodegradation of xenobiotic compounds and express the significance of vermicomposting

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – V-C

Course Title: BIOSAFETY AND CLINICAL RESEARCH

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Control laboratory hazards (chemical, biological and physical) and to practice safetystrategies and personal protective equipment
CO2	Develop stratagems for the use of genetically modified organisms and Hazardous materials
CO3	Comprehend the clinical research process and equate and recapitulate internationalregulations and clinical requirements for the clinical research
CO4	Establish skill in biopharmaceutical clinical trial research designs to encounter the health and medical needs of existing and impending biopharmaceutical product clients
CO5	Successfully measure and manage ethical clinical trial programs and biopharmaceutical development ventures
CO6	Accomplish the significance of the patient in drug development

ELECTIVE – VI-A

Course Title: Aquaculture

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the fundamental ideas about aquaculturing and reveal the production style inIndia
CO2	Commentate and compare the common cultivable species of fish and point out the significance of polyculture, monosex & monoculture
CO3	Reveal various culturing methods of carp species and point out socio-economic and environmental problem involved in aquaculturing
CO4	Illustrate common bacterial, viral, fungal and protozoan diseases in the course of fish farming and Express the significance of composition & types of feed
CO5	Analyze the marketing strategy of fish in local and export Markets and manifest thequality control while canning and freezing

ELECTIVE – VI-B

Course Title: LABORATORY ANIMALS FOR PRE-CLINICAL STUDIES

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Commentate various health monitoring programmes of animal in clinical studies.
CO2	Interpret and reveal the common bacterial and viral diseases in lab animals and decodevarious preventive and control measures involved.
CO3	Explore different experimental procedures for preclinical studies and resolve variousanimal inoculation procedures.
CO4	Analyse toxicological and bioassay studies of drugs and point out their mode of action.
CO5	Execute methods involved in disposal of dead animals, understand and implementethics in animal welfare and prevention of PCA.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – VI-C

Course Title: BIODIVERSITY AND CONSERVATION

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Exhibit an ability to assess gears, scope, and constraints of biodiversity
CO2	Demonstrate deeper insight into different types of habitat and ecosystems
CO3	Integrate knowledge and perspectives to analyze, assess and pact with economicproductivity and national security within the field of biodiversity
CO4	Describe the serious threats to biodiversity by human activities
CO5	Design Strategies for biodiversity conservation

CORE - XII

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate chromatography techniques for protein separation
CO2	Perform separation of serum proteins by electrophoresis
CO3	Quantify basic biological macromolecules using spectrometric techniques
CO4	Separate blood leukocytes using centrifugation techniques
CO5	Extract genetic material from microorganisms using appropriate analyticaltechniques
CO6	Evaluate the potability of drinking water by analyzing its physico – chemicaland microbial parameters
CO7	Determine the strength of waste water based on physical, chemical andbiological characterization
CO8	Analyze microbial air quality from indoor and outdoor environment

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Certificate Course III Title:
BIOMEDICAL, INDUSTRIAL AND SOLID WASTEMANAGEMENT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Create awareness on the basic methodology of wastewater treatment and disposal
CO2	Demonstrate knowledge on the segregation, shipping and treatment of biomedicalwastes with emphasis on ethics for the industry
CO3	Outline the sources, categories and constituents of solid waste along with protocols forhandling and management
CO4	Understand hazards of Municipal Solid Waste (MSW) and execute safe disposal ofpotentially harmful solid wastes
CO5	Compile and apply the legal legislations involved with health management in public aswell as private sectors

FOURTH SEMESTERCORE - XIII
Course Title: ENTREPRENEURSHIP IN MICROBIOLOGY
Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe and apply several entrepreneurial ideas and business theories in practicalframework
CO2	Clarify the metabolic pathways and control mechanisms of commercially importantmetabolites
CO3	Commentate single cell proteins and express the importance of mushroom cultivationand probiotics
CO4	Express the mass production of microbial inoculants used as Biofertilisers andBioinsecticides in response with field application and crop response
CO5	Analyze the application and commercial production of Monoclonal antibodies,Cytokines. TPH and teaching kids
CO6	Decode the significance of industrial production of Biofuels and Point out the role ofBioplastics and Biopigments

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE - VII

Course Title: BIOFERTILIZER TECHNOLOGY AND ORGANIC FARMING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about the immense reserves of microbial biodiversity and applicationof microbial bio-fertiliser
CO2	Assess the ability of microorganisms and their chemical constituents, to sustainablyminimize the damage from pests and to increase agricultural productivity.
CO3	Use natural Cyanobacterial bio fertilizers to maintain and build-up of soil fertility. Distinguish the types of bio fertilizers and develop integrated management for bestresults by using both nitrogenous and phosphatic bio fertilizers
CO4	Rate the quality of Packaging, storage, assess the shelf life, bio efficacy of biofertilizers as per BIS standards
CO5	Familiarize with the basic concepts of farm development and would be able to relatethe development of organic farming in their countries to global trends
CO6	Acquire insights about overall trade policy issues, multiple linkages between organicfarming and rural development, especially from the perspective of resilience and risk management
CO7	Gain knowledge and skills need to work in an organic certification agency and become an entrepreneur. Plan a Complete Farm Business includes marketing, operation andfinancial outline for a farm business

CORE - XIV

Course Title: LAB COURSE IV

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Screening of microbial population from soil for economically important primary andsecondary metabolites.
CO2	Describe the production of ecofriendly microbial fuels by utilizing various wastes.
CO3	Successful production and purification of enzymes from microorganism by standardmethods.
CO4	Qualitative and quantitative analysis of extracellular microbial enzymes.
CO5	Demonstrate laboratory production of wine.
CO6	Illustrate the production and extraction of natural pigments from micro organisms.

CORE - XV

Course Title: PROJECT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamental design, select appropriate topics and information from various sources for literature review.
CO2	Structure the methodologies to accomplish organized conduct of interdisciplinary research.
CO3	Complete an independent research project and furnish the outputs in the form ofdissertation.
CO4	Impart the outcome of their project in various seminars and conferences.
CO5	Present and defend their project work to a panel of experts.
CO6	Publish the research outcome in scientific peer reviewed journal.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M.SC., BIOCHEMISTRY

After successful completion of 2 years MSc programme the students will be able to	
PSO 1	Understanding of biological principles and the ability to make connections across different levels of biological organization, from molecules to cells, to whole organisms, populationsand ecosystems.
PSO 2	Students should be able to demonstrate advanced knowledge and understanding in macromolecular structure, enzyme kinetic behavior, gene expression, metabolic control, molecular signaling, immunity etc
PSO 3	Students should be able to use their practical skills of wide range of biochemical techniques in various laboratory investigations. Students should be able to develop generic skills that allow them to analyze, interpret and relate known and unknown biological phenomenon
PSO 4	Students should be able to communicate what they know through precise language, diagrammatic representation , graphical mode and using computational tools
PSO 5	Post-graduates will be able to identify problems related to environment, analyse and derive valid conclusions with fundamental knowledge in biology and computers. Apply reasoning to assess societal, health, safety and legal issues and understand his responsibilities by undergoing waste recycling process.

Course Title: BIOMOLECULES (CORE PAPER I)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	List the facts and milestone discoveries, key contributions of scientists that led to the establishment of Biochemistry as a separate discipline
CO2	Classify and explain the structure, biological importance and physico chemical properties of carbohydrates, from monosaccharides to polysaccharides, relate the importance of sugar derivatives and bacterial cell wall polysacchharides
CO3	Identify the structure of amino acids, classify proteins, explain their properties and relate the structural levels of organization of proteins
CO4	Describe the tertiary, quaternary structure, forces stabilizing the structure of proteins and explain the chemical synthesis of peptide
CO5	Illustrate the structure of nucleotides, distinguish DNA and RNA and describe the structure of DNA, its properties, types of RNA and their biological functions
CO6	Define and classify lipids with examples, explain the properties of fats and describe the structure and biological functions of phospholipids, glycolipids, sterols and terpenes

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: INTERMEDIARY METABOLISM (CORE PAPERII)
Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Define metabolism, acquire a wide knowledge on the metabolism of the glucose and identify the steps involved in biochemical pathways that produce ATP such as glycolysis, TCA cycle, ETC.
CO2	Explain the oxidation and synthesis of fatty acids, identify the steps involvedin metabolism of cholesterol, synthesis of prostaglandins, leukotrienes and thromboxanes.
CO3	Explain How biochemical energy is generated in cells using principles of thermodynamics (free energy enthalpy) using coupled reactions to show how an endergonic reaction can occur by coupling with exergonic reaction
CO4	Gain knowledge on synthesis of urea and other biologically important amines.
CO5	Write the chemical reactions for the individual steps in the purine and pyrimidine metabolism.

Course Title: PLANT BIOCHEMISTRY-I SEMESTER (COREPAPER III)Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Summarize Photosynthesis
CO2	Classify Plant Hormones And Explain Their Functions
CO3	Discuss Secondary Metabolites In Plants
CO4	Illustrate Nitrogen Fixation By Symbiosis Biochemistry Of Nitrogen Fixation
CO5	Evaluate The Anti Oxidant Defense In Plants
CO6	Distinguish Between Types of Stress Tolerance in plants

Course Title: ENZYMES (Core paper IV)

CO NUMBER
CO Statement

CO1
Gain knowledge in relevant principles of enzyme, mechanism of enzyme kinetics, enzyme catalysis emphasizes on capability of thestudents to work in a group and gather the information.

CO2
Analyse and interpret the graphs based on kinetics data. Identification of Enzyme specificity of unknown samples using MM- Equation or byLB plot.

CO3
Students will be familiarized with the terms such as activation energy, Lock and key theory and induce fit theory. Graduates get the knowledge of regulation of enzyme activity and its types can be able to apply in higher education. Distinguish the mechanism of action of specific enzymes such as chymotrypsin, carboxypeptidase, ribonuclease, lysoenzyme, abzymes and ribozymes

CO4
Interpret the types of enzyme inhibition.
Acquire a wide knowledge on the actions of coenzymes

CO5
Comprehend the various methods for production, purification,characterization and immobilization of enzymes.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai-600106.

Course Title: MEMBRANE BIOCHEMISTRY (Elective Paper - I)

CO NUMBER

CO Statement

CO1

Describe the structure and function of membranes, and illustrate thestructure of phospholipid and membrane bilayer.

Apply knowledge of liposomes in drug delivery and justify how Cell to Cell Communication occurs.

CO2

Classify the presence of different in RBC membrane.

Describe the consequence of damage occurs in RBC membrane and beable to understand the diseases caused due to its mutations.

CO3

Distinguish between passive and active transport; explain how substancesare directly transported across a membrane.

Describe the primary mechanisms by which cells import and exportmacromolecules.

CO4

Identify the main components of a signal transduction pathway

Differentiate between different types of signals. Describe how a cellpropagates and responds to signal.

CO5

Classify the type of molecules whose diffusion is restricted by membranes.

Course title: PHYTOMEDICINE (Elective Paper I)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain a wide knowledge on plants and the phytochemicals present in plants
CO2	Perform the qualitative, GC analysis and HPLC analysis of various phytoconstituents
CO3	Understand Indian systems of medicine
CO4	Classify hormones and their biological role
CO5	Interpret the clinical features of diabetes mellitus, insipidus. Acquire knowledge on disorders of adrenocortical hormones.

Course Title: STEM CELL BIOLOGY (Elective Paper I)

At the end of the course the students will be able to

CO NUMBER	**CO Statement**
CO1	Define the significance of stem cells
CO2	Illustrate the differentiation of stem cells
CO3	Understand techniques used for stem cell characterization
CO4	Analyze the therapeutic applications of stem cell

CO5	Describe the importance of Stem cell banking

Course Title: ANALYTICAL BIOCHEMISTRY (CORE PAPER V)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO STATEMENT
CO1	Analyze and apply the methodology involved in organ and tissue slice, homogenization techniques. Perform cell sorting and cell counting
CO2	The students will know the structure of atoms and molecules. The larger th number of wavelength emitted by these system makes it possible to investigate their structure in detail including electronic configuration of ground and various excited state and also biochemical assay of macromolecules Advanced knowledge on the interactions of electromagnetic radiation and matter and their applications in spectroscopyAnalyze and interpret spectroscopic data collected by the methods Assay ofbiomolecules (Carbohydrates, Cholesterol, Protein, Enzymes) using UV spectroscopy Estimate the amount of vitamins using spectrofluorimetry Interpret the molecular weight of compounds using mass spectra
CO3	To learn various techniques of product purification and design purification strateg based on product characterized and cost effectiveness Obtaining analytical skills to separate samples (amino acids) using paper chromatography Detection of sugars using thin layer chromatography Separation and purification of proteins using affinity chromatography Apply skills in separating various components of plant extract using HPLC
CO4	Demonstrate the methodology involved in separation of proteins based on molecular weight by SDS PAGE Separation of DNA by agarose gel electrophoresis by various electrophoreti techniques.
CO5	A practical knowledge on the separation of biological sample by centrifugation Separation of subcellular organelles by differential centrifugation

BIOCHEMICAL TECHNIQUES (CORE PAPER IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	• A practical knowledge on the separation of biological sample by centrifugation • Separation of subcellular organelles by differential centrifugation
CO2	• To learn various techniques of product purification and design purification strategy based on product characterized and cost effectiveness Obtaining analytical skills to separate samples (amino acids) using paper chromatography • Detection of sugars using thin layer chromatography • Separation and purification of proteins using affinity chromatography

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO3	• Know the structure of atoms and molecules. The larger the number of wavelength emitted by these system makes it possible to investigate their structure in detail including electronic configuration of ground and various excited state and also biochemical assay of macromolecules • Advanced knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy • Analyze and interpret spectroscopic data collected by the methods • Assay of biomolecules using UV spectroscopy
CO4	• The students will be able to demonstrate the methodology involved in separation of proteins, Nucleic acid by various electrophorectic techniques.
CO5	• Acquire knowledge on atomic structure. • Radiation, types of radioactive decay, • Detection and measurement of radioactivity using GM counter and Scintillation counter. • Biological hazards of radiation and safety measures in handling radio isotopes.

Course Title: HUMAN PHYSIOLOGY AND NUTRITION (COREPAPER VI)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Gaining a complete knowledge in the physiology of life. Classify blood groups so as to identify the blood groups of patients and donors forthe purpose of safe blood transfusion. Exposure to the nature and types of blood cells, blood groups, lymphatic system
CO2	Acquire knowledge on morphology of lungs, types of respiration, mechanism of gaseous exchange, role of heamoglobin, chloride shift and bohr effect.
CO3	gain knowledge on morphology and functions of kidney, structure of nephron , mechanism of mechanism of urine formation, Structure and functions of neuron,neuro transmitters, Mechanism of nerve impulse transmission
CO4	Realizing the fact that "Food as medicine" Cognizance of basic food groups viz. Carbohydrates, proteins and lipids and their nutritional aspects as well as calorific value
CO5	A wide exposure to the classification and biological significance vitamins andminerals present in food

Course Title: MOLECULAR BIOLOGY (CORE PAPER VII)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO1	Infer the central dogma of molecular biology and show that DNA is the genetic material through experimental evidence Compare and contrast the replication process in prokaryotes and eukaryotes and explain the events, enzymology, fidelity, inhibitors and regulation
CO2	Categorize DNA repair mechanisms, define mutation and list its types
CO3	Summarize the process of prokaryotic and eukaryotic transcription
CO4	Define genetic code, list its characteristics,relate genetic code to translation process and explain protein biosynthesis
CO5	Interpret the regulation of gene expression in prokaryotes using *lac* and *trp* operon

Course Title: BIOTECHNOLOGY (Elective Paper - II)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate the basic and recent techniques applied in the field of Biotechnology
CO2	Describe gene therapy and gain knowledge related to production of pharmaceutically important products
CO3	Apply the basic rDNA technique to produce transgenic animal, discuss gene transfer methods, their application in pharmaceutical industry, cloning and itsimportance
CO4	Interpret the principles and technical advances behind the in vitro culture of plantcells and Design plant related rDNA techniques
CO5	Discuss the basic requirements and tools employed in genetic engineering process.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss the concepts of ecology and the significant role of species in the environment
CO2	Discuss the negative impact of Humans behavior on environment.Identify and classify the Biogeographical zones of India
CO3	Present their views about biodiversity and justify their roles in conservation of biodiversity.
CO4	Explore the needs of Population Education and the impact of population growth in the society

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO5	Calculate the population rate
CO6	Identify and classify populated regions.

Course Title: MICROBIOLOGY (Elective Paper II)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Able to describe basic structure of bacteria, fungi, algae and protozoa and their biologica importance to mankind.
CO2	Explain the transfer of genetic information through various methods
CO3	Isolate, identify and characterize any microorganisms in the given environment. Acquire knowledge and lab skills to perform pathological sample.
CO4	Acquire, invent and practice, the theories and principles of food microbiology in current worldwide issues. Apply their skills in formulating the fermented foods and in food processing technology
CO5	Design bioreactors, rationale in medium formulation and appreciate the different types of fermentation process.
CO6	Evaluate the present worth on waste management in water resources and to recycle thesolid and liquid waste.

Course Title: BIOETHICS, IPR AND HUMAN RIGHTS

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Outline International Instruments On Human Rights
CO2	Compare The Powers And Functions Of SHRC AND NHRC
CO3	Valuate The Moral Sentiments Of Adamsmith And Thiruvalluvar
CO4	Analyze The Bioethics Of Cloning And Recombinant Drugs Production
CO5	Apply Article 21 In Different Case Studies And IPR and IPP.
CO6	Prioritize Biosafety Measures From Biohazards.

Course Title: ORGANIZATIONAL BEHAVIOUR (Elective Paper

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1	Understand the evolution of an organization and its important components

CO2	Analyse and effectively manage individual behavior in an organization
CO3	Analyse and effectively manage group behavior in an organization
CO4	Understand and appreciate the organization variables such structure , culture, change and creativity
CO5	Develop leadership styles to handle management stress in diverse organisations
CO6	Understand the nuances and critical contributions of trained personnel in the health care organisations

Course Title: GOOD LABORATORY PRACTICES (Elective

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamental points of good laboratory practices
CO2	Handle laboratory animals with care
CO3	Acquire knowledge on the protocols need to be followed
CO4	Analyze the biosafety of GM foods
CO5	Gain the Awareness of HACCP and, follow the Safety measures in Industrial Hygiene.

Course Title: MAJOR PRACTICAL-1

Course Outcomes: At the end of the Course, the Student will be able to:

CO 1	Become proficient in preparing laboratory reagents and use of glass wares
CO 2	Acquire expertise in determination of ash and moisture, proximate principles, minerals (Ca, P & Fe) and vitamin C in food
CO 3	Summarise the rich dietary sources of various nutrients of food through experiments
CO 4	Learn the isolation and estimation of DNA, RNA, Glycogen and Starch from biological sources
CO 5	Evaluate absorption maxima of protein and DNA sample as well as the melting temperature and GC content of a DNA sample
CO 6	Use Colorimeter and UV Spectrophotometer for biochemical analysis efficiently
CO 7	Gain hands on knowledge of Fluorimetry in estimating Thiamine and Riboflavin
CO 8	Carry out differential centrifugation technique for fractionation of subcellular organelles(nucleus and mitochondria) and assay of its marker enzyme
CO 9	Develop experimental, mathematical and interpersonal skills like collaboration, safety and ethics
CO 10	Imbibe required technical skills and confidence to take up independent research for their scientific growth as well as for employability

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: MAJOR PRACTICAL-II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To study the effect of various factors that affect enzyme activity
CO2	Separation & Identification of analytes based on planar chromatographic techniques
CO3	Separation & purification of biomolecules by column chromatographic techniques
CO4	Separation & resolution of macromolecules like nucleic acids, protein by electrophoresis
CO5	To retrieve & visualize the structure of gene, Enzyme, nucleic acid, proteins using computational tools.

Course Title: ADVANCED CLINICAL BIOCHEMISTRY (COREPAPER VIII)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Identify the metabolic errors that lead to different disorders of carbohydrate metabolism and help in the management of the same.
CO2	Predict the underlying disease condition based on the measurement of diagnostically significant enzymes.
CO3	Analyze the disorders in lipid metabolism based on the detailed lipid profile of the patient
CO4	Relate laboratory results to clinical diagnosis and relationship to liver, kidney, pancreas and gastrointestinal function
CO5	Use biochemical and molecular tools for diagnostic and therapeutic intervention on hereditary and acquired disorders.

Title: BIOSTATISTICS (CORE PAPER IX)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Recognize the definition of biostatistics and its scope
CO2	Ascertain the methods and importance of data collection and presentation
CO3	Examine the usage of statistical tools like measure of central tendency and measure of dispersion
CO4	Infer the results of skewness, kurtosis, correlation and regression
CO5	Appraise normal distribution and evaluate the concept of hypothesis testing
CO6	Apply hypothesis testing via t, f, z and chi square statistical distribution

Course Title: RESEARCH METHODOLOGY (CORE PAPER X)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Gain wide knowledge on the fundamentals of research
CO2	Identify the research problem and research design

CO3	Enlighten Importance of Hypothesis, Characteristics of a Good Hypothesis
CO4	Exposure to write thesis
CO5	Acquire a knowledge on finding scientific articles using Pubmed

Course Title: Hormonal Biochemistry (Elective Paper IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Understand the structure of hormones and receptors. Classify hormones based on nature, mechanism of action.
CO2	Illustrate cell signaling mechanism and Demonstrate Second messengers and their actions.
CO3	Explain the structure, biological action and regulation of hypothalamic and pituitary hormones.
CO4	Analyze and predict the cause for disease due to pituitary dysfunction.
CO5	Discuss about Pancreas and its hormonal secretion, biological actions. Analyze the clinical conditions with reference to pancreatic gland
CO6	Compare the structure and metabolic effects of adrenal hormones

Course title: ADVANCED MEDICAL LABORATORYTECHNOLOGY

(Elective Paper IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain a Wide knowledge on ABO blood grouping, Withdrawal of blood
CO2	State and discuss the importance of cerebrospinal fluid and semen
CO3	To know the methodology involved in OGTT, FTM analysis
CO4	Know the causes and consequences of amoebiasis and giardiasis
CO5	Culture of microorganisms and perform antibiotic sensitivity test

Course title: BIOENTREPRENEURSHIP MANAGEMENT (ElectivePaper IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recognize the importance of IPR, TRIPS, GATT, PATENT, Bioethics, Entrepreneurship, communication and management skills so as to prepare the next generation of Indian Industrialist
CO2	Undertake further studies in biochemistry and related areas or in multidisciplinary areas that involve biochemistry and help develop a range of generic skills that are relevant to wageemployment, self-employment and entrepreneurship.
CO3	Make the students to prepare business plan.
CO4	Understand the concept of Entrepreneurship, corporate social responsibility and, the ISOstandard and importance.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CO5	Gain entrepreneurial skills, understand the various operations involved in venture creation,identify scope for entrepreneurship in biosciences and utilize the schemes promoted through knowledge centers and various agencies

Course Title: ADVANCED CLINICAL BIOCHEMISTRY (COREPAPER VIII)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Identify the metabolic errors that lead to different disorders of carbohydrate metabolism and help in the management of the same.
CO2	Predict the underlying disease condition based on the measurement of diagnostically significant enzymes.
CO3	Analyze the disorders in lipid metabolism based on the detailed lipid profile of the patient
CO4	Relate laboratory results to clinical diagnosis and relationship to liver, kidney, pancreas and gastrointestinal function
CO5	Use biochemical and molecular tools for diagnostic and therapeutic intervention on hereditary and acquired disorders.
CO6	Recognize the blood disorders and classify them based on the underlying defect.

Course Title: BIOSTATISTICS (CORE PAPER IX)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Recognize the definition of biostatistics and its scope
CO2	Ascertain the methods and importance of data collection and presentation
CO3	Examine the usage of statistical tools like measure of central tendency and measure of dispersion
CO4	Infer the results of skewness, kurtosis, correlation and regression
CO5	Appraise normal distribution and evaluate the concept of hypothesis testing
CO6	Apply hypothesis testing via t, f, z and chi square statistical distribution

Course Title: RESEARCH METHODOLOGY (CORE PAPER X)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement
CO1	Gain wide knowledge on the fundamentals of research
CO2	Identify the research problem and research design
CO3	Enlighten Importance of Hypothesis, Characteristics of a Good Hypothesis
CO4	Exposure to write thesis
CO5	Acquire a knowledge on finding scientific articles using Pubmed

Course Title: Hormonal Biochemistry (Elective Paper IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO NUMBER	CO Statement

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaish.nav College
Arumbakkam, Chennai - 600106.

CO1	Understand the structure of hormones and receptors. Classify hormones based on nature, mechanism of action.
CO2	Illustrate cell signaling mechanism and Demonstrate Second messengers and their actions.
CO3	Explain the structure, biological action and regulation of hypothalamic and pituitary hormones.
CO4	Analyze and predict the cause for disease due to pituitary dysfunction.
CO5	Discuss about Pancreas and its hormonal secretion, biological actions. Analyze the clinical conditions with reference to pancreatic gland
CO6	Compare the structure and metabolic effects of adrenal hormones

Course title: ADVANCED MEDICAL LABORATORYTECHNOLOGY

(Elective Paper IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain a Wide knowledge on ABO blood grouping, Withdrawal of blood
CO2	State and discuss the importance of cerebrospinal fluid and semen
CO3	To know the methodology involved in OGTT, FTM analysis
CO4	Know the causes and consequences of amoebiasis and giardiasis
CO5	Culture of microorganisms and perform antibiotic sensitivity test

Course title: BIOENTREPRENEURSHIP MANAGEMENT (ElectivePaper IV)

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recognize the importance of IPR, TRIPS, GATT, PATENT, Bioethics, Entrepreneurship, communication and management skills so as to prepare the next generation of Indian Industrialist
CO2	Undertake further studies in biochemistry and related areas or in multidisciplinary areas that involve biochemistry and help develop a range of generic skills that are relevant to wageemployment, self-employment and entrepreneurship.
CO3	Make the students to prepare business plan.
CO4	Understand the concept of Entrepreneurship, corporate social responsibility and, the ISOstandard and importance.
CO5	Gain entrepreneurial skills, understand the various operations involved in venture creation,identify scope for entrepreneurship in biosciences and utilize the schemes promoted through knowledge centers and various agencies

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M. Sc., BIOTECHNOLOGY

PROGRAM SPECIFIC OUTCOMES

PSO1	Understand the core concepts, principles, applications, recent and emergingdevelopments in biotechnology and its associated fields.
PSO2	Master various techniques and apply them at different areas of life science for the professional career, higher education and entrepreneurship development.
PSO3	Possess contemporary knowledge in the field of biotechnology and ability to ascertaindifferent career options in biotechnology and its related domains.
PSO4	Acquire fundamental thinking to converse scientific ideas effectively in oral, visual and written, solve research problems, design and execute experiments, analyze and interpret data using statistical tools and draw suitable conclusion for the research objective.
PSO5	Familiarize with the essential knowledge on global environmental concern, ethical issues pertaining to the field of biotechnology and will uphold commitment and responsibilities of a biotechnologist.

Course Title: Biochemistry: Core Paper: 1

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Classify and analyze the structure, composition and function of biomolecules and gain knowledge on the acidity and alkalinity of the biological buffer systems; able to applythe principles of thermodynamics in the reactions involving high energy compounds
CO2	Illustrate the metabolic pathways of macromolecules such as carbohydrates.
CO3	Sketch the metabolic pathway of fatty acids and the structure of biological membraneand summarize the transport of ions across the membrane
CO4	Integrate the synthesis and degradation of protein metabolism and gain insights on thecell signaling pathways and hormonal regulation of mammalian metabolism
CO5	Discuss the metabolism of nucleic acids and recommend the type of analytical techniquefor the separation and purification of biomolecules

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Molecular Cell Biology- Core Paper: 2

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Determine the structure of cell organelles and biomolecules and discuss the dynamics of cell components
CO2	Demonstrate the different kinds of microscopy, hybridization techniques and DNA microarray.
CO3	Revise the structure and functions of Nucleic acids & genome organization.
CO4	Explain the replication, regulation, signaling and pathways of eukaryotic cell.
CO5	Discuss the regulation of cell cycle check points and compare the genes involved in cancer.

Course Title: Molecular Cell Biology- Core Paper: 3

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the historical perspective of modern microbiology and describe the morphological features of prokaryotic and eukaryotic cells.
CO2	Identify and compare the applications of various microscopic techniques.
CO3	Compare the effectiveness of moist heat, dry heat, filtration on controlling the microbial growth.
CO4	Describe the mechanism of action of various antimicrobial agents against different microorganisms.
CO5	Able to identify the virulence factor that contributes to the pathogenicity of various microorganisms
CO6	Correlate the beneficial and harmful effects of different types of microbes for the human mankind

Course Title: Immunology & Immunotechnology- Core Paper: 4

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Classify different types of immunity, cells and lymphoid organs and their protectiverole in immune system.
CO2	Outline the properties of antigens and antibody, and theories of antibody formation. Explains the pathways of complement system. Apply concepts of Hybridoma technology for the production of monoclonal antibody
CO3	Gain insights on cell mediated and antibody mediated immune response, different methods of extraction and purification of antigens and antibodies.
CO4	Exhibit knowledge in immune specific diseases- Hypersensitivity and auto immunity. Understand the immune response produced in tumors and transplantation.
CO5	Enumerate the various immunological techniques and its applications. Debate the importance of vaccines technology over the current trend of vaccine production

Course Title: Molecular Genetics Elective Paper: 1A

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the structure and functional aspects of genes and their contribution in evolution of genomes and to identify the DNA as the genetic material.
CO2	To acquire a strong foundation of Mendelian genetics and the laws of Mendelian inheritance and solve basic Mendelian and non - Mendelian genetics problems.
CO3	Assess the strength of mutations in genetic evolution and to identify the correlation between mutagenesis and carginogenesis.
CO4	Explain the significance of transposons in evolution and the fundamental aspects of plasmids that enable their exploitation in genetic engineering strategies.
CO5	Comprehensive and in-depth vision of inbreeding, Genome evolution, population variation, speciation and natural selection.

Course Title: Ecology, Evolution and Behavior - Elective: 1B

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss the concepts of ecology and its resource partitions.
CO2	Explicate the various species interaction in all levels of species diversity.
CO3	Compare the types of ecological succession, food web and food pyramids and analyze thecase studies on conservation of ecosystem.
CO4	Elaborate the concepts in theories of evolution and evolutionary timeline by constructing timeline maps of eras and justify the importance of various theories of evolutionary processes.
CO5	Adapt to the social community by developing communication & social skills that are essential to be a part of society.

Course Title: Developmental Biology -Core Elective: 1C

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To read the early embryonic development and molecular recognition.
CO2	To illustrate cell to cell communications, interactions and signal transduction pathwayfor the development of embryonic cells.
CO3	To explore the steps in cell division, cleavage and gastrulation in zebra fish, mammalsand chick.
CO4	To analyze the structure of embryonic development and the molecules involved.
CO5	To compare the development and developmental disorders of vertebrates.
CO6	To identify the maternal effect of gene in drosophila and hormonal control in amphibians.

Course Title: Biochemistry and Molecular Cell Biology Practical-Core Practical: I

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Prepare the buffer solutions by calibrating the pH
CO2	Estimate the bio molecules such as carbohydrates, protein, lipids and nucleic acids in unknown chemical solutions
CO3	Quantify the concentration of unknown DNA and RNA from different samples
CO4	Separate and identify the amino acids, sugars and lipids by employing paperchromatography
CO5	Sketch the gel permeation chromatography
CO6	Analyze the stages of mitosis, meiosis and effect of mutation.
CO7	Isolate nucleic acid from various samples observe the chromosome structure.
CO8	Demonstrate and equip the microtome sectioning for different tissues and to visualize the internal structures of tissues using histochemical technique.
CO9	Isolate and identify cell organelles from plant tissues
CO10	Identify the cellular and sub cellular components and detection of marker enzymes

Course Title: Microbiology, Immunology and Immunotechnology Practical; Core Practical: II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Isolate microorganisms from different sources and to differentiate the applications of various microbiology media for the growth of microorganisms.
CO2	Elucidate the growth of microorganisms using bacterial growth curve technique
CO3	Understand the fundamental of stains, basic staining techniques, and related bacterial and fungal morphology.
CO4	Characterize different group of microorganisms using biochemical tests
CO5	Evaluate the antibiotic property against bacterial pathogens using Kirby Bauer Method
CO6	To isolate, identify and culturing of lymphocytes. To purify IgG fraction by affinity chromatography
CO7	Understand the Antigen antibody reactions by performing widal, VDRL,slide & tube agglutination reactions
CO8	Perform single and double Immunodiffusion techniques
CO9	To perform various types of electrophoersis to quantify the antigens/ antibodies
CO10	To detect antigens or antibodies by ELISA

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Animal Biotechnology - Core Paper - 5

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Acquire theoretical knowledge required to handle and work with animal cells in culture, media preparation and methodology used to obtain primary and establishedcell lines.
CO2	Predict the methods used for the characterization of cell lines such as karyotyping, cell counting and viability assays.
CO3	Differentiate the various methods used for cell separation and to understand the technology of cryopreservation.
CO4	Describe the methodology involved in the transgenesis and the applications of transgenic animals.
CO5	Acquire a deeper understanding of the applications of animal cell culture to humanhealth and improvement and the strategies related to the ethics of animal cell lines.

Course Title: Plant Biotechnology - Core Paper: 6

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Outline the history of plant biotechnology and state its importance during the differentstages of plant development and Recollect the role of phyto hormones in plants
CO2	Learn in-depth the basic techniques of plant tissue culture and its application
CO3	Illustrate the organization of chloroplast mitochondrial genome and regulation of gene expression in nitrogen fixing bacteria
CO4	Develop molecular technique skills in plant tissue culture using Ti plasmid vectors in agrobacterium and able to gain insights on various polymorphism techniques
CO5	Elaborate the development of transgenic plants and its application in production of vaccine, drugs and protein

Course Title: Environmental Biotechnology -Core Paper: 7

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Perceive the role of biotechnology in environment protection and relate natural biogeochemical cycles with current environmental changes
CO2	Categorize various air pollutants and explain their effects on environment, human and other biotic communities
CO3	Illustrate reactor types and can explain its functioning along with its applications in industries
CO4	Elaborate the role of denitrifying bacteria in maintaining environmental balance and justifytheir role in waste water treatment process
CO5	Develop skills to utilize kinetics in successful industrial processes such as biofilm formationand special case biofilms
CO6	Explain various biomass generated and its role in energy production

Course Title: Pharmaceutical Biotechnology - Extra Disciplinary: 1

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the various types of drugs and its applications.
CO2	Demonstrate with pharmacokinetics and pharmacodynamics parameters of biopharmaceutical.
CO3	Exhibit knowledge in formulation and delivery of drugs.
CO4	Enumerate the various sources of biopharmaceuticals and its application
CO5	Comprehend the therapeutic value of biosimilar drugs
CO6	Illustrate the drug discovery process and pre-clinical studies of various therapeutic products.

Course Title: Forensic Science - Elective Paper: 2A

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Outline the background of the development of Forensic science and elaborate on the advancements in the development of this technology in India.
CO2	Describe the biological basis and fundamental principles of fingerprinting and the consecutive steps used for detection, preservation and enhancement of fingerprints.
CO3	Predict the chromatographic and spectroscopic methods used for sample preparation in forensics.
CO4	Compare the role of narcotics and other drugs in forensic applications and the methodsused for identifying and maintaining individual identity.
CO5	Analyze the significance of collecting biological evidences and social, legal and ethical concerns that can be solved using forensic science

Course Title: Marine Biotechnology - Elective Paper: 2B

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify and to correlate the significance of marine biota to humans in biotechnological perspective and to describe optimal methods available for their *invitro* culture and maintenance.
CO2	Effectively explain the strategies adopted for enhancing the culture of specific marine organisms and the genetic approaches used for manipulating growth, reproduction and disease resistance in aquaculture.
CO3	Define the major pollutants and to critically think to evaluate the human impact onmarine ecosystems and the influence of marine organisms in cycling of bioelements.
CO4	Develop competency for careers associated with research and development in marinerelated bioproducts, of advanced scope in pharmaceutical industry and in medical research.
CO5	Elaborate on biofouling, problems posed by marine biofouling and the biotechnological approaches used for their control.

Course Title: DNA Barcoding Technology - Elective Paper: 2C

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Chakkarn, Chennai - 600106.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Explain the history of DNA barcoding and criticize the significance of the field withrespect to conventional and older identification methods.
CO2	Outline the characters of DNA responsible for identifying organisms and distinguishthe role of mitochondrial, chloroplast and nuclear DNA in identification.
CO3	Elaborate the DNA barcodes used in identifying different types of organisms such as bacteria, fungi, plants and animals.
CO4	Choose and construct a work flow for DNA barcoding by using series of molecular biological techniques.
CO5	Utilize the bioinformatics tool to compare and assess the results of DNA barcode sequencing in order to identify an organism.
CO6	Discover the importance of DNA barcoding in various fields of human welfare andjudge their limitations.

Course Title: Animal and Plant physiology - Elective Paper: 3A

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain insights on components of cardio vascular system such as blood and blood groups. Explain the structure and conduction of heart and also the importance of harmones in humans.
CO2	Describe the structure and understand the mechanism of digestive, respiratory and excretory system.
CO3	Acquire knowledge on the structure and functions of skeletal, muscular Describe the structure of nervous system and understand the mechanism of nerve impulse transmission
CO4	Enumerate the process of photosynthesis, electron transport chain and CO_2 fixation inplants and illustrate the synthesis, storage, transport and action of plant hormones.
CO5	Demonstrate the importance of phytochrome, cryptochrome, phototropin in soluteuptake, transport and translocation and stress physiology of plants

Course Title: Clinical Trials; Elective Paper: 3B

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss Clinical trials: Study of various clinical trials
CO2	Enumerate New drug discovery process in clinical trials
CO3	Exhibit knowledge in Various regulatory requirements in clinical trials
CO4	Explain Pre-clinical toxicology
CO 5	Explore Basic terminology used in clinical research

Course Title: Stem Cell Biology; Elective Paper: 3C

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Predict the formation of stem cells, their isolation and *invitro* maintenance and to differentiate the potential of embryonic stem cells with adult stem cells.
CO2	Demonstrate the properties and differentiation of stem cells. Helps to understand the epigenetic regulation of stem cells,
CO3	Gain insights into the techniques involved in isolation, expansion and characterizationof stem cells
CO4	Evaluate the role of stem cells in clinical application and to design research strategiesfor disease control and prevention.
CO5	Acquire a deeper understanding of the ethical, legal and social concerns of Stem cell research and its applications to human health and improvement.

Course Title: Animal Biotechnology, Plant Biotechnology and Environmental Biotechnology -Core Practical: III

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate the media preparation for culturing of animal cells
CO2	Acquire skills in preparation of primary cell culture, trypsinization and counting of cells.
CO3	Enumerate and identify the viability of cell using typan blue method.
CO4	Analyze the cytotoxicity of the animal cells culture using MTT assay
CO5	Apply skills to isolate DNA from mammalian cell lines & fibroblast cells from chick.
CO6	Revise the training skills required to handle and perform experiments with plant cells in tissue culture media on a large scale, under sterile environment to generate *in vitro* plants.
CO7	Generate callus from explants of various plant sources and their subsequent maintenance through subcultures and also to effectively achieve micropropagation by regulating the concentration and combination of specific plant growth regulators in culture media.
CO8	Acquire skills for identifying, isolating and culturing anther under in vitro and embryos to obtain and analyse organogenesis.
CO9	Expertise in handling protoplast by isolating, culturing, testing viability and to carry out protoplast fusion by polyethene glycol.
CO10	To acknowledge the biological significance of Ti plasmids in genetic engineeringpractically by isolating plasmid DNA from cultured *Agrobacterium* cells.
CO11	Analyze, examine and estimate the quality of water by means of determining the acidity and alkalinity, estimating the nitrate concentration, finding dissolved oxygen concentration and estimating coliforms and to conclusively predict whether the water is potable.
CO12	Develop skills for isolating pesticide degrading bacteria from agricultural soil by repeated *in vitro* culture to isolate pure colonies.
CO13	Recognize the importance of reduce, reuse and recycle by diverting animal waste for biogas production and kitchen waste for vermicomposting using earthworms.
CO14	Create an awareness of constructing ecofriendly environment by reducing the amount of air pollutants with the demonstration of effect of SO_2 on crop plants.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Genetic Engineering - Core Paper: 8

CO1
Acquire knowledge on core concepts and applications of genetic engineering and rDNA technology.

CO2
Achieve broad thinking on different types of vectors and share insights of itsapplications in the field of biotechnology.

CO3
Differentiate the various steps involved in the construction of cDNA and genomiclibraries and their role in recombinant DNA technology.

CO4
Gain insights on principle and applications of various techniques such as, nucleic acidhybridization, DNA sequencing, Microarray and blotting in the field life science.

CO5
Understand the different strategies of gene therapy, its role in various inherited diseases and also recent developments in recombinant vaccines.

CO6
Summarize various applications of genetic engineering in different fields

Course Title: Bioprocess Technology -Core Paper: 9

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Acquainted with different methods of measuring microbial growth; and understandingthe growth and death kinetic parameters of batch and continuous growth process.
CO2	Attains insightful on design, different critical components and various types of fermenter and able to formulate medium components for the industrial production ofmicrobial metabolites.
CO3	Aware of various industrially important microbial products; their production processand assessment in modern industrial sector.
CO4	Demonstrate knowledge of intracellular product recovery from microbial biomass in industrial operation
CO5	Gain insights on multistage operation of downstream processing for product extraction involving, Liquid phase extraction, filtration, crystallization and drying.

Course Title: Bioinformatics - Core Paper: 10

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss about various types of biological databases and its importance
CO2	Explain various sequence alignment programs
CO3	Exhibit knowledge in evolutionary analysis and interpret in meaning manner
CO4	Enumerate genome structure and functions using gene sequencing technologies
CO5	Predict protein structure and to validate novel lead compounds using drug design approach

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Enzymes & Enzyme Technology -Core Paper: 11

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify the class, properties and functions of the enzymes and gain knowledge onvarious techniques involved in extraction, isolation and purification of enzymes.
CO2	Discuss the kinetics of enzyme catalyzed reactions and interpret the various equations involved in enzyme inhibition.
CO3	Determine the active site of an enzyme and discuss the general acid base catalysis of enzyme activity.
CO4	Illustrate the action and regulation of various enzymes and describe the production of industrial enzymes.
CO5	Appraise and practice the clinical and industrial application of enzymes for developing entrepreneurship skill.

Course Title: Advanced molecular Techniques -Elective Paper: 4A

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Apply the principles of molecular techniques for the isolation and purification of biomolecules and to acquire a vast knowledge on the interaction of DNA, RNA and Proteinin a cell.
CO2	Discuss the advancements in DNA and protein sequencing techniques and the applicationsof DNA, protein microarray in research perspective.
CO3	Develop skill in the protein separation techniques by understanding the principle of chromatography, electrophoresis and filtration and their applications in various research sectors.
CO4	Gain insight on the advances in Nucleic acid-based detection methods such as PCR based and hybridization methods.
CO5	Foster intellectual curiosity in molecular related- bioinstrumentation techniques thatextends well beyond the course with a major focus on molecular based diagnostic approaches.

Course Title: Nano Biotechnology- Elective Paper: 4B

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss the historical perspectives of nanotechnology and understand the physiochemical properties of different types of nanostructures.
CO2	Compare and gain knowledge on various types of nanoparticles synthesis such as, physical, chemical and biological and their advantages.
CO3	Summarize different techniques involved in the characterization of the nanostructures and its properties.
CO4	Criticize the toxic effect of nanoparticles in plants and foods and also to express ethical issues of nanotechnology and their need for regulation.
CO5	Debate the applications and emerging trends of nanotechnology in different areas of science and also able to list out the safety measures in handling of nanostructures.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Tissue Engineering- Elective Paper: 4C

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe the basics and scope of tissue engineering, cell differentiation and apoptosis.
CO2	Configure the models of tissue engineering bioreactors and tissue engineering assembly.
CO3	Acquire knowledge on transplantation and immunomodulation
CO4	Explain the organ replacement devices.
CO5	Emphasize the role of tissue engineering in implants.

Course Title: Genetic Engineering and Bioprocess technology

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain hands on experience on various instruments associated with genetic engineering and molecular biology.
CO2	Estimate, Extract and separate DNA using molecular techniques.
CO3	Prepare competent cells for the transformation of interest DNA into to host cells.
CO4	Master the skills required for the amplification of DNA fragments using PCR technique.
CO5	Perform DNA fingerprinting analysis using Restriction Fragment Length Polymorphism (RFLP) technique
CO6	Understand the concepts of blotting techniques using southern hybridization
CO7	Comprehend the basics of isolation, preservation and maintenance of various industrially important microorganisms.
CO8	Screen and identify industrially important microbes for their various metabolite production.
CO9	Separate proteins using precipitation methods and analyze the purity of the proteins using electrophoretic techniques
CO10	Perform cell immobilization using a entrapment method and Execute column chromatography for the purification of secondary metabolites.
CO11	Demonstrate the production of organic acids and wine.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: Bioinformatics, Enzymes and Enzyme technology - Practical: V

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Predict functions of gene and genomes using online tools
CO2	Perform patterns, domains and motifs search in proteins using various programs
CO3	Predict and evaluate the sequence and structure of proteins and peptides
CO4	Align protein and nucleotide sequence using various algorithms
CO5	Retrieve chemical compound and to predict its properties
CO6	Perform molecular interaction analysis of protein and lead compound
CO7	Determine the various parameters such as optimum pH,temperature , substrate concentration and specific activity of amylase/protease enzymes.
CO8	Design and sketch the purification of proteins.
CO9	Determine the molecular weight of amylase by SDS-PAGE.
CO10	Demonstrate immobilization of enzymes by entrapment methods

Course Title: Research Methodology, Bioethics & Biostatistics - Extra Disciplinary: 2

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Share insights on various types of research, research problems, conceptualization of a research design and different sampling methods.
	Debate the bioethical and moral issues revolving around artificial reproduction methods, prenatal diagnosis, organ transplants, Gene therapy and Cloning.
CO3	Understand the different sampling designs, Analyze and represent the different sample variables using various statistical tools.
CO4	Tabulate the different types of data and quantify the extent of their variation using different measures such as mean, median, standard deviation and error.
CO5	Gain knowledge on fundamental concepts of probability theory, test of significance and aware of basic and modern statistical software tools for the analysis of biological data.

Course Title: Herbal Technology-Open Elective Paper: 1

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Enable to identify the herbal materials and their therapeutic applications.
CO2	Analyse the different types of extraction of phytochemical constituents for promoted research.
CO3	Exhibit the industrial importance of herbal constituents and purification of their products.
CO4	Determine the quality of herbal drugs using molecular techniques and formulation of herbal drugs.
CO5	Discuss the guidelines for research in related fields and utilize the therapeutic properties of herbal drugs to meet the necessities of public health.

Department of Microbiology

FIRST
SEMESTER
CORE - I

Course Title: FUNDAMENTALS OF MICROBIOLOGY & MICROBIAL PHYSIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Emphasize the Principles of Classification, rules and its applications in Microbialtaxonomy.
CO2	Be acquainted with knowledge of bacterial cell structure, Staining methods, the nutritional requirements of bacteria and get equipped with various methods of bacterial growth measurement.
CO3	Understand the Principles of sterilization and disinfection, various physical and chemicalmeans of sterilization, and evaluation of disinfectants. Master aseptic techniques and able to perform routine culture handling tasks safely and effectively
CO4	Acquire an in-depth study of the concepts of metabolism, the different pathways ofenergy conservation microbial metabolism and anaerobic respiration.
CO5	Perceive significant knowledge of the nature of photosynthesis — enlisting differencesin photosystem of plants, algae, cyanobacteria.
CO6	Handle basic instruments – Autoclave, laminar air flow, incubator, pH meter,colorimeter used for the cultivation of bacteria.
CO7	Understand the principle and operation of different types of microscopes and theirapplications, with deep knowledge on the sample preparation and staining techniques.

CORE - II

Course Title: MEDICAL MICROBIOLOGY - I

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the importance of normal flora of human body and acquire knowledge onthe process of infectious disease
CO2	Acquire the basic concepts of medical microbiology and analyze how pathogenicorganisms causes the disease on human beings and animals
CO3	To compile a list of disease causing bacteria and compare their modes of infection,symptoms, diagnosis and treatment
CO4	Evaluate the role of pathogenic bacteria in human infections pertaining to respiratorytract, gastrointestinal tract, urinary tract, skin and soft tissue
CO5	Comprehend human-fungal interaction, which can be applied to obtain in-depthknowledge on fungal diseases and the mechanism behind the disease process
CO6	Review medically important fungi that cause disease and methods of identification for respective fungi from clinical specimens
CO7	Explain types of mycoses caused in humans and demonstrate their modes of infection, pathogenesis, and treatment with introduction to mycotoxins

CORE - III

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: BASICS IN IMMUNOLOGY AND IMMUNOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze various cells involved in Immune system and their response in humoral andcell mediated immunity and discuss ABO &Rh incompatibility.
CO2	Explore different type of foreign bodies and various classes of antibodies involving inantigen antibody reactions. Classify vaccines and approaches to new vaccines.
CO3	Standardize bacterial antigens and elucidate the purification of mono, polyclonalantibodies using recent and modern techniques for diagnostic Immunology.
CO4	Illustrate various mechanisms in tissue and organ transplantation and to regulateimmune response against tumor antigens.
CO5	Exemplify the effect of immune reactions in Hypersensitivity and Immunodeficiencydiseases.
CO6	Decode the role of Immunology in Auto immune diseases and disorders.

CORE - IV

Course Title: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concept of central dogma of molecular biology.
CO2	Describe the structure and function of DNA and RNA in a cell and have a conceptual knowledge about DNA as a genetic material.
CO3	Discuss the molecular mechanisms underlying mutations, DNA damage and repairmechanisms.
CO4	Comprehend the various gene transfer methods and its applications.
CO5	Understand the molecular mechanisms involved in transcription and translation andcompare and contrast the prokaryotic and eukaryotic RNA and protein synthesis.
CO6	Describe the importance of genetic code and concept of gene regulation with referenceto operon.
CO7	Understand and apply the principles and techniques of molecular biology for furthereducation and employment.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – I-A

Course Title: BIOINFORMATICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Comprehend the basic concepts and the significance of Biological data analysis.Compute Sequence submission and retrieval tools
CO2	Understand the basics of sequence alignment, algorithms and tools used forPhylogenetic Analysis
CO3	Evaluate the computational methods, tools and algorithms employed for BiologicalData Interpretation. High-throughput Gene expression data analysis from microarray
CO4	Effective Implementation of existing software tools to predict and understand theintersection of secondary protein structure and genome
CO5	Retrieve information from available databases and use them for microbial identifications and drug designing.
CO6	To impart knowledge about various concepts, advanced technical tools in docking,QSAR studies employed in computational drug discovery.
CO7	Analyse ADME response to drug response and its effect

ELECTIVE – I-B

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyse the basic concepts and theories of cell and reveal the similarities anddifferences of prokaryotic and eukaryotic cell
CO2	Compare and contrast cell wall of bacteria and fungi. Discuss intra and extra plasmiccell inclusions
CO3	Clarify and discuss various cell components and their significance
CO4	Manifest the role of chromosomes and its functions and express the synthesis and regulations of proteins
CO5	Resolve the role and significance of cell cycle and cell divisions in amitosis, mitosisand meiosis. Reveal cancer, aging and stem cells

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – I-C

Course Title: FORENSIC BIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Discuss the history & development of forensic science and predict the scope as well asneed for forensic sciences in the society
CO2	Explain the basic principles of forensic science including definitions used and conceptsin forensic science
CO3	Evaluate the importance of biological evidences including microorganisms, hair andsamples which are biological in nature
CO4	Compile list of toxins and poisonous chemicals, symptoms and antidotes, evaluatealcohol levels in biological samples using immunoassays
CO5	Acquire knowledge on the application ofvarious biological fluids as forensic evidences
CO6	Carry out molecular techniques for forensic analyses to solve crimes and paternaldisputes

Course Title: Lab Course – I

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate methods to observe and measure microorganisms by standardmicrobiological techniques
CO2	Acquainted with various sterilization techniques
CO3	Use various methods to control microbes
CO4	Identify pathogenic microorganisms in the laboratory set-up and interpret theirsensitivity towards commonly administered antibiotics
CO5	Demonstrate clinically important fungi
CO6	Estimate bio-macromolecules and applications of gene transfer mechanism
CO7	Acquire knowledge on proper handling of antibiotic resistant mutants
CO8	Interpret blood grouping and typing for compatibility
CO9	Discuss the interactions between antigens and antibodies in relation to human immunesystem and separate lymphocytes to demonstrate their importance in clinical research

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SECOND
SEMESTER
CORE - VI

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Know the spoilage mechanisms in foods and thus identify ways to control deteriorationand spoilage.
CO2	Apply principles involving various methods of food preservation and microbiologicalquality control programmes in food production and prevention of food-borne infections
CO3	Understand the beneficial role of microorganisms in fermented foods and in foodprocessing and the microbiology of different types of fermented food products
CO4	Realize the importance of microflora of milk and milk products, and the role of microorganisms in the fermentation and processing of milk
CO5	Be acquainted with fermentation protocols for production of microbial production oforganic acids, vitamins, amino acid
CO6	Build knowledge with the basics of food safety regulations ,food control agencies, , quality assurance programs FDA, HACCP, BIS , FSSAI, Gain knowledge about food adulteration and common food additives

CORE - VII

Course Title: MEDICAL MICROBIOLOGY - II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about host parasite relationship and demonstrate the techniques, whichare used to identify the parasites
CO2	Discuss about various parasitic infections, pathogenicity and diagnosis
CO3	Explain the mode of action of drugs used against parasitic infection
CO4	Revise the general properties and classification of viruses
CO5	Predict viral infections based on serological analysis
CO6	Assess the methods used for enumeration and quantification of virus from clinicalspecimens
CO7	Compare and distinguish the replication strategies of commonly occurring viruses

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE - VIII

Course Title: RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand basics of research, importance of literature, and constraints before designof a research, review or synopsis presentation
CO2	Explain different types of data and outline the techniques of data collection
CO3	Identify the importance of sampling, its types, and variables. Outline of reportpreparation and ethics of plagiarism
CO4	Assess and understand the basics statistical terminologies used in biostatistics
CO5	Gather knowledge on different type of statistical analyses and tests for analyzingbiological data
CO6	Empirical model building for prediction using biological data

ELECTIVE – II-A

Course Title: ENVIRONMENTAL MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Pronounce major habitats found on Earth's ecosystems and escalate the superiority ofthese ecosystems to humans, animals and plants.
CO2	Designate the associations among predator and prey populations and outline thestructure of food webs and trace the flow of energy through an ecosystem.
CO3	Illustrate the diversity of microorganisms in air and its significance and exemplify the air quality in Indian cities-mapping of the hot spots and explore theimpact of air borne microbes.
CO4	Express the role of indicative microorganisms and to apply knowledge in water qualityanalysis and in designing blueprint for drinking water treatment.
CO5	Interpret waste water and solid waste managementandcommentate the microbiology of xenobiotics in the environment.
CO6	Manifest the major environmental changes revealing with Global warming,Greenhouse effect and Ozone depletion and Express the management of e-waste.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106

ELECTIVE – II-B

Course Title: TISSUE BIOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain fundamental knowledge in principles, practices and application of animal andplant tissue biotechnology.
CO2	Acquire the knowledge about the techniques, laboratory organization and measuresadopted for maintenance of aseptic condition.
CO3	Explain the fundamental scientific principles that underlie cell culture and itsnutritional requirements.
CO4	Share insights in callus culture, cell suspension culture, and organ micro-culture, plantmicro-propagation, and somatic embryogenesis.
CO5	Aware on isolation and maintenance of animal cells culture developed from embryonicorgans, whole embryo and adult organs.
CO6	Discuss the benefits of cloning and hybridoma technology in the field of applied lifescience.
CO7	Explore the various applications of tissue biotechnology pertaining to Drug Designingand Drug Therapy

ELECTIVE – II-C

Course Title: MARINE BIOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concept of marine ecology and diversity and interpret the microbial association with coral and sponge
CO2	Analyze various biogeochemical cycles of marine environment and point out the microbes involved
CO3	Manifest the role of extremophiles in marine environment and reveal about microbial bioluminescence
CO4	Illustrate the microbial indicators of marine pollution and expound microbial contamination and control in sea food
CO5	Explore bioactive compounds of marine microbes and analyze bioremediation ofheavy metals and oil pollutants

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – III-A

Course Title: POULTRY FARMING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Relate the phylogeny of different poultry species and describe the design and types ofpoultry houses
CO2	Clarify the various types controlled process to maintain poultry houses
CO3	Compare and contrast the nutrient requirement of poultry species with BIS and NRC ofUSA. Express various essential nutrition and their functions required in poultry
CO4	Manifest the role of bacterial, viral, fungal and parasitic infections involved in poultry and expound metabolic and nutritional deficiency diseases and disorders
CO5	Explicate various sanitation and hygiene management practices in poultry houses
CO6	Point out economic principles and marketing approaches of poultry products for import and exports and decode the role of insurance and finance management in poultryenterprises

ELECTIVE – III-B

Course Title: APICULTURE

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the systematic position and life history of honey bee
CO2	Reveal the different stages and types of bee and discuss about the the cure and management of apiculture
CO3	Describe the practice of bee rearing process and analyse instruments employed in apiary
CO4	Compare and contrast the composition of honey and bee wax and interpret the yield inNational and international markets
CO5	Clarify the proposal for financial assistance and funding agencies and reveal themodern methods employed in artificial bee hives

ELECTIVE – III-C

Course Title: NUTRITION & DIETETICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the correlation analysis between proteins, carbohydrates, fats and health
CO2	Gain knowledge regarding vitamins and major elements
CO3	To implement strategies for diet preparation for different age groups
CO4	To compare and contrast various nutritional disorders
CO5	To familiarize with various food safety and hygiene practices

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE - IX

Course Title: LAB COURSE II

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate hazardous microbes from various foods using conventional and moderntechniques
CO2	Critique the quality of milk using laboratory test
CO3	Processing of different kinds of food samples for microbial load
CO4	Predict the microbial population of soil using laboratory techniques
CO5	Assess the soil fertility by microbial analysis
CO6	Demonstrate the techniques used to identify human parasites
CO7	Understand experimental tools used to cultivate and characterize clinically importantviruses and bacteriophages
CO8	Identify tolerance level of pathogens to antibiotics for evaluation of the quality of pharmaceuticals
CO9	To screen the pharmaceutical products for microbial contamination and to evaluateantiseptic agents for their efficiency

THIRD SEMESTERCORE – X

Course Title: RECOMBINANT DNA TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate expertise with the tools and techniques of genetic engineering- And use of various cloning vectors.
CO2	Understand the principle and the concept of cloning strategies of rDNA technology, Acquire knowledge in gene transfer methods.
CO3	Describe the various applications of PCR, and illustrate screening of genomic and cDNA libraries. Also learn about the DNA amplification and sequencing methods
CO4	Acquire an in-depth study of different gene cloning systems/Hosts and its manipulation inplant and animal transgenic.
CO5	Understand the use of site directed mutagenesis and the use of DNA in diagnosis of genetic disorder and infectious disease
CO6	Analyze the various advanced techniques in genetic engineering and its applications in biological research

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

CORE - XI

Course Title: PRINCIPLES OF BIOPROCESS TECHNOLOGY AND PHARMACEUTICAL MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Recognize the history , rudiments and notions of bioprocess technology and illustrate the industrial method of fermentation for various primary andsecondary metabolites
CO2	Execute screening of industrially important microbes, strain improvement,media formulation, sterlization and analyze various parameters to be monitored and controlled during fermentation processes and develop a strategy for fermenter design
CO3	Understand the ethics of major unit operations followed in downstream processingfor various economically important products
CO4	Assess the source of contamination and device safe working practices in pharmaceutical industry and to articulate with antimicrobial preservation ofpharmaceutical formulations during production and in products
CO5	Formulate antibiotics , therapeutic enzymes and immunological products and applyStandard protocols in pharmaceutical industry - IP, BP, USP and EP

ELECTIVE – IV-A

Course Title: BIOINSTRUMENTATION

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about the principles, uses, advantages and disadvantages ofinstruments routinely used in biological labs.
CO2	Acquaint with the basic concept of qualitative and quantitative analysis of a givensample
CO3	Critique the importance and applications of advanced biochemical instrumentationtechniques in modern day research.
CO4	Acquire cognitive and technical skills enabling students to gain knowledge aboutseparation concepts and their Control systems.
CO5	Develop skill in carrying out research projects by employing the basic chromatographic purification techniques.
CO6	Comprehend the terms, principle, instrumentation, operation and applications of Molecular spectroscopic techniques
CO7	Acquire knowledge about the basics and latest developments in gel electrophoresis forthe separation of DNA, proteins and compounds.
CO8	Gain a wide knowledge to use the radioisotopes in life sciences and radioactivelabelling

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE
– IV-B
Course Title: SOIL & AGRICULTURAL MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the formation, profile and types of soils and to exemplify the distributionof microbes in soil.
CO2	Express the role of Nitrogen fixers and Phosphate solubilizers in soil fertility.
CO3	Explicate the microbial interactions with animals and plants and decode positive andnegative relations and relate biogeochemical cycles.
CO4	Manifest the role of plant pathogens in crop response and reveal the control andpreventive measurements of bacterial, fungal viral pathogens.
CO5	Explore the importance of microbial degradation of agricultural products and organicmatter decomposition.

ELECTIVE – IV-C
Course Title: BREWING TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the concepts of brewing and reveal various raw materials involved
CO2	Interface various technologies for wort production
CO3	Choose the appropriate integrated fermentation techniques for beer production
CO4	Ability to Design and develop innovative design for brewing equipments
CO5	Understand sanitation and quality management concepts and ISO 9000, HACCPservices

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – V-A

Course Title: NANOBIOTECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the history and basics of nanobiotechnology and classify different types ofnanomaterials and be acquainted with the various properties of nanomaterials.
CO2	Gain knowledge of the different methods of synthesis of nanoparticles including physical, chemical and biological methods.
CO3	Aware of the interaction between biomolecules and nanoparticle surface and its applications.
CO4	Comprehend the principles of various physical and chemical characterizationtechniques.
CO5	Understand the applications of nanobiotechnology in the fields of biomedical, environment, food and cosmetology.
CO6	Identify the risk assessments involved in bio nano materials synthesis and

ELECTIVE – V-B

Course Title: BIODEGRADATION TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Commentate the role of heterotrophic microbes in aquatic, terrestrial and aridecosystems and microbial degradation of various natural polymers
CO2	Express the importance of biotransformation and decode the role of factors involved in biodegradation
CO3	Differentiate the significance of microbial degradation on natural fibres and analyse therole of microbes on leather
CO4	Compare and contrast surface from subsurface degradation process and point out paint,metal and concrete microbial degradation
CO5	Decode about biodegradation of xenobiotic compounds and express the significance of vermicomposting

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

ELECTIVE – V-C

Course Title: BIOSAFETY AND CLINICAL RESEARCH

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Control laboratory hazards (chemical, biological and physical) and to practice safetystrategies and personal protective equipment
CO2	Develop stratagems for the use of genetically modified organisms and Hazardous materials
CO3	Comprehend the clinical research process and equate and recapitulate internationalregulations and clinical requirements for the clinical research
CO4	Establish skill in biopharmaceutical clinical trial research designs to encounter the health and medical needs of existing and impending biopharmaceutical product clients
CO5	Successfully measure and manage ethical clinical trial programs and biopharmaceutical development ventures
CO6	Accomplish the significance of the patient in drug development

ELECTIVE – VI-A

Course Title: Aquaculture

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze the fundamental ideas about aquaculturing and reveal the production style inIndia
CO2	Commentate and compare the common cultivable species of fish and point out the significance of polyculture, monosex & monoculture
CO3	Reveal various culturing methods of carp species and point out socio-economic and environmental problem involved in aquaculturing
CO4	Illustrate common bacterial, viral, fungal and protozoan diseases in the course of fish farming and Express the significance of composition & types of feed
CO5	Analyze the marketing strategy of fish in local and export Markets and manifest thequality control while canning and freezing

ELECTIVE – VI-B

Course Title: LABORATORY ANIMALS FOR PRE-CLINICAL STUDIES

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Commentate various health monitoring programmes of animal in clinical studies.
CO2	Interpret and reveal the common bacterial and viral diseases in lab animals and decodevarious preventive and control measures involved.
CO3	Explore different experimental procedures for preclinical studies and resolve variousanimal inoculation procedures.
CO4	Analyse toxicological and bioassay studies of drugs and point out their mode of action.
CO5	Execute methods involved in disposal of dead animals, understand and implementethics in animal welfare and prevention of PCA.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106

ELECTIVE – VI-C

Course Title: BIODIVERSITY AND CONSERVATION

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Exhibit an ability to assess gears, scope, and constraints of biodiversity
CO2	Demonstrate deeper insight into different types of habitat and ecosystems
CO3	Integrate knowledge and perspectives to analyze, assess and pact with economicproductivity and national security within the field of biodiversity
CO4	Describe the serious threats to biodiversity by human activities
CO5	Design Strategies for biodiversity conservation

CORE - XII

Course Title: LAB COURSE III

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate chromatography techniques for protein separation
CO2	Perform separation of serum proteins by electrophoresis
CO3	Quantify basic biological macromolecules using spectrometric techniques
CO4	Separate blood leukocytes using centrifugation techniques
CO5	Extract genetic material from microorganisms using appropriate analyticaltechniques
CO6	Evaluate the potability of drinking water by analyzing its physico – chemicaland microbial parameters
CO7	Determine the strength of waste water based on physical, chemical andbiological characterization
CO8	Analyze microbial air quality from indoor and outdoor environment

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

FOURTH
SEMESTER
CORE - XIII
Course Title: ENTREPRENEURSHIP IN MICROBIOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe and apply several entrepreneurial ideas and business theories in practicalframework
CO2	Clarify the metabolic pathways and control mechanisms of commercially importantmetabolites
CO3	Commentate single cell proteins and express the importance of mushroom cultivationand probiotics
CO4	Express the mass production of microbial inoculants used as Biofertilisers andBioinsecticides in response with field application and crop response
CO5	Analyze the application and commercial production of Monoclonal antibodies,Cytokines. TPH and teaching kids
CO6	Decode the significance of industrial production of Biofuels and Point out the role ofBioplastics and Biopigments

ELECTIVE - VII

Course Title: BIOFERTILIZER TECHNOLOGY AND ORGANIC FARMING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about the immense reserves of microbial biodiversity and applicationof microbial bio-fertiliser
CO2	Assess the ability of microorganisms and their chemical constituents, to sustainablyminimize the damage from pests and to increase agricultural productivity.
CO3	Use natural Cyanobacterial bio fertilizers to maintain and build-up of soil fertility. Distinguish the types of bio fertilizers and develop integrated management for bestresults by using both nitrogenous and phosphatic bio fertilizers
CO4	Rate the quality of Packaging, storage, assess the shelf life, bio efficacy of biofertilizers as per BIS standards
CO5	Familiarize with the basic concepts of farm development and would be able to relatethe development of organic farming in their countries to global trends
CO6	Acquire insights about overall trade policy issues, multiple linkages between organic farming and rural development, especially from the perspective of resilience and risk management
CO7	Gain knowledge and skills need to work in an organic certification agency and becomean entrepreneur. Plan a Complete Farm Business includes marketing, operation and financial outline for a farm business

CORE - XIV

Course Title: LAB COURSE IV

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Screening of microbial population from soil for economically important primary andsecondary metabolites.
CO2	Describe the production of ecofriendly microbial fuels by utilizing various wastes.
CO3	Successful production and purification of enzymes from microorganism by standardmethods.
CO4	Qualitative and quantitative analysis of extracellular microbial enzymes.
CO5	Demonstrate laboratory production of wine.
CO6	Illustrate the production and extraction of natural pigments from micro organisms.

CORE - XV

Course Title: PROJECT

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the fundamental design, select appropriate topics and information from various sources for literature review.
CO2	Structure the methodologies to accomplish organized conduct of interdisciplinary research.
CO3	Complete an independent research project and furnish the outputs in the form ofdissertation.
CO4	Impart the outcome of their project in various seminars and conferences.
CO5	Present and defend their project work to a panel of experts.
CO6	Publish the research outcome in scientific peer reviewed journal.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M.Sc. Computer Science

FIRST SEMESTER (SYLLABUS)

Course Title: DESIGN AND ANALYSIS OF ALGORITHMS

CO1	Know the essentials of algorithms. Analyze the asymptotic performance of algorithms. Gain insights into randomized algorithms and primality testing.
CO2	Describe the divide-and-conquer and greedy paradigm. Explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer, greedy algorithms and analyse them.
CO3	Discuss the dynamic-programming paradigm and implementation of dynamic programming in various algorithmic design and analyze them.
CO4	Define the design of backtracking, branch and bound paradigm. Describe the algorithms using this paradigm. Synthesize and analyze them.
CO5	Know the concepts of non-deterministic algorithms, Lower bounds theory problems and the classes NP-hard and NP-complete problems.
CO6	Synthesize appropriate algorithm for a design situation

Course Title: PROGRAMMING IN PYTHON

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the basic concepts of various operating systems and data types.
CO2	Illustrate the concept of strings and its manipulation.
CO3	Illustrate python for file handling in databases.
CO4	Understand the various graphic methods to solve different problems.
CO5	Interpret data exploration and data munging.
CO6	Gain knowledge on data science.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: COMPUTER NETWORKS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Have knowledge of the basic principles, concepts of computer networks and the design of OSI layers.
CO2	To get insights into the Data Link Layer protocols
CO3	To provide overview of the Protocols of Medium Access sub layer
CO4	To identify the design issues and solutions in the Network Layer
CO5	To have basic knowledge of TCP protocol
CO6	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

Course Title: PROGRAMMING IN PHP

CO1	Develop the knowledge of Hardware and Software requirements, Installation of PHP, data types, different types of operators and Control Structures in PHP.
CO2	Implementation of arrays, Looping Structures, Functions in PHP.
CO3	Learn the concepts of File System. Working with Forms and Implementation of Regular Expressions in Forms.
CO4	Gain the Knowledge of OOPS concept.
CO5	Implementation of Database Connectivity using MYSQL and Learn the concepts of Cookies.
CO6	Implementation of Session and AJAX

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: OBJECT ORIENTED SOFTWARE ENGINEERING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Knows the reason about the basic Software life cycle models Importance of various kinds of Project Management methods, Tracking Software Quality, Quality Standards and Metrics.
CO2	Develop System Concepts for Object Modelling Design and implement a software design concepts to meet desired needs and Requirements. Design the UML concepts like sequential, Use cases and Activity diagram
CO3	Concepts of Use cases, actors, and common modelling techniques. Implement the concept use cases, business actors , Significance of identifying the subsystems and business requirements
CO4	Explain Design Workflow and System Design Concept Create Mapping Object Model to Database Schema Testing and verification process
CO5	Usage of Software Configuration Management Define maintenance and its types. Build Reverse and re-engineering process.
CO6	Create projects using tools of software engineering and techniques.

Course Title: UNIFIED MODELING LANGUAGE

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyse the basic concepts of object modeling.
CO2	Demonstrate various Basic Structural Modeling using the appropriate notation
CO3	Demonstrate various Basic Behavioral Modeling using the appropriate notation
CO4	Analyse various Advanced Behavioral Modeling using the appropriate notation
CO5	Analyse Architectural Modeling using the appropriate notation
CO6	Apply various uml diagrams for software development.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: OBJECT ORIENTED ANALYSIS AND DESIGN

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze object basics and UML.
CO2	Gain knowledge about attributes and relationship.
CO3	Interpret axioms and do a case study.
CO4	Detailed study about Micro level process.
CO5	Digital signatures.
CO6	Gain knowledge about various testing strategies.

Course Title: PRACTICAL I - PYTHON PROGRAMMING LAB

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Interpret the programming task logically and make the pseudo code.
CO2	Understand the IDE and write, execute and debug.
CO3	Implement the basic string functions.
CO4	Apply the concept of pygtk.
CO5	Understand the concept of interpret data exploration and data munging.
CO6	Understand and apply the knowledge on data science.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: PRACTICAL II - PHP PROGRAMMING LAB

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Develop application using Control structures and Looping statements.
CO2	Develop application using array functions, string functions, date functions.
CO3	Develop applications using user defined functions and file operations
CO4	Build and develop application using Cookies and Session management.
CO5	Build and implement applications using object oriented programming concept.
CO6	Design database connection application using MYSQL

SECOND SEMESTER (SYLLABUS)

Course Title: DIGITAL IMAGE PROCESSING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe the fundamentals of image processing and its applications.
CO2	Gain adequate knowledge of Image enhancement techniques in spatial domain
CO3	Detailed classification of Image enhancement techniques in frequency domain and compare with spatial domain techniques
CO4	Analyze the Image restoration and degradation concepts Identify the fundamentals techniques in image segmentation
CO5	Acquire a good knowledge of Image compression techniques
CO6	Interpret Image segmentation, restoration and compression techniques

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: ADVANCED DATA BASE MANAGEMENT SYSTEM

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Describe the characteristics of Database Management Systems and about the concepts and models of database.
CO2	Design ER-models to represent simple database application scenarios.
CO3	Convert the ER-model to relational tables, populate relational database. Improve the database design by normalization.
CO4	Describe the fundamental elements of Object and Object relational database management systems.
CO5	Get the knowledge of Data Warehousing And Distributed DBMS
CO6	Analyse and describe the Management issues of Mobile databases and Multimedia Databases

Course Title: ENTERPRISE COMPUTING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand various concepts of Enterprise programming, analyze and implement the RMI Architecture for the necessary applications.
CO2	Implement Session management using Servlet and implement JDBC for the database connectivity.
CO3	Develop Web applications using JSP and JSP error pages.
CO4	Design an application that sends and receives email with attachments.
CO5	Implement Database connectivity through Hibernate Framework and also build web applications using Spring MVC.
CO6	Study and use modern tools for rapidly building enterprise applications.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: DATAWAREHOUSING AND DATAMINING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Appreciate the basic principles, concepts and applications of data warehousing and data mining
CO2	Have a good knowledge of the preprocessing techniques
CO3	Perform Data Mining using association rules
CO4	Get insights from data using classification and prediction techniques
CO5	Acquire knowledge of clustering techniques and outliers
CO6	Apply data mining techniques to real world data by cleaning the data, integrating the data from different sources, predicting a model to group the data tuples into classes, discovering patterns using association rule mining and grouping the data set into clusters.

Course Title: MOBILE COMMUNICATIONS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain a detailed knowledge of Wireless Networking concepts. Analyse and compare the various cellular systems and its components.
CO2	Analyse the concepts of Telecommunication networks and illustrate the sessions and Protocols. Demonstrate the working of satellite systems.
CO3	Analyse various wireless techniques in wireless LAN and implement it into user environment.
CO4	Identify and analyse the existing routing protocols. Describe how tunnelling works and analyse various protocols using tools for traffic less packet delivery.
CO5	Describe the transport layer congestion control and tcp protocols .Demonstrate the snooping technique and provide solutions to protect users data from unauthorized users.
CO6	Compare various Wireless application protocols and techniques to choose the best protocol for developing mobile content applications using modern tools for multidisciplinary environments.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: HIGH SPEED NETWORKS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Identify the existing communication networks, understand the algorithm and technologies involved in internet and associated networks.
CO2	Develop specialized knowledge related to the building blocks and operation of high speed networking technology.
CO3	Demonstrate the knowledge of network planning and optimization
CO4	Apply the concepts to optimize and troubleshoot high speed network.
CO5	Use and assist in network design and implementation.
CO6	Select the ATM over other available transfer modes in network designs

Course Title: WAP and XML

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Develop knowledge of basic wireless environment, Wireless applications protocol.
CO2	Have a good knowledge of WAP gateway and their functionalities.
CO3	Construct the Wireless Markup Language and its applications.
CO4	Gain the knowledge of XML applications and Preparing style sheets.
CO5	Implementation of XSLT.
CO6	Compare accepted standards and guidelines to select appropriate applications of XML to meet specified performance requirements.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: **PRACTICAL III - ENTERPRISE COMPUTING LAB**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Invoke the remote methods in an application using Remote Method Invocation, Access database through Java programs, using Java Data Base Connectivity.
CO2	Manage sessions within an application and communication between sessions.
CO3	Implement and manage web sessions using Servlet and JSP. Handling Errors and Exceptions in any web application
CO4	Understanding Java Messaging Services done through javamail API.
CO5	Develop applications with hibernate framework.
CO6	Develop spring applications with spring framework.

47

Course Title: **PRACTICAL IV - DATA MINING LAB USING PYTHON**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Perform Data Cleaning, Data Integration
CO2	Perform Data Transformation
CO3	Remove Outliers
CO4	Perform Association Mining
CO5	Do Classification using Classification algorithms
CO6	Perform Clustering using Clustering algorithms

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

THIRD SEMESTER (SYLLABUS)
Course Title: SOFT COMPUTING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain basic knowledge of Artificial Neural Network, Fuzzy logic and Genetic algorithms
CO2	Analyse different neural network architectures
CO3	Get insight into classical sets and fuzzy sets
CO4	Develop the concepts of fuzzy relations and fuzzy propositions
CO5	Gain knowledge of Genetic algorithms and the various operators
CO6	Gain knowledge of various Algorithms

Course Title: INTERNET TECHNOLOGY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Acquire the knowledge of .NET environment. Expertise the fundamental concepts in developing the basics of C# programming
CO2	Develop, compile and execute console application in C# using object-oriented concepts. Construct console application in C# program using delegates and events
CO3	Build a web application in ASP.NET using webserver controls
CO4	Demonstrate web application with database connectivity
CO5	Integrate web application using cookies, sessions and web services
CO6	Create a complete web Application for real-time situations

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CLOUD COMPUTING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Articulate the main concepts, key technologies, strengths, and limitations, the current and future challenges of cloud computing. Analyse various cloud deployment models and their issues on the cloud.
CO2	Identify the architecture and infrastructure of various cloud services including SaaS, PaaS, and IaaS and apply them to develop a applications.
CO3	Analyse the implications of cloud collaboration with other applications.
CO4	Design and develop various algorithms using tools for virtualization in cloud computing and acquire the knowledge of doing research.
CO5	Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop secure cloud applications.
CO6	Develop and deploy cloud applications using modern tools and techniques based on the organizational needs.

Course Title: BIG DATA ANALYTICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Knows the reason about the evolution of data science and its development. Study the basic of big data analytics and to develop the code. Importance of various kinds of data comparing the other language.
CO2	Develop HDFS environment using NOSQL Implementing the queries. Aggregate the data using NOSQL
CO3	Concept of basic Hadoop, data format and analysing the data in the HDFS environment. Implementing the concept Hadoop pipes and implementations and java interfaces Significance of various methods of compression, serialization
CO4	Apply Mapreduce applications, unit test , MRUnit, Create file using Mapreduce sorting and shuffling process. Creating input and output format of Mapreduce.
CO5	Usage Hadoop related tools. Definition of hbase,Hbase clients, Cassandra, Pig, HiveQL Life Build data manipulation byHiveQL queries.
CO6	Analyze Life Build data manipulation byHiveQL queries.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CRYPTOGRAPHY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge about Conventional encryption model
CO2	Analyse Euclidean Algorithm and Number theory
CO3	Understanding Key exchanges.
CO4	Detailed representation of Hashing functions.
CO5	Describe the various Digital signatures logic.
CO6	Apply different encryption and decryption techniques

Course Title: INFORMATION SECURITY

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand Information Security Principles such as security attacks and services.
CO2	Design Terms, concepts related to public key cryptography and digital signatures.
CO3	Apply the Concepts of various privacy methods.
CO4	Analyse Typical Network Attacks and Threats from the Internet.
CO5	Create SNMP, Firewall design Principles and Intrusion detection system.
CO6	Create the protections and limitations provided by internet security technology

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: INTERNET SECURITY AND COMPUTER FORENSICS

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain a good understanding of the concepts and foundations of computer security, and identify vulnerabilities of IT systems
CO2	Analyse basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications
CO3	Identify some of the factors driving the need for network security and analyse various computer forensics systems
CO4	Analyse and summarize duplication and preservation of digital evidence
CO5	Illustrate the methods for data recovery, evidence collection and data seizure.

Course Title: PRACTICAL-V: INTERNET TECHNOLOGY LAB

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Design the algorithm
CO2	Develop console application using C#
CO3	Build and develop web-application using ASP.NET controls and validations
CO4	Develop web application using ASP.NET incorporating database connection
CO5	Develop web application using ASP.NET using cookies and session
CO6	Synthesize console and web application based on requirements

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: PRACTICAL-VI: BIG DATA ANALYTICS LAB

CO1	Derive the steps of algorithms for every exercise.
CO2	Scaling up machine learning techniques focusing on industry applications.
CO3	Exhibit the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
CO4	Implementation of big data analytics
CO5	Practice bigdata tools Pig, Hive etc.
CO6	Validate the students to have skills that will help them to solve complex real world problems in for decision support.

FOURTH SEMESTER (SYLLABUS)
Course Title: PROJECT & VIVA-VOCE

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate a depth of knowledge of modern technology.
CO2	Complete an independent research project, resulting in dissertation.
CO3	Communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
CO4	Self-study, reflect on their learning and take appropriate actions to improve it.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

M.Sc. INFORMATION TECHNOLOGY

FIRST SEMESTER
(SYLLABUS)

Course Title: CORE THEORY 1 - OPERATING SYSTEM

Course Code : Credits : 04 L:T:P:S : 4:0:0:0 CIA Marks : 40 Exam Hours : 03 ESE Marks : 60	
CO1	Basic concepts of operating system, process management, Threads - Interprocess Communication. CPU Scheduling
CO2	Discuss various Process Synchronization problems, critical region and monitors
CO3	Discuss about Deadlock Characterization, Methods for handling Deadlocks, Prevention, Avoidance, and Detection of Deadlock and Recovery from deadlock. Analyse the Memory Management and its allocation policies.
CO4	Evaluate the various Page Replacement Algorithms handled by Operating System. Analyse the Virtual memory and Thrashing concepts.
CO5	Interpret the mechanisms adopted for File Sharing in Distributed Applications.
CO6	Demonstrate the basic concepts of operating system

FIRST SEMESTER

Course Title: CORE THEORY 2 – COMPUTER ORGANIZATIONS AND ARCHITECTURE

Course Code : Credits : 04 L:T:P:S : 4:0:0:0 CIA Marks : 40 Exam Hours : 03 ESE Marks : 60	

Course outcomes: At the end of course, the student will be able to

COS	Content of module
CO1	Detailed representation about number systems and boolean algebra.
CO2	Describe the various types of flip flops, registers and circuit system.
CO3	Analyse the stack organization and identify the addressing modes.
CO4	Interpret peripheral devices with memory access.
CO5	Acquire a good knowledge about memory hierarchies and mapping.
CO6	Gain knowledge about Virtual memory and data manipulation

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CORE THEORY 3 - DATABASE MANAGEMENT SYSTEMS

.....

.....

Course Code : Credits : 04 L:T:P:S : 4:0:0:0 CIA Marks : 40 Exam Hours : 03 ESE Marks : 60

Course outcomes: At the end of course, the student will be able to

CO1	Describe a database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS. Design ER-models to represent simple database application scenarios.
CO2	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data for current needs. Develop applications using DDL, DML queries.
CO3	Identifies the Functional dependencies, decompositions, lossless join, and dependency preserving decomposition. Classify the various normalization techniques and improve the database design by applying it.
CO4	Use the concept of a transaction and design the database using some tools which satisfies the ACID properties when concurrent transaction occurs in a database. Evaluate the sophisticated access protocols to control access to the database.
CO5	Identifies the suitable File organization methods and access methods and design the database for storing the data.
CO6	Develop and evaluate a real database application using a database management system.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

FIRST SEMESTER

Course Title: CORE THEORY 4 - PRINCIPLES OF PROGRAMMING LANGUAGES

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain knowledge on programming in different paradigms. Express syntax and semantics in formal notation. Design features of programming languages, and justify their design decisions
CO2	Explain the general concepts of data types, Statements and Expressions and identify the design issues.
CO3	Identify the design issues of Subprograms and Blocks in programming languages
CO4	Compare the concepts of concurrency control and exception handling for various programming Languages.
CO5	Analyze and compare functional programming languages and the scripting languages.
CO6	Analyze a problem, and identify and define the computing requirements appropriate to its solution

Course Title: ELECTIVE 1 - LINUX SYSTEM ADMINISTRATION

Course outcomes: At the end of course, the student will be able to

CO1	Gain knowledge insights of Linux environment basics
CO2	Operate running Linux systems by managing the file system mounts and monitoring, concepts related to user and groups
CO3	Configure Linux packages and kernel and backup management using bacula
CO4	Acquire knowledge on shell commands, scripts, managing files, pipes and redirections. Choose appropriate Linux commands to make effective use of the environment to solve problems
CO5	Configure and mange simple TCP/IP network services, file system and web hosting on a Linux system
CO6	Effectively use the Linux system to accomplish typical personal, office, technical, and software development task

Course Title: ELECTIVE 1 - WINDOWS PROGRAMMING

Course outcomes: At the end of course, the student will be able to

CO1	Gain basic knowledge of windows programming and analyses the various windows development tools.
CO2	Construct Windows application by writing windows programming.
CO3	Use the MFC library to design and develop programs with GUI interfaces.
CO4	Demonstrate the workings of Graph and Word processor applications and develop the new applications by using containers.
CO5	Detailed knowledge of ActiveX, COM and DHTML features and design an ActiveX control with MFC. Use tools to customize various controls.
CO6	Analyze the user requirements and develop the various windows applications using new technologies and deploy it into multiple environments.

Course Title: ELECTIVE 1 - UNIX PROGRAMMING

Course outcomes: At the end of course, the student will be able to

CO1	Gain knowledge of Unix environment basics, pipes
CO2	Comprehend SHELL scripts with commands and scripts. Implement shell scripts using decision control, looping and control flow statements
CO3	Acquire knowledge on file management, directory services, system calls and device drivers. Choose appropriate UNIX commands to make effective use of the environment to solve problems
CO4	Configure the shell scripts with process and signals.
CO5	Apply Evaluate the inter-process communication using semaphores in the UNIX environment. Gain insights of sockets and its connections
CO6	Effectively use the UNIX system to accomplish typical personal, office, technical, and software development task.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: PRACTICAL I - OS Lab

Course outcomes: At the end of course, the student will be able to

CO1	Execute various basic and file/directory handling commands, Implement simple shell script for basic arithmetic and logical calculations, check various attributes of files and directories.
CO2	Implement Shell scripts to perform various operations on given strings
CO3	Execution of various system administrative commands
CO4	Implement Shell scripts to explore system variables
CO5	Implement Shell script to delete all the temporary files.
CO6	Implement Shell scripts search an element from an array.

Course Title: PRACTICAL II - MYSQL LAB

Course outcome: At the end of course, the student will be able to

CO1	Design and implement a Database Systems by creating tables, views for an applications.
CO2	Populate and query a database by performing basic operations like CREATE, DELETE, UPDATE, SELECT, ALTER using SQL DDL and DML commands.
CO3	Develop queries using SQL Operators and Functions.
CO4	Declare and enforce Integrity Constraints on a database using SQL commands.
CO5	Formulate queries by using set operations, join operations, functions, operators and sub queries.
CO6	Show execution of SQL queries using MySQL for database tables using DCL and TCL commands.

SECOND SEMESTER

Course Title: CORE THEORY-5 DATA STRUCTURES AND ALGORITHMS

Course outcomes: At the end of course, the student will be able

CO1	Define data structures like array, stack, queues and linked list.
CO2	Explain insertion, deletion and traversing operations on data structures.
CO3	Identify the asymptotic notations to find the complexity of an algorithm.
CO4	Compare various searching and sorting techniques.
CO5	Choose appropriate data structure while designing the algorithms.
CO6	Design advanced data structures using nonlinear data structures.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

Course Title: CORE THEORY 6 - COMPUTER NETWORKS

CO1	Gain a basic knowledge of Networking and functions of each layer in OSI and TCP/IP model. Demonstrate the network topology.
CO2	Diagnose the problems of a Current Multiplexing Techniques.
CO3	Classify the various multiple access protocols and identify the deficiencies in existing protocols, and then go onto formulate new and better protocols.
CO4	Apply the mathematical background of routing protocols. Analyze the collision occurred in current networks. Classify the classes of IP protocols and select the IP addresses for the given network.
CO5	Describe the issues surrounding in Session layer and Transport layer and identify how to rectify.
CO6	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

Course title: **CORE THEORY 7 - MICROPROCESSOR AND MICROCONTROLLER**

Course outcome: the end of course, the student will be able to

COS	Content of module
CO1	Recognize 8086 microprocessor simulator, knowledge of 8086 instruction set and ability to utilize it in assembly language programming. Importance of various kinds of Project Management methods, Tracking Software Quality, Quality Standards and Metrics.
CO2	Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.
CO3	Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
CO4	Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
CO5	Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
C06	Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices. Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.

SECOND SEMESTER

Course Title: **CORE THEORY 8 - PROGRAMMING IN PHP**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Develop the knowledge of Hardware and Software requirements, Installation of PHP, data types, different types of operators and Control Structures in PHP.
CO2	Implementation of arrays, Looping Structures, Functions in PHP.
CO3	Learn the concepts of File System. Working with Forms and Implementation of Regular Expressions in Forms.
CO4	Gain the Knowledge of OOPS concept.
CO5	Implementation of Database Connectivity using MYSQL and Learn the concepts of Cookies.
CO6	Implementation of Session and AJAX

SECOND SEMESTER

Course title: **ELECTIVE 2 - OBJECT ORIENTED SOFTWARE ENGINEERING**

Course outcome: the end of course, the student will be able to

CO1	Knows the reason about the basic Software life cycle models Importance of various kinds of Project Management methods, Tracking Software Quality, Quality Standards and Metrics.
CO2	Develop System Concepts for Object Modelling Design and implement a software design concept to meet desired needs and Requirements. Design the UML concepts like sequential, Use cases and Activity diagram
CO3	Concepts of Use cases, actors, and common modelling techniques. Implementing the concept use cases, business actors, Significance of identifying the subsystems and business requirements
CO4	Explain Design Workflow and System Design Concept Create Mapping Object Model to Database Schema Testing and verification process Creation.
CO5	Usage of Software Configuration Management Definition and Types of maintenance Life Build Reverse and re-engineering process.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SECOND SEMESTER

Course Title: **ELECTIVE 2 - UNIFIED MODELING LANGUAGE**

Course outcomes: At the end of course, the student will be able to

CO1	Analyze the basic concepts of object modeling.
CO2	Demonstrate various Basic Structural Modeling using the appropriate notation
CO3	Demonstrate various Basic Behavioral Modeling using the appropriate notation
CO4	Analyze various Advanced Behavioral Modeling using the appropriate notation
CO5	Analyze Architectural Modeling using the appropriate notation
CO6	Apply various UML diagrams for software development.

SECOND SEMESTER

Course title: **ELECTIVE 2 - OBJECT ORIENTED ANALYSIS AND DESIGN**

Course Outcome: At the end students will be able to

CO1	Analyze object basics and UML
CO2	Gain knowledge about attributes and relationship.
CO3	Interpret axioms and do a case study
CO4	Detailed study about Micro level process
CO5	Digital signatures
CO6	Gain knowledge about various testing strategies.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SECOND SEMESTER

Course Title: PRACTICAL III - MICROPROCESSOR LAB

Course outcome: the end of course, the student will be able to

CO1	Derive the steps of algorithms for every exercise.
CO2	Cognize to interface the circuits for various applications. Absorb the 8051 Microcontroller configuration and Instruction Sets.
CO3	Implementation of assembly language programs in 8086
CO4	Validate the students to have skills that will help them to solve complex real-world problems in for decision support.
CO5	Exhibit the fundamental techniques and principles in achieving assembly language instructions.
CO6	Validate the students to have skills that will help them to solve complex real-world problems in for decision support.

SECOND SEMESTER

Course Title: PRACTICAL IV - PHP PROGRAMMING LAB

CO1	Develop application using Control structures and Looping statements.
CO2	Develop application using array functions, string functions, date functions.
CO3	Develop applications using user defined functions and file operations
CO4	Build and develop application using Cookies and Session management.
CO5	Built and implement applications using object oriented programming concept.
CO6	Design database connection application using MYSQL

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

SECOND SEMESTER
SPOKEN TUTORIAL
THIRD SEMESTER
SYLLABUS

Course Title: CORE THEORY 9 - ENTERPRISE COMPUTING

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand various concepts of Enterprise Computing, analyze and implement the RMI Architecture for the necessary applications.
CO2	Implement Session management using Servlet and implement JDBC for the database connectivity.
CO3	Develop Web applications using JSP and JSP error pages.
CO4	Design an application that sends and receives email with attachments.
CO5	Implement Database connectivity through Hibernate Framework and also build web applications using Spring MVC.
CO6	Study and use modern tools for rapidly building enterprise applications.

THIRD SEMESTER

Course Title: **CORE THEORY 10 - PROGRAMMING IN PYTHON**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To acquire basic programming skills of Python programming language.
CO2	To develop applications using python sequence.
CO3	Implement basic object oriented concepts like inheritance and polymorphism.
CO4	Develop GUI applications using PyGTK. and GUI applications.
CO5	To have basic knowledge of implementing data science in python.
CO6	To use python as a tool for research.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

THIRD SEMESTER

Course Title: CORE THEORY 11 - DATAWAREHOUSING AND DATAMINING

CO1	To appreciate the basic principles, concepts and applications of data warehousing and data mining
CO2	Have a good knowledge of the preprocessing techniques
CO3	To perform Data Mining using association rules
CO4	To get insights from data using classification and prediction techniques
CO5	Knowledge of clustering techniques and outliers
CO6	To be able to apply data mining techniques to real world data by cleaning the data, integrating the data from different sources, predicting a model to group the data tuples into classes, discovering patterns using association rule mining and grouping the data set into clusters.

THIRD SEMESTER

Course Title: CORE THEORY 12 - SOFTWARE TESTING

Course outcomes: At the end of course, the student will be able to

CO1	Discuss about the concept of bugs and analyses the principles in software testing to prevent and remove bugs.
CO2	Discuss about domains and path Analyze Linguistic and Structural Metric
CO3	Discuss about Verification and Validation. Analyse various levels of Testing, Testing Approaches, and Types of Testing & Test Plan.
CO4	Analyze Defect Management Discuss about Acceptance testing and special test.
CO5	Analyze various automation testing tools.
CO6	Gain the knowledge about various testing tools.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

THIRD SEMESTER

Course Title: **ELECTIVE 3 - CRYPTOGRAPHY**

COS	Content of module
CO1	Gain knowledge about Conventional encryption model
CO2	Analyse Euclidean Algorithm and Number theory
CO3	Understanding Key exchanges.
CO4	Detailed representation of Hashing functions.
CO5	Describe the various Digital signatures logic.
CO6	Apply different encryption and decryption techniques

THIRD SEMESTER

Course Title: ELECTIVE3 - INFORMATION SECURITY

CO1	Understand Information Security Principles such as security attacks and services.
CO2	Design Terms, concepts related to public key cryptography and digital signatures.
CO3	Apply the Concepts of various privacy methods.
CO4	Analyse Typical Network Attacks and Threats from the Internet.
CO5	Create SNMP, Firewall design Principles and Intrusion detection system.
CO6	Create the protections and limitations provided by internet security technology

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

THIRD SEMESTER

Course Title: ELECTIVE 3 - INTERNET SECURITY AND COMPUTER FORENSICS

Course outcomes: At the end of course, the student will be able to

CO1	Gain a good understanding of the concepts and foundations of computer security, and identify vulnerabilities of IT systems
CO2	Analyse basic security tools to enhance system security and can develop basic security enhancements in stand-alone applications
CO3	Identify some of the factors driving the need for network security and analyse various computer forensics systems
CO4	Analyse and summarize duplication and preservation of digital evidence
CO5	Illustrate the methods for data recovery, evidence collection and data seizure.

THIRD SEMESTER

Course Title: PRACTICAL V - ENTERPRISE COMPUTING LAB

. Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Invoke the remote methods in an application using Remote Method Invocation, Access database through Java programs, using Java Data Base Connectivity.
CO2	Manage sessions within an application and communication between sessions.
CO3	Implement and manage web sessions using Servlet and JSP. Handling Errors and Exceptions in any web application
CO4	Understanding Java Messaging Services done through javamail API.
CO5	Develop applications with hibernate framework.
CO6	Develop spring applications with spring framework.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.

THIRD SEMESTER

Course Title: PRACTICAL VI - PYTHON PROGRAMMING LAB

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	To do programs using conditional statements and control statements
CO2	To do programs in List, Tuples, Function and handle exceptions
CO3	To do File handling, programs using classes, inheritance and regular expression
CO4	To connect to MYSQL database from python
CO5	To develop GUI applications using PyGTK
CO6	To develop programs using Numpy and Pandas

FOURTH SEMESTER

Course Title: PROJECT & VIVA-VOCE

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate a depth of knowledge of modern technology.
CO2	Complete an independent research project, resulting in dissertation.
CO3	Communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
CO4	Self-study, reflect on their learning and take appropriate actions to improve it.

PRINCIPAL
Dwaraka Doss Goverdhan Doss
Vaishnav College
Arumbakkam, Chennai - 600106.