JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY

Outcome Based Education
(Vision, Mission, PO, PSO, PEO and CO of UG and PG Programs)

Jaypee Institute of Information Technology
(Declared Deemed to be University u/s 3 of the UGC Act)
A-10, Sector-62, Noida - 201 309. (U.P.)

I N D E X

VISION

To become a centre of excellence in the field of IT and related emerging areas of education, training and research comparable to the best in the world for producing professionals who shall be leaders in innovation, entrepreneurship, creativity and management.

MISSION

MISSION 1: To develop as a benchmark University in emerging technologies.

MISSION 2: To provide state-of-the-art teaching learning process and R&D environment.

MISSION 3: To harness human capital for sustainable competitive edge and social relevance.

Vision, Mission, PO, PSO, PEO and CO of UG and PG Programs of Departments

BIOTECHNOLOGY

VISION: To be a centre of excellence in Biotechnology for providing quality education and carrying out cutting edge research to produce professionals, innovators, researchers and entrepreneurs.

MISSION 1: To offer contemporary, futuristic and flexible curricula of Biotechnology for teaching and training.

MISSION 2: To carry out globally acceptable cutting edge research through sponsored projects and to provide state of art laboratories for experimental work.

MISSION 3: To develop bio-safe, socially, ethically and environmentally acceptable solutions to address health, environmental, industrial, entrepreneurial and societal concerns.

PROGRAMME NAME: B.TECH. BIOTECHNOLOGY

Programme Educational Objectives (PEOs)

PEO 1: To provide fundamental and practical knowledge in the field of Biotechnology for pursuing research career in industry and academia.
PEO 2: To impart analytical and research skills and nurture entrepreneurial endeavours.
PEO 3: To develop biotechnologists with professional ethics to address global and societal issues for sustainable development.

Table 1: Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Table 2: Programme Specific Outcomes (PSOs)

PSO 1: Acquire indepth theoretical and practical knowledge in Biotechnology.
PSO 2: Able to apply the acquired knowledge to provide costeffective and sustainable solutions in Biotechnology.
PSO 3: Translate biotechnological knowhow to address environmental, ethical, intellectual property rights and societal issues.

Table 3: Academic Year 2019-20 Course Outcomes (COs)

Course Outcome (Semester-1)
Fundamental of Computer programming-I 18B11CI111: 1. Explain basic structure of HTML web page using different tags such as table, links, formatting and frame etc.2. Make use of Cascading style sheets and Java Scripts to develop web pages. 3. Explain SQL queries using MySQL to create database tables and retrieve the data from a single table.4. Demonstrate the simple python programs using the constructs such as lists, tuples, dictionaries, conditions, and loops. 5. Classify Number System and explain Basics of Computer Systems
Computer Programming lab I 18B15CI111: 1. Demonstrate basic structure of HTML web page using different tags. 2. Develop web pages using table tag, formatting tag, and hyper links. 3. Make use of Cascading style sheets and Java Scripts to develop web pages.4. Explain SQL queries using MySQL to create database tables and retrieve the data from a single table. 5. Demonstrate the simple python programs using the constructs such as lists, tuples, dictionaries, conditions, and loops.
Basic Mathematics I 15B11MA112: 1. Explain the concepts of sets, relation and functions. 2. Illustrate the concepts of complex numbers and their powers including roots. 3. Discuss the concepts of limits, continuity and differentiability and solve related problems of differential calculus. 4. Utilize integral calculus to evaluate area under the curve. 5.Explain matrices and determinants to solve the system of linear equations.
Physics for Biotechnology 15B11PH112: 1. Relate historical development of optics, atomic physics and biomechanics to the modern concepts. 2. Explain the relevant concepts of optics, biomechanics, laser, atomic structure, bio-fluid mechanics, allometry and statistical distribution 3. Apply of mathematical principles and laws of physics in handling physical problems with a specific focus on the biological systems. 4. Logically analyse biological systems using the laws of physics or biophysics
Engineering Workshop 18B15E112: 1. Tell the basic of manufacturing environment and various safety measures associated with it. 2. Apply the appropriate tools to fabricate joints utilizing work-bench tools. 3. Create various prototypes in the carpentry trade, fitting trade, welding trade and tin smithy trade.4. Demonstrate the working principle of lathe, shaper and milling machines and able to fabricate the prototypes of desired shape and accuracies.
English 15B11HS112: 1. Develop an understanding and appreciate the basic aspects of English as a communication tool. 2. Apply the acquired skills in delivering effective presentations 3. Demonstrate an understanding of different forms of literature and rhetorical devices 4. Examine literature as reflection of individual and society 5. Compose different forms of professional writing 6. Apply Phonetics through theory and practice for better pronunciation
Physics Lab-1 15B17PH171: 1. Recall optics and modern physics principles behind the experiments. 2. Explain the experimental setup and the principles involved behind the experiments performed. 3. Plan the experiment and set the apparatus and take measurements. 4. Analyze the data obtained and calculate the error. 5. Interpret and justify the results.
Course Outcome (Semester 2)
Basic Mathematics-2 15B11MA212: 1. Explain different tests for the convergence of sequence and series 2. Explain the basic concept of vectors and coordinate geometry. 3. Apply differentiation and integration in vector & scalar valued functions 4. Classify and solve the ordinary differential equations with constant coefficients. 5. Explain the measures of central tendency and apply the method of least squares for curve fitting. 6. Apply basic numerical methods for finding roots, differentiation and integration.
Biophysical Techniques 15B11PH212: 1. Select biophysical spectroscopic technique(s) for their application(s) in determining structural details and properties of molecules. 2. Explain underlying principles of different biophysical techniques at atomic and molecular level and working principles of related spectrometers/microscopes. 3. Apply different biophysical techniques and choose appropriate technique(s) for investigating structural details and properties of a molecular sample. 4. Analyse spectroscopic/microscopic data obtained from different biophysical techniques. 5. Evaluate numerical values of different physical parameters involved in the modelling of different biophysical techniques at atomic and molecular level.
Electrical Science-I15B11EC111: 1. Recall the concepts of voltage, current, power and energy for different circuit elements. 2. Apply the Kirchhoff laws to identify the node voltages and branch currents, apply different network theorems in the complex networks. 3. Demonstrate the physical model for given Sinusoidal AC signal and construct the phasor diagrams. 4. Explain V-I characteristics of Diodes and Illustrate the construction and operation of Bipolar Junction Transistor (BJT) for different configurations.
Fundamentals of Computers & Programming-II 18B11CI121: 1. Define basics of C programming language like its data types, operators, control flow and loop control. 2. Develop C programs using Controls flows like while, do while, for loops, if else , switch case, etc. 3. Experiment with single and multi dimensional arrays, structure and functions in C programming Language. 4. Explain basic features of object-oriented design such as encapsulation, polymorphism, inheritance, and abstraction and compare it with function oriented programming.5. Develop a simple web application with client and server side scripting using JavaScript and PHP and connect with a given relational database

Basic Bioscience Lab18B15BT111: 1. Demonstrate good laboratory practices and documentation . 2. Show working of equipments & instruments 3. Apply knowledge of essential concepts related to biomolecules 4. Analyze experimental data and drawing valid conclusion.

Electrical Science Lab-I15B17EC171: 1. Show the working of different electronic apparatus and to identify the electronic components. 2. Demonstrate the electrical circuits using Kirchhoff's law 3. To acquire the knowledge of network theorems for analysis of electrical circuits 4. Explain the characteristics of PN junction, Zener diode andanalyze the behavior of full/half wave rectifier, clippers, clampers and voltage regulator circuits. 5. Explain and analyze the input and output characteristics of BJT.

Computer Programming Lab-II18B15CI121: 1. Demonstrate basic programs of different data types and operators in C. 2. Develop C programs using Controls flows like while, do while, for loops, if else , switch case, etc. 3. Make use of single and multi dimensional arrays, structure and functions in C programming language. 4. Demonstrate basic features of object-oriented programming such as objects and classes in C++. 5. Develop a simple web application with client and server side scripting using Javascript and PHP and connect with a given relational database

Engineering Drawing & Design 18B15GE111: 1. Recall the use of different instruments used in Engineering Drawing and Importance of BIS and ISO codes. 2. Illustrate various types of mathematical curves and scale. 3. Classify different types of projection and Construct Orthographic projection of Point, Line, Plane and Solid. 4. Construct Isometric Projection and Conversion of Orthographic view to Isometric view and vice-versa. 5. Construct Engineering model in Drawing software(AutoCAD) and Compare it with conventional drawing.

Course Outcome (Semester-3)

Probability and Statistics 15B11MA302: 1. demonstrate different diagrammatic representation of data and explain the measures of central tendency, dispersion and asymmetry. 2. explain the concepts of probability theory and Bayes' theorem. 3. explain and solve the problems of probability distributions along with their mean, variance & moment generating functions. 4. explain sampling theory and apply test of hypothesis on small and large samples. 5. apply the method of least squares for curve fitting and explain correlation and regression.

Biochemistry 15B11BT211: 1. Summarize concepts of cell biology 2. Explain the structure and function of biological molecules 3. Analyze enzyme kinetic data and regulation of enzyme activity 4. Identify the key molecules involved in regulation of metabolic pathways and disorders

Electrical Science-2, 15B11EC211: 1. Recall the concepts of voltage, current, power and energy for different circuit elements. 2. Apply the Kirchhoff laws to identify the node voltages and branch currents, apply different network theorems in the complex networks. 3. Demonstrate the physical model for given Sinusoidal AC signal and construct the phasor diagrams. 4. Explain V-I characteristics of Diodes and Illustrate the construction and operation of Bipolar Junction Transistor (BJT) for different configurations.

Environmental Studies, 19B13BT211: 1. Explain diversity of environment, ecosystem resources and conservation 2. Identify hazards related to environmental pollution and safe management practices 3. Apply modern techniques for sustainable Urban planning and Disaster management 4. Recall Government regulations, Environmental Policies, Laws & Ethics 5. Survey ground situation on specific environmental aspects, and present a field report

Electrical ScienceLab-2, 15B11EC211: 1. Show the working of different electronic apparatus and to identify the electronic components. 2. Demonstrate the electrical circuits using Kirchhoff's law 3. To acquire the knowledge of network theorems for analysis of electrical circuits 4. Explain the characteristics of PN junction, Zener diode andanalyze the behavior of full/half wave rectifier, clippers, clampers and voltage regulator circuits. 5. Explain and analyze the input and output characteristics of BJT.

Thermodynamics And Chemical Processes Lab, 15B17BT371: 1. Apply the concept of Heat capacity, Specific gravity and Heat Transfer 2. Plan and Apply the concept of Material Balance 3. Demonstrate movement of molecule 4. Make use of Computational tools to study the thermodynamic properties

Thermodynamics and Chemical Processes, 17B1NHS531: 1. Define laws of thermodynamics and their application 2. Explain material and energy balance 3. Demonstrate knowledge of free energy, internal energy, enthalpy, entropy, phase rules for one component and two component systems, Gibb's free energy, fugacity for solutions and vapour-liquid equilibrium, 4. Make use of thermodynamics principles for biomolecular interaction 5. Apply knowledge of fluid rheology and heat transfer in biological systems and problems

Biochemical Techniques lab: 1. Demonstrate proficiency in calculations and reagent preparation 2. Explain fundamental biochmical principles related to structure and functions of biomolecules 3. Identify methods used to study various biomolecules 4. Able to examine the enzyme kinetics in biochemical reactions

Economics15B11HS211: 1. Explain the basic micro and macro economics concepts. 2. Analyze the theories of demand, supply, elasticity and consumer choice in the market. 3. Analyze the theories of production, cost, profit and break even analysis 4. Evaluate the different market structures and their implications for the behaviour of the firm. 5. Examine the various business forecasting methods. 6. Apply the basics of national income accounting and business cycles to Indian economy.

Course Outcome (Semester-4)

Introduction to Bioinformatics 15B11BT411: 1. Summarize biological databases, storage and retrieval methods, file formats 2. Explain Bioinformatics resources, computational tools and associated algorithms 3. Apply the bioinformatics concepts in genomics, proteomics and Drug discovery. 4. Analyze evolutionary tree to understand evolutionary genetics 5. Compare sequence alignment tools to predict structures & functions of gene, RNA and proteins

Introduction to Literature 15B1NHS431: 1. Interpret & classify genres and periods of literature to identify conventional as well as experimental forms of literature. 2. Understand theories and apply them on any text 3. Examine various texts from diverse cultures thematically and stylistically. 4. Analyze social and cultural changes over time and place through select representative texts of different cultures.

Human Resource Management 16B1NHS431: 1. Demonstrate a basic understanding of different functions of human resource management: Employer Selection, Training and Learning, Performance Appraisal and Remuneration, Human Relations and Industrial Relations. 2. Apply various tools and techniques in making sound human resource decisions. 3. Analyze the key issues related to administering the human resource management activities such as recruitment, selection, training, development, performance appraisal, compensation and industrial relation. 4. Critically assess and evaluate different human resource & industrial relation practises and techniques and recommend solutions to be followed by the organization

Bioinformatics Lab 15B17BT471: 1. Outline various computers hardware, operating system databases, storage and retrievals, file formats. 2. Apply the bioinformatics tools in homology search, genome annotation, repeat masking, gene prediction, promoter analysis. 3. Test for evolutionary relationship using sequence analysis and Phylogenetic tree 4. Predict structure and function of DNA, RNA and protein 5. Compare the existing tools to address the biological problems

Microbiology 15B11BT312: 1. Explain history and scope of microbiology 2. Summarize Microbial taxonomy 3. Apply the concept of microbial nutrition, growth and control methods 4. Identify the microbial metabolism, gene transfer methods and host pathogen interaction 5. Examine the suitability of microorganisms for industrial applications

Microbiology lab 15B17BT372: 1. Understand media preparationand sterilization techniques. 2. Understand culturing sub culturing. 3. Apply basic microbiological techniques to characterize microbes 4. Analyze enumeration techniques for microorganism and estimation of antimicrobial activity.

Genetics and Developmental biology 15B11BT313: 1. Explain principles of inheritance in genetics 2. Compare early developmental mechanics in invertebrates, vertebrates and plants 3. Analyze and solve the problems related to population genetics 4. Identify Human birth defects and genetic Disorders

Genetics and Developmental biology lab 15B17BT373: 1. Understand the different stages of cell division 2. Interpret the inheritance of human genetic traits 3. Make use of Drosophila as model organism in genetics studies. 4. Compare the developmental stages of different organisms

Principles of Management 15B1NHS434: 1. Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving 2. Examine the relevance of the political, legal, ethical, economic and cultural environments in global business. 3. Evaluate approaches to goal setting, planning and organizing in a variety of circumstances. 4. Evaluate contemporary approaches for staffing and leading in an organization. 5. Analyze contemporary issues in controlling for measuring organizational performance.

Introduction to Sociology 15B1NHS433: 1. Demonstrate an understanding of sociological perspectives and concepts. 2. Explain the concept of social stratification and types of stratification as class, caste and gender. 3. Apply the major sociological perspectives, concepts and methods in the systematic study of society 4. Analyze the relevance of various social Institutions in societies and how it shapes and influences social interactions.

Introduction to Psychology 15B1NHS432: 1. Demonstrate a basic understanding of different perspectives and concepts of psychology 2. Apply the concepts of psychology in day to day life 3. Examine the different theoretical perspectives and models of psychology 4. Develop solutions for problems related to psychology using appropriate tools/models

Introduction to Literature 15B1NHS431: 1. Understand figurative language to demonstrate communication skills individually and in a group. 2. Develop a critical appreciation of life and society through a close reading of select texts 3. Analyze a literary text thematically and stylistically and examine it as representing different spectrum of life, human behavior, and moral consciousness of society. 4. Interpret Literature as reflection of cultural and moral values of life and society

Life Skills 15B11HS111: 1. Understand Life Skill required to manage self and one's environment 2. Apply comprehensive set of skills for life success for self and others 3. Analyze group dynamics for its effective functioning 4. Evaluate the role of women leadership and gender issues

Financial Accounting 15B1NHS435: 1. Understand the basic concepts of Accounting. 2. Apply accounting concepts for recording of business transactions. 3. Compare and reconcile the accounting records with other sources of information 4. Evaluate the accounting records to identify and rectify the errors made during accounting process. 5. Construct the final accounts of a business

Course Outcome (Semester-5)

Fermentation & Downstream Processing 15B11BT512: 1. Explain unit operations in downstream processing 2. Summarize media optimization, microrganism isolation, preservation and enrichment 3. Apply unit operation calculation to solve industrial scale problems 4. Determine an optimum fermentation and purification strategies

Fermentation & Downstream Processing LAB 15B17BT572 : 1. Demonstrate separation of insoluble components 2. Apply cell lysis, protein concentration and purification techniques for isolation of desired protein 3. Design a downstream processing strategy for purification of desired molecule from culture broth 4. Analyze the experimental result and document in a scientific manner

Cell Culture Technology 15B11BT511: 1. Demonstrate knowledge on principles of plant and animal tissue culture. 2. Identify the requirements to construct a cell culture laboratory. 3. Apply knowledge and techniques to maintain differenttypes of cell cultures. 4. Examine cell culture techniques for applications in different fields of biotechnology.

Plant Tissue Culture Lab 15B17BT573: 1. Relate and interpret the role of tissue culture media and it's constituents in micropropagation of ex-plants 2. Show the effect of media composition and culture conditions on morphogenic responses in ex-plant 3. (Perform) tests for callus culturing and synthetic seed preparation. 4. Make use of in-vitro propagated plants to study phytocompounds.

Cell Culture Lab 15B17BT571: 1. Understand requirements for in vitro culturing of animal cells 2. Apply the fundamental knowledge of cell culture techniques to maintain animal cell line 3. Plan and perform tests for cell separation, characterization, differentiation and transformation processes 4. Demonstrate practical skills to apply laboratory procedures of cell culture for biotechnology investigations

IT Practice Lab 15B17CI577: 1. Explain features of programming environment for Python and Perl 2. Apply Perl based script for bioinformatics problem 3. Utilize Python for features and pattern finding in biological sequences and explore the app desiging 4. Perform the sequence analysis

Bio-Materials Science 16B1NPH534: 1. Recall basic fundamental of material structure such as crystal defects, phases etc. 2. Demonstrate properties of materials such as mechanical, chemical, surface, optical, magnetic etc 3. Selection of materials based on their properties such as ceramic, metal, polymer, composites etc 4. Analyzing the applicability of different biomaterials and listing them according to the applied fields like artificial organs

Minor Project-1 15B19BT591: 1. Select a relevant biotechnological problem 2. Summarize research literature related to the identified problem 3. Demonstrate data analysis ability 4. Demonstrate verbal and written presentation and communication skills

Technology and Culture 13B1NHS71: 1. Understand the main theories in cultural management, 2. Identify technological convergence and cultural divergence, relate the differences to the literature and suggest solutions 3. Interpret and communicate effectively in physical and virtual teams by choosing appropriate concepts, logic and selecting the apt IT tools. 4. Application of the theoretical knowledge to adapt to cultural differences in global work environment.

Principles of Management 15B1NHS434: 1. Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving 2.Examine the relevance of the political, legal, ethical, economic and cultural environments in global business. 3.Evaluate approaches to goal setting, planning and organizing in a variety of circumstances. 4.Evaluate contemporary approaches for staffing and leading in an organization. 5.Analyze contemporary issues in controlling for measuring organizational performance.

Strategic Human Resource Management 18B11NHS311: 1. Understand human resource management from a strategic perspective and analyze environmental challenges that impact HRM of an organization 2. Assess the human resource needs of the organization and design recruitment and selection strategies for an organization 3. Evaluate the processes of training and development, mentoring, performance management, compensation and reward management in an organization and design effective strategies for the same4.Critically assess career management system, work-life initiatives and other HRM practices of the organization

Indian Polity and Constitutional Democracy in India 18B12HS612: 1. Explain the importance of Polity and Constitution. 2. Interpret the Fundamental Rights and Duties. 3.Analyze the unity in diversity concept of our Nation 4. Analyze various concepts useful to understand the system of governance

Sociology of Youth16B1NHS 531: 1. Understand sociological perspectives relating to young people 2. Explain the ethical, cultural& social issues concerning Youth 3. Understand youth culture and to interprets the same 4. Analyze societal problems related to youth in the evolving society.

Entrepreneurship Development 19B12HS311: 1. Understand basic aspects of establishing a business in a competitive environment 2. Apply the basic understanding to examine the existing business ventures 3. Examine various business considerations such as marketing, financial and teaming 4. Assessing strategies for planning a business venture

Basic Numerical Methods 17B1NMA531: 1. explain the concepts of approximation and errors in computation. 2. apply numerical methods for solving algebraic and transcendental equations along with their convergence. 3. explain finite and divided difference formulae for numerical interpolation.4. apply numerical differentiation and integration in engineering applications. 5. solve a system of linear equations using direct and iterative methods. 6. solve ordinary differential equations using numerical methods.

Discrete Mathematics 16B1NMA531: 1. explain partial order relations, Hasse diagram, lattices and recursive functions. 2. solve the difference equations using generating function and Z-transform. 3. explain the propositional and predicate calculus to check the validity of arguments. 4. demonstrate graphs, digraphs, trees and use it to solve the different problems of graph theory. 5. illustrate various algebraic structures and their properties.6. explain the theory of formal languages and solve the related problems of automata.

Course Outcome (Semester-6)

Comparative and Functional Genomics 15B11BT611: 1. Explain the fundamental concepts of functional genomics, transcriptomics and proteomics 2. Apply advanced techniques for improved diagnostics and therapeutics 3. Categorize different bioinformatics tools related to genomics and proteomics 4. Integrate and infer the bioinformatics data obtained through genomics studies

Comparative and Functional Genomics Lab 15B17BT671: 1. Explain the basic concept of genes and genome 2. Compare and analyze functional genomic data using computational tools 3. Utilize the acquired knowledge of gene expression technologies 4. Apply and analyze cloning and expression of gene of interest

Minor Project-2 15B19BT691: 1. Outline the specific biotechnological problem and explain the related scientific approaches 2. Summarize the literature related to the specified topic 3. Analyze and demonstrate team effort in presentation and data analysis 4. Organize the data and develop scientific report writing skills

Instrumentation Techniques in Biotechnology 16B1NBT633: 1. Explain the principles, practices and instrumentation 2. Apply understanding of the principles, practices and instrumentation 3. Compare and contrast techniques of different instruments for their strength, limitations and creative use for problem-solving. 4. Assess sample preparation method(s) and problem solving

Genetic Disorders and Personalized Medicine 16B1NBT634: 1. Apply knowledge of genetic principles to understand disease etiology, clinical features and mode of inheritance 2. Explain and interpret different molecular diagnoses and genetic test results 3. Analyze the role of population and quantitative genetics for genetic disorders 4. Develop the concept of Personalized Medicine and integrate information from HGP databases 5. Assess the genetic counseling process and its impact from a cultural, ethical and psychosocial perspective

Nanoscience in Food Technology 19B13BT311: 1. Explain properties of nanoparticles and nanoemulsions 2. Outline food processing, packaging and preservation 3. Apply nanotechnology concepts to improve food quality, texture, and shelf life 4.

Apply concepts of nanoscience for improving agriculture yields 5. Analyze food quality degradation and pathogens detection, using nanosensors

Medical & Industrial Applications of Nuclear Radiation 16B1NPH636: 1. Define nuclear structure, properties and reactions; Nuclear magnetic resonance process 2. Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays 3. Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc. 4. Analyze different radiocarbon dating mechanisms and processes

Statistic 16B1NMA633: 1. make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data. 2. apply correlation and regression in statistical analysis of data. 3. explain sampling theory and its distributions. 4. explain the concepts and properties of estimation theory 5. apply sampling and estimation theory to find the confidence interval. 6. Analyze small and large sample data by using the test of hypothesis.

Social Media and Society 19B12HS612: 1. Infer the implications of digital change, and the concept of social media and e-marketing in the context of the changing marketing landscape 2. Elaborate the implications of cyberbranding and digitization on online marketing mix decisions 3. Develop specific models related to social media and social media analytics 4. Evaluate concepts related to Search Engine Marketing, Customer Centric Web Business models and Web Chain Analysis 5. Illustrate the new age marketing practices

Effective tools for Career Management and Development (Value Added) 18B13HS612: 1. Assess ones personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities. 2. Apply knowledge of all the Career Stages in making informed career decisions 3. Develop and maximize ones potential for achieving the desired career option 4. Analyze the processes involved in securing and managing career by employees of different organizations.

Marketing Management 18B12HS611: 1. To illustrate the fundamentals of marketing, marketing environment and market research. 2. To model the dynamics of marketing mix. 3. To demonstrate the implications of current trends in social media marketing and emerging marketing trends. 4. To appraise the importance of marketing ethics and social responsibility 5. To conduct environmental analysis, design business portfolios and develop marketing strategies for businesses to gain competitive advantage.

Literature & Adaptation 16B1NHS636: 1. Understand and outline the elements of adaptation and its various forms and relevance today. 2. Utilize visual literacy in reading filmed text and examine them as reflections of Readers' and Audience' perceptions. 3. Analyze texts and their adaptations beyond the surface level of narrative or character 4. Evaluate and interpret source texts and adaptations as reflections of cultures and times. 5. Compose a literary piece in any genre and design an adaptation of any literary piece in another form individually and in groups.

Econometric Analysis 19B12HS611: 1. Demonstrate the key concepts from basic statistics to understand the properties of a set of data. 2. Apply Ordinary Least Square method to undertake econometric studies. 3. Examine whether the residuals from an OLS regression are well-behaved. 4. Evaluate different model selection criteria for forecasting. 5. Create models for prediction from a given set of data.

Organizational Behaviour 16B1NHS635: 1. Identify dynamic human behavior through an insight into relationships between individuals, groups and organizations 2. Analyze individual management style as it relates to influencing and managing behavior in the organization. 3. Decide and justify set of strategies for meeting the special challenges in the 21st century competitive workplace 4. Assess the potential effects of behavioral factors in an organizational environment

Cognitive Psychology 16B1NHS632: 1. Apply the concepts of cognitive psychology and their application in everyday life 2. Analyze the different theoretical perspectives and models of cognitive psychology 3. Evaluate cognitive psychology issues and recommend possible solutions 4. Evaluate interventions/solutions for self-development and for handling different cognitive psychology issues and challenges

Bioeconomics 16B11NBT631: 1. Relate and summarize biological products as economic resources 2. Demonstrate understanding of economic pronciples for biological resources and develop the concept of sustainability 3. Make use of neoclassic economic theories and bioeconomic principles to find a robust solution to biotechnological and sustainability issues 4. Apply the knowledge of bioeconomic principles and SWOT analysis technique for developing sustainable solution and profit maximization from fisheries and agricultural sectors

Antimicrobial Resistance 16B1NBT632: 1. Explain the importance of antimicrobials and emerging resistance 2. Describe the biological mechanisms of antibiotic resistance 3. Analyze antimicrobial susceptibility tests 4. Support Antibiotic stewardship

Applied Mushroom Biology 16B19BT692: 1. Define mushroom biology 2. Experiment with mushroom cultivation 3. Explain environmental and medicinal aspects of mushroom 4. Analyze economics of mushroom cultivation

Operations Research 18B1MA611: 1. construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical and simplex method. 2. apply two-phase, Big-M and dual simplex method for linear programming problems. 3. make use of sensitivity analysis to linear programming problems. 4. solve transportation, assignment and travelling salesman problems. 5. apply cutting plane and branch & bound techniques to integer programming problems. 6. examine optimality conditions and solve multivariable nonlinear problems.

Numerical Aptitude 16B19MA691: 1. explain basics of mathematical aptitude. 2. explain sets, functions and representation of numbers. 3. solve problems on probability theory, quadratic equations and complex numbers. 4. explain inequalities, mensuration, data interpretation and errors.

Global Politics 20B12HS311: 1. Demonstrate an understanding of the meaning and nature of globalization by addressing its political, economic, cultural and technological dimensions 2. Analyzing the significance of contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security to global governance 3. Analyze how the global politics shapes domestic politics 4. Demonstrate an understanding of the working of the global economy, its anchors and resistances offered by global social movements

Project Management 16B1NHS631: 1. Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context 2. Analyze projects and their associated risks by understanding the various theoretical frameworks, non-numerical and numerical models in order to make correct selection decisions 3. Evaluate the various stages of project management and identify and determine correct techniques for planning, scheduling, controlling and terminating the projects 4. Evaluate project management processes, tools and techniques in order to achieve overall project success

Course Outcome (Semester-7)

Biostatistics and its applications 15B1NBT832: 1. Explain the various statistical methods to design a biological studies and data representation. 2. Apply different statistical methods and approaches to study the significance of a study. 3. Examine the relationship between different parameters of a study. 4. Choose appropriate statistical methods, tools and resources including prediction, validation and evaluation of the biological studies.

Enzymes in food processing,17B1NBT737: 1. Explain role of various enzymes in food processing. 2. Identify need for Technical enzymes 3. Examine recent technology in Food processing Industries 4. List quality assurance protocol and economic consideration.

Food Biotechnology,17B1NBT731: 1.Explain fundamental principles of food science and chemistry 2. Outline beneficial and harmful effects of microorganisms.3. Identify microbes for development of functional food 4. Examine methods that increase shelf life and food quality

Advanced cell biology 16B1NBT734 : 1. Explain cellular organization, integration, migration and communication 2. Illustrate membrane trafficking in cell environment 3. Identify the signalling event during biogenesis 4. Compare regeneration and maintenance of different tissue

Stem cells and Healthcare 17B1NBT734: 1. Compare the unique properties of stem cells derived from different sources 2. Select niche and various isolation and reprogramming methods of stem cells 3. Apply the acquired knowledge in Regenerative medicines 4. Analyze the guidelines, political and ethical issues for stem cell research

Term Paper 15B19BT792: 1. Conduct literature survey to identify the research problem 2. Identify the gaps/inadequacies in the existing literature based on a problem 3. Present an overview of the relevant literature for the specific research topic 4. Conclude on the findings and compile the term paper

Major Project (Part 1) 15B19BT791: 1 Explain and interpret the given research problem. 2. Organise the literature data to address the selected research problem 3. Examine the experimental tools to test for the selected research problem 4. Discuss and elaborate the findings in form of report and presentation.

Summer Training Viva 15B19BT793: 1. Extend theoretical knowledge to real time Industry and Institutes 2. Demonstrate a capacity for critical reasoning and independent learning 3. Make use of Industrial Training experience to prepare a scientific report 4. Develop greater clarity about academic and career goals

Indian Financial System 10B1NPD735: 1. Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market. 2. Analyze ways of fund raising in domestic and international markets 3. Understand functioning of Stock market and evaluate securities for investment.4. Apply the knowledge of Mutual Funds and Insurance in personal investment decisions 5. Apply knowledge of Income tax for calculation of tax liability of individual.

Customer Relationship Management 17B1NHS731: 1. Apply the financial, social and electronic aspects of the Customer Relationship in business situations. 2. Appraise the role of customer share and customer centricity in organizations. 3. Develop the skills to understand customization, innovation and co-creation in organizations and apply them in business contexts.4. Analyze the role of interactive technology for customer engagement, customer retention and customer experience management in organizations. 5. Evaluate the technological solutions and their applications for effective Customer Relationship Management across different functions in organizations. 6. Develop specific models for response modelling and consumer profiling in organizations.

Gender Studies 16B1NHS831: 1. Demonstrate knowledge of the construct of gender and the way it intersects with other social and cultural identities of race, class, ethnicity and sexuality 2. Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity and masculinity 3. Analyze the ways in which societal institutions and power structures such as the family, workplace impact the material and social reality of women's lives 4. Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporary settings 5. Evaluate and interpret information from a variety of sources including print and electronic media, film, video and other information technologies

Human Resource Analytics 18B12HS411: 1. Understand different analytical techniques used for solving HR related problems. 2. Apply descriptive and predictive analysis techniques to understand trends and indicators in human resource data. 3. Analyze key issues related to human resource management using analytical techniques. 4. Critically asses and evaluate the outputs obtained from analytical tools and recommend HR related decisions.5. Create hypotheses, propose solutions and validate using appropriate analytical techniques

Human Rights and Social Justice 17B1NHS733: 1. Interpret anthropological and sociological approaches to the provision of human rights for peoples and cultures 2. Appraise human rights practice within the context of local, national and global civil society; 3. Explain social justice framework to evaluate conflicts between rights 4. Apply organisational and management theories within the context of civil society;

Bio-computing and Applications 17B1NBT739: 1 Understand about the biocomputing methods , principles and practices.2. Outline the advanced genomics, transcriptomics and proteomics, methods 3. Apply web-based methods and tools for simulation of biological problems 4. Analyze vaccine designing and protein-ligand interactions for drug discovery

Nanoscience and Technology 17B1NPH732: 1. Define the Nanoscience and Technology and to know about various other terminologies and developments involved with Nanoscience and Technology 2. Classify the nanomaterials depending on the nature of dimensionalities, type of materials classes and explain the basic concepts of nanomaterials 3. Apply the concepts of Nanoscience for solving the theoretical and numerical problems 4. Determine the properties of nanomaterials through

suitable characterization tools
Waste Management 16B1NBT733: 1. Explain the fundamental concepts related to waste management 2. Make use of different Environmental Management Systems applying environmental laws for effective waste management 3. Analyze emerging waste management technologies to offer sustainable solution 4. Assess environmental, social and economic aspects of integrated waste management
Bioinformatics Algorithms (17B1NCI736): 1. Relate to different computational challenges in Computational Molecular Biology. 2. Examine proper algorithmic concepts to solve a computational problem. 3. Determine the importance of traditional to contemporary approaches for solving the biological problems. 4. Design strategy to resolve real-world biological challenges. 5. Identify appropriate algorithmic technique to solve a given bioinformatics related task. 6. Develop an optimized solution model for computational biology problems. 7. Formulate prediction tools and estimate the solutions for biological problems.
Course Outcome (Semester-8)
Biopharmaceutics and Pharmacokinetics 15B1NBT831: 1. Understand the pathway of drug and biologics development.2.Analyze the pharmacokinetics of Drug absorption, distribution, biotransformation and elimination from the body, Bioavailability, One and two compartmental theory3.Evaluate the in vitro dissolution testing in various simulated media and understand its relevance in drug development4.Apply biopharmaceutics factors governing the formulation designs of novel dosage forms.5.Compare various pharmacodynamic interactions
Human Nutrition and Health 15B1NBT835: 1. Relate roles and functions of principal nutrients and the processes involved in digestion, absorption and metabolism.2.Apply the knowledge of Dietary Guidelines, Nutrient Reference Values and nutrient content of primary food sources to estimate energy requirements, assess dietary quality and plan a healthy diet. 3.Explain the role of food and nutrients in health and disease processes 4.Evaluate the relationship between diet, lifestyle diseases and their nutritive demands.5.Plan diets to help in the prevention of chronic disease and provide appropriate nutrition during all phases of development
Market Research In Biosciences 19B12BT411: 1.Define basic understanding of market and marketing research 2.Interpret the nature of problem and infer the research method to be employed for a given bioproduct related problem 3.Make use of statistical and software tools for market research 4.Analyze and examine market research report based on strategic approaches
International Studies 15B1NHS832: 1.Interpret the major security issues in the Eurasia Region.2.Compare the developed and developing economies along with other major international economic concepts and institutions.3.Analyze the major historic, economic, political, socio-cultural and technological issues from a global perspective.4.Discuss India's relations with USA, Russia and China.
Major Projects (Part 2)   15B19BT891: 1.Summarize research literature and outline the problem statement.2.Plan experimental design to solve the identified problem. 3.Evaluate the experimental results and compare them with published literature4.Compose and present the scientific findings.
Molecular Ecology 18B12BT412: 1.Outline fundamentals of molecular ecology2.Select appropriate molecular tools and deduce sustainable solutions for ecosystem protection3.Analyze genetic behavior of populations in context to ecology4.Inspect ecological reports and conclude their importance for various research applications
Service Management Marketing 16B1NHS832: 1.Understand service products, consumers and markets2.Apply 4P's of marketing to service3.Determine and Interpret the customer Interface4.Create and design profitable service strategies
Industrial Sociology 18B12HS811: 1.Understand the scope of industrial sociology and major theories on labour and work2.Analyzing the contemporary issues related to industry in the post-LPG era3.Evaluating work in its social aspects such as gender, caste, class and unpaid work, as different from its better-known economic dimension.4.Evaluate and interpret information about emerging issues in industry through various sources like print and electronic media, film, documentary and other information technologies

PROGRAMME NAME: M.TECH. IN BIOTECHNOLOGY

Programme Educational Objectives (PEOs):

PEO 1: To impart advanced theoretical and practical knowledge in Biotechnologyand allied fields.
PEO2: To provide domain knowledge and expertise for successful career in academics, research and industry.
PEO3: To develop ethically and socially responsible professionals with leadership and entrepreneurship skills.

Table 4: Programme Outcomes (POs):

PO1: An ability to independently carry out research /investigation and development work to solve practical problems
PO2: An ability to write and present a substantial technical report/document
PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

Table 5: Programme Specific Outcomes (PSOs):

PSO1: Able to apply knowledge of Biotechnology for medical, industrialand environmental applications.

Table 6: Academic Year 2019-20 Course Outcomes (COs)

Course Outcome (Semester-1)

Biomolecules and Cell Communication (17M11BT111): 1. Explain the signal molecules and major cell signalingpathways 2. Analyze cell signaling pathways in normal and diseased conditions 3. Interpret the mechanisms and regulation of cell cycle and cell death 4. Analyze the therapeutic drug targets for cancer

Biosensors (17M12BT111): 1. Understand biosensors, its performance characteristics and advancement thereof 2. Analyze immobilization methods and their effect on biosensor performance 3. Evaluate performance of a given biosensor for - disease diagnosis, drug screening, pathogen and pollutant detection 4. Design methods to improve sensitivity of the biosensor

Molecular Modeling and Drug Design (17M11BT112): 1. Explain macromolecular structures, their Mathematical representation and visualization 2. Explain structural modeling, simulation and dynamics 3. Apply computational drug designing and simulation approaches for drug discovery 4. Compare in-silico ligand-target interaction methods

Phytotherapeutics and Pharmacology (17M12BT119): 1. Analyze the existing biotechnological techniques to develop plant based therapeutics 2. Evaluate the classes, synthesis and structure functional relationship of phytomolecules 3. Explain the therapeutic applications of phytochemicals 4. Identify the current aspects of phytomedicines on toxicity and clinical trials 5. Case studies to analyzeAyurpharmacoepidemiology 6. Use of bioinformatics tools and approaches to predict the molecular function of novel bioactive molecules

Product Development in Biotechnology (17M12BT118): 1. Outline various processes relevant for Biobusiness 2. Compare marketing techniques and related ethics 3. Select appropriate technology for the production of Biological products 4. Explain financial, regulatory, health policy aspects for biobased industries

Public Health Economics and Policy (18M12BT211): 1. Explain Government policies, socio-economic conditions and research methods in Public Health 2. Explain fundamentals of disease epidemiology 3. Applying computational tools for determining health indicators from primary and secondary data 4. Analysis of the role of health care in policy making

Research Methodology and Intellectual Property Rights (18M11GE111): 1. Explain the basic concepts and types of research 2. Define a research problem, its formulation, methodologies and analyze research related information 3. explain research ethics, understand IPR, patents and their filing related to their innovative works 4. explain and analyze the statistical data and apply the relevant test of hypothesis in their research problems.

Sustainable Agriculture (19M12BT113): 1. Interpret various practices in sustainable agriculture and sustainable food systems 2. Examine methods to promote soil health, minimize water use, and decrease pollution in farm soils 3. Outline appropriate certification guidelines and Economic Rules that apply for organic farming and biotechnological farm inputs 4. Recommend strategies to avoid degradation of soils on a farm through implementation of sustainable management practices in agriculture

Biotechniques Lab - I (17M15BT111): 1. Apply basic analytical techniques in biotechnology 2. Develop skills in molecular biology techniques 3. Examine and analyse gene expression 4. Make use of purification techniques for compounds

Regulatory Affairs (17M12BT116): 1. Explain regulatory markets and agencies; preclinical and clinical trials 2. Analyze the guidelines for approvals of new drugs/biologics 3. Interpret ICH guidelines applicable to drugs and biotechnology based therapeutic products. 4. Assess regulatory approvals via related case studies

Environmental Biotechnology (17M12BT115): 1. Interpret conventional and modern methods to understand dynamics of microbial communities 2. Apply and analyze environmental issues associated with industry and agriculture 3. Prioritize, and recommend environmentally safe practices for sustainable environmental management 4. Compare environmental laws, regulations, enviornmental impact assessment for project implementation and report

Course Outcome (Semester-2)

Bioprocess & Industrial Biotechnology (17M11BT113): 1. Relate role of economic principles in biomanufacturing processes 2. Apply knowledge of engineering principles in designing of bioreactors for prokaryotic and eukaryotic systems 3. Analyze the role of bioprocess conditions in eukaryote cell culture 4. Evaluate various strategies used for production of primary and secondary metabolites

Diseases and Healthcare (17M11BT114): 1. Explain the etiology, pathogenesis of infectious diseases and genetic disorders. 2. Choose and apply the strategies of different diagnostic tests. 3. Utilise expression systems and mutagenesis techniques for biopharmaceuticals production 4. Appraise biotechnology principles for production of recombinant proteins and nucleic acids as therapeutic agents

Nutraceuticals (17M12BT127): 1. Compare the traditional and modern trends in the nutraceutical Industry. 2. Evaluate the mechanism of action of micronutrients and phytochemicals in prevention of chronic diseases. 3. Explain the health benefits of microbial and algal nutraceuticals 4. Compare nutraceuticals and health food products in Indian and international market.

Biotechniques Lab-II (17M15BT112): 1. Experiment with high end analytical techniques in biotechnology 2. Develop basic and applied skills in cell culture 3. Examine and analyse disease-specific drug targets 4. Analyse bioactive compounds from plant and microbial systems

Project Based Learning-I (17M17BT111): 1. Compare and contrast the existing literature and interpret the research problem 2. Make use of biotechnological and allied fields to explore different strategies 3. Designing the research strategy 4. Conclude the research finding through presentation and technical report

IPR in Biotechnology (18M12BT116): 1. Explain and interpret the types of intellectual property rights, related laws and systems 2. Apply specific IPR issues pertaining to medical biotechnology 3. Evaluate plant and traditional knowledge protection 4. Appraise commercialization of intellectual property, infringements and laws applicable

Course Outcome (Semester-3)

Constitution of India (19M13HS211): 1. Demonstrate an understanding of the conflict between the Fundamental Rights

and Directive Principles in the Indian Constitution 2. Assess the nature of the Indian constitution and its applicability in the study of politics in India 3. Assess the devolution of powers and authority of governance of the Union government and the local government 4. Demonstrate an understanding of the powers and functions of the Indian executive, legislature and judiciary

Cost Accounts for Engineering Projects (19M12HS211): 1. Understand basic concepts of Cost Accounting 2. Apply concepts of cost in project management 3. Analyze cost behavior for decision making 4. Construct different budgets for controlling the cost

Dissertation (17M17BT213): 1. Identify the research problem and select suitable scientific methods to solve the given research problem 2. Formulate the plan and test for hypothesis   3. Assess the key findings and interpret the data   4. Compose the written scientific report and effectively present the data

Project Based Learning - II (17M17BT212): 1. Compare and contrast the existing literature and interpret the research problem 2. Make use of biotechnological and allied fields to explore different strategies 3. Designing the research strategy 4. Conclude the research finding through presentation and technical report

Seminar & Term Paper (17M17BT211): 1. Make use of existing literature to define a research problem. 2. Survey the available scientific resources & databases to address the problem 3. Evaluate and critique acquired knowledge 4. Conclude through oral and written scientific presentations

Course Outcome (Semester-4)

Dissertation (17M17BT216): 1. Survey research based literature to develop hypothesis 2. Design the experimental outlay to address the defined problem. 3. Evaluate and interpret key findings to provide solution 4. Create/ design the scientific report and communicate effectively the research data

Industrial Project (17M17BT217): 1. Choose an organization and relevant project as problem 2. Propose a research plan on acquired scientific concepts and tools to address the defined problem 3. Test for and analyze knowledge to construct solution for the identified problem 4. Compose and present the work done and discuss the research outcomes

PROGRAMME NAME: M.SC. MICROBIOLOGY

Programme Educational Objectives (PEOs):

PEO 1: To impart advanced theoretical and practical knowledge in Microbiologyand allied fields of Biotechnology
PEO2: To enhance knowledge and expertise for a successful career in academics, research and industry.
PEO3: To develop professionals with social, environmental and ethical awareness.

Table 7: Programme Outcomes (POs):

PO1: Demonstrate mastery over the subject area
PO2: Apply advanced knowledge in academics and research for lifelong learning
PO3: Able to developskill to presentand write scientific report(s) using ethical guidelines

Table 8: Programme Specific Outcomes (PSOs):

PSO1: Apply knowledge of Microbiology for health environmental industrial sustainable energy and societal applications in an ethically responsible way.

Table 9: Academic Year 2019-20 Course Outcomes (COs)

Course Outcome (Semester-1)

Microbial Physiology and Diversity (19M21BT111): 1. Classify the Diversity amongst archae, eubacteria and other microorganisms 2. Demonstrate ecological diversity, habitat interaction and microbial relationship. 3. Identify microbial nutritional, growth requirements and associated physiological mechanisms. 4. Analyze the different modes of metabolism in microorganisms.

Biostatistics and Applications (15B1NBT832): 1. Explain the various statistical methods to design a biological studies and data representation. 2. Apply different statistical methods and approaches to study the significance of a study. 3. Examine the relationship between different parameters of a study.   4. Choose appropriate statistical methods, tools and resources including prediction, validation and evaluation of the biological studies.

Microbial Genetics and Molecular Biology (19M21BT115): 1. Explain fundamental principles of molecular biology and technological advances in the field 2. Apply knowledge of microbial genome architecture and gene regulation 3. Analyse various methods of gene transfer and extra-chromosomal inheritance 4. Interpret different aspects of DNA mutations, DNA repair, Linkage & Mapping

Biomolecules (19M21BT113): 1. Explain the biomolecules structure and function 2. Analyze bioenergetics and metabolic pathways for physiological and pathological conditions 3. Apply the concepts of enzymes, hormones and signalling 4. Illustrate the basics in genomics and proteomics

Microbiology Lab-I (19M25BT111): 1. Understand various culture media, their applications and methods of sterilization 2. Apply standard microbiological techniques for isolation, culturing and enumeration of microorganisms 3. Make use of different methods for microbial identification and characterization 4. Compare methods of DNA isolation from microorganisms

Presentation and Communication Skills (19M21HS111): 1. Develop an in-depth understanding and appreciate the subtle aspects of English as a communication tool. 2. Assess the communication challenges of a diverse, global marketplace 3.

Create and Compose different forms of Professional writing 4. Evaluate the effectiveness of sample presentations 5. Apply the acquired skills in delivering effective presentations

Course Outcome (Semester-2)
Enzymes and Bioprocess Technology (19M21BT117): 1. Explain biochemical reactions and structure function relationships of different classes of enzymes 2. Apply production and optimization methods for industrial products 3. Apply microbial growth kinetics and bioreactors for production 4. Examine applications of enzyme technology and bioreactor engineering
Environmental Microbiology (19M21BT114): 1. Explain principle associations and role of microbes in ecosystem functioning 2. Identify contribution of microbes to various environments and demonstrate their application potential 3. Analyse different aspects of pollution and suggest methods of detoxification for polluted environments 4. Take part as productive team members in projects concerning to microbial ecology, soil and environmental microbiology 5. Summarize latest advances in microbe based technologies for applications in energy, environment, agriculture and industry
Medical Microbiology (19M21BT118): 1. Understand the association between microbes and human health 2. Apply advance techniques for disease diagnosis 3. Analyze antimicrobial agents and immune system in microbial diseases 4. Explain the epidemiology of microbial diseases and their effect on global health
Immunology and Immunotechnology (19M21BT116): 1. Explain the role of Immune system in human health and diseases. 2. Apply immunological techniques for diagnosis of various diseases. 3. Make use of antibody engineering for various applications. 4. Apply the advanced Immunological principle and technology for clinical purposes.
Microbiology Lab II (19M25BT112): 1. Apply microorganisms for environmental remediation 2. Make use of microorganisms for production of industrially important enzymes and metabolites 3. Apply immunological principles for understanding of microbial diseases 4. Analyze and compare antimicrobial agents 5. Compare pathogenic microbial genomes using computational tools

PROGRAMME NAME: INTEGRATED M.TECH IN BIOTECHNOLOGY

Programme Educational Objectives (PEOs): Same as **PEOs** of**M.Tech**in**BIOTECHNOLOGY**

POs: Same as **POs of B.Tech**and**M.Tech**in**BIOTECHNOLOGY**

PSOs: Same as **PSOs of B.Tech and M.Tech**in**BIOTECHNOLOGY**

Course Outcomes: Same as **Course Outcomes of B.Tech**and**M.Tech**in **BIOTECHNOLOGY**

COMPUTER SCIENCE & ENGINEERING AND INFORMATION TECHNOLOGY

VISION: To be a centre of excellence for providing quality education and carrying out cutting edge research to develop future leaders in all aspects of computing, IT and entrepreneurship

MISSION 1: To offer academic programme with state of art curriculum having flexibility for accommodating the latest developments in the areas of computer science and IT

MISSION 2: To conduct research and development activities in contemporary and emerging areas of computer science & engineering and IT.

MISSION 3: To inculcate IT & entrepreneurial skills to produce professionals capable of providing socially relevant and sustainable solutions.

PROGRAMME NAME: B.TECH. IN COMPUTER SCIENCE & ENGINEERING

Programme Educational Objectives(PEOs):

PEO 1: To provide core theoretical and practical knowledge in the domain of Computer Science & Engineering for leading successful career in industries, pursuing higher studies or entrepreneurial endeavours.

PEO 2: To develop the ability to critically think, analyze and make decisions for offering techno-commercially feasible and socially acceptable solutions to real life problems in the areas of computing.

PEO 3: To imbibe lifelong learning, professional and ethical attitude for embracing global challenges and make positive impact on environment and society.

Table 1: Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Table 2: Programme Specific Outcomes (PSOs)

PSO 1: Able to identify suitable data structures and algorithms to design, develop and evaluate effective solutions for real-life and research problems.
PSO 2: Able to excel in various programming/project competitions and technological challenges laid by professional societies.

Table 3: Academic Year 2019-20 Course Outcomes (COs)

Course Outcome (Semester-1)

Software Development Fundamentals- I   (15B11CI111): 1.Solve puzzles , formulate flowcharts, algorithms and develop HTML code for building web pages using lists, tables, hyperlinks, and frames. 2. Show execution of SQL queries using MySQL for database tables and retrieve the data from a single table. 3. Develop python code using the constructs such as lists, tuples, dictionaries, conditions, loops etc. and manipulate the data stored in MySQL database using python script. 4. Develop C Code for simple computational problems using the control structures, arrays, and structure. 5. Analyze a simple computational problem into functions and develop a complete program. 6. Interpret different data representation , understand precision, accuracy and error.

Software Development Fundamentals Lab-I   (15B17CI171): 1. Design HTML code for building web pages using lists, tables, hyperlinks, and frames. 2. Formulate flowcharts, algorithms and develop python programs for constructs such as lists, tuples, dictionaries, conditions and loops using Python 3.6.3. Design simple SQL queries using MySQL to create database tables and retrieve the data from a single table.4. Develop C programs for datatypes, expressions, conditional structure, and iterative control structure and pattern generation using Code Blocks and Virtual Lab. 5. Design C programs for array, structure, and functions using Code Blocks and Virtual Lab.

English (15B11HS112): 1. Develop an understanding and appreciate the basic aspects of English as a communication tool. Apply the acquired skills in delivering effective presentations. 2. Demonstrate an understanding of different forms of literature and rhetorical devices.3. Examine literature as reflection of individual and society. 4. Compose different forms of professional writing. 5. Apply Phonetics through theory and practice for better pronunciation

Mathematics I (15B11MA111): 1. Explain the concepts of limits, continuity and differentiability of functions of several variables. 2. Explain the Taylor's series expansion of functions of several variables and apply it in finding maxima and minima of functions. 3. Make use of double and triple integrals to find area and volume of curves and surfaces. 4. Explain the concepts of vector calculus and apply Green's, Stoke's and Gauss divergence theorems in engineering problems. 5. Solve the ordinary differential equations and explain the concepts of Laplace transform for solving engineering problems. 6. Utilize matrix algebra for solving a system of linear equations and explain eigenvalues, eigenvectors, diagonalization and quadratic form.

ENGINEERING DRAWING & DESIGN (18B15GE111): 1. Recall the use of different instruments used in Engineering Drawing and Importance of BIS and ISO codes.2. Illustrate various types of mathematical curves and scale. 3. Classify different types of projection and Construct Orthographic projection of Point, Line, Plane and Solid. 4. Construct Isometric Projection and Conversion of Orthographic view to Isometric view and vice-versa. 5. Construct Engineering model in Drawing software (AutoCAD) and Compare it with conventional drawing.

Physics-1 (15B11PH111): 1. Recall the basic principles of physics related to optics, relativity, quantum mechanics, atomic physics and thermodynamics. 2. Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved. 3. Apply the concepts/principles to solve the problems related to wave nature of light, relativity, quantum mechanics and atomic physics. 4. Analyze and examine the solution of the problems using physical and mathematical concepts involved.

PHYSICS LAB-1 (15B17PH171): 1. Recall optics and modern physics principles behind the experiments. 2. Explain the experimental setup and the principles involved behind the experiments performed. 4. Plan the experiment and set the apparatus and take measurements. 5. Analyze the data obtained and calculate the error. 6. Interpret and justify the results.

Course Outcome (Semester-2)

Software Development Fundamentals - II (15B11CI211): 1. Develop C programs using structures, pointers, functions, and files.2. Solve problems related to data storage, retrieval, searching, and sorting by utilizing stack/queue. 3. Make use of linked list to solve various problems. 4. Apply binary tree data structure to perform operations like searching, insertion, deletion, and traversing. 5. Explain basic features of object-oriented design such as objects, classes, encapsulation, polymorphism, inheritance, and abstraction. 6. Develop C++ programs using OOPs concepts like encapsulation, inheritance, polymorphism, and standard template library.

Software Development Fundamentals – II Lab (15B17CI271): 1. Make use of structures, pointers, functions, and files to build basic C programs. 2. Construct stack/queue based solutions for data storage, retrieval, searching, and sorting problems. 3. Apply linked list data structure to solve problems like polynomial operations and sparse matrix representation. 4. Build operations like searching, insertion, deletion, traversing on binary tree data structure. 5. Demonstrate fundamental concepts of object-oriented programming i.e. objects, classes, encapsulation, polymorphism, inheritance, and abstraction. 6. Apply object-oriented programming features like encapsulation, Inheritance, Polymorphism, and Standard Template Library to construct C++ programs.

Mathematics-2 (15B11MA211): 1. Apply different methods for solving ordinary differential equations of second order.
2. Explain different tests/methods of convergence for infinite series.3. Find the series solution of differential equations and use it to construct Legendre's polynomials and Bessel's functions.4. Classify the partial differential equations and apply Fourier series to find their solution.5. Explain Taylor's & Laurent's series expansion, singularities, residues and transformations.6. Apply the concept of complex variables to solve the problems of complex differentiation and integrations.

Workshop (18B15GE112): 1. Learn the basic of manufacturing environment and various safety measures associated with it. 2. Apply the appropriate tools to fabricate joints utilizing work-bench tools. 3. Create various prototypes in the carpentry trade, fitting trade, and welding trade. 4. Demonstrate the working principle of lathe, shaper and milling machines and able to fabricate the prototypes of desired shape and accuracies.

Electrical Science-1 Lab(15B17EC171): 1. Understand various active, passive components and instruments such as multimeter, bread board, regulated D.C. power supply. 2. Acquire the knowledge of electrical network and circuit such as branch, node, loop and mesh in networks and circuits. 3. Study and verification of reduction technique in the electrical circuits using different network theorems. 4. Study and verification of series & parallel AC circuits as well as open & short circuits test in single phase transformer.

Electrical Science-1 (15B11EC111): 1. Recall the concepts of voltage, current, power and energy for different circuit elements. Apply the Kirchhoff laws and different analyzing techniques to identify the different circuit parameters. 2. Define and apply the networks theorems in the complex AC and DC circuits, networks. Demonstrate the physical model for given Sinusoidal AC signal and construct the phasor diagrams. 3. Demonstrate the concept of resonance and operate different instrumental and measurement equipments. 4. Demonstrate the construction and working of single phase transformer

Physics-2 (15B11PH211): 1. Recall the basic concepts relating to electromagnetic theory, statistical physics, lasers, fiber optics and solid state physics. 2. Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved. 3. Apply the basic principles in solving variety of problems related to lasers, electromagnet theory, fiber and solid state physics. 4. Analyze and examine the solution of the problems using physical and mathematical concepts involved in the course.

Physics Lab-2 (15B17PH271): 1. Recall laser, fibre optics, semiconductor and solid state physics principles behind the experiments. 2. Explain the experimental setup and the principles involved behind the experiments performed. 3. Plan the experiment and set the apparatus and take measurements. 4. Analyze the data obtained and calculate the error. 5. Interpret and justify the results.

Course Outcome (Semester-3)

Theoretical Foundations of Computer Science (15B11CI212): 1. Apply the concepts of set theory, relations and functions in the context of various fields of computer science e.g. Database, Automata, Compiler etc. 2. Evaluate Boolean functions and Analyze algebraic structure using the properties of Boolean algebra. 3. Convert formal statements to logical arguments and correlate these arguments to Boolean logic, truth tables, rules of propositional and predicate calculus. 4. Apply the fundamental principle of counting, combinatorics and recurrence relations to find the complex pattern and sequences in given datasets. 5. Apply graph theory concepts for designing solutions of various computing problems e.g. shortest path, graph coloring, job sequencing etc. 6. Explain basic concepts of automata theory and formal languages e.g. Finite automata, regular expressions, context-free grammars etc.

Data Structures (15B11CI311): 1. Explain abstract data types, memory allocation schemes. and need of linear and non-linear data structures. 2. Apply OOPS concepts like Polymorphism, Templates, STL, *etc.* to implement various linear data structures, searching, and sorting. 3. Analyze the performance of various sorting and searching techniques.4. Demonstrate and implement various operations like search, traverse, insertion, deletion, *etc.* on different non-linear data structures. 5. Apply appropriate data structure to design an efficient solution for given and identified problem.

Data Structures Lab (15B17CI371): 1. Develop programs using object oriented programming (C++) including STL 2. Develop various searching (Linear, Binary, Interpolation, Median) and sorting (Merge, Radix, and Quick) algorithms 3. Experiment with lists, multi linked list for sparse matrix representation, rat in a maze problem, n queens problem, etc. 4. Develop the programs for different tree data structure operations like, storage, search, traverse, insertion, deletion, updating, etc. on binary trees, k-ary trees, binary search trees, AVL trees, heap trees, B trees and B+ trees. 5. Develop the various operations (Storage, Search, Traverse, Insertion, Deletion, Updating, Path finding, Minimum spanning tree etc.) on different Graph data structures. 6. Develop the programs for priority queue and hashing techniques.

Database Systems and Web (15B11CI312): 1. Explain the basic concepts of Database systems and Web components. 2. Model the real world systems using Entity Relationship Diagrams and convert the ER model into a relational logical schema using various mapping algorithms. 3. Develop a simple web application with client and server side scripting using Javascript and PHP and connect with a given relational database. 4. Make use of SQL commands and relational algebraic expressions for query processing. 5. Simplify databases using normalization process based on identified keys and functional dependencies. 6. Solve the atomicity, consistency, isolation, durability, transaction, and concurrency related issues of databases.

Database Systems and Web Lab (15B17CI372): 1. Explain the basic concepts of Database systems and Web components. 2. Develop web page using HTML, CSS with client side scripting using javascript. 3. Develop a simple web application with client and server side scripting using Javascript and PHP and connect to a given relational database. 4. Programming PL/SQL including stored procedures, stored functions, cursors, Triggers. 5. Design and implement a database schema for a given problem-domain and normalize a database. 6. Design a Project based on database management.

Electrical Science -2 (15B11EC211): 1. Study and analyze the first-order and second-order passive circuits. 2. Demonstrate the operational amplifier and logic gates and their applications in analog and digital system design. 3. Define the basics of signals, systems and communication. 4. Illustrate the electrical machines, transformers and analogous of electrical & mechanical systems.

Electrical Science Lab-2 (15B17EC271): 1.Understand Transient analysis and steady state response of series RC circuit. 2. Acquire the knowledge of circuits like Adder, Subtractor, Integrator, differentiator; inverting and non inverting amplifier circuits realized using Op-amp IC-741. 3. Study and Implementation of the different logic gates. 4. Construct Adder, Subtractor and Multiplexer circuits using logic gates.

Economics (15B11HS211): 1.Explain the basic micro and macro economics concepts. 2. Analyze the theories of demand, supply, elasticity and consumer choice in the market. 3. Analyze the theories of production, cost, profit and break even analysis 4. Evaluate the different market structures and their implications for the behavior of the firm. 5. Examine the various business forecasting methods. 6. Apply the basics of national income accounting and business cycles to Indian economy.

Course Outcome (Semester-4)

Algorithms & Problem Solving (15B11CI411):1.Analyze the complexity of different algorithms using asymptotic analysis.2. Select an appropriate data structure and apply related operations for a given problem.3. Apply algorithmic principles for solving a given problem.4. Identify, formulate and design an efficient solution to a given problem using appropriate data structure and algorithm design technique.
Algorithm and Problem Solving Lab (15B17CI471): 1.Choose and define appropriate data structure to a given problem 2. Understand various data structures and algorithm design techniques with the help of examples. 3. Apply and build various algorithms and design techniques to solve the given problem. 4. Analyze the algorithm by their complexity using asymptotic analysis. 5. Evaluate the correctness and complexity of the algorithm for a given problem. 6. Formulate, elaborate and design an efficient solution to a given problem using appropriate data structure and algorithm design technique
Life Skills (15B11HS111): 1.Understand Life Skill required to manage self and one's environment 2. Apply comprehensive set of skills for life success for self and others 3. Analyze group dynamics for its effective functioning. 4. Evaluate the role of women leadership and gender issues
Principles of Management (15B1NHS434): 1.Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving. 2. Examine the relevance of the political, legal, ethical, economic and cultural environments in global business. 3. Evaluate approaches to goal setting, planning and organizing in a variety of circumstances. 4. Evaluate contemporary approaches for staffing and leading in an organization. 5. Analyze contemporary issues in controlling for measuring organizational performance.
Environmental Studies (19B13BT211): 1.Explain diversity of environment, ecosystem resources and conservation . 2. Identify various pollution related hazard and their safe management 3. Apply modern techniques for sustainable Urban planning and Disaster management 4. Recall Government regulations, Environmental Policies, Laws & ethics 5. Survey ground situation on specific environmental aspects, examine risks involved, make a field report and present the findings
Financial Accounting (15B1NHS435): 1.Understand the basic concepts of Accounting. 2. Apply accounting concepts for recording of business transactions. 3. Compare and reconcile the accounting records with other sources of information 4. Evaluate the accounting records to identify and rectify the errors made during accounting process. 5. Construct the final accounts of a business
Introduction to Literature (15B1NHS431): 1.Understand figurative language to demonstrate communication skills individually and in a group. 2. Develop a critical appreciation of life and society through a close reading of select texts 3. Analyze a literary text thematically and stylistically and examine it as representing different spectrum of life, human behavior, and moral consciousness of society. 4. Interpret Literature as reflection of cultural and moral values of life and society
Introduction to Psychology (15B1NHS432): 1.Demonstrate a basic understanding of different perspectives and concepts of psychology 2. Apply the concepts of psychology in day to day life 3. Examine the different theoretical perspectives and models of psychology 4. Develop solutions for problems related to psychology using appropriate tools/models
Introduction to Sociology (15B1NHS433): 1.Demonstrate an understanding of sociological perspectives and concepts. 2. Explain the concept of social stratification and types of stratification as class, caste and gender. 3. Apply the major sociological perspectives, concepts and methods in the systematic study of society 4. Analyze the relevance of various social Institutions in societies and how it shapes and influences social interactions.
Sociology of Youth (16B1NHS 531): 1.Demonstrate an understanding of sociological perspectives and concepts. 2. Explain the concept of social stratification and types of stratification as class, caste and gender. 3. Apply the major sociological perspectives, concepts and methods in the systematic study of society 4. Analyze the relevance of various social Institutions in societies and how it shapes and influences social interactions.
Probability and Random Processes (15B11MA301): 1. Explain the basic concepts of probability, conditional probability and Bayes' theorem. 2. Identify and explain one and two dimensional random variables along with their distributions and statistical averages. 3. Apply some probability distributions to various discrete and continuous problems. 4. Solve the problems related to the component and system reliabilities. 5. Identify the random processes and compute their averages. 6. Solve the problems on Ergodic process, Poisson process and Markov chain.
Digital Systems Lab (18B15EC213): 1. Develop the MATLAB programs based on the concept of combinational digital circuits. 2. Develop the MATLAB programs to apply the theory of sequential digital circuits. 3. Experiment with MATLAB to apply the theory of signals & systems and digital signal processing. 4. Experiment with MATLAB to apply the concept of digital communication.
Digital Systems (18B11EC213): 1.Familiarize with the fundamentals of number system, Boolean algebra and Boolean function minimization techniques. 2. Analyze and design combinational circuits using logic gates. 3. Analyze state diagram and design sequential logic circuits using flip flops. 4. Understand the classification of signals & systems and learn basic signal operations & Fourier analysis. 5. Understand various steps involved in digitization and transmission of a signal.
Principles of Management (15B1NHS434): 1.Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving. 2. Examine the relevance of the political, legal, ethical, economic and cultural environments in global business. 3. Evaluate approaches to goal setting, planning and organizing in a variety of circumstances. 4. Evaluate contemporary approaches for staffing and leading in an organization. 5. Analyze contemporary issues in controlling for measuring organizational performance.
Quantitative Methods for Social Sciences (16B1NHS332): 1. Demonstrate the key concepts of different quantitative methods used in social sciences. 2. Classify and summarize the data to be used for analysis. 3. Apply the theoretical concept to perform basic data analysis in social sciences 4. Examine different statistical methods and be able to discuss the merits and limitations of a particular method. 5. Recommend appropriate conclusions following empirical analysis
Course Outcome (Semester-5)
Computer Networks (15B11CI511): 1.Defining the basics of networking, delay components and underlying technologies. 2. Illustrate the various key protocols in OSI model and TCP/IP protocol suite and explain various application protocols. 3.

Examine various transport protocols and its performance enhancing mechanisms. 4. Determine the shortest path for the network using various routing protocols and evaluate it. 5. Choose IP & MAC addressing mechanisms and data link layer protocols to solve communication, error detection and correction problems.

Computer Networks Lab (15B17CI571): 1. Classify all the wired/wireless technologies and the basic network building blocks. 2. Visualize and analyze the data packets of different TCP/IP layers. Store the data packets as *.pcap files. 3. Create client and server applications using the "Sockets" and the implementation of various protocols at Data link layer. 4. Model a communication network and Estimate the performance of the protocols at Network and Transport layer.

Information Security Lab (15B17CI576): 1.Demonstrate and illustrate the different cipher techniques and understand various anti-virus and anti worms. 2. Develop and make a code to implement various Symmetric key , Asymmetric key cryptographic techniques and steganography techniques. 3. Apply a client server programming for symmetric, asymmetric algorithms and key exchange algorithms, Application of information security to real world problems. 4. Examine and analyze the packet information for different protocols using Wireshark.

Software Engineering (15B11CI513): 1.Explain software engineering principles and software process models for project development, tool study. 2. Identify functional and non-functional requirements of a software project and design document software requirements specification. 3. Design, represent and document software requirements specification. Plan and execute activities for a software project. 4. Apply UML modeling for software design from software requirements specification. 5. Analyze code checklist. Perform code Reviews, Code Refactoring, and Code optimization, design pattern. 6. Apply testing principles, develop and implement various manual and automated testing procedures, formal methods. 7. Evaluate software in terms of general software quality attributes and possible trade-offs presented within the given problem.

Software Engineering Lab (15B17CI573): 1. Explain software engineering principles and software process models for project development, software requirements specification for a software project. 2. Apply Software Design and modelling. 3. Apply Software Optimizing and Refactoring. 4. Apply testing principles and implement various testing procedures. 5. Creation of software using software engineering principals.

Artificial Intelligence (15B11CI514): 1. Design, implement and analyze the problem solving agents using various informed, uninformed search strategies. 2. Analyze and apply algorithms to solve problems requiring evolutionary search strategies, constraint satisfaction and game theory. 3. Apply model of probabilistic reasoning in incomplete and uncertain environment. 4. Apply fundamental machine learning techniques on given data. 5. Develop the agents with natural language processing and learning capabilities.

Artificial Intelligence Lab (15B17CI574): 1. Construct problem solving agent using various Informed and uninformed search strategies. 2. Utilize evolutionary search algorithms to solve the real world complex problems. 3. Analyze and apply algorithms to solve problems requiring constraint satisfaction and game theory. 4. Demonstrate and understand the inference mechanisms using prepositional and first order logic.

Minor Project-I (15B19CI591): 1.Compare and Contrast all tools and techniques to generate solution that meet specific need to solve complex problems. 2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach. 3. Develop software systems that meet specified design and performance requirements that contributes to global, economic, environmental and social-context. 4. Evaluate& justify the proposed solution using appropriate learning strategies. 5. Design & develop integrated software models and techniques towards research initiatives.

Open Source Software Lab (15B17CI575): 1. Demonstrate the working of Git repository hosting service through git commands to manage files, support version control and contribute to open source community by providing enhanced versions. 2. Apply a mix of Client, Server and Database technologies to solve Open Source Software issues/ to enhance projects. 3. Develop Server-side programs using python with Database Servers- SQL, MongoDb. 4. Analyze baseline methods for pre-processing, clustering and classification algorithms using scikit-learn python libraries. 5. Build J2EE Programs using JDBC Connectivity with SQL Database and Apache/ Glassfish as web servers.

Principles of Management (15B1NHS434): 1.Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving. 2. Examine the relevance of the political, legal, ethical, economic and cultural environments in global business. 3. Evaluate approaches to goal setting, planning and   organizing in a variety of circumstances. 4. Evaluate contemporary approaches for staffing and leading in an organization. 5. Analyze contemporary issues in controlling for measuring organizational performance.

Sociology of Youth (16B1NHS531): 1.Understand Youth and youth culture in sociological perspectives. 2. Explain the ethical, cultural& social issues concerning youth. 3. Understand youth culture and to interprets the same. 4. Analyze societal problems related to youth in the evolving society.

Planning And Economic Development (16B1NHS532): 1.Understand the issues and approaches to economic development. 2. Apply the concepts of national income accounting, human development index and sustainable development. 3. Analyze the structural characteristics of the economy. 4. Analyze the role of Macroeconomic policies in the development process. 5. Assess the importance of federal development and decentralization.

Matrix Computations (16B1NMA533): 1.Explain the basics of matrix algebra and inverse of a matrix by partitioning. 2. Solve the system of linear equations using direct and iterative methods. 3. Explain the vector spaces and their dimensions, inner product space, norm of a vector and matrix. 4. Apply the Gram-Schmidt process to construct orthonormal basis and Q-R decomposition of a matrix. 5. Construct Gershgorin's circles and solve eigenvalue problems Jacobi, Givens, Householder, power and inverse power methods. 6. Analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.

Theory of Numbers (16B1NMA731): 1.Explain Euclid algorithm, linear Diophantine equations and prime numbers. 2. Solve system of linear congruences using properties of congruences. 3. Explain numbers of special form and number theoretic functions. 4. Apply the concepts of order, primitive roots and indices to solve conguences. 5. Apply Legendre symbol and quadratic reciprocity theorem to solve quadratic congruences. 6. Apply and analyse the concepts of number

theory in hashing, cryptography, calendar and ISBN check digits problems.

Quantam Mechanics for Engineers (16B1NPH531): 1.Remember basics of Quantum Mechanics and its applications. 2. Explain postulates of quantum mechanics, Dirac notation, Schrödinger Equation, Perturbation theory and Qubits. 3. Solve various problems related to different quantum systems and construct quantum circuits using quantum gates. 4. Analyse the results obtained for various physical systems and to establish the advantages of some simple protocols of quantum information processing.

Materials Science (16B1NPH532): 1.Recall variety of engineering materials for their applications in contemporary devices. 2. Explain dielectric, optical, magnetic, superconducting, polymer and thermoelectric properties. 3. Apply properties of dielectric, optical, magnetic, superconducting, polymer and thermoelectric materials to solve related problems. 4. Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various materials.

Laser Technology And Applications (16B1NPH533): 1.Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology. 2. Extend the knowledge of lasers in some applications like LIDAR, laser tracking, bar code scanner, lasers in medicine and lasers in industry. 3. Apply the optical ray transfer matrix to determine the stability of a laser resonator. 4. Distinguish the operational principles of CW, Q-switched, mode locked lasers; laser rate equations for three & four level lasers; different types of laser systems.

Nuclear Science And Engineering (16B1NPH535): 1.Relate terminology and concepts of nuclear science with various natural phenomenon and engineering applications. 2. Explain various nuclear phenomenon, nuclear models, mass spectrometers, nuclear detectors, particle accelerators. and classify elementary particles. 3. Solve mathematical problems for various nuclear phenomenon and nuclear devices. 4. Analyze the results obtained for various physical problems and draw inferences from the results.

Technology And Culture (17B1NHS531): 1.Understand the main theories in cultural management. 2. Identify technological convergence and cultural divergence, relate the differences to the literature and suggest solutions. 3. Interpret and communicate effectively in physical and virtual teams by choosing appropriate concepts, logic and selecting the apt IT tools. 4. Application of the theoretical knowledge to adapt to cultural differences in global work environment.

Basic Numerical Methods (17B1NMA531): 1.Explain the concepts of approximation and errors in computation. 2. Construct numerical methods for algebraic and transcendental equations and their convergence. 3. Outline the methods of interpolation using finite differences and divided difference formulas. 4. Make use of numerical differentiation and integration. 5. Solve the system of linear equations using direct and iterative methods. 6. Solve ordinary differential equations using different numerical methods.

Statistical Information Theory With Applications (17B1NMA533): 1.Explain the notions of information, entropy, relative entropy and mutual information. 2. Explain fuzzy sets and compare the various measures of discrepancy. 3. Develop and compare Shannon-Fano and Huffman source codes using measures of uncertainty. 4. Analyse the notion of distance measure in pattern recognition generated in Intuitionistic fuzzy environment. 5. Apply information theoretic concepts in encryption and decryption.

Strategic Human Resource Management (18B12HS311): 1.Understand human resource management from a strategic perspective and analyze environmental challenges that impact HRM of an organization. 2. Assess the human resource needs of the organization and design recruitment and selection strategies for an organization. 3. Evaluate the processes of training and development, mentoring, performance management, compensation and reward management in an organization and design effective strategies for the same. 4. Critically assess career management system, work-life initiatives and other HRM practices of the organization.

Indian Polity And Constitutional Democracy In India (18B12HS612): 1.Demonstrate an understanding about the current Indian political scenario by knowing about the structure of government in place. 2. Demonstrate an understanding of the role of Indian President, Prime Minister, Governor and other members of the legislature as representatives of the common masses. 3. Analyze the working of Indian federalism with reference to centre-state relations. 4. Analyze the impact of the contemporary challenges such as caste, gender, regionalism to the working of Indian democracy.

Decision Making Using Mathematical And Statistical Approaches (18B12MA311): 1.Explain the concept of decision making under various environments. 2. Apply various methods for solving single stage optimal problems in uncertainty and risk environments. 3. Apply decision tree analysis for solving multiple stage optimal problem. 4. Describe principle of optimality and formulation of dynamic programming problems. 5. Identify, formulate and solve problems arising in financial and industrial applications using dynamic programming techniques.

Logical Reasoning And Inequalities (18B12MA312): 1.Interpret the mathematical foundation of various inequalities. 2. Examine inequalities in the field of information theory and cryptography. 3. Apply the concepts of permutation and combination of multisets in combinatorics. 4. Apply special numbers in combinatorial and number theoretic problems. 5. Explain the basic concepts of logical reasoning and solve related problems.

Entrepreneurial Development (19B12HS311): 1. Understand basic aspects of establishing a business in a competitive environment. 2. Apply the basic understanding to examine the existing business ventures. 3. Examine various business considerations such as marketing, financial and teaming etc. 4. Assessing strategies for planning a business venture.

Course Outcome (Semester-6)

Computational Intelligence (16B1NCI643): 1.Infer vagueness, ambiguity and uncertainty in natural language using fuzzy logic concepts. 2. Apply the intelligent techniques using rough set theory, fuzzy Logic, genetic and hybrid techniques to solve different type of real world problems. 3. Analyze the principles of fuzzification, defuzzification and their applications in different set of problems. 4. Integrate and develop hybrid Intelligent techniques for real time engineering application. 5. Compare and conclude the results of different techniques through writing technical reports

Data And Web Mining (16B1NCI635): 1.Apply the pre-processing techniques to nominal, binary, categorical and ordinal data. 2. Design a Data warehouse using star, snowflake and galaxy schema and perform OLAP operations like roll-up, drill-down, slicing and dicing, etc. 3. Apply a wide range of classification techniques like Naïve-bayes, decision tree, and KNN for the numerous application including fraud detection, target marketing, medical diagnosis, etc. 4. Cluster the similar/dissimilar objects using different methods like partitioning, hierarchical and density based clustering. 5. Analyze the transactional data for finding frequent and interesting patterns using association rule mining techniques like Apriori and FP-Growth. 6. Analyze the link structure of web using page rank and HITS algorithms.

Front End Programming (20B16CS326): 1.Demonstrate new technologies by applying foundation paradigms. 2. Build strong foundations for basic front end tools & technologies thereby making them understand the application development lifecycle. 3. Develop elegant and responsive Front-end by leveraging latest technologies. 4. Explain activity creation and Android UI designing. 5. Develop an integrated mobile application to solve any complex real time problem.

Information Retrieval And Semantic Web (16B1NCI648): 1.Analyze the capabilities and limitations of information retrieval systems. 2. Apply techniques for design and implementation of retrieval systems for text and other media. 3. Analyze the results of retrieval from large quantities of data by using various algorithms of information retrieval and Optimization of the results. 4. Analyze the different retrieval metrics for retrieval evaluation. 5. Understand the concepts of web crawling and web retrieval and its optimization. 6. Apply the taxonomy and ontology concepts, Resource Description Framework (RDF) and web ontology language (OWL) on semantic web applications.

Java Programming (20B16CS322): 1.Write basic Java programs using Java constructs – loops, switch-case and arrays. 2. Define all basic concepts related to OOP concepts. 3. Develop java programs using Java collection framework. 4. Create or design an application based on Java programming constructs.

Literature And Adaptation (16B1NHS636): 1.Understand and outline the elements and theories of adaptation and its various forms, and relate with the texts reflecting the cultural, moral and linguistic changes in the contemporary society. 2. Utilize visual literacy to analyze the language and style adopted in filmed texts and examine them as reflections of Readers' and Audience' values and perceptions in the context of myriad cultures and multidisciplinary settings individually and in groups. 3. Analyze texts and their adaptations beyond the surface level of narrative or character as reflections of value systems of various cultures and times individually and in a team. 4. Evaluate, interpret and document source texts and adaptations thematically and stylistically to learn the nuances of language, culture and values of the society. 5. Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaptation of any literary/non literary piece in another form individually and in groups.

Marketing Management (18B12HS611): 1.To illustrate the fundamentals of marketing, marketing environment and market research. 2. To model the dynamics of marketing mix. 3. To demonstrate the implications of current trends in social media marketing and emerging marketing trends. 4. To appraise the importance of marketing ethics and social responsibility. 5. To conduct environmental analysis, design business portfolios and develop marketing strategies for businesses to gain competitive advantage.

Mathematical Foundations Of Geographic Information Systems (19M12MA611): 1.Understand the concept of trigonometry, Coordinate systems and Geometric transformations and their applications in Geographic Information System.
2. Identify basic set operations and database technology based on predicates, quantifiers and predicate logic. 3. Describe Geo-statistical methods, used for Geographic information systems. 4. Explain quantitative aspects for image analysis by using analytic and numerical methods. 5. Understand the concepts of space and time in spatial information systems and spatiotemporal data models.

Medical And Industrial Applications of Nuclear Radiations (16B1NPH636): 1.Define nuclear structure, properties and reactions; Nuclear magnetic resonance process 2. Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays 3. Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc. 4. Analyze different radiocarbon dating mechanisms and processes

Minor Project-2 (15B19CI691): 1.Compare and Contrast all tools and techniques to generate solution that meet specific need to solve complex problems. 2. Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach. 3. Develop software systems that meet specified design and performance requirements that contributes to global, economic, environmental and social-context. 4. Evaluate & justify the proposed solution using appropriate learning strategies. 5. Design & develop integrated software models and techniques towards research initiatives.

Moralities Of Everyday Life And Moral Decision Making (19B13HS611): 1.Apply and Analyze morality in all facets of personal and professional life. 2. Discover ways to address moral dilemmas by deliberating on the pros and cons to find the best possible outcome. 3. Justify and Formulate morally correct decisions and stand by them. 4. Adapt and develop a character respected by peers and superior alike.

Non-Linear Data Structures & Problem Solving (20B16CS324): 1.Demonstrate operations on different data structures. 2. Use critical thinking skills and creativity to choose the appropriate data structure and solve the given problem. 3. Identify the correctness and efficiency of the solution by constructing different test cases. 4. Develop solutions to real world problems by incorporating the knowledge of data structures.

Numerical Aptitude (16B19MA691): 1.Explain basics of mathematical aptitude. 2. Explain set, functions and representation of numbers. 3. Solve problem on probability theory, quadratic equations and complex numbers. 4. Explain inequalities, mensuration, data interpretation and errors.

Operations Research (18B12MA611): 1.Construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical and simplex method. 2. Apply two-phase, Big-M and dual simplex method for linear programming problems. 3. Make use of sensitivity analysis to linear programming problems. 4. Solve transportation, assignment and travelling salesman problems. 5. Apply cutting plane and branch & bound techniques to integer

programming problems. 6. Examine optimality conditions and solve multivariable nonlinear problems.
Organizational Behaviour (16B1NHS635): 1.Enhance critical thinking of dynamic human behavior through an insight into relationships between individuals, groups and organizations 2. Assess ones and other's individual management style as it relates to influencing and managing behavior in the organization. 3. Plan and adapt set of strategies for meeting the special challenges in the 21st century competitive workplace 4. Assess the potential effects of behavioral factors in an organizational environment
Photovoltatic Techniques (16B1NPH633): 1.Classify various types of renewable energy sources and explain working of photovoltaic device. 2. Demonstrate the use of basic principles to model photovoltaic devices. 3. Identify challenges and apply strategies to optimize performance of various type of solar cells 4. Analyze the Solar PV module, mismatch parameter and rating of PV module 5. Evaluate the performance of various stand-alone PV systems with battery and AC and DC load
Problem Solving Using C And C++ (20B16CS323): 1.Apply and use library functions, pointer arithmetic, arrays, and regular expressions and secure coding practices in programs. 2. Use critical thinking skills and creativity to choose the appropriate containers, iterators and algorithms for a given problem. 3. Demonstrate the use of concurrency principles, input and output streams and defensive techniques in programs.
Project Management (16B1NHS631): 1.Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context. 2. Analyze projects and their associated risks by understanding the various theoretical frameworks, non-numerical and numerical models in order to make correct selection decisions. 3. Evaluate the various stages of project management and identify and determine correct techniques for planning, scheduling, controlling and terminating the projects. 4. Evaluate project management processes, tools and techniques in order to achieve overall project success.
Renewable Energy (16B19EC691): 1.Explain the need of renewable sources of energy, impact of renewable energy on environment, challenges in the electric grid, Smart Grid. 2. Analyze basics of Solar radiation and Solar photovoltaic, Balance of PV systems. 3. Analyze wind energy resource and designing of Wind Energy Generators. 4. Illustrate different biomass energy resources, and extraction of biomass energy.
Social Media And Society (19B12HS612): 1.Infer the implications of digital change, and the concept of social media and e-marketing in the context of the changing marketing landscape. 2. Elaborate the implications of cyberbranding and digitization on online marketing mix decisions. 3. Develop specific models related to social media and social media analytics. 4. Evaluate concepts related to Search Engine Marketing, Customer Centric Web Business models and Web Chain Analysis 5. Illustrate the new age marketing practices.
Solid State Electronic Devices (16B1NPH632): 1.Define terminology and concepts of semiconductors with solid state electronic devices. 2. Explain various electronic, optical and thermal properties of semiconductors; various techniques used in device fabrication. 3. Solve numerical problems based on solid state electronic devices. 4. Examine the impact of various parameters on semiconductor devices and their performances.
Statistics (16B1NMA633): 1.Make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data. 2. Apply correlation and regression in statistical analysis of data. 3. Explain sampling theory and its distributions. 4. Explain the concepts and properties of estimation theory. 5. Apply sampling and estimation theory to find the confidence interval. 6. Analyze small and large sample data by using the test of hypothesis.
Theatre And Performance (16B1NHS634): 1.Demonstrate problem solving ability and effective life skills through theatre performances. 2. Develop awareness of the role of these arts in human life. 3. Apply skills of listening, articulation, awareness and collaboration through the creation of performance. 4. Design and present an original performance alone or in collaboration with other artists.
Theory of Computation And Compiler Design (15B11CI611): 1. Solve the problems related to regular expression, regular grammar, and Finite Automata. 2. Identify the phases of compilers for a programming language and construct the parsing table for a given syntax. 3. Discover syntax directed translation rules for a given context free grammar by examining S-attributed and L-attributed grammars. 4. Construct grammars and machines for a context free and context sensitive languages. 5. Build the intermediate code by applying various code optimization strategies.
Theory of Programming Languages (15B11CI612): 1.Define the characteristics of programming languages and the functionality of various phases of a compiler. 2. Demonstrate the formal grammars, functional programming paradigms, Logic programming paradigms, and multi-language programming concepts. 3. Construct deterministic top-down and bottom-up parsers. 4. Examine fundamental issues underlying the design decisions of different programming languages such as data types, sub programs, sequence control, storage management, event handling, parameter passing, etc. 5. Explain concurrency using C++, Java and Python. 6. Perform comparative evaluation of programming languages with respect to readability, writability, reliability, and cost of execution by selecting an appropriate programming language for evaluation of a computational problem.
Theory of Programming Langauges Lab (15B17CI672): 1.Understand the principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language. 2. Improve the ability of applying appropriate programming languages for various classes of programming problems. 3. Construct and apply programming languages parsers, programming abstractions, Graphical User Interfaces, Common Gate Way applications, database programming using Java and Python programming languages. 4. Analyze and examine the behavior of simple programs in imperative languages using concepts such as binding, scope, control structures, subprograms and parameter passing mechanisms. 5. Evaluate multi-language programming concepts using applicable concurrent programming features of C++, Java, and Python.
Wireless Networks (16B1NCI642): 1.Define basic concepts & terms related to IEEE 802.11wireless networks. 2. Explain cellular concepts of mobile radio propagation in wireless networks, IEEE 802.11 adhoc routing protocols and transport layer protocols. 3. Identify different categories and design issues of IEEE 802.11 MAC protocol. 4. Analyze metrics of MAC & Mobile IP based routing protocols using simulators 5. Evaluate various security parameters in wireless networks.

Cloud Based Entrprise Applications (16B1NCI644): 1.Differentiate between Public, Private, and Hybrid Clouds. 2. Develop Enterprise applications based on XML, JavaScript, Java Servlets, Java Server Pages, etc. 3. Develop web service based solutions by using REST, JSON, SOAP, etc. 4. Examine emerging technologies in cloud environment. 5. Evaluate the performance of different Public Cloud Platforms e.g., GAE, AWS and Azure. 6. Design and deploy Enterprise applications on one of the Cloud Service Providers, i.e., Amazon AWS or Microsoft Azure.

Agile Software Development (16B1NCI634): 1.Interpret the trade-offs between traditional software development methods and agile software development methods for a software project effectively. 2. Identify and make use of an appropriate agile software engineering approach viz. extreme programming, Scrum, Crystal techniques as a part of software development. 3. Apply Refactoring techniques on source code for improved design 4. Choose tools and construct the methods for testing Agile projects using various testing strategies. 5. List the Planning, tracking, estimation and monitoring of agile projects with techniques like burn down charts, velocity calculation and task boards etc.

Introduction To Mobile Application Development (16B1NCI633): 1.Analyze functional aspects of Android mobile operating system for developing Android applications. 2. Explain how Android applications work, their life cycle, manifest, Intents, event handling and using external resources. 3. Design and develop useful Android applications with compelling user interfaces by using, extending, and creating own layouts using different adapters and picker views, fragments, sending and receiving SMS and email. 4. Make use of Google Map API to develop location aware services through Internet for mobile environments. 5. Apply functional aspects of database handling to develop Android applications using SQLite database.

IoT And IoT Security (19B12CS311): 1.Define basic terminologies related to IoT and IoT security. 2. Explain IoT reference model, different architectural views and security aspects moving from machine to machine (M2M) technology to Internet of Things. 3. Identify infeasibility of hardware and software design constraints due to specific security implementations in real scenarios. 4. Analyze the security related challenges at various layers and security mechanisms adapted to address them. 5. Evaluate the performance of various IoT security protocols implemented at different layers.

Advanced Data Structures And Applications (16B1NCI631): 1.Comprehend insights of various variants of string processing and space partitioning data structures. 2. Build efficient storage and sorting mechanisms for large datawith the help of k-way merge-sort algorithm. 3. Analyze various advanced data structures- BST variants, Heap variants, Indexed Trees, Disjoin Set etc. 4. Compare performance of various Hashing algorithms. 5. Propose solutions for the real life problems with the aid of suitable data structures.

Big Data Analytics (19B12CS419): 1.Understand and Compare SQL, NOSQL and NewSQL database 2. Identify NoSQL /New SQL Systems to Store and process large volumes of structured and unstructured data 3. Develop a simple application and connect with a NoSQL database or Hadoop distributed file system. 4. Apply machine learning algorithms for data analysis. 5. Analyze parallel models of evolutionary algorithms for solving computation intensive problems.

Compiler Design (15B17CI671): 1.Design different types of automata. 2. Design programs using Lex and Yaac tools. 3. Apply lex and yacc programs to create lexical analyzer and language scanners and parsers. 4. Examine and construct different lexical analyzers and parsers.

Blockchain Technology (19B12CS312): 1.Define all the basic terminologies related to blockchain, bitcoin, decentralized applications and smart contracts. 2. Understand the pillar security featured in decentralized networks like cryptography, digital signatures, Proof of work and consensus algorithms. 3. Identify the feasibility of applying blockchain security features in real world scenarios using different consensus algorithms. 4. Analyze various consensus algorithms like PoW, PoS, PoB, Raft consensus, Paxos consensus, BFT etc. 5. Evaluation of blockchain based consensus algorithms namely Byzantine fault tolerance, proof of work etc.

Cloud Based Entrprise Applications (16B1NCI644): 1.Differentiate between Public, Private, and Hybrid Clouds. 2. Develop Enterprise applications based on XML, JavaScript, Java Servlets, Java Server Pages, etc. 3. Develop web service based solutions by using REST, JSON, SOAP, etc. 4. Examine emerging technologies in cloud environment. 5. Evaluate the performance of different Public Cloud Platforms e.g., GAE, AWS and Azure. 6. Design and deploy Enterprise applications on one of the Cloud Service Providers, i.e., Amazon AWS or Microsoft Azure.

Applicational Aspects Of Differential Equations (20B12MA311): 1.Solve ordinary differential equations in LCR and mass spring problems. 2. Explain orthogonality of functions and apply it to solve Sturm-Liouville boundary value problems. 3. Apply matrix algebra to find the solution of system of differential equations. 4. Formulate and solve first and second order partial differential equations. 5. Evaluate solution of differential equations arises in the field of engineering applications.

Applied Mathematical Methods (18B12MA612): 1.Explain the functional and its variations required to optimize the physical problem. 2. Apply different forms of Euler–Lagrange equation on the various variational problems with fixed boundaries. 3. Explain different types of integral equations including their conversions from IVP and BVP. 4. SolveVolterra and Fredholm integral equations using various analytical methods. 5. Explain various numerical methods along with their stability analysis. 6. Apply different numerical methods for solving differential equations.

Applied Mushroom Biology (16B19BT692): 1. Define mushroom biology. 2. Experiment with mushroom cultivation. 3. Explain environmental and medicinal aspects of mushroom. 4. Analyze economics of mushroom cultivation.

Effective Tools For Career Management And Development (18B13HS612): 1 Assess ones personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities.2. Apply knowledge of all the Career Stages in making informed career decisions.3. Develop and maximize ones potential for achieving the desired career option. 4. Analyze the processes involved in securing and managing career by employees of different organizations.

Global Politics (20B12HS311): 1. Demonstrate an understanding of the meaning and nature of globalization by addressing its political, economic, cultural and technological dimensions. 2. Analyzing the significance of contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security to global governance. 3. Analyze how the global politics shapes domestic politics. 4. Demonstrate an understanding of the working of

the global economy, its anchors and resistances offered by global social movements.

International Trade & Finance (19B12HS613): 1. Explain the foundations of international trade and finance in the era of globalisation. 2. Analyze the major models and theories of international trade. 3. Identify the effects of tariffs, quotas and technical progress on economic growth. 4. Examine the equilibrium in the Balance of Payments (BOP) and measures to correct disequilibrium. 5. Compare the fixed and flexible exchange rate, monetary policy and foreign trade multiplier. 6. Analyze the working of regional blocks & international organization.

Literature And Adaptation (16B1NHS636): 1. Understand and outline the elements and theories of adaptation and its various forms, and relate with the texts reflecting the cultural, moral and linguistic changes in the contemporary society. 2. Utilize visual literacy to analyze the language and style adopted in filmed texts and examine them as reflections of Readers' and Audience' values and perceptions in the context of myriad cultures and multidisciplinary settings individually and in groups. 3. Analyze texts and their adaptations beyond the surface level of narrative or character as reflections of value systems of various cultures and times individually and in a team. 4. Evaluate, interpret and document source texts and adaptations thematically and stylistically to learn the nuances of language, culture and values of the society. 5. Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaptation of any literary/non literary piece in another form individually and in groups

Econometric Analysis (19B12HS611): 1. Demonstrate the key concepts from basic statistics to understand the properties of a set of data. 2. Apply Ordinary Least Square method to undertake econometric studies. 3. Examine whether the residuals from an OLS regression are well-behaved. 4. Evaluate different model selection criteria for forecasting. 5. Create models for prediction from a given set of data.

Light Emitting Diodes- Basics & Applications (16B19PH692): 1. Recall the basic concepts of semiconducting materials, working of p-n junction diode and light emitting diodes. 2. Explain the various physical parameters involved in designing and fabrication of LEDs. 3. Solve various problems related to efficiency, emission intensity and spectrum of LEDs. 4. Analyse the problems in designing & fabricating blue, white and green high brightness LEDs.

Computational Physics (16B1NPH631): 1. Define key concepts used in Monte Carlo Simulation, Random walks, percolation and Numerical methods 2. Explain basics of numerical analysis, statistical mechanics, Monte Carlo simulations, percolation, random walks, neural networks 3. Model and simulate magnetic systems, polymers and networks; interpret simulation data 4. Develop advanced Monte Carlo techniques to solve Optimization problems. Simulate percolation of complex networks.

Course Outcome (Semester-7)

Advanced Databases (17B2NCI735): 1. Analyze concurrency control, transaction and recovery in data management. 2. Choose appropriate ways to optimize queries. 3. Apply queries in different forms (relational algebra, SQL, XQuery, CQL etc). 4. Apply queries in different forms (relational algebra, SQL, XQuery, CQL etc). 5. Devise appropriate ways to store and index data for particular types of data. 6. Develop and connect a sample web application with a given NOSQL database.

Bioinformatics Algorithms (17B1NCI736): 1. Relate to different computational challenges in Computational Molecular Biology. 2. Examine proper algorithmic concepts to solve a computational problem. 3. Determine the importance of traditional to contemporary approaches for solving the biological problems. 4. Design strategy to resolve real-world biological challenges. 5. Identify appropriate algorithmic technique to solve a given bioinformatics related task. 6. Develop an optimized solution model for computational biology problems. 7. Formulate prediction tools and estimate the solutions for biological problems.

Ethical Hacking (18B12CS434): 1. Define what is ethical hacking and penetration testing, and when and why penetration testing is required along with testing phases. 2. Classify and outline the penetration testing phases and relate the phases to the specified context. 3. Identify and analyse the stages a penetration tester requires to take in order to compromise a target system. 4. Examine and implement tools and techniques to carry out a penetration testing. 5. Critically evaluate security techniques used to protect system and user data to suggest countermeasures.

Computer Graphics(17B2NCI731): 1. Explain the basics and core concepts of computer graphics including different graphics systems, usage of GPUs, applications of computer graphics, and others. 2. Compose scenes by applying common 2D & 3D graphics algorithms such as, viewing transformations, clipping, projections, rendering, etc. using OpenGL. 3. Analyze models for lighting – distant and multiple light sources; reflection and models for shading – flat, smooth, Phong, etc. 4. Demonstrate the use of planer and surface curves, and use of visible surface detection methods for scene presentation. 5. Explain animation and key framing. 6. Interpret and critique procedural modelling, fractals, and particle systems and critique existing systems.

Large Scale Database Systems (18B12CS437): 1. Infer the background processes involved in queries and transactions, and explain how these impact on database operation and design 2. Explain the concept and challenge of big data and demonstrate the comparison of relational database systems with NoSQL databases 3. Compare and discover the suitability of appropriate large databases to manage, store, query, and analyze various form of big data 4. Apply techniques for data fragmentation, replication, and allocation to design a distributed or parallel database system

IoT Analytics (19B12CS426): 1. Understand how analytics relates to IoT data 2. Apply appropriate machine learning, Deep Learning algorithms to gain business insights from IoT data. 3. Analyze various big data platforms and massively parallel processing databases for IoT systems 4. Examine how streaming and predictive analytics can be used for IoT Data processing and analysis, in real time. 5. Understand the concept of network flow analytics using Flexible NetFlow in IoT systems. 6. Evaluate the performance of the overall system and security in IoT network. 7. Design methods and develop web based IoT applications using big data analytics for real world problems

Natural Language Processing (17B2NCI742): 1. Identification and description of various stages of Natural Language Processing (NLP). 2. Determine, identify and apply models related to NLP in distinguished application domains. 3. Classify and analyze various challenges, issues and complexity in NLP systems. 4. Compare and assess a variety of existing and emerging use cases and technologies for NLP. 5. Design and develop novel NLP applications.

Social Network Analysis (15B1NCI738): 1. Define social network growth models and their characteristics. 2. Compare and interpret social network structure, size and its connectivity pattern using degree distribution, clustering coefficient, centrality, motifs, density, etc. 3. Apply link prediction techniques like Jaccard Coefficient, Adamic Adar, Preferential attachment, Katz score, etc. to discover new links in the social network 4. Discover community structure in complex network using statistical techniques like Newman Girvan, Clique Percolation Method, Ford Fulkerman etc. 5. Model the cascading/flow of information in social network for maximizing the cascade, locating the seed nodes and influential nodes. 6. Develop secured social networks by applying mechanisms like K-anonymity, L-diversity, T-closeness, etc. to ensure privacy and security.

Learning and Natural Language Processing(17B1NCI731): 1. Explain different syntax and semantics approaches in NLP 2. Understand the fundamental mathematics applied in the field of NLP 3. Apply different models like Hidden Markov Model, SVM, CRF, RNN, LSTM in parts of speech tagging. 4. Apply different probabilistic parsing techniques in NLP 5. Apply different supervised and unsupervised techniques for document classification. 6. Analyse and apply appropriate Machine Learning techniques to solve the real world problem in NLP

Interconnection Networks in Computer Architecture (16B1NCI836): 1. Outline the architecture, design methodology, and characteristics of interconnection networks 2. Identify various topologies and routing schemes for On-Chip Networks 3. Analyze various flow control mechanisms in On-Chip Networks for deadlock/livelocks avoidance 4. Explain the functioning of Arbitration and Allocation schemes in router's micro-architecture 5. Propose and present solutions for effective communication in various interconnection network architectures

Major Project (15B19CI791): 1. Summarize the contemporary scholarly literature, activities, and explored tools for hands-on in the respective project area 2. List out the specific requirements to develop the workable solution for the identified computing problem. 3. Develop a workable computing solutions for the identified problem 4. Evaluate the performance of the developed solution 5. Improve the communication and writing skills in terms of presenting the results in written and verbal formats

Summer Trainning Viva (15B19CI793): 1. Summarize the contemporary activities with respect to their module, and explored tools for hands-on in the respective project area 2. Analyse industry requirements and work culture 3. Apply technical knowledge to construct computing-based solution with respect to the identified problem at industry/institute. 4. Interpret and critically evaluate the solution for the problem. 5. Create written discourse for presentation of work done at industry/institute.

IoT ARCHITECTURE AND PROTOCOLS (18B12CS440): 1. Identification and description of various components of Internet of Things (IoT) 2. Outline and illustrate various IOT architecture protocols and their applications in the real world applications 3. Identify and model various requirements of IoT for real world applications 4. Compare and assess a variety of existing and developing architecture technologies for IoT

Mathematical Foundations for Intellegent Systems (19B12CS422): 1. Explain the concepts of computing eigenvectors, vector spaces , manipulate linear transformation and various decomposition techniques, probability, entropy . 2. Explain concepts of unconstrained , constrained optimization ,convexity, blackbox& global Optimization , langrange's function .and its application such as Support Vector Machine etc.: 3. Explain concepts of time series analysis, linear vector calculus, Multivariable Calculus, Multivariate Chain Rule Gradient Descent Methods 4. Apply the concepts of linear algebra, probability, Fourier transformation, optimization techniques, concepts of calculus in study of intelligent systems 5. Analyze different approaches for constructing intelligent systems using concepts of linear algebra, probability, Fourier transformation, optimization techniques, concepts of calculus in study intelligent systems

Nature Inspired Computing (16B1NCI833): 1. Explain the concepts of problem solving via search, optimization and pattern recognition with various practical examples. 2. Apply the NIC methods to model, learn and optimize computing problems. 3. Analyze the key ideas, algorithmic steps of various nature inspired computing methods and their general applicability in various domains. 4. Compare and contrast the similarities and differences among various nature inspired computing methods. 5. Formulate and design an efficient solution to a given problem by using the most appropriate nature inspired computing method.

Cloud Computing (17B1NCI747): 1. Understand various Cloud Service Models and Virtualization Technology to Create Virtual Machines for cloud based applications using Virtual Machine Monitors (VMMs). 2. Analyze various VM migration techniques and their performances in cloud environments. 3. Analyze the performances of VMs for application specific cloud environments.4. Analyze and evaluate the performance of various energy aware computational techniques used in Cloud environments.5. Develop sustainable systems using cloud based methods and techniques.

Term Paper, (15B29CI792): 1. Infer the research problem stated along with the research methodologies used and their significance. 2. Appraise technical writing skills to compare and summarize the nature of work done so far in that area. 3. Develop effective communication skills to confidently justify theoretical propositions, methodologies, conclusions and limitations by preparing and presenting a seminar

Introduction to devops (19B12CS427): 1. Students will be able to understand the needs of scaled infrastructure of micro services and devops related process. 2. Students will be able to Plan, measure the need of various types of micro services and devops related process. 3. Students will be able to Write scripts for the creating and deploying the micro services for the Developed Application for the calculated load and error messages. 4. Students will be able to write scripts for the measuring and loading the reports Ansible and Python.

Industrial Automation using Internet of Things (19B12CS424): 1. Development of smart sensors and actuators for smart industry 2.Develop industrial control application using Embedded C and ARM Cortex Microcontrollers 3. Apply new ways of servicing customers and the creation of new revenue models 4. Analyze desired goal of industrial transformation 5. Design and development of IIoT Application for Industry 4.0 Architecture

Software Construction (18B12CS436): 1. Choose appropriate fundamental element of software construction for an actual software development. 2. Apply various Assertion, Error-Handling, Exceptions techniques for defensive programming. 3. Make use of appropriate coding standards and conventions of code construction at class routines, variables, and statements

level. 4. Experiment with code improvement strategies like Code Refactoring, Code Optimization and Tuning. 5. Demonstrate use of software construction techniques like parameterization, debugging and tools for GUI builders, unit testing , profiling, performance analysis and slicing .

Computer & Web Security (17B1NCI732): 1. Assessing computing system's threats and access control in Operating Systems 2. Explain Software Security Issues, their solutions along with cryptography 3. Evaluate various malware detection systems 4. Identify client-side web access threats like cross site scripting and SQL injection 5. Apply mechanisms of correct Identification and Authentication of users of computing resources 6. Examine non-cryptographic network protocol vulnerabilities and their solutions

Introduction to Blockchain(19B12CS420): 1. Understand cryptographic primitives used for cryptocurrency and describe implementation of crypto currency using Blockchain. 2. Design and develop smart contracts and decentralized applications. 3. Examine and implement tools and techniques to build a cryptocurrency and blockchain applications 4. Theoritical analysis of results of different tools using Blockchain through writing technical reports. 5. Design of innovative application models by leveraging the blockchain technology.

Computing for Data Science(19B12CS423): 1. Make use of basic concepts ,methods, and mathematics relevant to computational techniques for data science 2. Develop own statistical analyses and implement them with advanced statistical programming tools 3. Develop and apply advanced and associated computing techniques and technologies. 4. Compare the performance of multiple methods and models, recognize the connections between how the data were collected and the scope of conclusions from the resulting analysis, and articulate the limitations and abuses of formal inference and modeling. 5. Evaluate strategies for constructing models and can use different measures of model fit and performance to assess models.

Machine Learning (16B1NCI831): 1. To learn basic concepts of probability, statistics, linear algebra, convex optimization. 2. To understand concepts of learning system, supervised learning, unsupervised learning. 3. Apply techniques to handle issues related to learning model such as overfitting, feature scaling, dimensionality reduction. 4. Compare the different learning models using the evaluation parameters. 5. Determine the applicability of a learning model for a given problem. 6. Design a learning model for a specific real-world problem.

Managerial & Communication Skills (17B1NHS734): 1. Demonstrate understanding of basic aspects of business communication 2. Assess an individual's communication skills and adapt to meet challenges at the competitive workplace 3. Apply appropriate conflict handling style for effective conflict management 4.Demonstrate understanding about the opportunities and challenges of intercultural communication and in recognizing cultural variations 5. Apply appropriate steps for better decision making by interpreting information 6. Develop an understanding of professional ethics

Human Rights and social justice (17B1NHS733):1. Demonstrate an understanding of the concept and idea of human rights and social justice2. Evaluate and interpret information about human rights issues from various sources like print and electronic media, film, documentary and other information technologies 3. Demonstrate an understanding of the International norms and standards of human rights4. Analyze the emerging dimensions of human rights and the challenges posed by them

Human Resource Analytics (18B12HS411): 1. Understand different analytical techniques used for solving HR related problems. 2. Apply descriptive and predictive analysis techniques to understand trends and indicators in human resource data. 3. Analyze key issues related to human resource management using analytical techniques. 4. Critically asses and evaluate the outputs obtained from analytical tools and recommend HR related decisions. 5. Create hypotheses, propose solutions and validate using appropriate analytical techniques

Graph Algorithms and Applications (17B1NCI748): 1. Find the shortest path, minimum spanning tree, maximum flow, articulation points, bridges, etc. in the given weighted or unweighted graph 2. Model the real world computational problems using graph 3. Apply conventional, approximation and evolutionary algorithmic approaches for graph based computational problems like, covering problems, bipartite set matching, planarity testing, graph reliability, etc. 4. Develop computing solutions for the real world computational problems modelled using graph 5. Analyze the time and space complexities of the designed algorithms and developed solutions for the computational problems

Gender Studies (16B1NHS831): 1. Demonstrate knowledge of the construct of gender and the way it intersects with other social and cultural identities of race, class, ethnicity and sexuality 2. Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity and masculinity 3. Analyze the ways in which societal institutions and power structures such as the family, workplace impact the material and social reality of women's lives 4. Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporary settings 5. Evaluate and interpret information from a variety of sources including print and electronic media, film, video and other information technologies

Disaster Management (15B1NHS731): 1. Understand disasters ,their hazards and natural and social phenomena related to them 2. Analyse information on risks and relief. 3. Make use of disaster management principles and community involvement methods in Disaster Risk Reduction. 4. Evaluate the role of different approaches and Humanitarian Assistance needed to manage pre and post- disaster periods . 5. Formulate strategies for mitigation in future scenarios by applying technological innovations and learning lessons from past.

Customer Relationship Management, 17B1NHS731): 1. Apply the financial, social and electronic aspects of the Customer Relationship in business situations. 2. Appraise the role of customer share and customer centricity in organizations. 3. Develop the skills to understand customization, innovation and co-creation in organizations and apply them in business contexts. 4. Analyze the role of interactive technology for customer engagement, customer retention and customer experience management in organizations. 5. Evaluate the technological solutions and their applications for effective Customer Relationship Management across different functions in organizations. 6. Develop specific models for response modelling and consumer profiling in organizations.

Elements of Statistical Learning (19B12MA411): 1. Explain different type of learning techniques. 2. Apply and analyze linear regression techniques 3. Apply and analyze linear classification techniques 4. To use and analyse sparse kernel

machines 5. To compare learning models 6. to apply unsupervised learning techniques.

Generalized Fuzzy Set Theory with Applications (19B12MA412): 1. Apply the concept of Intuitionistic fuzzy sets in defining new information measures and in medical diagnosis and pattern recognition problems. 2. Explain various hesitant fuzzy and generalized fuzzy operations. 3. Describe various aggregation and generalized aggregation operators. 4. Apply the concept of Pythagorean fuzzy sets in defining new information measures and in multiple attribute decision making (MADM) problems. 5. Illustrate fuzzy and possibility measures with evidence theory.

Applied Numerical Methods (17B1NMA732): 1. solve system of linear equations using direct and iterative methods with their applications in various engineering problems. 2. explain finite and divided difference formulae for numerical interpolation. 3. apply the methods of least squares to best fit the given data. 4. apply numerical differentiation and integration in engineering applications. 5. solve system of non-linear equations and analyze the convergence of the methods. 6. evaluate the solutions of initial and boundary value problems using various numerical methods.

Applied Linear Algebra (17B1NMA731); 1. explain field, vectors, vector spaces and their dimensions. 2. apply linear transformations in solving practical engineering problems. 3. develop the concept of rank, determinant, existence and uniqueness of solution of a system of linear equations. 4. explain the concept of length, distance and inner-product. 5. apply the concept of orthogonality and orthogonal matrices to orthogonalize a set of linearly independent vectors. 6. analyze eigenvalues, eigenvectors and their properties to solve a system of ordinary differential equations.

Biology, Behaviour and Management (17B1NBT733): 1. Explain the biological basis of stress 2. Relate cognitive processes and stress management 3. Apply acquired knowledge in understanding and adjusting to different people and situations. 4. Improve quality of life by reducing chronic stress.

Social Network Analysis (15B1NCI738/15B1NCI732): 1. Define social network growth models and their characteristics. 2. Compare and interpret social network structure, size and its connectivity pattern using degree distribution, clustering coefficient, centrality, motifs, density, etc. 3. Apply link prediction techniques like Jaccard Coefficient, Adamic Adar, Preferential attachment, Katz score, etc. to discover new links in the social network 4. Discover community structure in complex network using statistical techniques like Newman Girvan, Clique Percolation Method, Ford Fulkerman etc. 5. Model the cascading/flow of information in social network for maximizing the cascade, locating the seed nodes and influential nodes. 6. Develop secured social networks by applying mechanisms like K-anonymity, L-diversity, T-closeness, etc. to ensure privacy and security.

Healthcare Marketplace (17B1NBT732) : 1. Explain healthcare market, drugs and devices, role of various stakeholders 2. Apply related intellectual property laws and regulatory approvals for healthcare sector 3. Analyze the various business models/ innovations in the healthcare industry 4. Compare economic aspects pertaining to the sector

Green Energy and Climate Modeling (16B1NPH732): 1. Recall the basic information about different energy resources, reserves; define the problem with fossil fuel 2. Explain green house effect, modelling of temperature measurement and physics behind the global warming 3. Demonstrate the basic principles and designs of different solar collectors and concentrators, and identify the best design/material/location to absorb maximum solar energy 4. Analyze the potential of different renewable energy sources like wind, ocean and bio mass energy 5. Compare the output of renewable energy source using different design under different conditions/location

Nanoscience and Technology (17B1NPH732): 1. Define the Nanoscience and Technology and to know about various other terminologies and developments involved with Nanoscience and Technology 2. Classify the nanomaterials depending on the nature of dimensionalities, type of materials classes and explain the basic concepts of nanomaterials 3. Apply the concepts of Nanoscience for solving the theoretical and numerical problems 4. Determine the properties of nanomaterials through suitable characterization tools

Indian Financial System (17B1NHS732): 1. Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market. 2. Analyze ways of fund raising in domestic and international markets 3. Understand functioning of Stock market and evaluate securities for investment. 4. Apply the knowledge of Mutual Funds and Insurance in personal investment decisions 5. Apply knowledge of Income tax for calculation of tax liability of individual.

Mobile Computing(17B1NCI749): 1. Assess the suitability of different techniques in multiplexing, modulation, spread spectrum, frequency reuse factor for specific wireless network requirements. 2. Identify important issues and concerns on security and privacy of a mobile computing environment and assess technical solution for security and privacy of user data. 3. Analyze performance aspects of medium accessing, transport layer methodologies and routing techniques in wireless networks (WLAN, WPAN) and mobile networks (GSM, UMTS, UTRAN). 4. Apply functional aspects of Android mobile operating system in developing mobile applications. 5. Build contemporary mobile applications based on different widgets, different views and view groups, SMS, mail, and location aware services through Internet for mobile environments. 6. Explain the working of different protocols for mobile network layer and mobile transport layer.

Data Compression Algorithms (16B1NCI733): 1. Explain and summarize theoretical and practical significance of various mathematical concepts of data compression 2.Demonstrate lossless and lossy compression techniques for images, videos, audios, etc 3. Applying different data compression algorithms for solving complex problems 4. Analyse the techniques for compression of binary data, image, audio and video 5. Elaborate new trends and possibilities of data compression for redesigning of algorithms.

Software Development and Management (18B12CS314): 1. Compare and evaluate various analysis techniques to elicit, select, negotiate, and prioritize requirements along with their mathematical specification. 2. Apply logical and critical thinking to analyze, synthesize and apply risk management principles and processes to determine risk and its mitigation plans. 3. Apply appropriate software design and modeling processes to specify, structure, model and validate requirements. 4. Analyze design and code to find effective solutions to optimize performance of system by making changing in them

Cryptography and Network Security – (17B2NCI743): 1. Recall mathematical preliminaries essential for cryptography 2. Understand security goals and classical encryption methods 3. Apply hashing algorithms in digital signatures, MAC, OPT

etc. 4. Analyse asymmetric & symmetric encryption algorithms, Cryptographic hash algorithms 5. Compare and Choose cryptographic techniques to provide Network Security for IP, transport and e-maling security

Course Outcome (Semester-8)

Cognitive Radio Network (17B2NCI739): 1. Define the spectrum scarcity problem and design of the wireless networks based on the cognitive radios. 2. Understand the technologies to allow an efficient use of TVWS for radio communications. 3. Apply various algorithms to achieve efficient sharing of the unutilized spectrum among cognitive and licensed users. 4. Able to analyze the challenges for deployment of dynamic spectrum access for various applications of wireless networks such as Internet of things, wireless sensor networks and cognitive radio networks.

Digital Transformation in Financial Services (19BI2HS814): 1. Outline the changes that influence the financial sector in digital age 2. Evaluate the key differences between traditional business management and technology management and the impact it has on business models 3. Analyze the new developments in Financial Technology in banking sector. 4. Analyze Consumer Behaviors& digital disruptions in Insurance 5. Evaluate the limits, risks and broader policy and social implications of digital technology. 6. Apply the knowledge of income tax by digital filing of income tax

Industrial Sociology 18B12HS811: 1. Understand the scope of industrial sociology and major theories on labour and work 2. Analyzing the contemporary issues related to industry in the post-Liberalization Privatization Globalization era 3. Evaluating work in its social aspects such as gender, caste, class and unpaid work, as different from its better known economic dimension. 4. Evaluate and interpret information about industry through various sources like print and electronic media, film, documentary and other information technologies

International Finance 19B12HS812: 1. Explain the global market scenario, its imperfections and risks which affect the multinational businesses trade. 2. Analyze the international transactions of balance of payments and understand their relationship with key macroeconomic indicators 3. Apply the concepts of foreign exchange market and currency derivatives for making transactions and risk hedging in foreign exchange market 4. Analyze the role of parity conditions and other factors in exchange rate determination.

International Studies 15B1NHS832: 1. Demonstrate an understanding of the basic concepts in the area of international studies 2. Compare the changes in India's foreign policy in the Cold War era and the post Cold War era 3. Analyze the major political developments and events since the 20th century 4. Demonstrate an understanding of the rise of new power centres in the changing world order

Knowledge Management 18B12HS814: 1. Demonstrate the way knowledge is embedded in today's organization and behavioral aspects involved in managing it 2.Compare and contrast different methods to preserve, nurture, share and manage knowledge 3. Identify appropriate methods for knowledge integration to gain competitive advantage 4. Identify the legal ramifications arising from knowledge sharing and an insight into the ethical concerns faced by individuals and organizations

Major Project 15B19CI891: 1. Summarize the contemporary scholarly literature, activities, and explored tools for hands-on in the respective project area 2. List out the specific requirements to develop the workable solution for the identified computing problem. 3. Develop a workable computing solutions for the identified problem 4. Evaluate the performance of the developed solution 5. Improve the communication and writing skills in terms of presenting the results in written and verbal formats

Optimization Techniques (16B1NMA831): 1. apply generalized, revised and dual simplex method for linear programming problems (LPP). 2. apply graphical, algebraic and linear programming techniques for pure and mixed strategy problems in game theory. 3. classify and solve the problems on queuing and inventory models. 4. solve and analyze the network scheduling and sequencing problems. 5. make use of dynamic programming technique to solve complex linear programming problems. 6. determine numerical solution of nonlinear multidimensional problems.

Multi Attribute Decision Making (20B12MA411): 1. explain basic steps in decision analysis and decision making environments. 2. apply group decision making methods to reach a collective decision. 3. develop the concept of multi criteria decision making process and attributes. 4. apply elementary methods to solve multi attribute decision making problems. 5. analyze value based and outranking methods to solve multi attribute decision making problems.

Fuzzy Optimization and Decision Making; 18B12MA811: 1. Explain the concept of fuzzy sets and fuzzy numbers. 2. Explain various fuzzy and generalized fuzzy operations. 3. Apply the concept of fuzzy relations and approximate reasoning. 4. Apply the concept of fuzzy sets and their generalizations in various decision making processes. 5. Apply various ranking techniques in solving fuzzy transportation problems.

Real Time Systems (17B2NCI744): 1. Outline the prime characteristics of a real-time system 2. Identify various scheduling algorithms over periodic/aperiodic tasks set and determine their optimality in Uni/multi-processor and overloading environment 3. Analyze the consequences of relaxing the conventional properties for real-time Databases 4. Evaluate the performance of various communication protocols in a real-time traffic scenario.

Software Defined Networks (20B12CS417): 1. To summarize the conceptual design of SDN and OpenFlow. 2. To identify the different new protocols and messages exchanged among different planes. 3. To experiment with SDN based network emulator and virtual networking. 4. To examine Network Function Virtualization for providing standard solutions towards networking problems. 5. To evaluate various SDN based formal verification tools and techniques for proving correctness of different planes.

Organizational Psychology (18B12HS813): 1. Demonstrate advanced knowledge in organizational psychology, including a discussion of its historical origins and development. 2. Explain the psychological principles underlying job analysis, selection process, and performance appraisal. 3. Evaluate critically the nature of leadership and its role and development within organizations 4. Analyze the impact of social, ethical, cultural economic and political influences on organizational behavior in local, national and global communities 5. Analyze critically the conceptual and theoretical frameworks relating to organizational psychology. 6. Creates a learning environment that promotes respect, collaboration, productive group interaction and creates new opportunities for development and exploration.

Performance analysis of computing systems (18B12CS413): 1. Demonstrate the performance goals for methods and

algorithms in computational systems and understand the various random variables with its applications. 2. Inspect and examine the outcome of experiments using various approaches or techniques 3. Select and interpret appropriate evaluation techniques, performance metrics and workloads for a system 4. Apply and build Markovian model to develop continuous & discrete-time queuing process by discussing various queuing models. 5. Classify and examine various probability distribution model for a given applications and compare the performance of various techniques or algorithms

Quality Issues in Engineering 18B12HS815: 1. Apply the concepts of quality within quality management systems by understanding various perspectives, historical evolution; and contributions of key gurus in the field of quality 2. Determine the effectiveness of acceptance sampling using single and double sampling plans and operating characteristic curves 3. Determine quality by employing a wide range of basic quality tools, lean concepts and process improvement techniques such quality function deployment 4. Examine the importance of six sigma, various quality standards, awards, certifications

Service Management and Marketing (16B1NHS832): 1. Understand service products, consumers and markets 2. Apply 4P's of marketing to service 3. Determine and Interpret the customer Interface 4. Create and design profitable service strategies

Autonomous Decision Making (18B12CS412): 1. Comprehend and represent the type of agents and environment 2. Apply various search techniques in partially-observable and dynamic environment and optimizing path. 3. Develop exact and approximate reasoning models for uncertain input and uncertain environment. 4. Construct temporal, utility-based, temporal-utility-based and multi-agents based models for reasoning in uncertain environment. 5. Examine and analyse the application of various techniques in different scenario of uncertain environment. 6. Evaluate and compare the performance of different techniques on the basis of complexity.

Cryptography and Network Security (17B2NCI743): 1. Describe classical encryption methods based on Substitution and Permutation 2. Implement and apply modern block and stream cipher techniques like DES, AES and RC4 3. Analyse the role of prime number theory and quadratic congruence in cryptography 4. Implement and apply asymmetric encryption algorithms of RSA , ElGamal and Elliptic Curve Cryptography 5. Criticize hashing algorithms like SHA-512 and SHA – 1024 6. Compare and Choose cryptographic techniques for using Digital Signatures and certificates in existing applications

Search-based Software Engineering (18B12CS415): 1. Explain the concepts of search-based software engineering and various types of optimization problems in the context of different software engineering problems. 2. Identify and define/formulate various software engineering activities/tasks as search-based optimization problem. 3. Design and develop methods for encoding the software engineering problems for finding optimal solutions from larger search space using search-based techniques. 4. Implement and apply different optimization techniques on various forms of software optimization problems using different SBSE Tools 5. Analyze the behavior of different optimization techniques corresponding to different forms of software optimization problems. 6. Evaluate the performance of different single and multi-objective optimization techniques using different quality indicators

Advanced Java Programming (19B12CS412): 1. Explain threads, synchronization and need of handling concurrency issues in applications. 2. Apply synchronization utilities to solve concurrency issues in given problem. 3. Build Java Programs using JDBC Connectivity with SQL Database. 4. Develop web application using Java Servlets. 5. Design and Develop web applications using Java Server Pages Technology and SQL databases.

High Performance Web and Mobile Applications (17B1NCI735): 1. Analyze differentiating aspects of high performance and regular web applications. 2. Explain the design goals of high performance web & mobile applications.
3. Design and develop Server and mobile applications for Multi threaded environment 4. Build the performance metrics for evaluating the application load. 5. Make use application testing suite for performance testing 6. Analyze the crash reports for various types of crashes due to multiple platforms of mobile devices in a consolidated manner.

Introduction to Deep Learning   [18B12CS428]: 1. Identify and express the motivation behind and need of Deep Learning. 2. Comprehend the basic theory of learning, probability in learning, error minimization and regularization techniques. 3. Design and Model Convolution Neural Networks for Image recognition and Computer Vision. 4. Apply Recurrent Neural Networks and LSTM for temporal data 5. Assess the Deep Learning techniques on the basis of performance measures such as training speed, classification error, kappa coefficient, precision, recall and F-Measure.

Distributed Computing (18B1NCS431): 1. Identify and solve event ordering related problems occurring due to various synchronization related issues in distributed systems (e.g., using Lamport, Vector, Matrix clock implementations). 2. Compare and explain the solutions for mutual exclusion and deadlock related issues for various application specific scenarios that may occur in distributed environments (e.g., using token and non-token based techniques). 3. Examine and distinguish data consistency and replication related issues for various distributed scenarios. 4. Evaluate and assess fault tolerance related issues for perceiving reliable systems in distributed environments. 5. Show how the concepts of distributed computing have been applied in existing distributed database systems, distributed file systems and cloud based systems.

Photonics and Applications (18B12PH811): 1. Recall the fundamental properties of light and the processes involved in the generation of light 2. Interpret the theory of fiber optics 3. Apply the fundamentals of various nonlinear optical effects in technology; make use of holography and its applications 4. Compare the operational principles, characteristics and trade-offs of optical detectors and modulators of light

Astrophysics (18B12PH812): 1. Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units 2. Explain the models of universe, ideas of stellar astrophysics, life cycles of stars, physical principles that rules galaxies, and general theory of relativity 3. Apply mathematical principles and laws of physics to solve problems related to astrophysical systems 4. Compare different models of universe and decide which one is logically acceptable and why

BIOPHYSICS (18B12PH813): 1. Find the connections between physics and biology of living system, Physical processes in the living organisms 2. Understand the idea of DNA computing with the construction of different DNA logic gates. 3. Apply the idea of different radiation sources to explain radiobiology to understand the effect of radiation on living system 4. Analyzing the working of different bio-devices: Organic semiconductor, solar cell, OLED, PLED, AMOLED, biosensors.

PROGRAMME NAME:B.TECH. IN INFORMATION TECHNOLOGY

Programme Educational Objectives (PEOs):

PEO 1: To impart core theoretical and practical knowledge of Computer Science & Engineering and emerging Information Technologies for leading successful career in industries, pursuing higher studies or entrepreneurial endeavours.
PEO 2: To develop the ability to critically think, analyze, design and develop IT based solutions.
PEO 3: To imbibe the life-long learning and understanding of ethical values, their duties toward environmental issues and sensitize them toward their social responsibility as IT professional.

Programme Outcomes (POs):See Table 1

Table 4: Programme Specific Outcomes (PSOs):

PSO 1: Able to identify suitable data structures and algorithms to design, develop and evaluate effective solutions for real-life and research problems.
PSO 2: Able to excel in various programming/project competitions and technological challenges laid by professional societies.

Table 5: Academic Year 2019-20 Course Outcomes (COs):

Course Outcome (Semester - 1)
ENGINEERING DRAWING AND DESIGN (18B15GE111): 1. Recall the use of different instruments used in Engineering Drawing and Importance of BIS and ISO codes.2.Illustrate various types of mathematical curves and scale.3.Classify different types of projection and Construct Orthographic projection of Point, Line, Plane and Solid.4.Construct Isometric Projection and Conversion of Orthographic view to Isometric view and vice-versa.5.Construct Engineering model in Drawing software (AutoCAD) and Compare it with conventional drawing.
ENGLISH (15B11HS112): 1. Develop an understanding and appreciate the basic aspects of English as a communication tool. 2.Apply the acquired skills in delivering effective presentations3.Demonstrate an understanding of different forms of literature and rhetorical devices4.Examine literature as reflection of individual and society5.Compose different forms of professional writing6.Apply Phonetics through theory and practice for better pronunciation
MATHEMATICS I (15B11MA111): 1. explain the concepts of limits, continuity and differentiability of functions of several variables. 2.explain the Taylor's series expansion of functions of several variables and apply it in finding maxima and minima of functions.3.make use of double and triple integrals to find area and volume of curves and surfaces. 4.explain the concepts of vector calculus and apply Green's, Stoke's and Gauss divergence theorems in engineering problems. 5.solve the ordinary differential equations and explain the concepts of Laplace transform for solving engineering problems. 6.utilize matrix algebra for solving a system of linear equations and explain eigenvalues, eigenvectors, diagonalization and quadratic form.
PHYSICS-1 (15B11PH111): 1. Recall the basic principles of physics related to optics, relativity, quantum mechanics, atomic physics and thermodynamics.2.Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved. 3.Apply the concepts/principles to solve the problems related to wave nature of light, relativity, quantum mechanics and atomic physics. 4.Analyze and examine the solution of the problems using physical and mathematical concepts involved.
PHYSICS LAB-1 (15B17PH171): 1. Recall optics and modern physics principles behind the experiments. 2.Explainthe experimental setup and the principles involved behind the experiments performed. 3.Plan the experiment and set the apparatus and take measurements. 4.Analyze the data obtained and calculate the error.5.Interpret and justify the results.
SOFTWARE DEVELOPMENT FUNDAMENTALS 1 LAB & 15B17CI171: 1. Design HTML code for building web pages using lists, tables, hyperlinks, and frames.2.Develop python programs for constructs such as lists, tuples, dictionaries, conditions and loops using Python 3.6.3.Design simple SQL queries using MySQL to create database tables and retrieve the data from a single table.4.Develop C programs for datatypes, expressions, conditional structure, and iterative control structure and pattern generation using Code Blocks and Virtual Lab. 5.Design C programs for array, structure, and functions using Code Blocks and Virtual Lab.
SOFTWARE DEVELOPMENT FUNDAMENTALS-I & 15B11CI111: 1. Solve puzzles, formulate flowcharts, algorithms and develop HTML code for building web pages using lists, tables, hyperlinks, and frames2.Show execution of SQL queries using MySQL for database tables and retrieve the data from a single table. 3.Develop python code using the constructs such as lists, tuples, dictionaries, conditions, loops etc. and manipulate the data stored in MySQL database using python script.4.Develop C Code for simple computational problems using the control structures, arrays, and structure.5.Analyze a simple computational problem into functions and develop a complete program.6.Interpret different data representation , understand precision, accuracy and error
Course Outcome (Semester - 2)
ELECTRICAL SCIENCE LAB -1 & 15B17EC171: 1. Understand various active, passive components and instruments such as multimeter, bread board, regulated D.C. power supply.2.Acquire the knowledge of electrical network and circuit such as branch, node, loop and mesh in networks and circuits.3.Study and verification of reduction technique in the electrical circuits using different network theorems.4.Study and verification of series & parallel AC circuits as well as open & short circuits test in single phase transformer.

ELECTRICAL SCIENCE-1 & 15B11EC111: 1. Recall the concepts of voltage, current, power and energy for different circuit elements. Apply the Kirchhoff laws and different analyzing techniques to identify the different circuit parameters.2.Define and apply the networks theorems in the complex AC and DC circuits, networks. Demonstrate the physical model for given Sinusoidal AC signal and construct the phasor diagrams.3.Demonstrate the concept of resonance and operate different instrumental and measurement equipments. 4.Demonstrate the construction and working of single phase transformer

MATHEMATICS-2 & 15B11MA211: 1. apply different methods for solving ordinary differential equations of second order.2.explain different tests/methods of convergence for infinite series.3.find the series solution of differential equations and use it to construct Legendre's polynomials and Bessel's functions.4.classify the partial differential equations and apply Fourier series to find their solution.5.explain Taylor's & Laurent's series expansion, singularities, residues and transformations.6.apply the concept of complex variables to solve the problems of complex differentiation and integrations.

PHYSICS LAB-2 & 15B17PH271: 1. Recall laser, fibre optics, semiconductor and solid state physics principles behind the experiments.2.Explainthe experimental setup and the principles involved behind the experiments performed. 3.Plan the experiment and set the apparatus and take measurements. 4.Analyze the data obtained and calculate the error.
5.Interpret and justify the results.

PHYSICS-2 & 15B11PH211: 1. Recall the basic concepts relating to electromagnetic theory, statistical physics, lasers, fiber optics and solid state physics.2.Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved.3.Apply the basic principles in solving variety of problems related to lasers, electromagnet theory, fiber and solid state physics.4.Analyze and examine the solution of the problems using physical and mathematical concepts involved in the course.

SOFTWARE DEVELOPMENT FUNDAMENTALS-2 & 15B11CI211: 1. Develop C programs using structures, pointers, functions, and files.2.Solve problems related to data storage, retrieval, searching, and sorting by utilizing stack/queue.3.Make use of a linked list to solve various problems.4.Apply binary tree data structure to perform operations like searching, insertion, deletion, and traversing.5.Explain the basic features of object-oriented design such as objects, classes, encapsulation, polymorphism, inheritance, and abstraction.

SOFTWARE DEVELOPMENT LAB-2 & 15B17CI271: 1. Make use of structures, pointers, functions, and files to build basic C programs.2.Construct stack/queue based solutions for data storage, retrieval, searching, and sorting problems.3.Apply linked list data structure to solve problems like polynomial operations and sparse matrix representation.4.Build operations like searching, insertion, deletion, traversing on binary tree data structure.5.Demonstrate fundamental concepts of object-oriented programming i.e. objects, classes, encapsulation, polymorphism, inheritance, and abstraction.6.Apply object-oriented programming features like encapsulation, Inheritance, Polymorphism, and Standard Template Library to construct C++ programs.

WORKSHOP & 18B15GE112: 1. Learn the basic of manufacturing environment and various safety measures associated with it.2.Apply the appropriate tools to fabricate joints utilizing work-bench tools.3.Create various prototypes in the carpentry trade, fitting trade, and welding trade.4.Demonstrate the working principle of lathe, shaper and milling machines and able to fabricate the prototypes of desired shape and accuracies.

Course Outcome (Semester - 3)

DATA STRUCTURES AND ALGORITHMS & 18B11CS211: 1. Analyze the complexity of different algorithms using asymptotic analysis.2.Implement various linear and non linear data structures and their related operations.3.Select and apply relevant data structure for a given problem and evaluate its performance.4.Select and apply appropriate algorithmic design technique (Greedy, backtracking, Divide and Conquer, DP) for solving a given problem and evaluate the solution.

DATA STRUCTURES AND ALGORITHMS LAB & 18B15CS211: 1. Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications.2.Interpret the complexity of algorithms for given problems. 3.Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities.4.Examine case-study specific application of Heaps, Graphs, and Hashing methods.5.Model algorithmic solutions for small real-life problems using Backtracking, Greedy algorithm and Dynamic programming, Branch and Bound, and others

DATABASE SYSTEM AND WEB LAB & 15B17CI372: 1. Explain the basic concepts of Database systems and Web components. 2.Develop web page using HTML, CSS with client side scripting using javascript.3.Develop a simple web application with client and server side scripting using Javascript and PHP and connect to a given relational database.
4.Programming PL/SQL including stored procedures, stored functions, cursors, Triggers.5.Design and implement a database schema for a given problem-domain and normalize a database.6.Design a Project based on database management

DATABASE SYSTEMS & WEB & 15B11CI312: 1. Explain the basic concepts of Database systems and Web components. 2.Model the real world systems using Entity Relationship Diagrams and convert the ER model into a relational logical schema using various mapping algorithms 3.Develop a simple web application with client and server side scripting using Javascript and PHP and connect with a given relational database 4.Make use of SQL commands and relational algebraic expressions for query processing. 5.Simplify databases using normalization process based on identified keys and functional dependencies 6.Solve the atomicity, consistency, isolation, durability, transaction, and concurrency related issues of databases

ECONOMICS & 15B11HS211: 1. Explain the basic micro and macro economics concepts.2.Analyze the theories of demand, supply, elasticity and consumer choice in the market.3.Analyze the theories of production, cost, profit and break even analysis4.Evaluate the different market structures and their implications for the behavior of the firm.5.Examine the various business forecasting methods.6.Apply the basics of national income accounting and business cycles to Indian economy.

ELECTRICAL SCIENCE LAB -2 & 15B17EC271: 1. Understand Transient analysis and steady state response of series RC circuit. 2.Acquire the knowledge of circuits like Adder, Subtractor, Integrator, differentiator; inverting and non

inverting amplifier circuits realized using Op-amp IC-741. 3. Study and Implementation of the different logic gates. 4. Construct Adder, Subtractor and Multiplexer circuits using logic gates.

ELECTRICAL SCIENCE-2 & 15B11EC211: 1. Study and analyze the first-order and second-order passive circuits.2.Demonstrate the operational amplifier and logic gates and their applications in analog and digital system design.3.Define the basics of signals, systems and communication.4.Illustrate the electrical machines, transformers and analogous of electrical & mechanical systems.

THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE & 15B11CI212: 1. Apply the concepts of set theory, relations and functions in the context of various fields of computer science e.g. Database, Automata, Compiler etc. 2.Evaluate Boolean functions and Analyze algebraic structure using the properties of Boolean algebra. 3.Convert formal statements to logical arguments and correlate these arguments to Boolean logic, truth tables, rules of propositional And predicate calculus.4.Apply the fundamental principle of counting, combinatorics and recurrence relations to find the complex pattern and sequences in Given datasets.5.Apply graph theory concepts for designing solutions of various computing problems e.g. shortest path, graph coloring, job Sequencing etc. 6.Explain basic concepts of automata theory and formal languages e.g. Finite automata, regular expressions, context-free grammars etc.

Course Outcome (Semester - 4)

COMPUTER ORGANISATION AND ARCHITECTURE & 15B11CI313: 1. Summarize and compare the different computer systems based on RISC and CISC Architecture.2.Categorize different types of computers based on Instruction set Architecture.3.Apply the knowledge of performance metrics to find the performance of systems.4.Design RISC and CISC based Computer using Hardwired / Microprogrammed Controller.5.Create and analyze an assembly language program of RISC and CISC based systems.6.Apply the knowledge of pipeline, IO and cache to understand these systems. Further, analyze the performance of such systems.

COMPUTER ORGANISATION AND ARCHITECTURE LAB & 15B17CI373: 1. Implement basic ALU of 2-bit and 4-bit computer using hardwired simulation tool2.Initialization and fetching of data from specific memory using various addressing mode of 8085 and 80863.Develop 8085 and 8086 assembly language programs using software interrupts and various assembler directives. 4. Develop Microprocessor Interfacing program using PPI for various external devices5. Develop MIPS assembly language programs using software interrupts and various assembler directives.6.Create application and its software using 8085/8086 microprocessor or microcontrollers

DIGITAL SYSTEMS & 18B11EC213: 1. Familiarize with the fundamentals of number system, Boolean algebra and Boolean function minimization techniques.2.Analyze and design combinational circuits using logic gates.3.Analyze state diagram and design sequential logic circuits using flip flops.4.Understand the classification of signals & systems and learn basic signal operations & Fourier analysis.5.Understand various steps involved in digitization and transmission of a signal.

DIGITAL SYSTEMS LAB & 18B15EC213: 1. Develop the MATLAB programs based on the concept of combinational digital circuits.2.Develop the MATLAB programs to apply the theory of sequential digital circuits.3.Experiment with MATLAB to apply the theory of signals & systems and digital signal processing. 4.Experiment with MATLAB to apply the concept of digital communication.

ENVIRONMENTAL STUDIES & 19B13BT211: 1.Explain diversity of environment, ecosystem resources and conservation. 2. Identify various pollution related hazard and their safe management3.Apply modern techniques for sustainable Urban planning and Disaster management 4. Recall Government regulations, Environmental Policies, Laws & ethics5.Survey ground situation on specific environmental aspects, examine risks involved, make a field report and present the findings

FINANCIAL ACCOUNTING & 15B1NHS435: 1. Understand the basic concepts of Accounting.2.Apply accounting concepts for recording of business transactions.3.Compare and reconcile the accounting records with other sources of information4.Evaluate the accounting records to identify and rectify the errors made during accounting process.5.Construct the final accounts of a business

HUMAN RESOURCE MANAGEMENT & 16B1NHS431: 1. Demonstrate a basic understanding of different functions of human resource management: Employer Selection, Training and Learning, Performance Appraisal and Remuneration, Human Relations and Industrial Relations.2.Apply various tools and techniques in making sound human resource decisions.3.Analyze the key issues related to administering the human resource management activities such as recruitment, selection, training, development, performance appraisal, compensation and industrial relation.4.Critically assess and evaluate different human resource & industrial relation practices and techniques and recommend solutions to be followed by the organization

INTRODUCTION TO LITERATURE & 15B1NHS431: 1. Understand figurative language to demonstrate communication skills individually and in a group.2.Develop a critical appreciation of life and society through a close reading of select texts 3.Analyze a literary text thematically and stylistically and examine it as representing different spectrum of life, human behavior, and moral consciousness of society. 4.Interpret Literature as reflection of cultural and moral values of life and society

INTRODUCTION TO PSYCHOLOGY & 15B1NHS432: 1. Demonstrate a basic understanding of different perspectives and concepts of psychology2.Apply the concepts of psychology in day to day life3.Examine the different theoretical perspectives and models of psychology4.Develop solutions for problems related to psychology using appropriate tools/models

INTRODUCTION TO SOCIOLOGY & 15B1NHS433: 1. Demonstrate an understanding of sociological perspectives and concepts.2.Explain the concept of social stratification and types of stratification as class, caste and gender.3.Apply the major sociological perspectives, concepts and methods in the systematic study of society4.Analyze the relevance of various social Institutions in societies and how it shapes and influences social interactions.

LIFE SKILLS & 15B11HS111: 1. Understand Life Skill required to manage self and one's environment2.Apply comprehensive set of skills for life success for self and others3.Analyze group dynamics for its effective functioning

4.Evaluate the role of women leadership and gender issues

PRINCIPLES OF MANAGEMENT & 15B1NHS434: 1. Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving2.Examine the relevance of the political, legal, ethical, economic and cultural environments in global business.3.Evaluate approaches to goal setting, planning and organizing in a variety of circumstances.4.Evaluate contemporary approaches for staffing and leading in an organization.5.Analyze contemporary issues in controlling for measuring organizational performance.

PROBABILITY AND RANDOM PROCESSES & 15B11MA301: 1. Explain the basic concepts of probability, conditional probability and Bayes' theorem.2.Identify and explain one and two dimensional random variables along with their distributions and statistical averages.3.Apply some probability distributions to various discrete and continuous problems.4.Solve the problems related to the component and system reliabilities.5.Identify the random processes and compute their averages. 6.Solve the problems on Ergodic process, Poisson process and Markov chain.

QUANTITATIVE METHODS FOR SOCIAL SCIENCES & 16B1NHS332: 1. Demonstrate the key concepts of different quantitative methods used in social sciences. 2.Classify and summarize the data to be used for analysis.3.Apply the theoretical concept to perform basic data analysis in social sciences.4.Examine different statistical methods and be able to discuss the merits and limitations of a particular method5.Recommend appropriate conclusions following empirical analysis

Course Outcome (Semester - 5)

BASIC NUMERICAL METHODS & 17B1NMA531: 1. explain the concepts of approximation and errors in computation. 2.construct numerical methods for algebraic and transcendental equations and their convergence. 3.outline the methods of interpolation using finite differences and divided difference formulas.4.make use of numerical differentiation and integration. 5.solve the system of linear equations using direct and iterative methods.6.solve ordinary differential equations using different numerical methods.

CLOUD BASED ENTERPRISE SYSTEMS & 15B22CI521: 1. Define all the basic terminologies related to cloud computing and basic nodejs concepts.2.Write basic nodejs programs for creating server, rendering html, routing, get and post methods. 3.Develop all nodejs programs using nested loops and api methods to restrict post and get requests.4.Test for the issues in the existing code using debugging tools or other exception handling methods.5.Basic understanding of the importance of various advanced concepts of big data like hadoop, mapreduce, mongodb, combiners, practitioners, pig and hive.6.Create or design an end to end API using nodejs and store the posted data in a mongodb collection.

CLOUD BASED ENTERPRISE SYSTEMS LAB & 15B28CI581: 1. Create Server app and its modules in node js2.Develop multi core server apps with rendering images, html, routing in node js3.Use nodejs for multi core apps and mongodb4.Analyse the VMs and cloud services for the cloud deployment5.Understand the cloud concept for App dev using nodejs and mongodb.

COMPUTER NETWORKS LAB & 15B17CI571: 1. Classify all the wired/wireless technologies and understand the network architecture with its basic building blocks2.Visualize and analyze the data packets of different TCP/IP layers. Store the data packets as *.pcap files.3.Create client and server applications using the "Sockets" and the implementation of various protocols at Data link layer4.Model a communication network and Estimate the performance of the protocols at Network and Transport layer.

COMPUTER NETWORKS & 15B11CI511: 1. Defining the basics of networking, delay components and underlying technologies2.Illustrate the various key protocols in OSI model and TCP/IP protocol suite and explain various application protocols.3.Examine various transport protocols and its performance enhancing mechanisms.4.Determine the shortest path for the network using various routing protocols and evaluate it.5.Choose IP & MAC addressing mechanisms and data link layer protocols to solve communication, error detection and correction problems

ENTREPRENEURSHIP DEVELOPMENT & 19B12HS311: 1. Understand basic aspects of establishing a business in a competitive environment2.Apply the basic understanding to examine the existing business ventures 3.Examine various business considerations such as marketing, financial and teaming etc.4.Assessing strategies for planning a business venture

INDIAN POLITY AND CONSTITUTIONAL DEMOCRACY IN INDIA & 18B12HS612: 1. Demonstrate an understanding about the current Indian political scenario by knowing about the structure of government in place2.Demonstrate an understanding of the role of Indian President, Prime Minister, Governor and other members of the legislature as representatives of the common masses3.Analyze the working of Indian federalism with reference to centre-state relations4.Analyze the impact of the contemporary challenges such as caste, gender, regionalism to the working of Indian democracy

INFORMATION SECURITY LAB & 15B17CI576: 1. Demonstrate and illustrate the different cipher techniques and understand various anti-virus and anti worms2.Develop and make a code to implement various Symmetric key , Asymmetric key cryptographic techniques and steganography techniques3.Apply a client server programming for symmetric ,asymmetric algorithms and key exchange algorithms4.Examine and analyze the packet information for different protocols using Wireshark.5.Apply security techniques to real world problems

LASER TECHNOLOGY AND APPLICATIONS & 16B1NPH533: 1. Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology2.Extend the knowledge of lasers in some applications like LIDAR, laser tracking, bar code scanner, lasers in medicine and lasers in industry 3.Apply the optical ray transfer matrix to determine the stability of a laser resonator4.Distinguish the operational principles of CW, Q-switched, mode locked lasers; laser rate equations for three & four level lasers; different types of laser systems

MATERIALS SCIENCE & 16B1NPH532: 1. Recall variety of engineering materials for their applications in contemporary devices 2.Explain dielectric, optical, magnetic, superconducting, polymer and thermoelectric properties 3.Apply properties of dielectric, optical, magnetic, superconducting, polymer and thermoelectric materials to solve related problems 4.Prove and estimate solution of numerical problems using physical and mathematical concepts involved with

various materials

MATRIX COMPUTATIONS & 16B1NMA533: 1. Explain the basics of matrix algebra and inverse of a matrix by partitioning.2.Solve the system of linear equations using direct and iterative methods.3.Explain the vector spaces and their dimensions, norm of a vector and matrix.4.Apply the concepts of inner product space to construct Q-R decomposition and orthonormal basis using Gram-Schmidt process. 5.Construct Gershgorin's circles and solve eigenvalue problems including power and inverse power methods.6.Analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.

MINOR PROJECT-1 & 15B19CI591: 1. Analyze chosen literature addressing real world research problem to identify the requirements2.Build technical report detailing the software specification, design, test plan, and implementation details. 3.Build a practicable solution for the research problem4.Evaluate results to test the effectiveness of the proposed solution 5.Develop effective communication skills for presentation of project related activities

MULTIMEDIA LAB & 15B28CI582: 1.Illustrate aesthetics of visual composition.2.Demonstrate various operations in Adobe Photoshop CS5 such as, applying filters and effects, colour and tonal adjustments, automating tasks, image editing, image enhancement, image restoration, etc.3.Design graphics & user interfaces using Adobe Photoshop CS54.Demonstrate various operations in Adobe Illustrator CS5 such as, adding typography, creating, editing & using brushes, applying filters & effects, etc.5.Create graphics layouts, illustrations and vector drawing using Adobe Illustrator CS5.

NUCLEAR SCIENCE AND ENGINEERING & 16B1NPH535: 1. Relate terminology and concepts of nuclear science with various natural phenomenon and engineering applications. 2.Explain various nuclear phenomenon, nuclear models, mass spectrometers, nuclear detectors, particle accelerators. and classify elementary particles. 3.Solve mathematical problems for various nuclear phenomenon and nuclear devices.4.Analyze the results obtained for various physical problems and draw inferences from the results.

PLANNING AND ECONOMIC DEVELOPMENT & 16B1NHS532: 1.Understand the issues and approaches to economic development.2.Evaluate National income accounting, human development index and sustainable development. 3.Apply an analytical framework to understand the structural characteristics of development. 4.Analyze the role of Macroeconomic stability & policies and Inflation in the development process.5.Evaluate the importance of federal development and decentralization.

PRINCIPLES OF MANAGEMENT & 15B1NHS434: 1. Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving2.Examine the relevance of the political, legal, ethical, economic and cultural environments in global business.3.Evaluate approaches to goal setting, planning andorganizing in a variety of circumstances.4.Evaluate contemporary approaches for staffing and leading in an organization.5.Analyze contemporary issues in controlling for measuring organizational performance.

QUANTUM MECHANICS FOR ENGINEERS & 16B1NPH531: 1. Remember basics of Quantum Mechanics and its applications.2.Explain postulates of quantum mechanics, Dirac notation, Schrödinger Equation, Perturbation theory and Qubits.3.Solve various problems related to different quantum systems and construct quantum circuits using quantum gates.4.Analyse the results obtained for various physical systems and to establish the advantages of some simple protocols of quantum information processing.

SOCIOLOGY OF YOUTH & 16B1NHS531: 1. Understand sociological perspectives relating to young people2.Explain the ethical, cultural& social issues concerning Youth3.Understand youth culture and to interprets the same 4.Analyze societal problems related to youth in the evolving society.5.Understand sociological perspectives relating to young people

STRATEGIC HUMAN RESOURCE MANAGEMENT & 18B11NHS311: 1. Understand human resource management from a strategic perspective and analyze environmental challenges that impact HRM of an organization2.Assess the human resource needs of the organization and design recruitment and selection strategies for an organization3.Evaluate the processes of training and development, mentoring, performance management, compensation and reward management in an organization and design effective strategies for the same4.Critically assess career management system, work-life initiatives and other HRM practices of the organization

TECHNOLOGY AND CULTURE & 13B1NHS71: 1. Understand the main theories in cultural management,2.Identify technological convergence and cultural divergence, relate the differences to the literature and suggest solutions3.Interpret and communicate effectively in physical and virtual teams by choosing appropriate concepts, logic and selecting the apt IT tools.4.Application of the theoretical knowledge to adapt to cultural differences in global work environment.

THEORY OF NUMBERS & 16B1NMA731: 1. Explain Euclid algorithm, linear Diophantine equations and prime numbers.2.Solve system of linear congruences using properties of congruences.3.Explain numbers of special form and number theoretic functions.4.Apply the concepts of order, primitive roots and indices to solve conguences.5.Apply Legendre symbol and quadratic reciprocity theorem to solve quadratic congruences.6.Apply and analyse the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.

<div align="center">Course Outcome (Semester -6)</div>

ADVANCED DATA STRUCTURES AND APPLICATIONS & 16B1NCI631: 1. Comprehend insights of various variants of string processing and space partitioning data structures.2.Build efficient storage and sorting mechanisms for large data with the help of k-way merge-sort algorithm.3.Analyse various advanced data structures-BST Variants, Heap variants, Indexed Trees, Disjoint Set etc.4.Compare performance of various Hashing algorithms.5.Propose solutions for the real life problems with the aid of suitable data structures.

AGILE SOFTWARE DEVELOPMENT & 16B1NCI634:1. Interpret the trade-offs between traditional software development methods and agile software development methods for a software project effectively.2.Identify and make use of an appropriate agile software engineering approach viz. extreme programming, Scrum, Crystal techniques as a part of software development. 3. Apply Refactoring techniques on source code for improved design4.Choose tools and construct

the methods for testing Agile projects using various testing strategies5.List the Planning, tracking, estimation and monitoring of agile projects with techniques like burn down charts, velocity calculation and task boards etc.

APPLICATIONAL ASPECTS OF DIFFERENTIAL EQUATIONS & 20B12MA311:1. Solve ordinary differential equations in LCR and mass spring problems.2.Explain orthogonality of functions and apply it to solve Sturm-Liouville boundary value problems.3.Apply matrix algebra to find the solution of system of differential equations.4.Formulate and solve first and second order partial differential equations.5.Evaluate solution of differential equations arises in the field of engineering applications.

APPLIED MATHEMATICAL METHODS & 18B12MA612: 1. explain the functional and its variations required to optimize the physical problem. 2.apply different forms of Euler–Lagrange equation on the various variational problems with fixed boundaries. 3.explain different types of integral equations including their conversions from IVP and BVP. 4.solve Volterra and Fredholm integral equations using various analytical methods. 5.explain various numerical methods along with their stability analysis. 6.apply different numerical methods for solving differential equations.

BLOCKCHAIN TECHNOLOGY & 19B12CS312: 1. Define all the basic terminologies related to blockchain, bitcoin, decentralized applications and smart contracts.2.Understand the pillar security featured in decentralized networks like cryptography, digital signatures, Proof of work and consensus algorithms.3.Identify the feasibility of applying blockchain security features in real world scenarios using different consensus algorithms.4.Analyze various consensus algorithms like PoW, PoS, PoB, Raft consensus, Paxos consensus, BFT etc.5.Evaluation of blockchain based consensus algorithms namely Byzantine fault tolerance, proof of work etc.

CLOUD BASED ENTERPRISE APPLICATIONS & 16B1NCI644: 1. Differentiate between Public, Private, and Hybrid Clouds2.Develop Enterprise applications based on XML, JavaScript, Java Servlets, Java Server Pages, etc.3.Develop web service based solutions by using REST, JSON, SOAP, etc.4.Examine emerging technologies in cloud environment.5.Evaluate the performance of different Public Cloud Platforms e.g., GAE, AWS and Azure.6.Design and deploy Enterprise applications on one of the Cloud Service Providers, i.e., Amazon AWS or Microsoft Azure.

COGNITIVE PSYCHOLOGY & 16B1NHS632: 1. Understand and apply the concepts of cognitive psychology in everyday life2.Analyze the different models of various cognitive processes3.Evaluate cognitive psychology issues and recommend possible solutions4.Evaluate interventions/solutions for self-development through cognitive processes

COMPUTATIONAL INTELLIGENCE & 16B1NCI643: 1. Infer vagueness, ambiguity and uncertainty in natural language using fuzzy logic concepts.2.Apply the intelligent techniques using rough set theory, fuzzy Logic, genetic and hybrid techniques to solve different type of real world problems.3.Analyze the principles of fuzzification, defuzzification and their applications in different set of problems. 4.Integrate and develop hybrid Intelligent techniques for real time engineering application. 5.Compare and conclude the results of different techniques through writing technical reports

DATA MINING AND WEB ALGORITHMS & 15B22CI621: 1. Understand the basic categories and pre-processing of data. 2.Analyze the transactional data for finding frequent and interesting patterns using association rule mining techniques like Apriori and FP-Growth.3.Apply a wide range of classification techniques like Naïve-bayes, decision tree, and KNN for the numerous application including fraud detection, target marketing, medical diagnosis, etc.4.Cluster the similar/dissimilar objects using different methods like partitioning, hierarchical and density based clustering5.Analyze the link structure of web using page rank and HITS algorithms.6.Develop recommendation system using collaborative filtering techniques

DATA MINING AND WEB ALGORITHMS LAB & 15B22CI681: 1. Apply the data pre-processing techniques on the dataset and implement association rule mining techniques like Apriori and FP-Growth to analyze frequent and interesting patterns in the transactional data.2.Apply a wide range of classification techniques like Naïve-Bayes, decision tree and KNN for the numerous data mining applications.3.Implement and validate the Clustering methods and outcomes of different methods like partitioning, hierarchical and density based clustering.4.Analyze the link structure of web using different Web caching and ranking algorithms.5.Creation of project using data mining technique to solve the real world problems like fraud detection, hand writing recognition, stock prediction etc.

ECONOMETRIC ANALYSIS & 19B12HS611: 1. Demonstrate the key concepts from basic statistics to understand the properties of a set of data.2.Apply Ordinary Least Square method to undertake econometric studies.3.Examine whether the residuals from an OLS regression are well-behaved.4.Evaluate different model selection criteria for forecasting.5.Create models for prediction from a given set of data.

EFFECTIVE TOOLS FOR CAREER MANAGEMENT AND DEVELOPMENT & 18B13HS612-HS/H5: 1. Assess ones personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities.2.Apply knowledge of all the Career Stages in making informed career decisions.3.Develop and maximize ones potential for achieving the desired career option.4.Analyze the processes involved in securing and managing career by employees of different organizations.

FRONT END PROGRAMMING & 20B16CS326: 1. Demonstrate new technologies by applying foundation paradigms 2.Build strong foundations for basic front end tools & technologies thereby making them understand the application development lifecycle.3.Develop elegant and responsive Front-end by leveraging latest technologies4.Explain activity creation and Android UI designing5.Develop an integrated mobile application to solve any complex real time problem

GLOBAL POLITICS & 20B12HS311: 1. Demonstrate an understanding of the meaning and nature of globalization by addressing its political, economic, cultural and technological dimensions2.Analyzing the significance of contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security to global governance3.Analyze how the global politics shapes domestic politics4.Demonstrate an understanding of the working of the global economy, its anchors and resistances offered by global social movements

INFORMATION RETRIEVAL AND SEMANTIC WEB & 16B1NCI648: 1. Analyze the capabilities and limitations of information retrieval systems. 2.Apply techniques for design and implementation of retrieval systems for text and other media. 3.Analyze the results of retrieval from large quantities of data by using various algorithms of information retrieval and Optimization of the results.4.Analyze the different retrieval metrics for retrieval evaluation.5.Understand the concepts

of web crawling and web retrieval and its optimization.6.Apply the taxonomy and ontology concepts, Resource Description Framework (RDF) and web ontology language (OWL) on semantic web applications

INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT & 16B1NCI633: 1. Analyze functional aspects of Android mobile operating system for developing Android applications2.Explain how Android applications work, their life cycle, manifest, Intents, event handling and using external resources3.Design and develop useful Android applications with compelling user interfaces by using, extending, and creating own layouts using different adapters and picker views, fragments, sending and receiving SMS and email4.Make use of Google Map API to develop location aware services through Internet for mobile environments5.Apply functional aspects of database handling to develop Android applications using SQLite database

IOT AND IOT SECURITY & 19B12CS311: 1. Define basic terminologies related to IoT and IoT security.2.Explain IoT reference model, different architectural views and security aspects moving from machine to machine (M2M) technology to Internet of Things.3.Identify infeasibility of hardware and software design constraints due to specific security implementations in real scenarios.4.Analyze the security related challenges at various layers and security mechanisms adapted to address them.5.Evaluate the performance of various IoT security protocols implemented at different layers.

JAVA PROGRAMMING & 20B16CS322: 1. Write basic Java programs using Java constructs – loops, switch-case and arrays.2.Define all basic concepts related to OOP concepts3.Develop java programs using Java collection framework 4.Create or design an application based on Java programming constructs

LIGHT EMITTING DIODES - BASICS & APPLICATIONS & 16B19PH692: 1. Recall the basic concepts of semiconducting materials, working of p-n junction diode and light emitting diodes.2.Explain the various physical parameters involved in designing and fabrication of LEDs.3.Solve various problems related to efficiency, emission intensity and spectrum of LEDs.4.Analyse the problems in designing & fabricating blue, white and green high brightness LEDs.

LITERATURE AND ADAPTION & 16B1NHS636: 1. Understand and outline the elements and theories of adaptation and its various forms, and relate with the texts reflecting the cultural, moral and linguistic changes in the contemporary society.2.Utilize visual literacy to analyze the language and style adopted in filmed texts and examine them as reflections of Readers' and Audience' values and perceptions in the context of myriad cultures and multidisciplinary settings individually and in groups.3.Analyze texts and their adaptations beyond the surface level of narrative or character as reflections of value systems of various cultures and times individually and in a team.4.Evaluate, interpret and document source texts and adaptations thematically and stylistically to learn the nuances of language, culture and values of the society.5.Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaptation of any literary/non literary piece in another form individually and in groups

MARKETING MANAGEMENT & 18B12HS611: 1. To illustrate the fundamentals of marketing, marketing environment and market research.2.To model the dynamics of marketing mix.3.To demonstrate the implications of current trends in social media marketing and emerging marketing trends.4.To appraise the importance of marketing ethics and social responsibility5.To conduct environmental analysis, design business portfolios and develop marketing strategies for businesses to gain competitive advantage.

MEDICAL AND INDUSTRIAL APPLICATIONS OF NUCLEAR RADIATIONS & 16B1NPH636: 1. Define nuclear structure, properties and reactions; Nuclear magnetic resonance process2.Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays3.Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc.4.Analyze different radiocarbon dating mechanisms and processes

MINOR PROJECT-2 & 15B29CI691: 1. Compare and Contrast all tools and techniques to generate solution that meet specific need to solve complex problems.2.Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach3.Develop software systems that meet specified design and performance requirements that contributes to global, economic, environmental and social-context4.Evaluate & justify the proposed solution using appropriate learning strategies5.Design & develop integrated software models and techniques towards research initiatives

MORALITIES OF EVERYDAY LIFE AND MORAL DECISION MAKING & 19B13HS611: 1. Apply and Analyze morality in all facets of personal and professional life2.Discover ways to address moral dilemmas by deliberating on the pros and cons to find the best possible outcome 3.Justify and Formulate morally correct decisions and stand by them 4.Adapt and develop a character respected by peers and superior alike

NON-LINEAR DATA STRUCTURES & PROBLEM SOLVING & 20B16CS324: 1. Demonstrate operations on different data structures.2.Use critical thinking skills and creativity to choose the appropriate data structure and solve the given problem.3.Identify the correctness and efficiency of the solution by constructing different test cases.4.Develop solutions to real world problems by incorporating the knowledge of data structures

OPERATIONS RESEARCH & 18B12MA611: 1. construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical and simplex method.2.apply two-phase, Big-M and dual simplex method for linear programming problems.3.make use of sensitivity analysis to linear programming problems.4.solve transportation, assignment and travelling salesman problems. 5.apply cutting plane and branch & bound techniques to integer programming problems. 6.examine optimality conditions and solve multivariable nonlinear problems.

ORGANIZATIONAL BEHAVIOR & 16B1NHS635: 1. Enhance critical thinking of dynamic human behavior through an insight into relationships between individuals, groups and organizations2.Assess ones and other's individual management style as it relates to influencing and managing behavior in the organization.3.Plan and adapt set of strategies for meeting the special challenges in the 21st century competitive workplace 4.Assess the potential effects of behavioral factors in an organizational environment

PHOTOVOLTAIC TECHNIQUES & 16B1NPH633: 1. Classify various types of renewable energy sources and explain working of photovoltaic device.2.Demonstrate the use of basic principles to model photovoltaic devices.3.Identify challenges and apply strategies to optimize performance of various type of solar cells 4.Analyze the Solar PV module, mismatch parameter and rating of PV module5.Evaluate the performance of various stand-alone PV systems with battery and AC and DC load	
PROBLEM SOLVING USING C AND C++ & 20B16CS323: 1. Apply and use library functions, pointer arithmetic, arrays, and regular expressions and secure coding practices in programs.2.Use critical thinking skills and creativity to choose the appropriate containers, iterators and algorithms for a given problem.3.Demonstrate the use of concurrency principles, input and output streams and defensive techniques in programs.	
PROJECT MANAGEMENT & 16B1NHS631: 1. Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context2.Analyze projects and their associated risks by understanding the various theoretical frameworks, non-numerical and numerical models in order to make correct selection decisions3.Evaluate the various stages of project management and identify and determine correct techniques for planning, scheduling, controlling and terminating the projects4.Evaluate project management processes, tools and techniques in order to achieve overall project success	
RENEWABLE ENERGY & 16B19EC691: 1. Explain the need of renewable sources of energy, impact of renewable energy on environment, challenges in the electric grid, Smart Grid2.Analyze basics of Solar radiation and Solar photovoltaics, Balance of PV systems3.Analyze wind energy resource and designing of Wind Energy Generators4.Illustrate different biomass energy resources, and extraction of biomass energy	
SOCIAL MEDIA AND SOCIETY & 19B12HS612: 1. Infer the implications of digital change, and the concept of social media and e-marketing in the context of the changing marketing landscape2.Elaborate the implications of cyberbranding and digitization on online marketing mix decisions3.Develop specific models related to social media and social media analytics4.Evaluate concepts related to Search Engine Marketing, Customer Centric Web Business models and Web Chain Analysis5.Illustrate the new age marketing practices	
SOLID STATE ELECTRONIC DEVICES & 16B1NPH632: 1. Define terminology and concepts of semiconductors with solid state electronic devices.2.Explain various electronic, optical and thermal properties of semiconductors; various techniques used in device fabrication.3.Solve numerical problems based on solid state electronic devices.4.Examine the impact of various parameters on semiconductor devices and their performances.	
STATISTICS & 16B1NMA633: 1. Make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data. 2.Apply correlation and regression in statistical analysis of data. 3.Explain sampling theory and its distributions.4.Explain the concepts and properties of estimation theory. 5.Apply sampling and estimation theory to find the confidence interval. 6.Analyze small and large sample data by using the test of hypothesis.	
Data and Web Mining & 16B1NCI635: 1. Apply the pre-processing techniques to nominal, binary, categorical and ordinal data.2.Design a Data warehouse using star, snowflake and galaxy schema and perform OLAP operations like roll-up, drill-down, slicing and dicing, etc3.Apply a wide range of classification techniques like Naïve-bayes, decision tree, and KNN for the numerous application including fraud detection, target marketing, medical diagnosis, etc.4.Cluster the similar/dissimilar objects using different methods like partitioning, hierarchical and density based clustering.5.Analyze the transactional data for finding frequent and interesting patterns using association rule mining techniques like Apriori and FP-Growth.6.Analyze the link structure of web using page rank and HITS algorithms.	
WIRELESS NETWORKS & 16B1NCI642: 1. Define basic concepts & terms related to IEEE 802.11wireless networks 2.Explain cellular concepts of mobile radio propagation in wireless networks, IEEE 802.11 adhoc routing protocols and transport layer protocols.3.Identify different categories and design issues of IEEE 802.11 MAC protocol4.Analyze metrics of MAC & Mobile IP based routing protocols using simulators5.Evaluate various security parameters in wireless networks	
Course Outcome (Semester - 7)	
APPLIED LINEAR ALGEBRA & 17B1NMA731: 1. Explain field, vectors, vector spaces and their dimensions.2.Apply linear transformations in solving practical engineering problems.3.Develop the concept of rank, determinant, existence and uniqueness of solution of a system of linear equations.4.Explain the concept of length, distance and inner-product.5.Apply the concept of orthogonality and orthogonal matrices to orthogonalize a set of linearly independent vectors. 6 Analyze eigenvalues, eigenvectors and their properties to solve a system of ordinary differential equations.	
APPLIED NUMERICAL METHODS & 17B1NMA732: 1. Solve system of linear equations using direct and iterative methods with their applications in various engineering problems. 2.Explain finite and divided difference formulae for numerical interpolation.3.Apply the methods of least squares to best fit the given data.4.Apply numerical differentiation and integration in engineering applications. 5.Solve system of non-linear equations and analyze the convergence of the methods.6.Evaluate the solutions of initial and boundary value problems using various numerical methods.	
CLOUD COMPUTING & 17B1NCI747: 1. Understand various Cloud Service Models and Virtualization Technology to Create Virtual Machines for cloud based applications using Virtual Machine Monitors (VMMs). 2.Analyze various VM migration techniques and their performances in cloud environments.3.Analyze the performances of VMs for application specific cloud environments.4.Analyze and evaluate the performance of various energy aware computational techniques used in Cloud environments.5.Develop sustainable systems using cloud based methods and techniques.	
COMPUTER AND WEB SECURITY & 17B1NCI732: 1. Assessing computing system's threats and access control in Operating Systems2.Explain Software Security Issues, their solutions along with cryptography3.Evaluate various malware detection systems 4.Identify client-side web access threats like cross site scripting and SQL injection 5.Apply mechanisms of correct Identification and Authentication of users of computing resources6.Examine non-cryptographic network protocol vulnerabilities and their solutions	

COMPUTER GRAPHICS & 17B2NCI731: 1. Explain the basics and core concepts of computer graphics including different graphics systems, usage of GPUs, applications of computer graphics, and others.2.Compose scenes by applying common 2D & 3D graphics algorithms such as, viewing transformations, clipping, projections, rendering, etc. using OpenGL.3.Analyze models for lighting – distant and multiple light sources; reflection and models for shading – flat, smooth, Phong, etc.4.Demonstrate the use of planer and surface curves, and use of visible surface detection methods for scene presentation.5.Explain animation and key framing.6.Interpret and critique procedural modelling, fractals, and particle systems and critique existing systems.
COMPUTING FOR DATA SCIENCE & 19B12CS423: 1. Make use of basic concepts ,methods, and mathematics relevant to computational techniques for data science2.Develop own statistical analyses and implement them with advanced statistical programming tools3.Develop and apply advanced and associated computing techniques and technologies.4.Compare the performance of multiple methods and models, recognize the connections between how the data were collected and the scope of conclusions from the resulting analysis, and articulate the limitations and abuses of formal inference and modeling.5.Evaluate strategies for constructing models and can use different measures of model fit and performance to assess models.
CUSTOMER RELATIONSHIP MANAGEMENT & 17B1NHS731: 1. Apply the financial, social and electronic aspects of the Customer Relationship in business situations.2.Appraise the role of customer share and customer centricity in organizations.3.Develop the skills to understand customization, innovation and co-creation in organizations and apply them in business contexts.4.Analyze the role of interactive technology for customer engagement, customer retention and customer experience management in organizations.5.Evaluate the technological solutions and their applications for effective Customer Relationship Management across different functions in organizations.6.Develop specific models for response modelling and consumer profiling in organizations.
DATA COMPRESSION ALGORITHMS & 16B1NCI733: 1. Explain and summarize theoretical and practical significance of various mathematical concepts of data compression. 2.Demonstrate lossless and lossy compression techniques for images, videos, audios, etc. 3.Applying different data compression algorithms for solving complex problems. 4.Analyse the techniques for compression of binary data, image, audio and video. 5.Elaborate new trends and possibilities of data compression for redesigning of algorithms.
ELEMENTS OF STATISTICAL LEARNING & 19B12MA411: 1. Explain different type of learning techniques.2.Apply and analyze linear regression techniques3.Apply and analyze linear classification techniques4.Use and analyse sparse kernel machines5.Compare learning models6.Apply unsupervised learning techniques.
ETHICAL HACKING & 18B12CS434: 1. Define what is ethical hacking and penetration testing, and when and why penetration testing is required along with testing phases.2.Classify and outline the penetration testing phases and relate the phases to the specified context.3.Identify and analyse the stages a penetration tester requires to take in order to compromise a target system.4.Examine and implement tools and techniques to carry out a penetration testing.5.Critically evaluate security techniques used to protect system and user data to suggest countermeasures.
GENDER STUDIES & 16B1NHS831: 1. Demonstrate knowledge of the construct of gender and the way it intersects with other social and cultural identities of race, class, ethnicity and sexuality2.Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity and masculinity3.Analyze the ways in which societal institutions and power structures such as the family, workplace impact the material and social reality of women's lives4.Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporary settings 5.Evaluate and interpret information from a variety of sources including print and electronic media, film, video and other information technologies
HEALTHCARE MARKETPLACE & 17B1NBT732: 1. Explain healthcare market, drugs and devices, role of various stakeholders2.Apply related intellectual property laws and regulatory approvals for healthcare sector3.Analyze the various business models/ innovations in the healthcare industry4.Compare economic aspects pertaining to the sector
HUMAN RESOURCE ANALYTICS & 18B12HS412: 1. Gain an understanding of the different analytical techniques used for solving HR related problems.2.Apply descriptive and predictive analysis techniques to understand trends and indicators in human resource data.3.Analyze key issues related to Workforce Planning, Diversity, Talent Sourcing, Talent Acquisition, Talent Engagement, Training and Intervention, Performance Management and Retention using analytical techniques. 4.Critically asses and evaluate the outputs obtained from analytical tools and recommend HR related decisions.5.Create and hypothesize the situation given and check for its validity using appropriate analytical technique.
HUMAN RIGHTS AND SOCIAL JUSTICE & 17B1NHS733: 1. Solve system of linear equations using direct and iterative methods with their applications in various engineering problems. 2.Explain finite and divided difference formulae for numerical interpolation.3.Apply the methods of least squares to best fit the given data.4.Apply numerical differentiation and integration in engineering applications. 5.Solve system of non-linear equations and analyze the convergence of the methods.6.Evaluate the solutions of initial and boundary value problems using various numerical methods.
INDIAN FINANCIAL SYSTEM & 10B1NPD735: 1. Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market.2.Analyze ways of fund raising in domestic and international markets3.Understand functioning of Stock market and evaluate securities for investment.4.Apply the knowledge of Mutual Funds and Insurance in personal investment decisions5.Apply knowledge of Income tax for calculation of tax liability of individual.
INDUSTRIAL AUTOMATION USING IOT & 19B12CS424: 1. Development of smart sensors and actuators for smart industry2.Develop industrial control application using Embedded C and ARM Cortex Microcontrollers3.Apply new ways of servicing customers and the creation of new revenue models4.Analyze desired goal of industrial transformation 5.Design and development of IIoT Application for Industry 4.0 Architecture

INTRODUCTION TO DEVOPS & 19B12CS427: 1. Students will be able to understand the needs of scaled infrastructure of micro services and devops related process.2.Students will be able to Plan, measure the need of various types of micro services and devops related process.3.Students will be able to Write scripts for the creating and deploying the micro services for the Developed Application for the calculated load and error messages.4.Students will be able to write scripts for the measuring and loading the reports Ansible and Python.

IOT ANALYTICS & 19B12CS426: 1. Understand how analytics relates to IoT data2.Apply appropriate machine learning, Deep Learning algorithms to gain business insights from IoT data.3.Analyze various big data platforms and massively parallel processing databases for IoT systems4.Examine how streaming and predictive analytics can be used for IoT Data processing and analysis, in real time.5.Understand the concept of network flow analytics using Flexible NetFlow in IoT systems.6.Evaluate the performance of the overall system and security in IoT network.7.Design methods and develop web based IoT applications using big data analytics for real world problems

MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING & 17B1NCI731: 1. Explain different syntax and semantics approaches in NLP2.Understand the fundamental mathematics applied in the field of NLP3.Apply different models like Hidden Markov Model, SVM, CRF, RNN, LSTM in parts of speech tagging4.Apply different probabilistic parsing techniques in NLP 5.Apply different supervised and unsupervised techniques for document classification6.Analyze and apply appropriate Machine Learning techniques to solve the real world problem in NLP

MAJOR PROJECT PART - 1 & 15B29CI791: 1. Summarize the contemporary scholarly literature, activities, and explored tools for hands-on in the respective project area2.List out the specific requirements to develop the workable solution for the identified computing problem.3.Develop a workable computing solutions for the identified problem 4.Evaluate the performance of the developed solution5.Improve the communication and writing skills in terms of presenting the results in written and verbal formats

MATHEMATICAL FOUNDATIONS FOR INTELLIGENT SYSTEMS & 19B12CS422: 1. Explain the concepts of computing eigenvectors, vector spaces , manipulate linear transformation and various decomposition techniques, probability, entropy .2.Explain concepts of unconstrained , constrained optimization ,convexity,blackbox& global Optimization , Lagrange's function .and its application such as Support Vector Machine etc.:3.Explain concepts of time series analysis, linear vector calculus, Multivariable Calculus, Multivariate Chain Rule Gradient Descent Methods 4.Apply the concepts of linear algebra, probability, Fourier transformation, optimization techniques, concepts of calculus in study of intelligent systems5.Analyze different approaches for constructing intelligent systems using concepts of linear algebra, probability, Fourier transformation, optimization techniques, concepts of calculus in study intelligent systems

NANO-SCIENCE AND TECHNOLOGY & 17B1NPH732: 1. Define the Nanoscience and Technology and to know about various other terminologies and developments involved with Nanoscience and Technology2.Classify the nanomaterials depending on the nature of dimensionalities, type of materials classes and explain the basic concepts of nanomaterials 3.Apply the concepts of Nanoscience for solving the theoretical and numerical problems4.Determine the properties of nanomaterials through suitable characterization tools

NATURE INSPIRED COMPUTING & 16B1NCI833: 1. Explain the concepts of problem solving via search, optimization and pattern recognition with various practical examples.2.Apply the NIC methods to model, learn and optimize computing problems.3.Analyze the key ideas, algorithmic steps of various nature inspired computing methods and their general applicability in various domains.4.Compare and contrast the similarities and differences among various nature inspired computing methods.5.Formulate and design an efficient solution to a given problem by using the most appropriate nature inspired computing method.

SOCIAL NETWORK ANALYSIS & 15B1NCI738: 1. Define social network growth models and their characteristics. 2.Compare and interpret social network structure, size and its connectivity pattern using degree distribution, clustering coefficient, centrality, motifs, density, etc.3.Apply link prediction techniques like Jaccard Coefficient, Adamic Adar, Preferential attachment, Katz score, etc. to discover new links in the social network4.Discover community structure in complex network using statistical techniques like Newman Girvan, Clique Percolation Method, Ford Fulkerman etc.5.Model the cascading/flow of information in social network for maximizing the cascade, locating the seed nodes and influential nodes.6.Develop secured social networks by applying mechanisms like K-anonymity, L-diversity, T-closeness, etc. to ensure privacy and security.

SOFTWARE CONSTRUCTION & 18B12CS436: 1. Choose appropriate fundamental element of software construction for an actual software development.2.Apply various Assertion, Error-Handling, Exceptions techniques for defensive programming.3.Make use of appropriate coding standards and conventions of code construction at class routines, variables, and statements level.4.Experiment with code improvement strategies like Code Refactoring, Code Optimization and Tuning.5.Demonstrate use of software construction techniques like parameterization, debugging and tools for GUI builders, unit testing , profiling, performance analysis and slicing .

STRESS: BIOLOGY, BEHAVIOUR AND MANAGEMENT & 17B1NBT733: 1. Explain the biological basis of stress 2.Relate cognitive processes and stress management3.Apply acquired knowledge in understanding and adjusting to different people and situations.4.Improve quality of life by reducing chronic stress.

SUMMER TRAINING VIVA & 15B29CI793: 1. Summarize the contemporary activities with respect to their module, and explored tools for hands-on in the respective project area2.Analyse industry requirements and work culture3.Apply technical knowledge to construct computing-based solution with respect to the identified problem at industry/institute.4.Interpret and critically evaluate the solution for the problem.5.Create written discourse for presentation of work done at industry/institute.

TERM PAPER & 15B29CI792: 1. Infer the research problem stated along with the research methodologies used and their significance.2.Appraise technical writing skills to compare and summarize the nature of work done so far in that area.3.Develop effective communication skills to confidently justify theoretical propositions, methodologies, conclusions and limitations by preparing and presenting a seminar

Course Outcome (Semester - 8)

ADVANCED JAVA PRORGRAMMING & 19B12CS412: 1. Explain threads, synchronization and need of handling concurrency issues in applications. 2.Apply synchronization utilities to solve concurrency issues in given problem.3.Build Java Programs using JDBC Connectivity with SQL Database.4.Demonstrate and implement web application using Java Servlets.5.Build Java Programs using Java Server Pages technology.

AUTONOMOUS DECISION MAKING & 18B12CS412: 1. Comprehend and represent the type of agents and environment2.Apply various search techniques in partially-observable and dynamic environment and optimizing path. 3.Develop exact and approximate reasoning models for uncertain input and uncertain environment.4.Construct temporal, utility-based, temporal-utility-based and multi-agents based models for reasoning in uncertain environment.5.Examine and analyse the application of various techniques in different scenario of uncertain environment. 6.Evaluate and compare the performance of different techniques on the basis of complexity.

CRYPTOGRAPHY AND NETWORK SECURITY & 17B2NCI743: 1. Describe classical encryption methods based on Substitution and Permutation2.Implement and apply modern block and stream cipher techniques like DES, AES and RC43.Analyse the role of prime number theory and quadratic congruence in cryptography4.Implement and apply asymmetric encryption algorithms of RSA , ElGamal and Elliptic Curve Cryptography5.Criticize hashing algorithms like SHA-512 and SHA – 10246.Compare and Choose cryptographic techniques for using Digital Signatures and certificates in existing applications

DISTRIBUTED COMPUTING & 18B12CS419: 1. Identify and solve event ordering related problems occurring due to various synchronization related issues in distributed systems (e.g., using Lamport, Vector, Matrix clock implementations). 2.Compare and explain the solutions for mutual exclusion and deadlock related issues for various application specific scenarios that may occur in distributed environments (e.g., using token and non-token based techniques). 3.Examine and distinguish data consistency and replication related issues for various distributed scenarios. 4.Evaluate and assess fault tolerance related issues for perceiving reliable systems in distributed environments. 5.Show how the concepts of distributed computing have been applied in existing distributed database systems, distributed file systems and cloud based systems.

HIGH PERFORMANCE WEB AND MOBILE APPLICATIONS & 17B1NCI735: 1. Analyze differentiating aspects of high performance and regular web applications. 2.Explain the design goals of high performance web & mobile applications. 3.Design and develop Server and mobile applications for Multi threaded environment 4.Build the performance metrics for evaluating the application load. 5.Make use application testing suite for performance testing6.Analyze the crash reports for various types of crashes due to multiple platforms of mobile devices in a consolidated manner.

INDUSTRIAL SOCIOLOGY & 18B12HS811: 1. Understand the scope of industrial sociology and major theories on labour and work2.Analyzing the contemporary issues related to industry in the post-LPG era3.Evaluating work in its social aspects such as gender, caste, class and unpaid work, as different from its better known economic dimension.4.Evaluate and interpret information about emerging issues in industry through various sources like print and electronic media, film, documentary and other information technologies

INTERNATIONAL FINANCE & 19B12HS812: 1. Explain the global market scenario, its imperfections and risks which affect the multinational businesses trade.2.Analyze the international transactions of balance of payments and understand their relationship with key macroeconomic indicators3.Apply the concepts of foreign exchange market and currency derivatives for making transactions and risk hedging in foreign exchange market4.Analyze the role of parity conditions and other factors in exchange rate determination.

INTERNATIONAL STUDIES & 15B1NHS832: 1. Demonstrate an understanding of the basic concepts in the area of international studies2.Compare the changes in India's foreign policy in the Cold War era and the post Cold War era3.Analyze the major political developments and events since the 20th century4.Demonstrate an understanding of the rise of new power centres in the changing world order

INTRODUCTION TO DEEP LEARNING & 18B12CS428: 1. Identify and express the motivation behind and need of Deep Learning.2.Comprehend the basic theory of learning, probability in learning, error minimization and regularization techniques.3.Design and Model Convolution Neural Networks for Image recognition and Computer Vision. 4.Apply Recurrent Neural Networks and LSTM for temporal data 5.Assess the Deep Learning techniques on the basis of performance measures such as training speed, classification error, kappa coefficient, precision, recall and F-Measure.

MACHINE LEARNING TOOLS IN BIOINFORMATICS & 18B12BT414: 1. Explain about the machine learning principle biological complexities and resources 2.Apply Pattern Identification methods for motif discovery3.Apply machine learning in solving biological problems.4.Analyzing the use of machine learning in disease-drug discovery

OPTIMIZATION TECHNIQUES & 16B1NMA831: 1. apply generalized, revised and dual simplex method for linear programming problems (LPP). 2.apply graphical, algebraic and linear programming techniques for pure and mixed strategy problems in game theory.3.classify and solve the problems on queuing and inventory models. 4.solve and analyze the network scheduling and sequencing problems.5.make use of dynamic programming technique to solve complex linear programming problems. 6.determine numerical solution of nonlinear multidimensional problems.

PHOTONICS AND APPLICATIONS & 18B12PH811: 1. Recall the fundamental properties of light and the processes involved in the generation of light2.Interpret the theory of fiber optics3.Apply the fundamentals of various nonlinear optical effects in technology; make use of holography and its applications4.Compare the operational principles, characteristics and trade-offs of optical detectors and modulators of light

PROJECT PART-II & 15B29CI891: 1. Summarize the contemporary scholarly literature, activities, and explored tools for hands-on in the respective project area2.List out the specific requirements to develop the workable solution for the identified computing problem.3.Develop a workable computing solutions for the identified problem4.Evaluate the performance of the developed solution5.Improve the communication and writing skills in terms of presenting the results in written and verbal formats

QUALITY ISSUES IN ENGINEERING & 18B12HS815: 1. Apply the concepts of quality within quality management systems by understanding various perspectives, historical evolution; and contributions of key gurus in the field of quality2.Determine the effectiveness of acceptance sampling using single and double sampling plans and operating characteristic curves3.Determine quality by employing a wide range of basic quality tools, lean concepts and process improvement techniques such quality function deployment4.Examine the importance of six sigma, various quality standards, awards, certifications
SEARCH BASED SOFTWARE ENGINEERING & 18B12CS415: 1. Explain the concepts of search-based software engineering and various types of optimization problems in the context of different software engineering problems.2.Identify and define/formulate various software engineering activities/tasks as search-based optimization problem.3.Design and develop methods for encoding the software engineering problems for finding optimal solutions from larger search space using search-based techniques 4.Implement and apply different optimization techniques on various forms of software optimization problems using different SBSE Tools5.Analyze the behavior of different optimization techniques corresponding to different forms of software optimization problems.6.Evaluate the performance of different single and multi-objective optimization techniques using different quality indicators
SERVICE MANAGEMENT MARKETING & 16B1NHS832: 1. Understand service products, consumers and markets 2.Apply 4P's of marketing to service3.Determine and Interpret the customer Interface4.Create and design profitable service strategies

PROGRAMME NAME:M.TECH IN COMPUTER SCIENCE & ENGINEERING

Programme Educational Objectives (PEOs):

PEO 1: To prepare professionals who will have successful career in industries, academia, research and entrepreneurial endeavours.

PEO 2: To prepare graduates who will demonstrate analytical, research, design and implementation skills offering techno-commercially feasible and socially acceptable solutions to real life problems.

PEO 3: To prepare graduates who will thrive to pursue life-long learning and contribute to society as an ethical and responsible citizen.

Table 6: Programme Outcomes (POs):

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.
PO2: An ability to write and present a substantial technical report/document.
PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program

Table 7: Programme Specific Outcomes (PSOs):

PSO 1:Students should be able to develop and implement the solution of real life computing problems using contemporary technologies.
PSO 2: Students should be able to apply ethical principles and commit to professional and social responsibilities.

Table 8:Academic Year 2019-20 Course Outcomes (COs):

Course Outcome (Semester - 1)
Data structure & Algorithms for Big Data (17M11CS111): 1. Define basic concepts of Big Data and relating them to them with various Big Data technologies (e.g., Hadoop, Spark) 2.Explain Hadoop cluster architecture and its components and Differentiate Hadoop Distributed File System (HDFS) from other storage techniques, e.g., NFS and UNIX file system 3.Construct data structure and algorithms for HDFS and MapReduce and further applying them to different Big Data problems.4.Apply hashing on large scale multi-dimensional data sets using Locality Sensitive Hashing.5.Analyze and apply advance data structures and algorithms (e.g., B and B+ Tree, R and R+ Tree, Matrix multiplication) for solving big data problems6.Evaluate Streaming Algorithms, Sublinear optimization, Machine Learning, Hadoop systems
Machine Learning and Data Mining & 17M11CS112: 1. Differentiate between Classification, Clustering and Association Rules techniques.2.Apply and Compare different classification techniques, e.g., k-Nearest Neighbours, Naïve Bayes, ID3 Decision Trees, Support Vector Machine, Ensemble methods. 3.Apply and compare different clustering techniques, e.g., k-means, k-mediods, etc.4.Apply Apriori algorithm to generate the frequently used rules in a market basket analysis. 5.Apply different dimensionality reduction techniques e.g. PCA, SVD, Factor Analysis, Linear Discriminant Analysis, etc., in big data scenarios.6.Apply Artificial Neural Network techniques, i.e., Back propagation, Feed forward Network, Kohonen Self-Organising Feature Maps, Learning Vector Quantization, etc, for solving classification and clustering problems.
E-Commerce and Social Web 17M11CS121: 1. Compare and categorize different commercial models of E-commerce. 2.Design and develop marketing strategies based on interactions and insights from Social web to enhance revenue promote brand and reach out to customers.3.Make Use of Open source API s from various social networking sites.4.Outline suggestions and recommendations for Social Shopping.5.Measure the effect of different Social media marketing strategies using Social Media metrics.
Web Intelligence (19M12CS111): 1. Outline the various web technologies, methods, and models used to design an

intelligent web.2.Make use of web caching strategies at varied level: user, web server, and gateway server.3.Analyze and Model the users' browsing behavior on web.4.Evaluate various Web content mining algorithms and Web language models for Web Applications. 5. Design and develop the computational intelligent web algorithms to handle complex real problems

Soft Computing and Applications 17M22CS113: 1. Select defuzzification and other methods in fuzzy decision making2.Analyze different fuzzy inference systems for various real world problems.3.Develop solutions for different problems using genetic algorithm and it's extensions 4.Apply different neural network based algorithm 5.Analyze the suitability of hybrid systems for a given problem

Metaheuristics in Modeling and Optimization (19M12CS112): 1. Interpret and explain the concepts of Metaheuristics based optimization and it's application in a diverse range of applications.2.Model single solution and population based Metaheuristic algorithms to solve a given optimization problem. 3.Model Metaheuristic algorithms to solve Multi-objective optimization problems. 4.Model hybrid Metaheuristic algorithms to solve a given optimization problem. 5.Explain algorithms and architectures for parallel implementation of Metaheuristics.

Wireless Sensor and Actuator Networks 14M1NCI339: 1. Develop distribution models for deterministic or stochastic network deployment 2.Designing communication protocols for wireless sensor network standards 3.Develop mathematical models for energy consumption 4.Analyse medium access mechanisms, routing protocols 5.Analyse cross layer schemes, including load balancing and node clustering 6.Performance evaluation of sleep scheduling strategy with data prediction and aggregation methods7.Develop Coverage Maximization models for optimizing network lifetime

Blockchain Technology and Applications & 18M12CS117: 1. Define what is blockchain and cryptocurrency, and when and why blockchain is required with its application areas.2.Understand and describe how blockchain works. Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building.3.Identify and analyze the real world problems that the blockchain is trying to solve.4.Examine and implement tools and techniques to build a blockchain application.5.Explore the platforms such as Bitcoin, Ethereum, and Hyperledger to create and evaluate the blockhain applications.

3D Graphics and Animation / 17M12CS115: 1. Explain the theories of 3D objects and various media environments.2.Propose solutions to given case studies by illustrating various methods and environments related to 3D graphics such as geometry, transformations and modeling, visibility detection, lighting, illumination, etc.3.Create multimedia-rich content, specifically comic frames and animations.4.Design dynamic and interactive animations using scripting to implement fun games and create richer content.5.Critique and compare various advanced animation principles such as rigid body dynamics, natural phenomena and modelling, 3D object manipulation, etc.

Advanced Algorithms Lab (17M15CS111): 1. Implement algorithms and use appropriate advanced data structures for solving computing problems.2.Design algorithms using divide-and-conquer, greedy and dynamic programming strategies, and further recite algorithms that employ these strategies.3.Illustrate the mathematical foundation of network flows and some important flow algorithms.4.Implement randomized algorithms to solve various problems, and validate their correctness and complexity.5.Understand P, NP, polynomial reduction, NP-hardness, and NP-Completeness. 6.Comprehend and select algorithm design approaches in a problem specific manner.

Cloud Technology Lab 17M15CS11 3: 1. Demonstrate the architecture and layers of Cloud Service Models, Deployment models etc. 2.Understand the working of CloudSim and run different scheduling alogorithms. 3.Analyze various Scheduling algorithms and compare their performances 4.Apply and evaluate the energy aware algorithms for using DVFS techniques.

Course: Machine Learning and Data Mining Lab [17M15CS112]: 1. Identify the programming languages for machine learning techniques2.Use Python to apply and evaluate Linear regression, Logistic regression, kNN, kMeans and ID3 on different datasets3.Deploy SVM and Neural Network by accessing and understanding the files that make up a trained model.4.Apply Deep Learning Neural networks to model object detection, video tagging, music genre detection etc.5.Evaluate different machine learning models on the basis of their performances

Research Methodology & Intellectual Property Rights (18M11GE111): 1. understand the basic concepts and types of research2.define a research problem, its formulation, methodologies and analyze research related information3.follow research ethics, understand IPR, patents and their filing related to their innovative works.4.understand and analyze the statistical data and apply the relevant test of hypothesis in their research problems

Course Outcome (Semester - 2)

Cloud and Web Services Software Engineering   17M11CS121: 1. Demonstrate role of Soft¬ware engineering in combining cloud and web services computing paradigms for service development.2.Make use of web & cloud services and service engineering process to design, implement, and test, deploy and execute services. 3.Categorize various cloud services into compute, storage, database, application, analytics, network, and deployment.4.Analyze the requirements for developing and migrating applications to Web and Cloud Services. 5. Appraise different design patterns, reference architectures, performance metrics, testing for Cloud and Web Services.

Performance Evaluation of Computing Systems, 17M11CS122: 1.Demonstrate the ability to describe the correct tools and techniques for computer system performance evaluation 2. Identify the probability distribution in a given stream of data that corresponds to a source of randomness in a system. 3. Design the appropriate model of a discrete, dynamic, stochastic system using the theory of random processes. 4. Inspect the mathematical modeling techniques, Markov chains, queuing theory for analyzing the system. 5. Select the appropriate experiments and perform a simulation study of the given system.

Internet of Things (18M12CS419): 1. Identification of purpose, requirements and description of various components and specifications of IoT devices, applications and protocols. 2. Develop the Process Model, Domain Model, Information Model and Service Model specifications using IoT communication protocols. 3. Analyze the characteristics and functioning of various IoT specific communication protocols used in different layers of IoT devices.4. Evaluate various IoT protocols and components for building IoT applications for real world problems and sustainable solutions.

Large Scale Graph Algorithms and Analytics (17M22CS115): 1. Understand the characteristics & significance of large scale graphs over complex structures2.Analyze several techniques to yield and process information from large data sources 3.Apply the concept of random network theory to large graphs4.Evaluate the heterogeneous behaviour in large-scale graphs with hyper-graphs and multi-graphs for recommendation 5. Design algorithmic frameworks for large-scale complex interconnected structures

Performance Engineering Lab, 17M15CS122: 1. Experiment with GProf to calculate the performance and statistics of a program in terms of call counts and timing information of functions.2.Compare the performance of different protocols by simulating various network scenarios in NS2 Simulator.3.Design wired and wireless networks in NS2 and analyze the simulation results using AWK and Python programming.4.Examine the performance of M/M/1, M/D/1 and D/M/1 Queuing models in NS2. 5. Utilize the Weka Tool for analyzing data file.

Cloud and Web Services Lab   17M15CS121: 1. Recall and show use of core OO concepts like classes, files, packages, modules, inheritance, exception handling and data structures.2.Demonstrate creation, validation and parsing of well-formed XML documents using DTD and XML Schema3.Design, Implement, Deploy and Test Services. 4.Make use of Amazon Web Services (AWS) from free tier. 5. Construct simple application that consume using both cloud and web services.

Project Based Learning I (Open Source Software Development) & 17M17CS111: 1. Conduct literature review to compare and contrast their project with existing work in the area and prepare a project proposal to be delivered to their peers and faculty members2.Develop an ability to function in task oriented team, divide role responsibilities to build a project on open data3.Understand professional and ethical responsibility & acquire ability to communicate effectively amongst team members, peers &evaluators 4.Analyze and identify various open data frameworks, RESTful APIs, Python libraries for project implementation; plan & submit project development timeline5.Appraise by giving milestone presentations to their peers and faculty about their current progress.6.Prepare technical report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details.

IoT System Development Lab 17M15CS123: 1. Explain Node-RED IDE platform for IoT application development and demonstrate I/O nodes, flows, third party palettes, import/export of flows in Node-RED. 2.Develop user defined functional nodes and deploy it in Node-Red. 3.Analyze various IoT Communication protocols using APIs with Arduino and Raspberry Pi along with sensors and actuators. 4.Apply and evaluate the characteristics of different IoT devices.5.Design and develop IoT based applications for various challenges and problems related to Sustainable Development, e.g., energy and waste management, water conservation, clean energy, improving public health, sustainable urbanization, smart agriculture etc.

Cryptography & Computer Security (14M1NCI231): 1. Understand principles & theories of cryptography and computer security; Classify symmetric encryption techniques2.Apply the knowledge of number theory in public key cryptographic techniques3.Analyze security mechanisms using rigorous approaches, including theoretical for intrusion detection systems 4.Evaluate Authentication Techniques and Hash Algorithms

English for Research Paper Writing (19M13HS111): 1. Demonstrate an understanding of all the aspects of grammar and language needed to write a paper.2.Use of writing skills with proper grammar usage.3.Classify each section of a paper after careful analysis of Literature Review.4.Determine the skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion.5.Compile all the information into a refined research paper after editing and proofreading

Course Outcome (Semester - 3)

Constitution of India 19M13HS211: 1. Outline the salient features of Indian Constitution and its preamble.2.Critical evaluation of fundamental rights given by the constitution.3.Evaluate the role of different institution responsible for the implementation of constitutional rules. 4. Understand functioning of Election Commission

Advanced Operations Research (18M12MA111): 1.develop linear programming problems and make use of generalized, revised and dual simplex method to solve linear programming problems and Apply parametric and sensitivity analysis to analyze optimal solution of linear programming problems.2.identify and solve the deterministic inventory models with and without shortages. 3.construct the network models and analyze the criticalactivities using PERT/CPM for project planning.
4.identify pure and mixed strategy games and solve and analyze them using graphical and linear programming techniques.5.solve multi-objective and goal programming problems by graphical and simplex method. 6. demonstrate Khun-Tucker conditions and apply them to solve non-linear programming problems, quadratic and separable programming problems.

17M17CS121- Project Based Learning-II (Software Development Automation): 1. Develop a project on live problems by applying automated software development process. 2.Confront the issues related to development of project which includes team work, test driven design, data collections etc.3.Develop oral communication skill and prepare technical report. 4. Critically review the projects developed by peers.

SEMINAR AND TERM PAPER & 17M17CS212: 1. Summarize the literature around a significant research problem in the field of Computer Science2.Analyze the research articles from a deeper perspective and examine the research gaps 3.Improve the communication and writing skills by compiling the findings in the form of report and seminar

DISSERTATION & 17M27CS213: 1. Identify a research problem after thorough literature survey.2.Apply the acquired knowledge in the field of computer science while proposing a solution to the identified research problem.3.Implement the proposed solution to exhibit the programming skill.4.Evaluate the solution to meet the given set of requirements.5.Demonstrate and defend their research work to a panel of experts.6.Demonstrate the research output in terms of publications.

INDUSTRIAL PROJECT & 17M27CS214: 1. Identify an organization and relevant project as problem2.Review relevant literature related to identified project3.Apply acquired Computer Science concepts and tools to solve the business-related problem4.Analyze various solution alternatives to solve the given problem5.Evaluate proposed solution with respect to alternatives to establish its efficacy6.Create oral and written account of the work done and its results and conclusions

Course Outcome (Semester - 4)

DISSERTATION & 17M27CS223: 1. Identify a research problem after thorough literature survey.2.Apply the acquired

knowledge in the field of computer science while proposing a solution to the identified research problem.3.Implement the proposed solution to exhibit the programming skill.4.Evaluate the solution to meet the given set of requirements.5.Demonstrate and defend their research work to a panel of experts.6.Demonstrate the research output in terms of publications.

INDUSTRIAL PROJECT & 17M27CS224: 1. Identify an organization and relevant project as problem2.Review relevant literature related to identified project3.Apply acquired Computer Science concepts and tools to solve the business-related problem4.Analyze various solution alternatives to solve the given problem5.Evaluate proposed solution with respect to alternatives to establish its efficacy6.Create oral and written account of the work done and its results and conclusions

PROGRAMME NAME:M.TECH IN COMPUTER SCIENCE &ENGINEERING (SPECIALISATION IN DA)

Programme Educational Objectives (PEOs):

PEO 1: To prepare professionals who will have successful career in industries, academia, research and entrepreneurial endeavours.

PEO 2: To prepare graduates who will demonstrate analytical, research, design and implementation skills offering techno-commercially feasible and socially acceptable solutions to real life problems.

PEO 3: To prepare graduates who will thrive to pursue life-long learning and contribute to society as an ethical and responsible citizen.

Programme Outcomes (POs): Refer Table 6

Table 9: Academic Year 2019-20 Programme Specific Outcomes (PSOs):

PSO 1: Students should be able to engage in sustainable development and demonstrate data analysis skills for effective interpretation and decision making to solve real life problems.

PSO 2: Students should be able to apply ethical principles and commit to professional and social responsibilities.

Table 10: Academic Year 2019-20 Course Outcomes (COs):

Course Outcome (Semester - 1)

SOFT COMPUTING AND APPLICATIONS & 17M22CS113: 1. Select defuzzification and other methods in fuzzy decision making2.Analyze different fuzzy inference systems for various real world problems.3.Develop solutions for different problems using genetic algorithm and it's extensions 4.Apply different neural network based algorithm 5.Analyze the suitability of hybrid systems for a given problem

BLOCKCHAIN TECHNOLOGY AND APPLICATIONS & (18M12CS117): 1. Define what is blockchain and cryptocurrency, and when and why blockchain is required with its application areas.2.Understand and describe how blockchain works. Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building.3.Identify and analyze the real world problems that the blockchain is trying to solve.4.Examine and implement tools and techniques to build a blockchain application.5.Explore the platforms such as Bitcoin, Ethereum, and Hyperledger to create and evaluate the blockhain applications.

DATA SCIENCE PROGRAMMING LAB -I & 17M25CS113: 1. Understand the syntax and semantics of R programming language.2.Importing different data formats and Apply data pre-processing techniques to handle missing values and noisy data values3.Apply Data Visualization techniques for graphical representation and analysis of real world data 4.Apply varied Supervised and unsupervised techniques for classification

MACHINE LEARNING AND DATA MINING LAB & 17M15CS112: 1. Identify the programming languages for machine learning techniques2.Use Python to apply and evaluate Linear regression, Logistic regression, kNN, kMeans and ID3 on different datasets3.Deploy SVM and Neural Network by accessing and understanding the files that make up a trained model.4.Apply Deep Learning Neural networks to model object detection, video tagging, music genre detection etc.5.Evaluate different machine learning models on the basis of their performances

CLOUD BASED BIG DATA SYSTEMS LAB I & 17M25CS111: 1. Outline cloud based big data systems and classify them on basis of their features and applicability2.Apply Hadoop file system shell commands to perform various Hadoop distributed file system (HDFS) operations3.Develop a real-world application using the MapReduce framework4.Apply Cassandra CQL commands to define, query and analyze a NoSQL database. 5.Apply NuoDB operations to insert and query data.

RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS & 18M11GE111: 1. Understand the basic concepts and types of research2.define a research problem, its formulation, methodologies and analyze research related information3.follow research ethics, understand IPR, patents and their filing related to their innovative works. 4.understand and analyze the statistical data and apply the relevant test of hypothesis in their research problems

Course Outcome (Semester - 2)

ADVANCED MACHINE LEARNING LAB & 17M25CS122: 1. Use Python for implementing fundamental machine learning algorithms2.Deploy Neural Network with TensorFlow by accessing and understanding the files that make up a trained model.3.Apply Deep Learning Neural networks to model object detection, video tagging, music genre detection etc.4.Evaluate different deep learning models on the basis of their performances

CLOUD BASED BIG DATA SYSTEMS LAB-II & 17M25CS121: 1. Outline and classify cloud based big data systems on basis of their features and applicability2.Apply MongoDB commands to define and query big data. 3.Analyze big data with aggregation and Map Reduce frameworks of MongoDB. 4.Analyze big data by loading and querying operations of Hadoop Hive5.Assess performance of Hadoop HBase for random, realtime read/write access to big data. 6.Develop a real-world application by using MongoDB or HBase as the database

CLOUD BASED BIG DATA SYSTEMS-II & 17M21CS121: 1. Outline and classify cloud based big data systems on basis of their features and applicability 2.Apply MongoDB commands to define, query, manipulate and analyze big data.
3. Manage Big Data and perform data analysis by loading and querying data using Hive 4.Utilize HBase for random, real-time read/write access to big data.5.Design a real-world application by using MongoDB or HBase as the database

DATA SCIENCE PROGRAMMING LAB-II & 17M25CS123: 1. Applying the basic syntax used for data manipulation in Python 2.Apply different methods for Exploratory Data Analysis3.Apply different metrics for distance calculation
4.Apply and Compare different classification techniques, e.g., k-Nearest Neighbours, Logistic Regression, Support Vector Machine, Ensemble etc. 5.Apply Artificial Neural Network techniques i.e. Feed forward Network, etc. for solving classification problems.6.Analyse the real world problem to identify the appropriate data science techniques for classification, clustering and Association rules

EMPIRICAL RESEARCH AND PERFORMANCE EVALUATION & 17M21CS122: 1. Critically analyze the published research papers and Summarize literatures on a chosen topic.2.Develop research proposals, stating its context, demographics, standardization, and research design.3.Analyze gaps in existing knowledge base, formulate research problems and research questions4.Will be able to evaluate adequacy of the chosen performance metrics of their as well as peer's research project

ENGLISH FOR RESEARCH PAPER WRITING & 19M13HS111: 1. To understand the aspects of grammar and language needed to write a paper.2.To have improved Writing Skills with proper grammar usage3.To have knowledge of what to write in each section of a paper after careful analysis of Literature Review4.To be adept in skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion5.To be capable of drafting a refined research paper after editing and proofreading

INTERNET OF THINGS & 18M12CS115: 1. Identification of purpose, requirements and description of various components and specifications of IoT devices, applications and protocols.2.Develop the Process Model, Domain Model, Information Model and Service Model specifications using IoT communication protocols.3.Analyze the characteristics and functioning of various IoT specific communication protocols used in different layers of IoT devices.4.Evaluate various IoT protocols and components for building IoT applications for real world problems and sustainable solutions.

LINEAR STATISTICAL MODELS & 18M12MA211: 1. explain random vectors, random matrices, multivariate distributions and their properties.2.develop Chi-square, F and t- distributions using the concepts of quadratic form in random vector. 3.construct simple and multiple linear regression models using least square and maximum likelihood method.4.justify the linear regression models by test of hypothesis.5.estimate multivariate normal regression models. 6.evaluate non-full rank models using reparametrization, side conditions and support the model by test of hypothesis.

NATURE INSPIRED COMPUTING AND APPLICATIONS & 19M12CS211: 1. Identify the need of computational complexity, evolutionary, and approximate algorithms.2.Understand nature inspired algorithms, its strength, weakness, and suitability3.Make use of nature-inspired algorithms to design, learn and optimize problem4.Evaluate performance of Nature inspired algorithm in context of problem solving in optimized manner5.Create a real environment effective artificial system with the use of properties exhibited from nature.

PROJECT BASED LEARNING-I (OPEN DATA CENTRIC SERVICES DEVELOPMENT) & 17M27CS111: 1. Identification of a live problem and design system model with feasibility study2.Conduct literature review to compare and contrast the project with existing work3.Confront the issues related to development of project which includes team work, setting and achieving milestones, test driven design, data collections etc.4.Develop oral communication skill and prepare technical report.5.Critically review the project developed by peers.

Course Outcome (Semester - 3)

CONSTITUTION OF INDIA & 19M13HS211: 1. Outline the salient features of Indian Constitution and its preamble. 2.Critical evaluation of fundamental rights given by the constitution.3.Evaluate the role of different institution responsible for the implementation of constitutional rules.4.Understand functioning of Election Commission

ADVANCED OPERATIONS RESEARCH & 18M12MA111: 1. Develop linear programming problems and make use of generalized, revised and dual simplex method to solve linear programming problems and Apply parametric and sensitivity analysis to analyze optimal solution of linear programming problems.2.Identify and solve the deterministic inventory models with and without shortages. 3.Construct the network models and analyze the criticalactivities using PERT/CPM for project planning. 4.Identify pure and mixed strategy games and solve and analyze them using graphical and linear programming techniques.5.Solve multi-objective and goal programming problems by graphical and simplex method 6.Demonstrate Khun-Tucker conditions and apply them to solve non-linear programming problems, quadratic and separable programming problems

PROJECT BASED LEARNING - II (OPEN INITIATIVE CENTRIC SYSTEMS DEVELOPMENT) & 17M27CS121:
1. Understand the requirements from managers and end users.2.Design system model with feasibility study for identified problem. 3.Apply the tools, technology and techniques for the development of different modules by different team members by using code templates4.Assess the product by testing the modules.5.Analyze the technical as well as socio-politico-economic issues involved for launching start up

SEMINAR AND TERM PAPER & 17M17CS212: 1. Summarize the literature around a significant research problem in the field of Computer Science2.Analyze the research articles from a deeper perspective and examine the research gaps 3.Improve the communication and writing skills by compiling the findings in the form of report and seminar

DISSERTATION & 17M27CS213: 1. Identify a research problem after thorough literature survey.2.Apply the acquired knowledge in the field of computer science while proposing a solution to the identified research problem.3.Implement the proposed solution to exhibit the programming skill.4.Evaluate the solution to meet the given set of requirements.5.Demonstrate and defend their research work to a panel of experts.6.Demonstrate the research output in terms of publications.
INDUSTRIAL PROJECT & 17M27CS214: 1. Identify an organization and relevant project as problem2.Review relevant literature related to identified project3.Apply acquired Computer Science concepts and tools to solve the business-related problem4.Analyze various solution alternatives to solve the given problem5.Evaluate proposed solution with respect to alternatives to establish its efficacy6.Create oral and written account of the work done and its results and conclusions
Course Outcome (Semester - 4)
DISSERTATION & 17M27CS223: 1. Identify a research problem after thorough literature survey.2.Apply the acquired knowledge in the field of computer science while proposing a solution to the identified research problem.3.Implement the proposed solution to exhibit the programming skill.4.Evaluate the solution to meet the given set of requirements.5.Demonstrate and defend their research work to a panel of experts.6.Demonstrate the research output in terms of publications.
INDUSTRIAL PROJECT & 17M27CS224: 1. Identify an organization and relevant project as problem2.Review relevant literature related to identified project3.Apply acquired Computer Science concepts and tools to solve the business-related problem4.Analyze various solution alternatives to solve the given problem5.Evaluate proposed solution with respect to alternatives to establish its efficacy6.Create oral and written account of the work done and its results and conclusions

PROGRAMME NAME: INTEGRATED M.TECH IN COMPUTER SCIENCE & ENGINEERING

Programme Educational Objectives (PEOs): Same as **PEOs** of **M.Tech** in**COMPUTER SCIENCE & ENGINEERING**

POs: Same as **POs of B.Tech and M.Tech** in**COMPUTER SCIENCE & ENGINEERING**

PSOs: Same as **PSOs of B.Tech and M.Tech** in**COMPUTER SCIENCE & ENGINEERING**

Course Outcomes: Same as **Course Outcomes** of **B.Tech and M.Tech** in**COMPUTER SCIENCE & ENGINEERING**

DEPARTMENT: ELECTRONICS AND COMMUNICATION ENGINEERING

VISION: To be a centre of excellence in education, training and research in Electronics and Communication Engineering to cultivate technically competent professionals for Industry, Academia and Society.

MISSION: **1:** To impart education through contemporary, futuristic and flexible curricula with innovative teaching learning methods and hands on training with well equipped Labs.

2: To carry out cutting edge research in different areas of Electronics and Communication Engineering.

3: To inculcate technical and entrepreneurial skills in professionals to provide socially relevant and sustainable solutions

PROGRAMME NAME: B.TECH. IN ELECTRONICS AND COMMUNICATION ENGINEERING

PEOs: 1: To provide strong foundation in Electronics and Communication Engineering to pursue professional career, entrepreneurship and higher studies.

2: To evolve capability to analyze, design and develop feasible solutions to real world problems.

3: To inculcate professional ethics, managerial and communication skills to develop ingenious solutions for benefit of society and environment.

POs: **1: Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs: **1:** To identify the engineering problems and develop solutions in the area of communication, signal processing, VLSI and embedded systems.

2: To demonstrate proficiency in utilisation of software and hardware tools along with analytical skills to arrive at appropriate solutions.

Academic Year 2019-20 Course Outcomes (COs)

Course Outcome (Semester 1)

Physics-1 (15B11PH111) 1 . Recall the basic principles of physics related to optics, relativity, quantum mechanics, atomic physics and thermodynamics. **2.** Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved. **3**. Apply the concepts/principles to solve the problems related to wave nature of light, relativity, quantum mechanics and atomic physics. **4.** Analyze and examine the solution of the problems using physical and mathematical concepts involved.

Mathematics-1 **(15B11MA111) 1.** Explain the concepts of limits, continuity and differentiability of functions of several variables. 2**.** Explain the Taylor's series expansion of functions of several variables and apply it in finding maxima and minima of functions. 3.Make use of double and triple integrals to find area and volume of curves and surfaces. 4.Explain the concepts of vector calculus and apply Green's, Stoke's and Gauss divergence theorems in engineering problems. 5.Solve the ordinary differential equations and explain the concepts of Laplace transform for solving engineering problems. 6.Utilize matrix algebra for solving a system of linear equations and explain eigen values, eigen vectors, diagonalization and quadratic form.

English (15B11HS112) 1. Develop an understanding and appreciate the basic aspects of English as a communication tool. 2. Apply the acquired skills in delivering effective presentations. 3.Demonstrate an understanding of different forms of literature and rhetorical devices. 4.Examine literature as reflection of individual and society 5.Compose different forms of professional writing 6.Apply Phonetics through theory and practice for better pronunciation

Physics Lab-1 (15B17PH171) 1.Recall optics and modern physics principles behind the experiments. 2.Explain the experimental setup and the principles involved behind the experiments performed. 3.Plan the experiment and set the apparatus and take measurements. 4.Analyze the data obtained and calculate the error. 5.Interpret and justify the results.

Software Development Fundamentals-I (15B11CI111) 1.Solve puzzles , formulate flowcharts, algorithms and develop HTML code for building web pages using lists, tables, hyperlinks, and frames.2.Show execution of SQL queries using MySQL for database tables and retrieve the data from a single table. 3.Develop python code using the constructs such as lists, tuples, dictionaries, conditions, loops etc. and manipulate the data stored in MySQL database using python script. 4.Develop C Code for simple computational problems using the control structures, arrays, and structure. 5.Analyze a simple computational problem into functions and develop a complete program. 6.Interpret different data representation , understand precision, accuracy and error

Software Development Lab-I (15B17CI171) 1.Design HTML code for building web pages using lists, tables, hyperlinks, and frames. 2.Develop python programs for constructs such as lists, tuples, dictionaries, conditions, and loops using Python 3.6. 3.Design simple SQL queries using MySQL to create database tables and retrieve the data from a single table. 4.Develop C programs for datatypes, expressions, conditional structure, and iterative control structure and pattern generation using Code Blocks and Virtual Lab. 5.Design C programs for array, structure, and functions using Code Blocks and Virtual Lab

Workshop (18B15GE112) 1.Tell the basic of manufacturing environment and various safety measures associated with it. 2.Apply the appropriate tools to fabricate joints utilizing work-bench tools. 3.Create various prototypes in the carpentry trade, fitting trade, welding trade and tin smithy trade. 4.Demonstrate the working principle of lathe, shaper and milling machines and able to fabricate the prototypes of desired shape and accuracies.

Course Outcome(Semester 2)

Physics-2 (15B11PH211) 1.Recall the basic concepts relating to electromagnetic theory, statistical physics, lasers, fibre optics and solid state Physics. 2.Illustrate the various physical phenomena with interpretation based on the mathematical expressions involved. 3.Apply the basic principles in solving variety of problems related to lasers, electromagnet theory, fibre and solid state physics. 4.Analyze and examine the solution of the problems using physical and mathematical concepts involved in the course.

Physics Lab-2 (15B17PH271) 1.Recall laser, fiber optics, semiconductor and solid state physics principles behind the experiments. 2..Explain the experimental setup and the principles involved behind the experiments performed. 3.Plan the experiment and set the apparatus and take measurements. 4.Analyze the data obtained and calculate the error. 5.Interpret and justify the results.

SOFTWARE DEVELOPMENT FUNDAMENTALS – II (15B1CI211) 1.Develop C programs using structures, pointers, functions, and files. 2.Solve problems related to data storage, retrieval, searching, and sorting by utilizing stack/queue.3.Make use of a linked list to solve various problems. 4.Apply binary tree data structure to perform operations like searching, insertion, deletion, and traversing. 5.Explain the basic features of object-oriented design such as objects, classes, encapsulation, polymorphism, inheritance, and abstraction.

Software Development Fundamentals – II Lab (15B17CI271) 1.Make use of structures, pointers, functions, and files to build basic C programs. 2.Construct stack/queue based solutions for data storage, retrieval, searching, and sorting problems. 3.Apply linked list data structure to solve problems like polynomial operations and sparse matrix representation. 4.Build operations like searching, insertion, deletion, traversing on binary tree data structure. 5.Demonstrate fundamental concepts of object-oriented programming i.e. objects, classes, encapsulation, polymorphism, inheritance, and abstraction. 6.Apply object-oriented programming features like encapsulation, Inheritance, Polymorphism, and Standard Template Library to construct C++ programs.
Mathematics-2 (15B11MA211) 1.apply different methods for solving ordinary differential equations of second order. 2.explain different tests/methods of convergence for infinite series. 3.find the series solution of differential equations and use it to construct Legendre's polynomials and Bessel's functions. 4.classify the partial differential equations and apply Fourier series to find their solution. 5.explain Taylor's & Laurent's series expansion, singularities, residues and transformations. 6.apply the concept of complex variables to solve the problems of complex differentiation and integrations.
Electrical science-1 (15B11EC111) 1.Recall the concepts of voltage, current, power and energy for different circuit elements. Apply the Kirchhoff laws and different analyzing techniques to identify the different circuit parameters. 2.Define and apply the networks theorems in the complex AC and DC circuits, networks. Demonstrate the physical model for given Sinusoidal AC signal and construct the phasor diagrams. 3.Demonstrate the concept of resonance and operate different instrumental and measurement equipments. 4.Demonstrate the construction and working of single phase transformer
Electrical Science Lab-I (15B17EC171) 1.Understand various active, passive components and instruments such as multimeter, bread board, regulated D.C. power supply. 2.Acquire the knowledge of electrical network and circuit such as branch, node, loop and mesh in networks and circuits. 3.Study and verification of reduction technique in the electrical circuits using different network theorems. 4.Study and verification of series & parallel AC circuits as well as open & short circuits test in single phase transformer.
Engineering Drawing and Design (18B15GE111) 1.Recall the use of different instruments used in Engineering Drawing and Importance of BIS and ISO codes. 2.Illustrate various types of mathematical curves and scale. 3.Classify different types of projection and Construct Orthographic projection of Point, Line, Plane and Solid. 4.Construct Isometric Projection and Conversion of Orthographic view to Isometric view and vice-versa. 5.Construct Engineering model in Drawing software (AutoCAD) and Compare it with conventional drawing.

Course Outcome (Semester 3)
Probability and Random Processes (15B11MA301) 1.Explain the basic concepts of probability, conditional probability and Bayes' theorem. 2.Identify and explain one and two dimensional random variables along with their distributions and statistical averages. 3.apply some probability distributions to various discrete and continuous problems. 4.solve the problems related to the component and system reliabilities. identify the random processes and compute their averages. 5.solve the problems on Ergodic process, Poisson process and Markov chain.
Signal and Systems (15B11EC311) 1.Understand the mathematical representation, classification, applications and analyze both continuous and discrete time signals and systems. 2.Analyze and interpret the response of continuous and discrete time LTI system in time domain 3.Choose and demonstrate the use of different frequency domain transforms to examine and explain the spectral representation of the CT and DT signals and systems. 4.Apply Laplace and Z transform to analyze and examine the response and behavior of the CT and DT system
Signal and System Lab (15B17EC371) 1.Understanding of MATLAB and its various applications, Classification of continuous time signals and discrete time signals. 2.Apply the coding skills of MATLAB for Convolution of continuous time signals and discrete time signals, for DFT and IDFT. 3.Analyze different LTI systems with Frequency domain representation of continuous time and discrete time periodic and aperiodic signals. 4.Determine Laplace Transform of continuous time signals and Z-Transform of discrete time signals. Introduction to SIMULINK and to realize systems described by differential and difference equations
Analogue Electronics (15B11EC411) 1.Define different modes of operation of a transistor and explain multistage amplifier. 2.Explain and analyze the various BJT and MOS amplifier circuits for different frequency ranges 3.List and explain the building blocks of an Op-Amp and its characteristics. 4..Explain the effect of feedback on amplifier characteristics and make use of various feedbacks. 5.Apply basic understanding of Op-Amp to construct various electronics circuits for specified gain and waveform.
Analogue Electronics Lab (15B17EC471) 1.Plot the transient, frequency response of second-order RC circuit using SPICE/MULTISIM and utilize the plot to compare 3-dB cut-off frequency with theoretical calculation. 2.Analyze the bias point and plot frequency response of single-stage amplifiers and they will be able to build an amplifier of given specifications. 3.Build a common-source amplifier for a specified gain using N-channel MOSFET. 4.Analyze BJT based simple constant current biasing circuit and subsequently improves its specification by using modified current mirror. 5.Determine differential gain, common mode gain and CMRR of BJT based differential amplifier. 6.Simulate an operational amplifier and use it in different applications.
Electrical Science –II, (15B11EC211) 1.Study and analyze the first-order and second-order passive circuits. 2.emonstrate the operational amplifier and logic gates and their applications in analog and digital system design. 3.Define the basics of signals, systems and communication. 4.Illustrate the electrical machines, transformers and analogous of electrical & mechanical systems.
Electrical Science-2 Lab (15B17EC271) 1.Understand Transient analysis and steady state response of series RC circuit. 2.Acquire the knowledge of circuits like Adder, Subtractor, Integrator, differentiator; inverting and non inverting amplifier circuits realized using Op-amp IC-741. 3.Study and Implementation of the different logic gates. 4.Construct Adder, Subtractor and Multiplexer circuits using logic gates.

Economics (15B11HS211) 1.Explain the basic micro and macro economics concepts. 2.Analyze the theories of demand, supply, elasticity and consumer choice in the market. 3.Analyze the theories of production, cost, profit and break even analysis 4.Evaluate the different market structures and their implications for the behavior of the firm. 5.Examine the various business forecasting methods. 6.Apply the basics of national income accounting and business cycles to Indian economy.

Environmental Studies (19B13BT211) 1.Explain diversity of environment, ecosystem resources and conservation 2.Identify hazards related to environmental pollution and safe management practices 3.Apply modern techniques for sustainable Urban planning and Disaster management 4.Recall Government regulations, Environmental Policies, Laws & Ethics 5.Survey ground situation on specific environmental aspects, and present a field report

Course Outcome (Semester 4)

Digital Signal Processing (15B11EC413) 1.Recall the principles of z-transforms, explain the DFTs (Discrete Fourier Transform) and develop FFT (Fast Fourier Transform) algorithms for DFT. 2.Construct and Analyze the digital FIR (Finite Impulse Response) and IIR (Infinite Impulse Response) filters. 3.Demonstrate multi-rate signal processing and relate DSP (Digital Signal Processing) in various applications.

Analog and Digital Communication (18B11EC212) 1.Understand need of modulation and differentiate among various amplitude modulation schemes and design simple systems for generating and demodulating amplitude modulated signals. 2.Analyze the generation and detection of FM signal and design basic systems for the indirect and direct generation of FM signals. 3.Understand the concepts of transmitters and receivers for analog modulations, Sampling process, time division multiplexing and GSOP. 4.Understand the concepts of waveform coding techniques, Line coding schemes and analysis of ISI Mitigation Techniques 5.Understand the concepts of digital modulation techniques and evaluate their probability of error and bandwidth efficiency.

Digital Signal Processing Lab (15B17EC473) 1.Recall and interpret discrete time signals and systems in time domain and in frequency domain 2.Develop and demonstrate coding skills from basic mathematical operations to complex operations like DFT and FFT. 3.Identify and examine different digital filter structures. 4.Determine and observe magnitude and phase characteristics (Frequency response Characteristics) of digital 5.IIR-Butterworth, Chebyshev filters and digital FIR filters using window techniques for various applications of DSP.

Analog and Digital Communication Lab (18B15EC212) 1.Design of circuits for analogue modulation/demodulation techniques. 2.Understand the concepts of sampling process, and time division multiplexing. 3.Design and implement digital modulation techniques. 4.Implementation of modulation techniques using MATLAB.

Digital Circuit Design Lab (18B15EC215) 1.Learn the nomenclature of digital ICs, familiarize and verify the truth tables of logic gates using ICs.2.Analyze, construct and verify various combinational circuits and their functionalities. 3.Identify basic requirements to analyze, construct and verify sequential circuits. 4.Utilize VHDL to implement and simulate the combinational and sequential logic circuits.

Digital Circuit Design (18B11EC215) 1.Understand the representation and conversion of various number systems and binary codes. 2.Understand the fundamental concepts and techniques used in digital electronics which in turn form a digital logic.3.Analyze and construct combinational and sequential logic circuits. Develop skill to troubleshoot digital circuits using Finite state machines. Study and Implement combinational and sequential circuits using VHDL. 4.Classify different semiconductor memories and analyze digital system design using PLDs. Classify and analyze wave shaping circuits and digital logic families.

Quantitative Methods for Social Sciences (16B1NHS332) 1.Demonstrate the key concepts of different quantitative methods used in social sciences. 2.Classify and summarize the data to be used for analysis. 3.Apply the theoretical concept to perform basic data analysis in social sciences. 4.Examine different statistical methods and be able to discuss the merits and limitations of a particular method. 5.Recommend appropriate conclusions following empirical analysis

LIFE SKILLS (15B11HS111) 1.Understand Life Skill required to manage self and one's environment 2.Apply comprehensive set of skills for life success for self and others 3.Analyze group dynamics for its effective functioning 4.Evaluate the role of women leadership and gender issues

Introduction to Sociology (15B1NHS433) 1.Demonstrate an understanding of sociological perspectives and concepts. 2.Explain the concept of social stratification and types of stratification as class, caste and gender. 3.Apply the major sociological perspectives, concepts and methods in the systematic study of society 4.Analyze the relevance of various social Institutions in societies and how it shapes and influences social interactions.

Introduction to Psychology (15B1NHS432) 1.Demonstrate a basic understanding of different perspectives and concepts of psychology 2.Apply the concepts of psychology in day to day life 3.Examine the different theoretical perspectives and models of psychology 4.Develop solutions for problems related to psychology using appropriate tools/models

Introduction to Literature (15B1NHS431) 1.Understand figurative language to demonstrate communication skills individually and in a group. 2.Develop a critical appreciation of life and society through a close reading of select texts 3.Analyze a literary text thematically and stylistically and examine it as representing different spectrum of life, human behavior, and moral consciousness of society. 4.Interpret Literature as reflection of cultural and moral values of life and society

Human Resource Management (16B1NHS431) 1.Demonstrate a basic understanding of different functions of human resource management: Employer Selection, Training and Learning, Performance Appraisal and Remuneration, Human Relations and Industrial Relations. 2.Apply various tools and techniques in making sound human resource decisions. 3.Analyze the key issues related to administering the human resource management activities such as recruitment, selection, training, development, performance appraisal, compensation and industrial relation. 4.Critically assess and evaluate different human resource & industrial relation practices and techniques and recommend solutions to be followed by the organization

Financial Accounting (15B1NHS435) 1.Understand the basic concepts of Accounting. 2.Apply accounting concepts for recording of business transactions. 3.Compare and reconcile the accounting records with other sources of information 4.Evaluate the accounting records to identify and rectify the errors made during accounting process. 5.Construct the final accounts of a business

Course Outcome (Semester 5)

Matrix Computations, (16B1NMA533) 1.Explain the basics of matrix algebra and inverse of a matrix by partitioning. 2.Solve the system of linear equations using direct and iterative methods. 3.Explain the vector spaces and their dimensions, norm of a vector and matrix. 4.Apply the Gram-Schmidt process to construct orthonormal basis and Q-R decomposition of a matrix 5.Construct Gershgorin's circles and solve eigenvalue problems including power and inverse power methods. 6.Analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.

Theory of Numbers (16B1NMA731) 1.Explain Euclid algorithm, linear Diophantine equations and prime numbers. 2.Solve system of linear congruences using properties of congruences. 3.Explain numbers of special form and number theoretic functions.4.Apply the concepts of order, primitive roots and indices to solve conguences. 5.Apply Legendre symbol and quadratic reciprocity theorem to solve quadratic congruences. 6.Apply and analyze the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.

Basic Numerical Methods (17B1NMA531) 1.explain the concepts of approximation and errors in computation. 2.construct numerical methods for algebraic and transcendental equations and their convergence. 3.outline the methods of interpolation using finite differences and divided difference formulas. 4.make use of numerical differentiation and integration. 5.solve the system of linear equations using direct and iterative methods. solve ordinary differential equations using different numerical methods.

Decision Making using Mathematical and Statistical Approaches (18B12MA311) 1.explain the concept of decision making under various environments. 2.apply various methods for solving single stage optimal problems in uncertainty and risk environments 3.apply decision tree analysis for solving multiple stage optimal problem. 4.describe principle of optimality and formulation of dynamic programming problems 5.identify, formulate and solve problems arising in financial and industrial applications using dynamic programming techniques

Statistical Information Theory with Applications (17B1NMA533) 1.explain the notions of information, entropy, relative entropy and mutual information. 2.explain fuzzy sets and compare the various measures of discrepancy. 3.develop and compare Shannon-Fano and Huffman source codes using measures of uncertainty. 4.analyse the notion of distance measure in pattern recognition generated in Intuitionistic fuzzy environment. 5.apply information theoretic concepts in encryption and decryption.

Logical Reasoning and Inequalities (18B12MA312) 1.interpret the mathematical foundation of various inequalities. 2.examine inequalities in the field of information theory and cryptography. 3.apply the concepts of permutation and combination of multisets in combinatorics. 4.apply special numbers in combinatorial and number theoretic problems. 5.explain the basic concepts of logical reasoning and solve related problems.

Quantum Mechanics for Engineers (16B1NPH531) 1.Remember basics of Quantum Mechanics and its applications. 2.Explain postulates of quantum mechanics, Dirac notation, Schrödinger Equation, Perturbation theory and Qubits. 3.Solve various problems related to different quantum systems and construct quantum circuits using quantum gates. 4.Analyse the results obtained for various physical systems and to establish the advantages of some simple protocols of quantum information processing.

Materials Science (16B1NPH532) 1.Recall variety of engineering materials for their applications in contemporary devices 2.Explain dielectric, optical, magnetic, superconducting, polymer and thermoelectric properties
3.Apply properties of dielectric, optical, magnetic, superconducting, polymer and thermoelectric materials to solve related problems 4.Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various materials

Laser Technology and Applications (16B1NPH533) 1.Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology 2.Extend the knowledge of lasers in some applications like LIDAR, laser racking, bar code scanner, lasers in medicine and lasers in industry 3.Apply the optical ray transfer matrix to determine the stability of a laser resonator 4.Distinguish the operational principles of CW, Q-switched, mode locked lasers; laser rate equations for three & four level lasers; different types of laser systems

Nuclear Science and Engineering (16B1NPH535) 1.Relate terminology and concepts of nuclear science with various natural phenomenon and engineering applications. 2.Explain various nuclear phenomenon, nuclear models, mass spectrometers, nuclear detectors, particle accelerators. and classify elementary particles. 3.Solve mathematical problems for various nuclear phenomenon and nuclear devices. 4.Analyze the results obtained for various physical problems and draw inferences from the results.

Principles of Management (15B1NHS434) 1. Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving 2.Examine the relevance of the political, legal, ethical, economic and cultural environments in global business.3.Evaluate approaches to goal setting, planning and organizing in a variety of circumstances. 4.Evaluate contemporary approaches for staffing and leading in an organization. 5.Analyze contemporary issues in controlling for measuring organizational performance.

Sociology of Youth (16B1NHS531) 1.Understand sociological perspectives relating to young people 2.Explain the ethical, cultural& social issues concerning Youth 3.understand youth culture and to interprets the same 4.Analyze societal problems related to youth in the evolving society.

Planning and Economic Development (16B1NHS532) 1.Understand the issues and approaches to economic development. 2.Apply the concepts of national income accounting, human development index and sustainable development. 3.Analyse the structural characteristics of the economy. 4.Analyze the role of Macroeconomic policies in the development process. 5.Assess the importance of federal development and decentralization

Technology and Culture (17B1NHS531) 1.Understand the main theories in cultural management,2.Identify technological convergence and cultural divergence, relate the differences to the literature and suggest solutions 3.Interpret and communicate effectively in physical and virtual teams by choosing appropriate concepts, logic and selecting the apt IT tools. 4.Application of the theoretical knowledge to adapt to cultural differences in global work environment.

Strategic Human Resource Management (18B12HS311) 1.Understand human resource management from a systemic, strategic and theoretical perspective 2.Evaluate the environmental challenges that impact human resource management and HR evaluation system 3.Conduct a basic job analysis and design various HR strategies 4.Critically assess human resource policies and practices with respect to business strategies followed by the organization

Indian Polity and Constitutional Democracy in India (18B12HS612) 1.Demonstrate an understanding about the current Indian political scenario by knowing about the structure of government in place 2.Demonstrate an understanding of the role of Indian President, Prime Minister, Governor and other members of the legislature as representatives of the common masses 3.Analyze the working of Indian federalism with reference to centre-state relations 4.Analyze the impact of the contemporary challenges such as caste, gender, regionalism to the working of Indian democracy

Digital Communication (15B11EC511) 1.Understand the concepts of Sampling process, time division multiplexing and GSOP.2.Understand the concepts of waveform coding techniques, PSD of different line coding schemes and analysis of ISI Mitigation Techniques 3.Understand the concepts of digital modulation techniques and evaluate their probability of error and bandwidth efficiency.4.Understand the concepts of error control coding schemes.

Electromagnetic Engineering (15B11EC612) 1.Recall concepts of vector calculus to solve complex problems and relate among different coordinate systems. 2.Explain the basic principles of electrostatics and magnetostatics and relate the electric and magnetic fields using Maxwell's Equations. 3.Illustrate the propagation of electromagnetic waves in different medium and their reflection and transmission parameters. Distinguish among different wave polarizations. 4.Estimate the current, voltage and power for the different types of transmission lines, determine reflection parameters. Demonstrate the Waveguide theory, Wave equations, and evaluate different waveguide parameters. 5.Classify and compare the different parameters associated with the antenna and also interpret the radiation mechanism.

Digital Communication Lab (15B17EC571) 1.Learning about DSO functioning, Function Analyzer, bread board, and circuit connection. Sampling and quantization of an analog signal. Generation & detection of ASK, FSK & PSK using trainer kit.2.Design circuits for Amplitude Shift Keying, Frequency Shift Keying and Phase Shift Keying using IC LF 398. Understanding of the concept of different line coding schemes and draw corresponding waveforms. 3.Understanding the concept of modulation and demodulation. 4.Implement Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Quadrature Amplitude Modulation and their demodulation on trainer kit.

Environmental Sciences (15B11GE301) 1.Explain different aspects of environment, ecosystem and associated concerns 2.Identify various practices that can impact the environmental resource management 3.Apply modern techniques including sustainable solutions and green technologies for a better environment 4.Survey ground situation on specific environmental aspects, examine risks involved, make a field report and present the findings 5.Recall environment related Government regulations, policies, safety norms and Laws.

Minor Project - I (15B19EC591) 1.Identifying, planning and initiation of the individual projects in the domain selected by them, respectively. 2.Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc. 3.Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study. 4.Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics. 5.Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.

Entrepreneurship Development (19B12HS311) 1.Understand basic aspects of establishing a business in a competitive environment2.Apply the basic understanding to examine the existing business ventures 3.Examine various business considerations such as marketing, financial and teaming etc.4.Assessing strategies for planning a business venture

Unix Programming Lab (15B17CI579) 1.Demonstrate use of common Unix/Linux commands 2.Apply Unix/Linux file redirection and pipelining to combine utilities to perform complex tasks 3.Develop shell scripting using Selection, Case & Conditional Statements 4.Build shell scripts to solve various problems using commands like grep, line number, test, expressions, compare, command line input, etc.5.Create and manage files and directories, file permissions, and navigate the Unix/Linux file system

Discrete Mathematics (16B1NMA531) 1.Explain partial order relations, Hasse diagram, lattices and recursive functions. 2.Solve the difference equations using generating function and Z-transform. 3.Explain the propositional and predicate calculus to check the validity of arguments.4.Demonstrate graphs, digraphs, trees and use it to solve the different problems of graph theory. 5.Illustrate various algebraic structures and their properties. Explain the theory of formal languages and solve the related problems of automata.

Course Outcome (Semester 6)

Solid State Electronic Devices (16B1NPH632) 1.Define terminology and concepts of semiconductors with solid state electronic devices. 2.Explain various electronic, optical and thermal properties of semiconductors; various techniques used in device fabrication. 3.Solve numerical problems based on solid state electronic devices4.Examine the impact of various parameters on semiconductor devices and their performances.

Photovoltaic Techniques (16B1NPH633) 1.Classify various types of renewable energy sources and explain working of photovoltaic device. 2.Demonstrate the use of basic principles to model photovoltaic devices. 3.Identify challenges and apply strategies to optimize performance of various type of solar cells 4.Analyze the Solar PV module, mismatch parameter and rating of PV module 5.Evaluate the performance of various stand-alone PV systems with battery and AC and DC load

Medical & Industrial Applications of Nuclear Radiation (16B1NPH636) 1.Define nuclear structure, properties and reactions; Nuclear magnetic resonance process 2.Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays 3.Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc. 4.Analyze different radiocarbon dating mechanisms and processes

Computational Physics (16B1NPH631) 1.Define key concepts used in Monte Carlo Simulation, Random walks, percolation and Numerical methods 2.Explain basics of numerical analysis, statistical mechanics, Monte Carlo simulations, percolation, random walks, neural networks 3.Model and simulate magnetic systems, polymers and networks; interpret simulation data 4.Develop advanced Monte Carlo techniques to solve Optimization problems. Simulate percolation of complex networks.

Light Emitting Diodes: Basics and Applications (16B19PH692) 1.Recall the basic concepts of semiconducting materials, working of p-n junction diode and light emitting diodes. 2.Explain the various physical parameters involved in designing and fabrication of LEDs. 3.Solve various problems related to efficiency, emission intensity and spectrum of LEDs. 4.Analyse the problems in designing & fabricating blue, white and green high brightness LEDs.

Telecommunication Networks (15B11EC611) 1.Understand the basic concepts of Telecommunication network model, Traffic Engineering and Switching technologies. 2.Understand the concepts of OSI model and analyze the various error and flow control mechanisms introduced by data link layer. 3.Understand the TCP/IP protocol, routing algorithm and apply the concept of subnetting to allocate and distribute the logical addresses in a network. 4.Understand concept of LAN access protocols, ISDN, B-ISDN and ATM, their implementation and performance issues.

Control Systems (15B11EC613) 1.Classify the open loop and closed loop control systems and construct mathematical model for physical systems. 2.Solve complex systems through block diagram reduction method and signal flow graph technique. 3.Determine transient response and steady state response of the systems using standard test signals. 4.Analyze the stability of the system and select suitable controllers and compensators for linear time invariant system. 5.Apply time domain and frequency domain techniques to identify the stability of control systems. 6.Solve continuous time and discrete time systems using state variable approach.

Theatre and Performance (16B1NHS634) 1.Demonstrate problem solving ability and effective life skills through theatre performances 2.Develop awareness of the role of these arts in human life 3.Apply skills of listening, articulation, awareness and collaboration through the creation of performance. 4.Design and present an original performance alone or in collaboration with other artists

Social Media and Society (19B12HS612) 1.Infer the implications of digital change, and the concept of social media and e-marketing in the context of the changing marketing landscape 2.Elaborate the implications of cyberbranding and digitization on online marketing mix decisions 3.Develop specific models related to social media and social media analytics 4.Evaluate concepts related to Search Engine Marketing, Customer Centric Web Business models and Web Chain Analysis 5.Illustrate the new age marketing practices

Project Management (16B1NHS631) 1.Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context 2.Analyze projects and their associated risks by understanding the various theoretical frameworks, non-numerical and numerical models in order to make correct selection decisions 3.Evaluate the various stages of project management and identify and determine correct techniques for planning, scheduling, controlling and terminating the projects 4.Evaluate project management processes, tools and techniques in order to achieve overall project success

Organizational Behavior (16B1NHS635) 1.Enhance critical thinking of dynamic human behavior through an insight into relationships between individuals, groups and organizations 2.Assess ones and other's individual management style as it relates to influencing and managing behavior in the organization. 3.Plan and adapt set of strategies for meeting the special challenges in the 21st century competitive workplace 4.Assess the potential effects of behavioral factors in an organizational environment

Moralities of Everyday Living & Moral Decision Making (19B13HS611) 1.Apply and Analyze morality in all facets of personal and professional life 2.Discover ways to address moral dilemmas by deliberating on the pros and cons to find the best possible outcome 3.Justify and Formulate morally correct decisions and stand by them 4.Adapt and develop a character respected by peers and superior alike

Marketing Management (18B12HS611) 1.To illustrate the fundamentals of marketing, marketing environment and market research. 2.To model the dynamics of marketing mix. 3.To demonstrate the implications of current trends in social media marketing and emerging marketing trends. 4.To appraise the importance of marketing ethics and social responsibility 5.To conduct environmental analysis, design business portfolios and develop marketing strategies for businesses to gain competitive advantage.

Literature & Adaption (16B1NHS636) 1.Understand and outline the elements and theories of adaptation and its various forms, and relate with the texts reflecting the cultural, moral and linguistic changes in the contemporary society. 2.Utilize visual literacy to analyze the language and style adopted in filmed texts and examine them as reflections of Readers' and Audience' values and perceptions in the context of myriad cultures and multidisciplinary settings individually and in groups. 3.Analyze texts and their adaptations beyond the surface level of narrative or character as reflections of value systems of various cultures and times individually and in a team. 4.Evaluate, interpret and document source texts and adaptations thematically and stylistically to learn the nuances of language, culture and values of the society. 5.Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaptation of any literary/non literary

piece in another form individually and in groups

International Trade And Finance (19B12HS613) 1.Explain the foundations of international trade and finance in the era of globalization. 2.Analyze the major models and theories of international trade 3.Identify the effects of tariffs, quotas and technical progress on economic growth. 4.Examine the equilibrium in the Balance of Payments (BOP) and measures to correct disequilibrium. 5.Compare the fixed and flexible exchange rate, monetary policy and foreign trade multiplier. 6.Analyze the working of regional blocks & international organization.

Global Politics (20B12HS311) 1.Demonstrate an understanding of the meaning and nature of globalization by addressing its political, economic, cultural and technological dimensions 2.Analyzing the significance of contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security to global governance 3.Analyze how the global politics shapes domestic politics 4.Demonstrate an understanding of the working of the global economy, its anchors and resistances offered by global social movements

Effective tools for Career Management and Development, (18B13HS612) 1.Assess ones personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities. 2.Apply knowledge of all the Career Stages in making informed career decisions. 3.Develop and maximize ones potential for achieving the desired career option. 4. the processes involved in securing and managing career by employees of different organizations.

Econometric analysis (19B12HS611) 1.Demonstrate the key concepts from basic statistics to understand the properties of a set of data. 2.Apply Ordinary Least Square method to undertake econometric studies. 3.Examine whether the residuals from an OLS regression are well-behaved. 4.Evaluate different model selection criteria for forecasting. 5.Create models for prediction from a given set of data.

Cognitive Psychology (16B1NHS632) 1.Understand and apply the concepts of cognitive psychology in everyday life 2.Analyze the different models of various cognitive processes 3.Evaluate cognitive psychology issues and recommend possible solutions 4.Evaluate interventions/solutions for self-development through cognitive processes

Principles of Management, (15B1NHS434) 1.Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving 2.Examine the relevance of the political, legal, ethical, economic and cultural environments in global business. 3.Evaluate approaches to goal setting, planning and organizing in a variety of circumstances.4.Evaluate contemporary approaches for staffing and leading in an organization.5.Analyze contemporary issues in controlling for measuring organizational performance.

Applied Mushroom Biology (16B19BT692) 1.Define mushroom biology2.Experiment with mushroom cultivation3.Explain environmental and medicinal aspects of mushroom4.Analyze economics of mushroom cultivation

Data Structures and Algorithm Lab (15B17CI578) 1.Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications.2.Interpret the complexity of algorithms for given problems. 3.Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities.4.Examine case-study specific application of Heaps, Graphs, and Hashing methods.
5.Model algorithmic solutions for small real-life problems using Backtracking, Greedy algorithm and Dynamic programming, Branch and Bound, and others

Problem Solving using C and C++ (20B16CS323) 1.Apply and use library functions, pointer arithmetic, arrays, and regular expressions and secure coding practices in programs.2.Use critical thinking skills and creativity to choose the appropriate containers, iterators and algorithms for a given problem.3.Demonstrate the use of concurrency principles, input and output streams and defensive techniques in programs.

Non-Linear Data Structures and Problem Solving (20B16CS324) 1.Demonstrate operations on different data structures.2.Use critical thinking skills and creativity to choose the appropriate data structure and solve the given problem.3.Identify the correctness and efficiency of the solution by constructing different test cases.4.Develop solutions to real world problems by incorporating the knowledge of data structures

Data Structures & Algorithms (15B11CI518) 1.Apply fundamental operations on data structures such as linked-lists, trees, binary search trees, AVL trees, heap trees, graphs, and hash-tables.2.Analyze and compare different sorting algorithms - Merge Sort, Quick sort, Shell sort and Bucket Sort.3.Identify suitable data structure and develop solution for the given problem.4.Formulate solutions for programming problems or improve existing code using algorithms such as, Backtracking, Branch and Bound, Greedy algorithm and Dynamic programming.

Java Programming & 20B16CS322 (Value Added) 1.Write basic Java programs using Java constructs – loops, switch-case and arrays.2.Define all basic concepts related to OOP concepts3.Develop java programs using Java collection framework 4.Create or design an application based on Java programming constructs

Front End Programming(20B16CS326) 1.Demonstrate new technologies by applying foundation paradigms 2.Build strong foundations for basic front end tools & technologies thereby making them understand the application development lifecycle.
3.Develop elegant and responsive Front-end by leveraging latest technologies4.Explain activity creation and Android UI designing 5.Develop an integrated mobile application to solve any complex real time problem

Statistics (16B1NMA633) 1.make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data. 2.apply correlation and regression in statistical analysis of data. 3.explain sampling theory and its distributions.4.explain the concepts and properties of estimation theory. 5.apply sampling and estimation theory to find the confidence interval. 6.analyze small and large sample data by using the test of hypothesis.

Numerical Aptitude (16B19MA691) 1.explain basics of mathematical aptitude.2.explain set, functions and representation of numbers3.solve problem on probability theory, quadratic equations and complex numbers 4.explain inequalities, mensuration, data interpretation and errors.

Operations Research (18B12MA611) 1.Construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical and simplex method.2.Apply two-phase, Big-M and dual simplex method for linear programming problems.3.Make use of sensitivity analysis to linear programming problems. 4.Solve transportation, assignment and travelling salesman problems. 5.Apply cutting plane and branch & bound techniques to integer programming problems. 6.Examine optimality conditions and solve multivariable nonlinear problems.

Applied Mathematical Methods (18B12MA612) 1.Explain the functional and its variations required to optimize the physical problem. 2.Apply different forms of Euler–Lagrange equation on the various variational problems with fixed boundaries. 3.Explain different types of integral equations including their conversions from IVP and BVP. 4.Solve Volterra and Fredholm integral equations using various analytical methods. 5.Explain various numerical methods along with their stability analysis. 6. different numerical methods for solving differential equations.

Mathematical Foundations of Geographic Information Systems (19M12MA611) 1.Understand the concept of trigonometry, Coordinate systems and Geometric transformations and their applications in Geographic Information System.2.Identify basic set operations and database technology based on predicates, quantifiers and predicate logic.3.Describe Geo-statistical methods, used for Geographic information systems.4.Explain quantitative aspects for image analysis by using analytic and numerical methods. 5.Understand the concepts of space and time in spatial information systems and spatiotemporal data models..

Applicational Aspects of Differential Equations (20B12MA311) 1.Solve ordinary differential equations in LCR and mass spring problems.2.Explain orthogonality of functions and apply it to solve Sturm-Liouville boundary value problems.3.Apply matrix algebra to find the solution of system of differential equations.4.Formulate and solve first and second order partial differential equations.5.Evaluate solution of differential equations arises in the field of engineering applications.

Telecommunication Networks Lab (15B17EC671) 1.Learn about network simulator, and building/installing NS2 for conducting network simulation and summarizing OSI, TCP & UDP.2.Set up and analysis of the wired and LAN networks and understanding UDP/TCP agents with CBR/FTP traffic source respectively. 3.To create and analyze the mobile ad-hoc network and heterogenous networks and routing algorithm.4.To label and explain data trace file (.tr) of Wired, Wireless and LAN Networks and evaluating throughput in Wired networks (with and without errors).

Minor Project - II (15B19EC691) 1.Identifying, planning and initiation of the individual projects in the domain selected by them, respectively. 2.Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.3.Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study.4.Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics.5.Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.

Renewable Energy (16B19EC691) 1.Explain the need of renewable sources of energy, impact of renewable energy on environment, challenges in the electric grid, Smart Grid 2.Analyze basics of Solar radiation and Solar photovoltaics, Balance of PV systems 3.Analyze wind energy resource and designing of Wind Energy Generators 4.Illustrate different biomass energy resources, and extraction of biomass energy

Advanced Radio Access Networks (18B12EC311) 1.Recall the basic concepts of Digital Communication, Antenna and Wave Propagation, and Wireless Communication. 2.Identify the different components of wireless network based on the 3GPP reference network model. 3.Analyze the architecture and channel structure of LTE and also examine the LTE call flow. 4.Explain the importance of Optimization and Pre-Launch Optimization in radio access network.

Course Outcome (Semester 7)

Indian Financial System (17B1NHS732) 1.Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market. 2.Analyze ways of fund raising in domestic and international markets 3.Understand functioning of Stock market and evaluate securities for investment. 4.Apply the knowledge of Mutual Funds and Insurance in personal investment decisions. 5.Apply knowledge of Income tax for calculation of tax liability of individual.

Disaster Management (15B1NHS731) 1.Understand disasters, their hazards and natural and social phenomena related to them. 2.Analyze information on risks and relief for disaster management. 3.Make use of management principles and community involvement methods in disaster risk reduction. 4.Evaluate the role of different approaches and humanitarian assistance to manage pre and post- disaster periods.5.Formulate strategies for mitigation in future scenarios by applying technological innvoations and learning lessons from past

Managerial & Communication Skills (17B1NHS734) 1.Demonstrate understanding of basic aspects of business ommunication.2.Assess an individual's communication skills and adapt to meet challenges at the competitive workplace 3.Apply appropriate conflict handling style for effective conflict management .4.Demonstrate understanding about the opportunities and challenges of intercultural communication and in recognizing cultural variations . 5.Apply appropriate steps for better decision making by interpreting information 6.Develop an understanding of professional ethics

Nano-Science and Technology (17B1NPH732) 1.Define the Nanoscience and Technology and to know about various other terminologies and developments involved with Nanoscience and Technology 2.Classify the nanomaterials depending on the nature of dimensionalities, type of materials classes and explain the basic concepts of nanomaterials 3.Apply the concepts of Nanoscience for solving the theoretical and numerical problems 4.Determine the properties of nanomaterials through suitable characterization tools

Green Energy and Climate Modelling (16B1NPH732) 1.Recall the basic information about different energy resources, reserves; define the problem with fossil fuel 2.Explain green house effect, modelling of temperature measurement and physics behind the global warming 3.Demonstrate the basic principles and designs of different solar collectors and concentrators, and identify the best design/material/location to absorb maximum solar energy 4.Analyze the potential of different renewable energy sources like wind, ocean and bio mass energy5.Compare the output of renewable energy source using different design under different onditions/location

Applied Linear Algebra, (17B1NMA731) 1.Explain field, vectors, vector spaces and their dimensions.2.Apply linear transformations in solving practical engineering problems.3.Develop the concept of rank, determinant, existence and uniqueness of solution of a system of linear equations.4.Explain the concept of length, distance and inner-product.5.Apply the concept of orthogonality and orthogonal matrices to orthogonalize a set of linearly independent vectors.6.Analyze eigenvalues, eigenvectors and their properties to solve a system of ordinary differential equations.

Applied Numerical Methods, (17B1NMA732) 1.Solve system of linear equations using direct and iterative methods with their applications in various engineering problems. 2.Explain finite and divided difference formulae for numerical interpolation. 3.Apply the methods of least squares to best fit the given data.4.Apply numerical differentiation and integration in engineering applications. 5.Solve system of non-linear equations and analyze the convergence of the methods.6.Evaluate the solutions of initial and boundary value problems using various numerical methods.

Generalized Fuzzy Set Theory with Applications (19B12MA412) 1.Apply the concept of Intuitionistic fuzzy sets in defining new information measures and in medical diagnosis and pattern recognition problems. 2.Explain various hesitant fuzzy and generalized fuzzy operations.3.Describe various aggregation and generalized aggregation operators. 4.Apply the concept of Pythagorean fuzzy sets in defining new information measures and in multiple attribute decision making (MADM) problems.5.Illustrate fuzzy and possibility measures with evidence theory.

Healthcare Marketplace (17B1NBT732) 1.Explain healthcare market, drugs and devices, role of various stakeholders2.Apply related intellectual property laws and regulatory approvals for healthcare sector3.Analyze the various business models/ innovations in the healthcare industry 4.Compare and examine economic aspects pertaining to the sector

Stress: Biology, Behaviour and Management (17B1NBT733) 1.Explain the biological basis of stress 2.Relate cognitive processes and stress management3.Apply acquired knowledge in understanding and adjusting to different people and situations.4.Improve quality of life by reducing stress.

Customer Relationship Management (17B1NHS731) 1.Apply the financial, social and electronic aspects of the Customer Relationship in business situations.2.Appraise the role of customer share and customer centricity in organizations. 3.Develop the skills to understand customization, innovation and co-creation in organizations and apply them in business contexts. 4.Analyze the role of interactive technology for customer engagement, customer retention and customer experience management in organizations.5.Evaluate the technological solutions and their applications for effective Customer Relationship Management across different functions in organizations.6.Develop specific models for response modelling and consumer profiling in organizations.

Human Rights and Social Justice (17B1NHS733) 1.Demonstrate an understanding of the concept and idea of human rights and social justice2.Evaluate and interpret information about human rights issues from various sources like print and electronic media, film, documentary and other information technologies 3.Demonstrate an understanding of the International norms and standards of human rights4.Analyze the emerging dimensions of human rights and the challenges posed by them

Gender Studies (16B1NHS831) 1.Demonstrate knowledge of the construct of gender and the way it intersects with other social and cultural identities of race, class, ethnicity and sexuality 2.Apply feminist and gender theory in an examination of the social construct of femininity and masculinity 3.Analyze the ways in which societal institutions and power structures that impact the material and social reality of women's lives 4.Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporary settings 5.Evaluate and interpret information on gender from variety of media sources and other information technologies

Human Resource Analytics (18B12HS411) 1.Understand different analytical techniques used for solving HR related problems. 2.Apply descriptive and predictive analysis techniques to understand trends and indicators in human resource data. 3.Analyze key issues related to human resource management using analytical techniques. 4.Critically asses and evaluate the outputs obtained from analytical tools and recommend HR related decisions. 5.Create hypotheses, propose solutions and validate using appropriate analytical tehcniques

Mobile Communications (15B11EC731) 1.Explain the evolution of mobile communication and basics of all the wireless standards currently being employed. 2.Perform mathematical analysis and design of cellular system. Hand OFF problem its solutions and their effect on designing. Cellular capacity improvement designs and investigating their deployments and effects. 3.Analyse large and small scale propagation models and their design both mathematically and conceptually. The usability of these models from context o f design engineer. Interpretation of fading and various parameters contributing to it. 4.Explain architecture of 2G, 3G and 4G systems, their respective data rates and issues associated with them. Formulate research problems based on the issues associated with 4G systems as they are currently being deployed.

RF and Microwave Engineering (17B1NEC734) 1.Explain the concepts of microwave circuits and scattering arameters. 2.Evaluate the performance of several waveguide components and determine their responses and applications. 3.Analyze the behaviour of microwave sources based on solid state devices and tubes at microwave frequencies. 4.Determine mearurent

parameters of microwave components and understand the ISM applications of Microwave Energy.

Smart and Sustainable Systems (18B12EC420) 1.Explain the motivation for sustainable systems; implementation challenges and policy initiatives. Understand the basics of smart systems including sensors, sensor network integration, Internet of Things (IOT). Illustrate the role of smart technologies in implementing sustainable systems 2.Understand the basics of renewable sources of energy including: Solar Energy, Wind Energy, and Biomass and the fundamentals of smart grids. Analyze the role of renewable energy in sustainable systems. 3.Illustrate the concept of sustainable urban infrastructures. Application of electronic and digital technologies to urbanization issues, smart urban transportation: electric vehicles (EVs). 4.Understand the role of ICTs in reducing GHG emissions, green data centers, and energy efficient wireless and wired communications

Introduction to data analysis with R (17B1NEC742) 1.Identify continuous/discrete probabilistic models for a given random variable distribution 2.Test for hypothesis using statistical tests like z-test, t-test ANOVA etc. 3.Explain unsupervised and supervised machine learning algorithms 4.Utilize software in Matalb/R languages for implementation of ANOVA, Regression, and Machine learning techniques

Image Analysis and Feature Extraction (18B12EC421) 1.Understanding the facts and ideas of Image Processing and demonstrate the review of Signal processing, Matrix algebra and Probability. 2.Develop the basic understanding of Sampling and Quantization of the processed Image and its Transforms. 3.Examine the result in the processed image by applying Edge detection, Segmentation, Registration, Tracking and Reconstruction. 4.Determine the object recognition, Image compression and its optimization using Nature inspired algorithm.

Information Theory and Applications (17B1NEC735) 1.Understand the concept of probability, its relation with information, entropy, and their application in communication systems. 2.Identify theoretical and practical requirements for implementing and designing compression algorithms. 3.Analyze the relationship between bandwidth and capacity of communication channels and its importance in real life communication systems. 4.Analyze the need for channel coding in digital communication systems. 5.Generate error correcting codes for error detection and correction.

Essentials of VLSI Testing   (17B1NEC736) 1.Understand the fundamental of Digital System testing 2.Analyze Stuck-at faults model and Fault Simulation algorithms 3.Perform Combinational and Sequential ATPG 4.Analyze Controllability and Observability of Combinational and Sequential circuits 5.Understand Design for Testability (DFT), Built-In-Self-Test(BIST), and Test Vector Compression

Fundamentals of Embedded Systems (15B1NEC733) 1.Understanding of the fundamental concepts for embedded systems design and complete architecture of the ATMEGA16/32 microcontroller. 2.Identify various on chip peripherals of the ATMEGA16/32 microcontroller and make use of them for designing embedded applications. 3.Experiment the basic concepts of embedded 'C' programming and make use of them in designing embedded system applications around various sensors and actuators.4.Understanding of the basic concept of RTOS, detailed study of ARM7 architecture (32 bit) and study of wireless protocols.

Cognitive Communication Systems (17B11EC732) 1.Understand the concepts of various generation of wireless communication and spectrum scarcity. 2.Understand the concepts of radio (CR) architecture, functions of cognitive radio 3.Analyzing the Spectrum sharing and management and Spectrum sensing methods 4.Evaluating the performance of optimization of dynamic spectrum access and management.

Term Paper (15B19EC792) 1.Summarize the contemporary scholarly literature, activities and techniques for various domain of Electronics Engineering. 2.Analyze the recent technology and research trends in Electronics and Communication. 3.Develop the skill so that they can communicate effectively in both verbal and written form.

Convergence & Next Generation Networks (19B12EC413) 1.Understand principles of multimedia, quality of service, network security and various signaling systems and their application session management. 2.Apply above concepts for developing the framework required for secure transport of multimedia with required quality of service. 3.Analyze NGN architecture with application of QOS, security and signaling systems, and evaluate the current technology trends of network convergence.

Machine Learning and Statistical Pattern Recognition (19B12EC417) 1.Identify supervised learning generative/discriminative learning, parametric/non-parametric learning, 2.Test for their Knowledge in Clustering, dimensionality reduction, kernel methods 3.Explain Bias/variance tradeoffs; VC theory; large margins 4.Utilize software Python to design and implement text and web data processing applications.

Major Project-1 (15B19EC791) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering. 2.Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time 3.Evaluate /Validate sound conclusions based on evidence and analysis 4.Develop the skill in student so that they can communicate effectively in both verbal and written form.

Multimedia Communications (18B12EC412) 1.Familiarize with basics of data compression used in the development of various construction algorithms for source codes.2.Identify theoretical and practical requirements for implementation and designing of Error Resilient Codes.3.Learn fundamentals of transform coding, digital image processing and its applications.4.Analyse the need of image compression & video compression and distinguish between different image CODECs.5.Familiarize with psychoacoustic principle used in the development of audio codec standards.

Radar Signals and Systems (17B1NEC738) 1.Demonstrate the basic principle of RADAR System.2.Solve the Radar equations and find out the transmitted and received power3.Analyze the working principle of CW, Frequency Modulated, MTI and Pulsed Radar4.Analyze the Radar Signal and its detection in noise with the concept of Matched filter 5.Analyze the applications of Radar in tracking and Imaging, Guided Missile and Aircraft Navigation.

Deep Learning for Multimedia (19B12EC416) 1.Compare various loss functions and optimization methods for deep learning approaches 2.Experiment with various CNN architectures for related applications 3.Apply and analyze sequence models for natural language processing 4.Utilize and compare various deep learning techniques in real life problems

Bioinformatics Algorithms (17BINCI736) 1.Relate to different computational challenges in Computational Molecular Biology. 2.Examine proper algorithmic concepts to solve a computational problem. 3.Determine the importance of traditional to contemporary approaches for solving the biological problems. 4.Design strategy to resolve real-world biological challenges. 5.Identify appropriate algorithmic technique to solve a given bioinformatics related task. 6.Develop an optimized solution model for computational biology problems. 7.Formulate prediction tools and estimate the solutions for biological problems.

Summer Industrial Training Viva (15B19EC793) 1.Extend theoretical knowledge to real time Industry. 2.Demonstrate the capacity for critical reasoning and independent learning. 3.Make use of Industrial Training experience to prepare a scientific report. 4.Develop greater clarity about career goals in present condition.

Optical Communication (17B11EC733) 1.Develop an understanding of optical fiber, its structure, types, propagation and transmission properties. 2.Identify and examine the different kinds of losses and signal distortion in optical Fibers. 3.Classify the Optical sources and detectors and their principle of operation. 4.Design a fiber optic link based on budget analysis.

Elements of Statistical Learning (19B12MA411) 1.Explain different type of learning techniques. 2.Apply and analyze linear regression techniques 3.Apply and analyze linear classification techniques 4.To use and analyse sparse kernel machines 5.To compare learning models 6.To apply unsupervised learning techniques.

Course Outcome (Semester 8)

Photonics and Applications (18B12PH811) 1.Recall the fundamental properties of light and the processes involved in the generation of light.2.Interpret the theory of fiber optics.3.Apply the fundamentals of various nonlinear optical effects in technology; make use of holography and its applications.4.Compare the operational principles, characteristics and trade-offs of optical detectors and modulators of light.

Astrophysics (18B12PH812) 1.Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units2.Explain the models of universe, ideas of stellar astrophysics, life cycles of stars, physical principles that rules galaxies, and general theory of relativity3.Apply mathematical principles and laws of physics to solve problems related to astrophysical systems4.Compare different models of universe and decide which one is logically acceptable and why

Bio-Physics (18B12PH813)1.Find the connections between physics and biology of living system, Physical processes in the living organisms2.Understand the idea of DNA computing with the construction of different DNA logic gates.3.Apply the idea of different radiation sources to explain radiobiology to understand the effect of radiation on living system 4.Analyzing the working of different bio-devices: Organic semiconductor, solar cell, OLED, PLED, AMOLED, biosensors.

Service Management and Marketing (16B1NHS832) 1.Understand service products, consumers and markets2.Apply 4P's of marketing to service3.Determine and Interpret the customer Interface4.Create and design profitable service strategies

Quality Issues in Engineering (18B12HS815) 1.Apply the concepts of quality within quality management systems by understanding various perspectives, historical evolution; and contributions of key gurus in the field of quality2.Determine the effectiveness of acceptance sampling using single and double sampling plans and operating characteristic curves3.Determine quality by employing a wide range of basic quality tools, lean concepts and process improvement techniques such quality function deployment 4.Examine the importance of six sigma, various quality standards, awards, certifications

Organizational Psychology (18B12HS813) 1.Demonstrate advanced knowledge in organizational psychology, including a discussion of its historical origins and development.2.Explain the psychological principles underlying job analysis, selection process, and performance appraisal.3.Evaluate critically the nature of leadership and its role and development within organizations 4.Analyze the impact of social, ethical, cultural economic and political influences on organizational behavior in local, national and global communities5.Analyze critically the conceptual and theoretical frameworks relating to organizational psychology. 6.Creates a learning environment that promotes respect, collaboration, productive group interaction and creates new opportunities for development and exploration.

Knowledge Management (18B12HS814) 1.Demonstrate the way knowledge is embedded in today's organization and behavioral aspects involved in managing it2.Compare and contrast different methods to preserve, nurture, share and manage knowledge 3.Identify appropriate methods for knowledge integration to gain competitive advantage4.Identify the legal ramifications arising from knowledge sharing and an insight into the ethical concerns faced by individuals and organizations

International Studies (15B1NHS832) 1.Demonstrate an understanding of the basic concepts in the area of international studies 2.Compare the changes in India's foreign policy in the Cold War era and the post Cold War era3.Analyze the major political developments and events since the 20th century4.Demonstrate an understanding of the rise of new power centres in the changing world order

International Finance (19B12HS812) 1.Explain the global market scenario, its imperfections and risks which affect the multinational businesses trade.2.Analyze the international transactions of balance of payments and understand their relationship with key macroeconomic indicators3.Apply the concepts of foreign exchange market and currency derivatives for making transactions and risk hedging in foreign exchange market4.Analyze the role of parity conditions and other factors in exchange rate determination.

Industrial Sociology (18B12HS811) 1.Understand the scope of industrial sociology and major theories on labour and work 2.Analyzing the contemporary issues related to industry in the post-Liberalization Privatization Globalization era 3.Evaluating work in its social aspects such as gender, caste, class and unpaid work, as different from its better known economic dimension.4.Evaluate and interpret information about industry through various sources like print and electronic media, film, documentary and other information technologies

Digital Transformation in Financial Services (19BI2HS814) 1.Outline the changes that influence the financial sector in digital age2.Evaluate the key differences between traditional business management and technology management and the impact it has on business models3.Analyze the new developments in Financial Technology in banking sector.4.Analyze Consumer Behaviors & digital disruptions in Insurance5.Evaluate the limits, risks and broader policy and social implications of digital technology. 6.Organising for Digital Innovation and Apply the knowledge of income tax by digital filing of income tax.

Information Theory and Application (17B1NEC735) 1.Understand the concept of probability, its relation with information, entropy, and their application in communication systems.2.Identify theoretical and practical requirements for implementing and designing compression algorithms.3.Analyze the relationship between bandwidth and capacity of communication channels and its importance in real life communication systems.4.Analyze the need for channel coding in digital communication systems.5.Generate error correcting codes for error detection and correction.

Natural Language Processing with Deep Learning (19B12EC414)1.Understanding the problems associated with Natural language processing and recent technological developments.2.Applying deep learning approaches to improve the performance NLP tasks.3.Develop the basic concepts of python programming to NNM models which can deal with NLP.4.Analyzing performance of various neural networks in the NLP applications.

Network Security (20B12EC415) 1.Understand the security requirements of networked information systems and general principles of cryptography.2.Apply above concepts for developing security mechanisms used for network access, message confidentiality, message authentication non-repudiation.3.Apply the above security mechanisms to understand of standard security protocols used in the IP network.4.Analyze network vulnerabilities to adversarial attacks/intrusions, and security solutions for preventing such attacks/intrusions.

Project Part-2 (15B19EC891) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ echniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering.2.Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time3.Evaluate /Validate sound conclusions based on evidence and analysis4.Develop the skill in student so that they can communicate effectively in both verbal and written form.

Satellite Communication (18B12EC417) 1.Define Satellite and its historical background, outline the basic concepts of Satellite communications, recall the Kepler's laws of planetary motion2.Develop the equations of the orbit, explain the satellite launching and launch vehicles and outline terminology of earth-orbiting Satellites.3.Demonstrate the space segment, antenna subsystem, estimate different parameters and design uplink and downlink.4.Apply various multiple access techniques for satellite communication and analyze Noise and Bandwidth. Also Interpret applications of various types of satellites established in different earth orbits.

Sonar System and Acoustic Imaging (16B1NEC831) 1.Define and explain sonar terminology and choose parameters for side scan sonar according to the required azimuth and range resolutions2.Select parameters for synthetic aperture sonar (SAS) as per the design requirements.3.Analyze the continuous time frequency modulation (CTFM) technique for sonar applications 4.Apply and discover signal processing application for ship speed measurement system like JANUS.5.Take part in the development of simple array design for acoustic localization.

Machine Learning tools in Bioinformatics (18B12BT414) 1.Explain about the machine learning principle biological complexities and resources2.Apply Pattern Identification methods for motif discovery3.Apply machine learning in solving biological problems. 4.Analyzing the use of machine learning in disease-drug discovery

Optimization Techniques (16B1NMA831) 1.apply generalized, revised and dual simplex method for linear programming problems (LPP).2.apply graphical, algebraic and linear programming techniques for pure and mixed strategy problems in game theory. 3.classify and solve the problems on queuing and inventory models.4.solve and analyze the network scheduling and sequencing problems.5.make use of dynamic programming technique to solve complex linear programming problems. 6.determine numerical solution of nonlinear multidimensional problems.

Fuzzy Optimization and Decision Making (18B12MA811) 1.Explain the concept of fuzzy sets and fuzzy numbers. 2.Explain various fuzzy and generalized fuzzy operations.3.Apply the concept of fuzzy relations and approximate reasoning. 4.Apply the concept of fuzzy sets and their generalizations in various decision making processes.5.Apply various ranking techniques in solving fuzzy transportation problems.

Multi Attribute Decision Making (20B12MA411) 1.explain basic steps in decision analysis and decision making environments. 2.apply group decision making methods to reach a collective decision.3.develop the concept of multi criteria decision making process and attributes.4.apply elementary methods to solve multi attribute decision making problems. 5.analyze value based and outranking methods to solve multi attribute decision making problems.

Advanced Topics in Wireless Communication (19B12EC412) 1.Explain basics of MIMO systems and need of diversity schemes 2.Analyze the effect of fading in the wireless medium and mathematical modeling of fading channels3.Analyze channel capacity expression of MIMO systems4.Analyze the MIMO detection system and need of UWB systems

Advanced Microcontrollers & RTOS, (20B12EC412) 1.Understanding fundamentals of ARM7 processor and detailed study of architecture and peripherals of the ARM7 based LPC2148 microcontroller.2.Understanding and study of the complete architecture of the ARM-CORTEX M3/M4 processor and STM32F407 (ARM-CORTEX based microcontroller). 3.Experiment and configure different peripherals of STM32 Microcontrollers and Interfacing Sensor and Actuators with the microcontroller4.Understand fundamentals of RTOS and its implementation

Basics of Antenna Theory and Wave Propagation (20B12EC413) 1.Recall the concepts of Electromagnetic field theory, classify different types of antennas, illustrate antenna parameters and demonstrate the effect on antenna parameters due to changes in the physical dimensions.2.Compare Broadband Antennas, Frequency Independent antennas and Aperture antennas. Explain Dipole antenna and their characteristic, loop antenna3.Design Array Antennas and identify the E and H fields for the antennas. Design Reconfigurable antenna, Active antenna, Dielectric antennas and measure radiation pattern, polarization and VSWR. 4.Define terminology relevant to mode of propagation and examine the propagation of radio waves in different atmospheres.
Digital Control System (18B12EC413) 1.To represent the systems in both in Z domain and in state space representation. 2.To analyze transient and steady state behaviors of linear discrete time control systems with modified transfer function.3.To understand and gain knowledge in stability analysis of digital control systems.4.To Design Digital Control Systems
Digital Integrated Circuits in Deep Submicron Technology (19B12EC415) 1.Recall the important concepts of logic gates, static input-output characteristics, noise margins and propagation delay2.Illustrate the key issues in deep submicron technology node. 3.Identify and solve static and dynamic design issues for high speed combinational and sequential circuits.4.Analysis and design of VLSI memories
Introduction to IOT (18B12EC411) 1.Outline the basic concepts of IOT with networking and protocol considerations in IOT scenario.2.Identify various IOT hardware platforms and their utilization with various sensors and actuators.3.Experiment the basic concepts of python programming and make use of them in image processing, data analytics and machine learning applications. 4.Examine various case studies and cloud platforms in an IOT scenario for monitoring, control and analysis.
Satellite Communication (FASTTRACK) (18B12EC417) 1.Define Satellite and its historical background, outline the basic concepts of Satellite communications, recall the Kepler's laws of planetary motion2.Develop the equations of the orbit, explain the satellite launching and launch vehicles and outline terminology of earth-orbiting Satellites.3.Demonstrate the space segment, antenna subsystem, estimate different parameters and design uplink and downlink.4.Apply various multiple access techniques for satellite communication and analyze Noise and Bandwidth. Also Interpret applications of various types of satellites established in different earth orbits.
Basics of Antenna Theory and Wave Propagation (FASTTRACK) (20B12EC413) 1.Recall the concepts of Electromagnetic field theory, classify different types of antennas, illustrate antenna parameters and demonstrate the effect on antenna parameters due to changes in the physical dimensions.2.Compare Broadband Antennas, Frequency Independent antennas and Aperture antennas. Explain Dipole antenna and their characteristic, loop antenna3.Design Array Antennas and identify the E and H fields for the antennas. Design Reconfigurable antenna, Active antenna, Dielectric antennas and measure radiation pattern, polarization and VSWR.4.Define terminology relevant to mode of propagation and examine the propagation of radio waves in different atmospheres.

PROGRAMME NAME: M.TECH. IN ELECTRONICS AND COMMUNICATION ENGINEERING
- **SPECIALIZATION IN COMMUNICATION SYSTEMS**
- **SPECIALIZATION IN MICRO ELECTRONICS SYSTEMS & EMBEDDED TECHNOLOGY**
- **SPECIALIZATION IN MACHINE LEARNING AND SIGNAL PROCESSING**
- **SPECIALIZATION IN MICROELECTRONIC SYSTEMS AND IOT**
- **SPECIALIZATION IN WIRELESS COMMUNICATION**

PEOs: **1:** To provide strong foundation in Electronics and Communication Engineering to pursue professional career, entrepreneurship and higher studies.
2: To evolve capability to analyze, design and develop feasible solutions to real world problems.
3: To inculcate professional ethics, managerial and communication skills to develop ingenious solutions for benefit of society and environment.

M.TECH. IN ECE (SPECIALIZATION IN COMMUNICATION SYSTEMS)
POs: **1:** An ability to independently carry out research /investigation and development work to solve practical problems
2: An ability to write and present a substantial technical report/document
3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.
PSOs: **1:** Students will be able to analyze and develop models, tools and techniques to solve complex problems in communication systems.
2: Students will be able to demonstrate entrepreneurial skills and ethical principles.

Academic Year 2019-20 Course Outcomes (COs)

Course Outcome (Semester 1)

Advanced Wireless and Mobile Communication (17M11EC119) 1.Relate and recall the concepts of Wireless and Mobile Communication 2.Understand the Wireless and Mobile CommunicationTechniques of Mobile wireless Networks 3.Apply theknowledge of Wireless and Mobile CommunicationTechniques in Mobile wireless Networks like (GSM/UMTS/HSPA/LTE)4.Analyze the application of 3GPP based techniques Mobile wireless Networks like (GSM/UMTS/HSPA/LTE)

ECE Design and Simulation Lab (17M15EC113) 1.To learn the simulation environment for the design and simulation of Electronics and Communication Engineering (ECE)2.Implementation of Digital Signal Processing functions, Transformations and Communication Systems3.Simulation of Signal Processing, Communication Systems (RF, Microwave, Optical etc.) 4.Design and Analysis of Microwave Devices and Circuits Using EM and Circuit Simulator.

VLSI Physical Design(13M1NEC338) 1.Recall the basics of IC design2.Understand the process of VLSI layout design3.Applying the basic physical design algorithms for VLSI circuits.4.Analyze the physical design automation techniques used in the best-known academic and commercial layout systems.

Research Methodology & Intellectual Property Rights (18M11GE111) 1.Understand the basic concepts and types of research2.Define a research problem, its formulation, methodologies and analyze research related information 3.Follow research ethics, understand IPR, patents and their filing related to their innovative works4.Understand and analyze the statistical data and apply the relevant test of hypothesis in their research problems.

Estimation over Distributed Networks (16M3NEC361) 1.To course aims to familiarize students with the importance of distributed adaptation, optimization and learning by multi-agent systems over distributed networks 2.The course aims to help student analyze efficient processing of Massive data using Distributed Networks.3.The course helps students understand, Importance and Need of distributed Networks.4.The course helps students to analyze local information available at individual nodes in a distributed manner.5.The students will be able to compute the computational complexity and compare various distributed algorithms.

Soft Computing (19M12EC112) 1.Explain soft computing techniques and their roles in building intelligent machines 2.Apply neural networks to pattern classification and regression problems3.Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems4.Apply genetic algorithms to combinatorial optimization problems 5.Evaluate and compare solutions by various soft computing approaches for problems use existing software tools.

Advance Digital Signal Processing (18M22EC116/17M11EC118)1.Recall the principles of various transform techniques like Z, Chirp Z, Hilbert, Discrete Fourier transform and Fast Fourier Transform.2.Demonstrate the ability to apply different methods to design and analyze digital FIR (Finite Impulse Response) and IIR (Infinite Impulse Response) filters with its structural realization.3.Analyze Multirate signal processing and examine its application. 4.Comprehend different methods for designing adaptive filters and examine its application

Course Outcome (Semester 2)

English for Research Paper Writing (19M13HS111) 1.Demonstrate an understanding of all the aspects of grammar and language needed to write a paper.2.Use of writing skills with proper grammar usage.3.Classify each section of a paper after careful analysis of Literature Review.4.Determine the skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion.5.Compile all the information into a refined research paper after editing and proofreading

Project Based Learning-1 (17M21EC113) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.2.Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time and maintain technical correctness with effective presentation.3.Use latest techniques and software tools for achieving the defined objectives.4.Evaluate /Validate sound conclusions based on analysis and effectively document it in correct language and proper format.

Advanced Embedded System (17M21EC114) 1.Outline the fundamental concepts of ARM7 processor and study of ARM7 based controller (LPC2148) with on chip peripherals. 2.Understanding the fundamental concepts of ARM CORTEX processor and study of ARM CORTEX based controller (STM32) with on chip peripherals.3.Experiment the concepts of embedded C programming and make use of them to program on chip and external peripherals with LPC2148 and STM32 microcontroller.4.Understanding the basic concept of Linux operating system and its programming.

ASIC Verification using System Verilog (18M12EC111) 1.Recall the basics and need of ASIC verification 2.Understand the concepts of verilog and system verilog3.Applying system verilog to code, simulate and verify the system4.Analyze the verification environment to build and verify DUT through testbenches

Adaptive Filters (19M12EC111) 1.The course aims to familiarize student with need of adaptive systems and their properties2.The course helps students to study algorithms useful for optimization of adaptive systems such as Stochastic Gradient Algorithms3.The course helps students evaluate the performance of adaptive system such as convergence rates and mean-square error criterion 4.The course helps student design adaptive systems for real time stochastic systems

ECE Design and Simulation Lab 2 (17M15EC114) 1.Learn MATLAB simulation programming using random signal2.Modelling and estimating of the communication channels over various networks3.Performance analysis of collocated and distributed networks using MATLAB simulations4.Design and simulate algorithms/techniques for advance wireless networks

Statistical Signal Processing (17M11EC121) 1.Understand the need of random variables and random processes in signal processing.2.Experiment with various algorithms to model the random signals.3.Apply and Analyze Wiener and adaptive filters for signal processing applications.

Selected Topics in Communication (17M12EC129) 1.Learn how to find the moments of random distribution with the help of Moment Generating Function (MGF)2.Develop the ability to study different wireless fading channels/distributions and explore transmit and receive diversity3.Analyze the performance of different fading channels in terms of BER, Outage Probability, Channel capacity etc., both without diversity and with diversity techniques 4.Demonstrate the ability to comprehend and develop advanced wireless modeling techniques viz., MIMO, Cooperative communication, OFDM, etc. to test for improved performance.

Course Outcome (Semester 3)

Project Based Learning (17M17EC129) 1. Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc. 2. Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time. 3. Use latest techniques and software tools for achieving the defined objectives. 4. Evaluate /Validate sound conclusions based on evidence and analysis.

Constitution of India (19M13HS211) 1. Outline the salient features of Indian Constitution and its preamble. 2. Critical evaluation of fundamental rights given by the constitution. 3. Evaluate the role of different institution responsible for the implementation of constitutional rules. 4. Understand functioning of Election Commission.

Seminar and Term Paper (17M17EC218) 1. Understand relevant theories, methods and research design relating to the seminar topic selected by a student. 2. Analyze the work of other authors/researchers and contribute to the field of knowledge with the cooperation of the supervisor. 3. Evaluate the previously published research works, findings and conclusions. 4. Develop and refine the master's dissertation topic and proposal, Develop the effective technical writing, communication and presentation skills.

Dissertation (17M17EC219) 1. Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering. 2. Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology. 3. Use latest techniques and software tools for achieving the defined objectives. Evaluate /Validate sound conclusions based on evidence and analysis. 4. Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain.

Cost Accounting for Engineering Projects (19M12HS211) 1. Understand basic concepts of Cost Accounting. 2. Apply concepts of cost in project management. 3. Analyze cost behaviour for decision making. 4. Construct different budgets for controlling the cost.

Course Outcome (Semester 4)

DISSERTATION(17M17EC222) 1. Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering. 2. Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology. 3. Use latest techniques and software tools for achieving the defined objectives. Evaluate /Validate sound conclusions based on evidence and analysis. 4. Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain

INDUSTRIAL PROJECT (17M17EC223)1. Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering. 2. Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology. 3. Use latest techniques and software tools for achieving the defined objectives. Evaluate /Validate sound conclusions based on evidence and analysis. 4. Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain

M.TECH. IN ECE (SPECIALIZATION IN MICRO ELECTRONICS SYSTEMS & EMBEDDED TECHNOLOGY))

POs: **1:** An ability to independently carry out research /investigation and development work to solve practical problems

2: An ability to write and present a substantial technical report/document

3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

PSOs: **1:** Students will be able to analyze and develop models, tools and techniques to solve complex problems in microelectronics and embedded systems.

2: Students will be able to demonstrate entrepreneurial skills and ethical principles.

Academic Year 2019-20_ Course Outcomes (COs)

Course Outcome (Semester 1)
VLSI Physical Design(13M1NEC338) 1.Recall the basics of IC design2.Understand the process of VLSI layout design 3.Applying the basic physical design algorithms for VLSI circuits.4.Analyze the physical design automation techniques used in the best-known academic and commercial layout systems.
Research Methodology & Intellectual Property Rights (18M11GE111) 1.understand the basic concepts and types of research 2.define a research problem, its formulation, methodologies and analyze research related information F3.ollow research ethics, understand IPR, patents and their filing related to their innovative works 4.understand and analyze the statistical data and apply the relevant test of hypothesis in their research problems.
Estimation over Distributed Networks (16M3NEC361) 1.To course aims to familiarize students with the importance of distributed adaptation, optimization and learning by multi-agent systems over distributed networks 2.The course aims to help student analyze efficient processing of Massive data using Distributed Networks.3.The course helps students understand, Importance and Need of distributed Networks. 4.The course helps students to analyze local information available at individual nodes in a distributed manner.5.The students will be able to compute the computational complexity and compare various distributed algorithms.
Soft Computing (19M12EC112) 1.Explain soft computing techniques and their roles in building intelligent machines2.Apply neural networks to pattern classification and regression problems 3.Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problemsApply genetic algorithms to combinatorial optimization problems4.Evaluate and compare solutions by various soft computing approaches for problems use existing software tools.
Microelectronic Devices Technology and Design Interface (17M21EC111) 1.Relate and recall the concepts of semiconductor physics, devices and technology   2.Understand the MOS structure and explain the operation of MOS transistors 3.Apply the knowledge of MOSFET scaling, short-geometry effects and fabrication techniques in advanced nanoscale devices and circuits 4.Analyze the device layout and characteristics, Analyze design flow and design interface
VLSI Design and Simulation Lab-I (17M25EC111) 1.Understanding the fundamental concepts of C programming, architecture and interfacing of on chip and external peripherals with AT89C51 micro controller2.Apply the concept of embedded 'C' programming & interfacing in designing embedded application around various sensors and Actuotors. 3.Experiment the embedded system designs on simulator & development board.Use EDA tool for VLSI circuit design 4.Apply the MOS device theory to obtain the MOS I-V characteristics and perform parameter extraction 5.Analyze the static and switching characteristics of MOS-based circuits

Digital Integrated Circuit Design (17M21EC112) 1.Develop an understanding of exiting challenges in digital IC design, and analysis of CMOS inverter performance.2.Identify and estimate the delay and power consumption in CMOS based gates and choosing best design configuration via logical effort.3.Design and analyze combinational and sequential logic circuits effectively. 4.Design different types of semiconductor memories and test integrated circuits for fault tolerance.

Course Outcome (Semester 2)

English for Research Paper Writing (19M13HS111) 1.Demonstrate an understanding of all the aspects of grammar and language needed to write a paper. 2.Use of writing skills with proper grammar usage. 3.Classify each section of a paper after careful analysis of Literature Review.4.Determine the skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion.5.Compile all the information into a refined research paper after editing and proofreading

Project Based Learning-1 (17M21EC113) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc. 2.Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time and maintain technical correctness with effective presentation.
3.Use latest techniques and software tools for achieving the defined objectives. 4.Evaluate /Validate sound conclusions based on analysis and effectively document it in correct language and proper format.

Advanced Embedded System (17M21EC114) 1.Outline the fundamental concepts of ARM7 processor and study of ARM7 based controller (LPC2148) with on chip peripherals. 2.Understanding the fundamental concepts of ARM CORTEX processor and study of ARM CORTEX based controller (STM32) with on chip peripherals.3.Experiment the concepts of embedded C programming and make use of them to program on chip and external peripherals with LPC2148 and STM32 microcontroller.4.Understanding the basic concept of Linux operating system and its programming.

Analogue Integrated Circuit Design (17M21EC115) 1.Relate and recall the MOS device physics 2.Understand the concepts of single-stage amplifiers, differential amplifiers and current mirrors 3.Apply the phenomenon of noise and its effect on analogue circuits 4.Analyze the multistage CMOS amplifiers (op amps) and voltage references

VLSI Design & Simulation Lab 2 (17M25EC112) 1.Familiarize with the VLSI CAD tools 2.Structure creation & Visualization of VLSI devices and systems 3.Characterize and validation of VLSI devices and systems

ASIC Verification using System Verilog (18M12EC111) 1.Recall the basics and need of ASIC verification2.Understand the concepts of verilog and system verilog3.Applying system verilog to code, simulate and verify the system4.Analyze the verification environment to build and verify DUT through testbenches

Adaptive Filters (19M12EC111) 1.The course aims to familiarize student with need of adaptive systems and their properties 2.The course helps students to study algorithms useful for optimization of adaptive systems such as Stochastic Gradient Algorithms3.The course helps students evaluate the performance of adaptive system such as convergence rates and mean-square error criterion4.The course helps student design adaptive systems for real time stochastic systems

Course Outcome (Semesster 3)

Project Based Learning (17M27EC126) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.2.Analyze/ Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time3.Use latest techniques and software tools for achieving the defined objectives.4.Evaluate /Validate sound conclusions based on evidence and analysis.

Constitution of India(19M13HS211) 1.Outline the salient features of Indian Constitution and its preamble. 2.Critical evaluation of fundamental rights given by the constitution.3.Evaluate the role of different institution responsible for the implementation of constitutional rules.4.Understand functioning of Election Commission

Advanced Operations Research (18M12MA111) 1.Construct and solve linear programming problems and analyze their optimal 2.solution using parametric and sensitivity analysis identify and solve the deterministic inventory models with and without shortages. 3.construct the network models and analyze the critical activities using PERT/CPM for project planning. 4.identify pure and mixed strategy games and solve and analyze them using graphical and linear programming techniques. 5.solve multi-objective and goal programming problems by graphical and simplex method. 6.demonstrate Khun-Tucker conditions and apply them to solve non-linear programming problems, quadratic and separable programming problems.

Seminar and Term Paper (17M27EC211) 1.Understand relevant theories, methods and research design relating to the seminar topic selected by a student2.Analyze the work of other authors/researchers and contribute to the field of knowledge with the cooperation of the supervisor 3.Evaluate the previously published research works, findings and conclusions 4.Develop and refine the master's dissertation topic and proposal, Develop the effective technical writing, communication and presentation skills

Dissertation (17M27EC212) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering.2.Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology3.Use latest techniques and software tools for achieving the defined objectives. Evaluate /Validate sound conclusions based on evidence and analysis4.Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain
Cost Accounting for Engineering Projects (19M12HS211) 1.Understand basic concepts of Cost Accounting2.Apply concepts of cost in project management3.Analyze cost behaviour for decision making 4.Construct different budgets for controlling the cost
Industrial Project (17M27EC213) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering.2.Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology 3.Use latest techniques and software tools for achieving the defined objectives. 4.Evaluate /Validate sound conclusions based on evidence and analysis5.Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain
Course Outcome (Semester 4)
DISSERTATION(17M27EC215) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering. 2. Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology 3. Use latest techniques and software tools for achieving the defined objectives. Evaluate /Validate sound conclusions based on evidence and analysis 4. Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain
INDUSTRIAL PROJECT (17M27EC216) 1.Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering. 2. Gain knowledge of the State-of-Art in the chosen field of study. Analyze various feasible methods of solving a problem to slot a suitable solution methodology 3. Use latest techniques and software tools for achieving the defined objectives. Evaluate /Validate sound conclusions based on evidence and analysis 4.Demonstrate the oral and written communication skills. Describe the importance of possible future developments in the selected domain

M.TECH IN ECE (SPECIALIZATION IN MACHINE LEARNING AND SIGNAL PROCESSING)

POs: **1:** An ability to independently carry out research /investigation and development work to solve practical problems

2: An ability to write and present a substantial technical report/document

3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

PSOs: **1:** Students will be able to analyze and develop models, tools and techniques to solve complex problems in machine learning and signal processing.

2: Students will be able to demonstrate entrepreneurial skills and ethical principles.

M.TECH. IN ECE (SPECIALIZATION IN MICROELECTRONIC SYSTEMS AND IoT)

POs: **1:** An ability to independently carry out research /investigation and development work to solve practical problems

2: An ability to write and present a substantial technical report/document

3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

PSOs: **1:** Students will be able to analyze and develop models, tools and techniques to solve

complex problems in VLSI and IoT.

2: Students will be able to demonstrate entrepreneurial skills and ethical principles.

M.TECH. IN ECE (SPECIALIZATION IN WIRELESS COMMUNICATION)

POs: **1:** An ability to independently carry out research /investigation and development work to solve practical problems

2: An ability to write and present a substantial technical report/document

3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program.

PSOs: **1:** Students will be able to analyze and develop models, tools and techniques to solve complex problems in wireless communication systems.

2: Students will be able to demonstrate entrepreneurial skills and ethical principles.

PROGRAMME NAME: INTEGRATED M.TECH IN ELECTRONICS AND COMMUNICATION ENGINEERING

Programme Educational Objectives (PEOs): Same as **PEOs** of **M.Tech** in **ELECTRONICS AND COMMUNICATION ENGINEERING**

POs: Same as **POs of B.Tech and M.Tech** in **ELECTRONICS AND COMMUNICATION ENGINEERING**

PSOs: Same as **PSOs of B.Tech and M.Tech** in **ELECTRONICS AND COMMUNICATION ENGINEERING**

Course Outcomes: Same as **Course Outcomes** of **B.Tech** and **M.Tech** in **ELECTRONICS AND COMMUNICATION ENGINEERING**

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

VISION : To be a centre of excellence in preparing professionals by imbibing human values and to carryout contemporary and futuristic research in humanities and social sciences.

MISSION :
1. To provide socially relevant and high quality professional education in a wide range of inter-disciplinary areas of humanities and social sciences.

2. To conduct quality research in different areas of humanities and social sciences.

3. To imbibe pluralistic values, democratic and equalitarian doctrines of the society at large.

DEPARTMENT NAME: JAYPEE BUSINESS SCHOOL

VISION: To be a centre of excellence for grooming management professionals for providing leadership in industries and organizations and venture into entrepreneurship.

MISSION : 1: To offer management education for enhancing knowledge and skills across functional areas through benchmarked-curriculum using innovative teaching learning methods.

2: To conduct contemporary and futuristic interdisciplinary research in areas of management.

3: To interact with industry and other stakeholders and establish effective linkages for professional and entrepreneurial enrichment of management professionals.

PROGRAMME NAME: MBA

PEOs:1: To impart extensive knowledge of management theories, concepts and models to solve business problems and create new opportunities for successful professionals.

2: To inculcate self-awareness, discipline and team-work, leadership, effective communication skills and research orientation.

3: To sensitize students about social issues and develop them as socially conscious managers and leaders.

4: To infuse a spirit of innovation and entrepreneurship for personal and societal well-being.

POs: 1: Management Knowledge: Demonstrate in-depth knowledge of various domains of Management, including broader global perspectives, with an ability to discriminate, evaluate, analyse and synthesize existing as well as new knowledge, and integrate the same for enhancement of knowledge

2: Critical Thinking: Exhibit critical awareness to develop strategies and solutions to current business problems

3: Application: Apply the knowledge of management to manage projects in the work environment efficiently and develop effective and innovative business strategy.

4: Communication Skills: Communicate simple and complex managerial activities confidently and effectively through reports and effective presentations.

5: Independence: Demonstrate that they can function independently and/ or take responsibility for managing professional practices, in highly complex environments.

6: Collaboration and Leadership: Collaborate and lead teams across organizational boundaries and demonstrate leadership qualities to maximize the usage of diverse skills of team members.

7: Innovation: To identify timely opportunity to create value and wealth for the stakeholders of the society for sustainable development**.**

8: Ethics and Entrepreneurship: To identify the contemporary social problems, explore the opportunities for social entrepreneurship, design business solutions, exhibit value based leadership**.**

9: Life-long Learning: Observe and examine critically the outcomes of one's actions, make corrective measures, and learn from mistakes without depending on external feedback**.**

Academic Year 2019-20 Course Outcomes

COURSE OUTCOMES (TRIMESTER 1)
17M11BEC11 Managerial Economics **1.**Understand the basic concepts of Demand, Supply and Market**2**Identify the economic problem a comapny/industry is facing in light of the micro economics concepts .**3.**Apply microeconomics concepts in overcoming the economic challenges **4.**Develop economic models for managerial decision making
17M11BAF11: ACCOUNTING FOR MANAGERS (Academic Year 2019-20 and 2020-21) **1**Remember and understand the accounting fundamentals and process **2**Apply these fundamentals and process to work out the end result of business operations through financial statements **3**Analyze these financial statements to know business efficiency, profitability and financial position**4**Evaluate financial information for usage in future planning and optimizing profitability
Marketing Mgmt - I - 17M11BMM11 **1.**Understand fundamentals of marketing management.**2.**Apply knowledge and skills related to marketing management.**3.**Evaluate issues related to consumers and markets.

Organizational Behavior: 1811BHR11 ([Academic Year 2019-20 and 2020-21](#))
1. Understand impact of work environment variables on behaviour in organizations**2.** Identify individual and group characteristics and appreciate the link contributing to the emergence of Organizational Behaviour and culture **3.**Apply techniques in managing self and others in the organization.

18M11BGM11 Business Statistics and Analytics for Decision making ([Academic Year 2019-20](#))
1Understand the concepts of statistics and their usage in business**2**Make use of the various concepts and techniques in statistics to solve business problems**3**Analyze relationships between various business variables and concepts to draw inferences**4**Create various statistical models to apply to business problems

COURSE OUTCOMES (TRIMESTER – III)	

Organizational Structure and Design: 18M11BHR02 1. Understand the concept of design options and parameters in designing various forms of effective organizations.**2.**Apply various design options and parameters in different forms of organization structure.**3.**Evaluate the organization structure and align with strategy, size, culture and power dynamics. **4.**Design and develop structure in future business organizations.

Social and Professional Skills: 17M11BES12 1. Understand attributes of social and professional skills.**2.**Demonstrate attributes of social and professional skills to handle business problems.**3.**Examine the social and professional concerns in business context. **4.**Improve attributes related to social and professional skills towards becoming a better human being.

Indian Ethos and Business Ethics: 18M11BGM16 1. Understand fundamental knowledge about ethics, moral values and principles and different theories of ethical behaviour.**2.**Utilise principles and practices of the "Indian Management Studies", for the betterment of individual and the society.**3.**Examine the ethical principles to solve the moral dilemma faced by managers' every day.**4.**Evaluate the role of ethical business practices and their implementations for achieving long term goals of the organizations.

Business and Corporate Laws: 17M11BGM15 1 Interpret business and commercial laws.**2.**Apply business and commercial laws in day-to-day business activities.**3.**Examine business problems in legal context.**4.**Evaluate the application of business and commercial laws in current business environment.

Financial Management-II: 17M11BAF13 1. Comprehend and summarise different concepts and fundamentals of working capital management and management accounting.**2.**Utilise the concepts of financial management and management accounting in different financial decisions.**3.**Analyse the working capital position of an organisation.**4.**Appraise management accounting tools and techniques to solve complex management problems.

Project Management: 12MEOM25 1. Understand key concepts, theories, models and tools used in project management.**2.**Apply the key concepts, theories, models and tools used in project management.**3.**Analyse business problems using key concepts, theories, models and tools used in project management.**4.**Evaluate strategic options in project management in terms of scope, priority, costs, resources, risks.**5.**Develop practical solutions to modern day business challenges related to project management.

Business Research Methods: 18M11BGM14 1. Comprehend and summarise the basic concepts of business research and its process.**2**Apply various concepts and approaches of business research.**3.**Evaluate the research articles based on the standard methodology of business research.**4.**Prepare the research report for management problems.

Comprehensive Viva: 18M11BCV11 Explain and demonstrate the understanding of the different courses of studied during MBA

Corporate Internship: 17M17BIN11 1explain and relate to the business and competitive environment in which the organization is operating.**2**Apply and make use of the concepts of the management subjects for industry analysis. **3**Examine financial position of the organization viz-a-viz competitors.**4**Design and create project report.

Security Analysis and Portfolio Management: 17M12BAF11 ([Academic Year 2019-20 and 2020-21](#))
 1Explain various concepts related to the financial markets. **2**Apply concepts of "portfolio theory" for the determination of risk return tradeoff and selection of best portfolio from the feasible investment portfolios.**3**Evaluate securities under consideration and assess the portfolio performance using standard finance models.**4**Construct a well diversified portfolio.

Consumer Behaviour: 17M12BMM18 1. Comprehend concepts of consumer behaviour with real life and reflect upon the decision problems and the need for societal marketing and marketing ethics in building a customer centric business. 2. Apply concepts of consumer behaviour for solving business problems. 3. Examine situations related to consumer decision making and consumption processes. 4. Design marketing strategies based on consumer knowledge and research.

Corporate Taxation & Planning (17M12BAF14) 1. Understand various direct and indirect tax laws a[nd] their incidence on growth of business 2. Apply the laws in business activities to optimize stakeholders' weal[th] 3. Analyze applicability for reducing the tax liabilities. 4. Evaluate application of tax laws to avoid pe[nal] consequences

Performance and Compensation Management: 17M12BHR13 1. Understand performance dimension a[nd] relate with role of appraisal In Performance Management and Compensation Management. 2. Use appropria[te] concepts to solve performance and compensation problems. 3. Examine characteristics of Appraisal syste[m,] the process of moderation and existing Pay Models in an organisation. 4. Evaluate processes of Employ[ee] Engagement with reference to Job analysis, job design and job evaluation. 5. Design new Performan[ce] Appraisal and Compensation structure for competitive Business organization.

Training & Development: 17M12BHR18 1. Understand the concept of Training and Development a[nd] aligning with participant psychology. 2 Analyse Training and Development methodologies and attributes of [a] good trainer 3. Evaluate training effectiveness and conduct impact analysis. 4. Develop training programm[es] with emphasis on learning outcome, cost, benefits and need analysis.

Integrated Marketing Communications: 17M12BMM13: 1. Understand the fundamentals of Integrat[ed] Marketing communications. 2. Plan an IMC campaign for an organization. 3. Examine the need for marketi[ng] communication and its relationship with consumer behavior. 4. Evaluate the effectiveness of various IM[C] campaigns.

17M11BES11 Effective Self Management (Academic Year 2019-20 and 2020-21)
1Comprehend and summarise concepts of managing self.**2**Apply concepts of self management for developing self.**3**Develop skills for effective self management.

Business Communication/17M11BMM11(Academic Year 2019-20 and 2020-21)
1Understand principles of effective communication.**2**Make effective use of Communication skills.**3**Create Resume, reports, proposals and business plans

COURSE OUTCOMES (TRIMESTER – II)

17M11BIS11: Management Information System (Academic Year 2019-20 and 2020-21)
1Understand the role of MIS in organizations for business strategy and competitive advantage**2**Apply MIS use in functional areas, MSS and Intelligent Information Systems.**3**Analyze issues relating to MIS management including system development and implementation and its impact on workplace, ethics and security **4**Evaluate the issues related to managing Enterprise Systems and global information systems and aligning MIS with future technological developments of the information age.

Financial Management - I: 17M11BAF12
1Understand different forms of business, finance and finance functions.
2Apply concepts of investment, financing and dividend functions.**3**Analyse proposals and plans to make financial decisions.**4**Evaluate proposals and plans to make financial decisions.

17M11BMM12: Marketing Management II
1Understand the various advanced concepts of marketing management. **2**Develop marketing strategies using various marketing techniques.**3**Analyze recent developments in marketing domain.**4**Evaluate the marketing plans with reference to business environment.

Operations Management (17M11BOM12)
1Understand key concepts, theories, models and tools used in operations management in both manufacturing and service sectors. **2**Apply key concepts, theories, models and tools used in operationsmanagement into real life business situations.**3**Analyse specific operations related business issue and devise a strategy and action plans.**4**Assess various strategic options in operations in terms of location, process flows, layout, and operations model.**5**Develop the right strategy and practical solutions to modern day business challenges.

Human Resource Management: 17M11BHR03
1Understand the significance of human resource planning, recruiting, selection processes, T&D, compensation and performance management.**2**Visualize and Identify challenges of managing people**3**Apply these concepts in overcoming the challenges**4**Prepare the organization for facing the future HR challenges.

17M11BGM18: Entrepreneurship and Innovation dentify the attitudes, values, characteristics, behavior, and processes associated with successful entrepreneurial behavior.**2**Understand what is meant by entrepreneurship and innovation from both a theoretical and practical perspective.**3**Examine the role of creativity in entrepreneurship and review the components of the creative process**4**Develop and critique a business plan for implementing entrepreneurial activities in a globalised and competitive environment being responsible for the social, ethical and culture issues.

17M11BEC12 Macroeconomics and Business Policy 1 Understand the concepts of macroeconomics and national income accounting **2**Make use of the various concepts and macroeconomic models to understand,interpret and solve economic problems **3**Analyze relationships between various economic variables and concepts to draw inferences about the health of economy **4**Create various economic models to apply to economic problems

Quantitative Management and Decision Making (17M11BOM11)
1Understand key concepts, theories, models and tools used in operations research in both manufacturing and service sectors. **2**Apply key concepts, theories, models and tools used in operations research into real life business situations.**3**Analyse specific operations research related business issue and devise a strategy and action plans.**4**Assess various strategic options in operation research such as game theory, decision tree, queing theoryand various models.**.5**Develop right strategy and practical solutions to modern day business challenges.

COURSE OUTCOMES (TRIMESTER – IV)

Business Strategy: 18M11BST11 (Academic Year 2019-20 and 2020-21)
 1Understand concepts, frameworks, methods, tools and techniques used to formulate and implement business strategies. **2**Apply concepts, frameworks, methods, tools and techniques used to formulate business strategies. **3**Examine strategies taken up by businesses and analyze its effect on business operations
4Develop business strategies for organizations.

 ANALYTICAL AND TECHNICAL SKILLS: 18M11BES13 (Academic Year 2019-20 and 2020-21)
1Understand and interpret concepts related to quantitative aptitude, logical reasoning and MS Excel.**2**Solve questions related to quantitative aptitude and logical reasoning
3Analyse managerial problems using available functions in MS Excel.

Financial Statement Analysis and Business Valuation: 17M12BAF12 (Academic Year 2019-20 and 2020-21)
 1Understand different components of Annual Reports.2Apply appropriate measures for executing the financial analysis.3Evaluate the results for setting strategies4Propose strategic financial decisions

Project Appraisal and Financing: 17M12BAF13 (Academic Year 2019-20 and 2020-21)
1Understand the process of project appraisal.**2**Apply concepts of management in project appraisal.**3**Evaluate available options based on the concepts of project appraisal.
4Create business plan on the basis of learning of the course.

Corporate Taxation & Planning (17M12BAF14) (Academic Year 2019-20 and 2020-21)
 1Understand various direct and indirect tax laws and their incidence on growth of business**2**Apply the laws in business activities to optimize stakeholders' wealth
3Analyze applicability for reducing the tax liabilities.**4**Evaluate application of tax laws to avoid penal consequences

12MEAF28: Fixed Income Securities (Academic Year 2019-20 and 2020-21)
1Explain various features of fixed income markets**2**Utilise bond market concepts to analyse different types of fixed income securities**3**Measure and evaluate performance of fixed income securities. **4**Formulate effective hedging strategies

18M12BAF19: Financial Modelling 1 Understand and demonstrate use of different financial models using MS Excel.**2**Apply MS Excel to solve corporate finance problems.**3**Analyse results of existing financial models.**4**Develop computer-based financial models.

PREDICTIVE ANALYTICS: 18M12BBA16 (Academic Year 2019-20 and 2020-21)
1. Understand the predictive modelling process 2. Make use of the different predictive analytics techniques in various business problems 3. Distinguish and draw inferences from the output generated using the different prediction models 4. Build theory by examining the relationships among various business variables of interest

17M12BMM13:Integrated Marketing Communications 1 Understand the fundamentals of Integrated Marketing communications.**2**Plan an IMC campaign for an organizatIon.**3**Examine the need for marketing communication and its relationship with consumer behavior.**4**Evaluate the effectiveness of various IMC campaigns.

Business to Business Marketing (17M12BMM15) 1 Understand the basic concept of Marketing in B2B context. **2**Apply appropriate concepts of B2B marketing in relevant situations**3**Analyze market research methods employed in a B2B environment, along with competitive analysis.**4**Develop a realistic perspective for Marketing in Organisations.

17M12BHR11: MANAGING EMPLOYEE RELATION (Academic Year 2019-20 and 2020-21)
1Demonstrate understanding the factors influencing complex Employee Relations in an organisation.**2**Examine the intricacies of Management of Discipline and effective handling of Grievance.**3**Evaluate the process of Collective Bargaining and distinguish the functioning of various Dispute resolution machinery.**4**Develop skills and knowledge to deal with various IR situation.

17M12BHR14:TALENT MANAGEMENT (Academic Year 2019-20 and 2020-21)
1Understand the process and purpose of Talent Mgt and translate understanding in creating Talent Model.**2**Identify various elements of Succession planning and Talent assesment.**3**Examine the process of integation of Succession Planning and Career Planning and challenges involved.**4**Evaluate linkage of various HR practices and talent Mgt for retaining talent.

Competency Management and Assessment Center: 17M12BHR15 (Academic Year 2019-20 and 2020-21)
1Understand fundamentals of competency management and assessment centers. **2** Apply and Experience the process of competency mapping and uses of Assessment Center process and related techniques**3**Develop a competency model for business application.

Strategic Human Resource Management: 17M12BHR17 1 Distinguish between traditional and strategic approaches, domestic and internationaloperations, organic and inorganic growth issues.**2**Analyse critical scenarios and come up with an agenda for action based on knowledge of SHRM.**3**Design and develop strategies that contribute effectively to solve HR issues in an organization setting.

18M12BIB11: Cross Cultural Management 1 Understand the complex and changing environmental forces that impact international business, and how companies can effectively adapt to these forces.
2Assess the attractiveness of potential international markets, as well as the alternatives for entering and expanding within these markets.**3**Evaluate cross-cultural leadership and management practices that will promote success in international business**4**Discuss global issues in the context of cross cultural management that will allow them to gain deeper insights in world issues and will allow them to keep on top of issues that may affect them as individuals and as part of a larger entity.

DATA MANAGEMENT AND ANALYSIS USING R: 18M12BBA12 (Academic Year 2019-20 and 2020-21)
1. Understand the nuances of data manipulation, visualization and analysis. 2. Make use of the tools and techniques for data manipulation, visualization and analysis. 3. Discover and compare different packages in R software for data manipulation, visualization and analysis. 4. Create reports, dashboards etc using R to communicate with the outside world

COURSE OUTCOMES (TRIMESTER – V)

Employability Skills: 18M11BES14 (Academic Year 2019-20 and 2020-21)
1. Understand the recruitment process and the deliverables involved for campus placement and corporate career. 2. Utilize the knowledge gained during the MBA coursework to make attractive CVs for oneself 3. Evaluate issues and business news in order to be able to participate in group discussions successfully 4. Formulate strategies and tactics to face Personal interviews and group discussions

18M12BAF21:INSOLVENCY AND BANKRUPTCY MANAGEMENT (Academic Year 2019-20)
1. Understand situations leading to bankruptcy, its law and practice. 2. Apply knowledge to revive and rehabilitate sick companies. 3. Analyze options to avoid liquidation of company. 4. Evaluate options to minimise bankruptcy losses and costs.

18M12BAF22:MERGERS, ACQUISITIONS & CORPORATE RESTRUCTURING (Academic Year 2019-20)
1. Understand the need and processes of mergers, acquisitions and corporate restructuring. 2. Apply the concepts

of Mergers and Acquisition in price determination. 3. Analyse various techniques to select the suitable one for existing business operations. 4. Evaluate post merger and acquisition consequences and take corrective measures.

12MEAF25: Commodities Derivatives Market (Academic Year 2020-21)
1. Explain various concepts related to the Commodity markets**. 2.** Apply their knowledge about commodity markets for trading commodities at the Commodity Exchanges 3. Assess how commodity derivatives are traded & priced 4. Prepare and formulate trading and hedging strategies using commodity derivatives

Options, Futures & Risk Management: 17M12BAF16 (Academic Year 2020-21)
1. Understand different types of financial derivatives and their uses. 2. Discover pricing of various financial derivatives. 3. Evaluate different derivative strategies under different market conditions. 4. Create hedging/ arbitraging Strategies using financial derivatives.

Product and Brand Management: 17M12BMM11 (Academic Year 2019-20 and 2020-21)
1. Understand Product & Brand Management Concepts. 2. Remember Stages of New Product Development. 3. Apply PBM Knowledge in Product and Brand Mgmt. 4. Analyse Brand Performance in the market. 5. Develop and Implement Brand Marketing Programs. 6. Evaluate Brand Performance

17M12BMM12: Social Media & E Marketing (Academic Year 2019-20 and 2020-21)
1. Understand the basics of social media and e marketing. 2. Develop social media content. 3. Appraise the role of social media in marketing research. 4. Design an effective e marketing plan.

EMPLOYMENT LAWS: 17M12BHR12
1. Understand the Legal framework,History and growth of Legal System 2. Analyse the Legal provisions of Laws affecting Compensation,Social security and Wage and Salary Administration. 3. Examine the implications of Regulative Laws including Model Code and its implications in Industry. 4. Interpret the Laws laid down by the Apex Court/High Courts on various Service and Labour matters.

HR Metrics and Analytics: 18M12BHR22
1. Examine the use of internal and external measurement frameworks. 2. Conduct detailed problem analysis assessments. 3. Generate decisions based on evidence rather than opinion. 4. Utilise a range of HR assessment tools to improve organisational performance

Logistics Management (17M12BOM14)
1. Understand key concepts, theories, models and tools used in logistics management in both manufacturing and service sectors. 2. Apply key concepts, theories, models and tools used in logistics management into real life business situations. 3. Analyse specific logistics management related business issue and devise a strategy and action plans. 4. Assess various strategic options in logistics management in terms of models, implementation approach and relative merits and demerits. 5. Develop strategies and practical solutions to modern day business challenges.

Strategic Quality Management (18M12BOM23)
1. Understand key concepts, theories, models and tools used in quality management in both manufacturing and service sectors. 2. Apply key concepts, theories, models and tools used in quality management into real life business situations. 3. Analyse specific quality management related business issue and devise a strategy and action plans. 4. Assess various strategic options in quality management in terms of models, implementation approach and relative merits and demerits.

INTERNATIONAL TRADE OPERATIONS AND LOGISTICS: 17M12BIB32 (Academic Year 2019-20 and 2020-21)
1. Understand regulatory formalities required for international trade. 2. Choose appropriate method of payment for international trade transaction 3. Examine the concepts in international trade operations and logistics to appreciate the modalities of international trade. 4. Discuss documentary aspects of an export import transaction along with their implications on export sales contract

DATA VISUALIZATION: 18M12BBA13
1. Understand the various ways in which different types of data can be visualized. 2. Make use of the capabilities of the tableau software to make charts that are able to convey the information in the right sense. 3. Examine the relationships that may exist between the various business variables to draw inferences about the business. 4. Create reports, dashboards etc using tableau to communicate with the outside world.

QUERYING DATABASES USING SQL 18M12BBA17
1. Understand the use of SQL in various functional areas of business. 2. Make use of the commands of SQL for data retrieval and manipulation. 3. Simplify the data management issues in business using the SQL software. 4. Improve the database building process for a company.

COURSE OUTCOMES (TRIMESTER – VI)

Business Sustainaibility; 17M11BGM16 1. Understand the theories and principles of business sustainability 2. Apply concepts of business sustainability 3. Analyse business problems and provide sustainable solutions. 4. Create plan for sustainability of business

Social Internship: 18M17BIN12 1. Explain concepts of Social Entrepreneurship. 2. Design project report using concepts of management in solving social problems.
International Financial Management: 17M12BAF17 1. Understand the concepts and procedures of international finance. 2. Apply various issues relating to foreign currency and its effect on international trade. 3. Evaluate financial framework for international business. 4. Combine various issues strategically with broader context of international finance.
Strategic Manufacturing Operations Management (18M12BOM22) 1. Understand key concepts, theories, models and tools used in Manufacturing Operations management in both manufacturing and service sectors. 2. Apply key concepts, theories, models and tools used in Manufacturing Operations management into real life business situations. 3. Analyse Manufacturing Operations management related business issue and devise a strategy and action plans. 4. Assess strategic options in Manufacturing Operations management in terms of models, implementation approach and relative merits and demerits. 5. Develop strategies and practical solutions to modern day business challenges.
Sales and Operations Planning (18M12BOM21) 1. Understand key concepts, theories, models and tools used in Sales and Operations Planning in both manufacturing and service sectors. 2. Apply key concepts, theories, models and tools used in Sales and Operations Planning into real life business situations. 3. Analyse Sales and Operations Planning related business issue and devise a strategy and action plans. 4. Assess strategic options in Sales and Operations Planning in terms of models, implementation approach and relative merits and demerits. 5. Develop strategies and practical solutions to modern day business challenges.
Sales and Distribution Management: 17M12BMM14   **1.** Comprehend sales management concepts and selling process. 2. Apply concepts, tools and techniques of selling and distribution in real life scenario. 3. Examine the processes adopted by sales management for recruitment, training, motivation and compensation. 4. Assess logistics in sales and distribution channels. 5. Develop strategies for sales and channel management.
Performance and Compensation Management: 17M12BHR13   **1.** Understand performance dimension and relate with role of appraisal In Performance Management and Compensation Management. 2. Use appropriate concepts to solve performance and compensation problems. 3. Examine characteristics of Appraisal systems, the process of moderation and existing Pay Models in an organisation. 4. Evaluate processes of Employee Engagement with reference to Job analysis, job design and job evaluation. 5. Design new Performance Appraisal and Compensation structure for competitive Business organization.
Team Building and Conflict Management: 18M12BHR20 (Academic Year 2019-20 and 2020-21)   **1.** Understand the importance of Team Building for Organizational Effectiveness 2. Identify inter group and intra group dynamics. 3. Analyse conflict management process for effective team building. 4. Develop new teams in organizations.
18M12BIB15: International Business Strategy   **1.** Understand and explain concepts and theories from literature concerning global business strategy. 2. Apply frameworks and theories of international business to analyse business situations and make sound strategic decisions in the international business context. 3. Evaluate the benefits and risks associated with different strategies for doing business internationally. 4. Discuss business analysis and strategy proposal clearly and professionally while working collaboratively to complete a task.
SURVEY ANALYTICS: 18M12BBA18   **1.** Understand the concepts of survey design and analysis. 2. Make use of the methods and rules to analyze complex survey. 3. Analyze and process survey-based data. 4. Develop complex survey designs

Course Outcomes (COs) (AY 2020-21):

SEMESTER-I (COURSE OUTCOMES)
Business Statistics and Analytics: 18M11BGM11   1. Understand the concepts of statistics and their usage in business. 2. Make use of the various concepts and techniques in statistics to solve business problems. 3. Analyze relationships between various business variables and concepts to draw inferences. 4. Create various statistical models to apply to business problems
Corporate Finance: 17M11BAF12   1. Understand different forms of business, finance and finance functions. 2. Apply concepts of investment, financing and dividend functions. 3. Analyse proposals and plans to make financial decisions. 4. Evaluate proposals and plans to make financial decisions.
Marketing Management

1. Understand the concepts of Marketing Management. 2. Apply Marketing concepts for Business Management. 3. Analyze Marketing environment and challenges. 4. Develop Marketing Strategies using various Marketing Techniques. 5. Evaluate Marketing Plans

Economics For Business And Government

1. Understand basic concepts of economics for business and government. 2. Make use of the concepts related to managerial economics for business decision 3. Analyse micro and macroeconomic environment for business and government 4. Evaluate firm level and government level policies and their impact on business decisions.

SEMESTER-III (COURSE OUTCOMES)

Business Strategy: 18M11BST11

1. Understand concepts, frameworks, methods, tools and techniques used to formulate and implement business strategies. 2. Apply concepts, frameworks, methods, tools and techniques used to formulate business strategies. 3. Examine strategies taken up by businesses and analyze its effect on business operations 4. Develop business strategies for organizations.

18M12MM22:Strategic marketing (Academic Year 2020-21)

1. Understand concept of strategic marketing. 2. Discover customers' needs and competitive analysis. 3. Examine marketing strategies in competitive environment. 4. Formulate strategies for emerging and new businesses.

18M12MM19 :Customer Relationship Management (Academic Year 2020-21)

1. Understand the fundamentals of CRM. 2. Identify the role of business intelligence in decision making for effective CRM. 3. Analyze the impact of CRM on Sales and Marketing strategy. 4. Evaluate the effectiveness of CRM tools and techniques for businesses.

Inventory and Warehouse Management: 17M12BOM13

1. Understand concepts of inventory and warehouse management. 2. Identify the application of appropriate tools and techniques for solving problem in inventory and warehouse management. 3. Evaluate the performance of inventory and warehouse management system. 4. Design the layout of the warehouse

Sustainable Supply Chain Management (17M12BOM16) (Academic Year 2020-21)

1. Understand key concepts, theories, models and tools used in Supply Chain management in both manufacturing and service sectors. 2. Apply key concepts, theories, models and tools used in Supply Chain management into real life business situations. 3. Analyse Supply Chain management related business issue and devise a strategy and action plans. 4. Assess strategic options in Supply Chain management in terms of models, implementation approach and relative merits and demerits. 5. Develop strategies and practical solutions to modern day business challenges.

The World of Social Media: 18M12BDM11 (Academic Year 2020-21)

1. Understand the fundamentals of Social Media world. 2. Identify the various opportunities on Social Media. 3. Analyze the difference between the contents of Social Media. 4. Evaluate the various social media platforms for information sharing and gathering.

Online Campaign Management: 18M12BDM15 (Academic Year 2020-21)

1. Understand various digital marketing channels and tools. 2. Apply digital asset management tools 3. Analyze the challenges and pitfalls of an online campaign. 4. Evaluate an online campaign. 5. Design and develop an effective online campaign.

18M12BIB14: Global Sourcing & Business Development (Academic Year 2020-21)

1. Understand key concepts, theories, models and tools used in Global sourcing of goods and services. 2. Apply key concepts, theories, models and tools used in operations strategy into real life business situations. 3. Analyse specific global sourcing related business issue and devise a strategy and action plans. 4. Assess various strategic options in global sourcing in terms of make or buy, location, and operations model. 5. Develop the right strategy and practical solutions to modern day business challenges.

PROGRAMME NAME: BBA

PEOs:1   Provide knowledge of management concepts and theories to pursue professional career and or take up higher education.

2 Enhance self awareness, team work, technological, communication and research skills.

3 Apply tools and techniques for making informed decisions.

4 Sensitise students about the social, ethical and environmental issues of business.

5 Equip the students with skills to adapt to change and develop an orientation towards lifelong learning.

POS1 Acquire knowledge and understand fundamental principles and concepts of business management.

2 Apply the concepts to solve day-to-day business problems.

3 Communicate effectively with all the stakeholders of the organisation.

4 Develop entrepreneurial mindset and interpersonal skills.

5 Imbibe life-long learning skills to contribute as responsible citizens.

Academic Year : 2019-20 , 2020-21 Programme Name: BBA

SEMESTER I Course Outcomes
Financial Accounting: 19B11BAF11 (Academic Year 2019-20 and 2020-21) 1.Remember and understand the accounting fundamentals and process. 2.Apply these fundamentals and process to work out the end result of business operations through financial statements.3.Analyze these financial statements to know business efficiency, profitability and financial position. 4.Evaluate financial information for usage in future planning and optimizing profitability.
Principles of Management: 19B11BGM11 1.Define and understand the role of Management in an Organization. 2.Apply fundamental concepts,functions and Principles of Management.3.Analyse application of management knowledge to diagnose and solve organizational problems.
Managerial Economics: 19B11BGM12 (Academic Year 2019-20 and 2020-21) 1 .Define the concepts and theories related to managerial economics. 2.Understand the concepts of managerial economics.3.Make use of economic models for firm-level decision making.4.Examine managerial decision making in light of economic models and theories
Statistics for Business Decisions: 19B11BGM13 1.Understand the basic concepts of business statistics. 2.Apply concepts and methods of statistics for business problems.3.Analyze statistical data to make decisions.
Business Communication: 19B11BAE11 (Academic Year 2019-20 and 2020-21) 1.Understand the principles of effective communication.2.Make use of principles and techniques for effective verbal and non-verbal communication.3.Develop resume, reports, proposals and business plans.
India's Diversity and Business: 19B12BGE12 (Academic Year 2019-20 and 2020-21) 1.Understand and appreciate India's diversity.2.Identify the importance of a diverse workforce and strategies to promote diversity 3.Draw inference about India's diversity and its implications for the business.
SEMESTER II Course Outcomes
Theatre and Performance: 19B11BGE18 1 Demonstrate problem solving ability and effective life skills through theatre performances.**2**Apply skills of listening, articulation, awareness and collaboration through performance. **3**Design and present an original performance alone or in group.
Introduction to Spreadsheets: 19B15BSE11 1 Remember the specific comands and shortcuts in excel. **2**Understand the role of spreadsheet applications to collect, organize, manage and present information. **3**Apply the features / functions available in the spreadsheet software.
Marketing Management: 19B11BMM11 1 Understand the basic concepts of marketing management. **2**Apply marketing principles for making marketing mix decisions.**3**Analyse the impact of dynamic business scenario on marketing decision.
Corporate Accounting and Reporting: 19B11BAF14 1 Understand accounting fundamentals and process of preparing company accounts.**2**Analyse annual reports of a company.**3**Prepare financial statement by applying accounting concepts.

Organiazational Behaviour: 19B11BHR11 1 Understand the individual variables and group dynamics and their impact on behavior of employees.**2**Apply behaviour management models for managing self and others in the organization.**3**Analyze the impact of individual and group behavior on organizational culture and employee performance.
Business and Economic Environment: 19B11BGM14 1 Understand business environment and its major components**2**Utilize knowledge of business environment to understand its impact on business decisions   **3**Analyze the impact of government policies and regulations on business
Technology, Governance, and Ethics: 19B11BGM24 1 Understand the concepts of e-governance and its importance and usability for Digital India**2**Apply the IT knowledge and tools for facilitating e-governance   **3**Analyse ethical issues regarding the use of information technologies in business.
Community Initiatives: 19B17BSE12 1 Understand the symbiotic connect between self and society/community at large.**2**Identify key social or community related issues around.**3**Analyze various solutions for addressing social issues.

Course Outcomes (COs) (AY 2020-21):

SEMESTER I Course Outcomes
Business Mathematics: 20B11BGM22   1. Understand the basic concepts of business mathematics. 2. Make use of mathematics techniques to solve business problems. 3. Analyse the results of calculations to make business decisions.
Introduction to Sociology: 20B11BGM23   1. Understand the conecepts of sociology and their influence on individual and society. 2. Apply the concepts of sociology to the development of business. 3. Analyse the impact of sociological changes on growth of new business.
IT Tools for Business: 19B15BSE18   1. Understand the basic IT tools to collect, organize, and manage information. 2. Apply the knowledge of internet applications for end-user productivity. 3. Create effective presentations by applying the knowledge of software tools.
Social Media and society: 19B12BGE16   1. Understand the concept of social media and its impact on society 2. Make use of social media protocols responsibly. 3. Analyze usage of social media tools and its influence on users.
Principles of Business Management: 20B11BGM24   1. Define and understand the role of Management in an Organization. 2. Apply fundamental concepts,functions and Principles of Management 3. Analyse application of management knowledge to diagnose and solve organizational problems.

SEMESTER III Course Outcomes
Cost and Management Accounting: 19B11BAF13 1 Understand concepts of cost and management accounting.   **2**Utilize the concepts of cost and management accounting for organizational decisions.**3**Appraise management accounting tools and techniques to solve complex management problems
Entrepreneurial Development: 19B11BGM20 1 Understand te basics aspects of establishing new business in competitive environment.**2**Apply the basic understanding to examine the existing business ventures.   **3**Examine various business considerations of different functional areas of business.
Human Resource Management: 19B11BHR12 1 Understand the concepts of Human Resource Management.   **2**Apply the concepts for effective management of people.**3**Analyze the challenges for better employee performance.

Oral and Written Communication: 20B11BGM27 1 Understand the principles of effective oral and written communication**2**Apply necessary formats and procedures for business communication**3**Analyze the context for effective communication**4**Create Resume, reports, proposals, business letters and business plans

Global Business Environment: 20B11BGM26 1 Understand concepts of global business environment.
2Analyse the impact of political, socio-economic, technological and legal factors on global business ventures.
3Evaluate different foreign market entry strategies.

Business Analytics: 19B12BGE13 1 Understand the basics of Business Analytics.**2**Apply Business Analytics techniques to business management functions.**3**Analyse the business data for decision making.

Social Media And Digital Marketing: 20B11BMM12 1 Understand social media networks as tools for marketing.
2Apply digital marketing techniques to social media management.**3**Analyse social media analytics.**4**Develop social media marketing strategies.

Computing Tools and Programming: 19B15BSE14 1 Understand the basic structure of a programming language and concept of databases.**2**Make use of tools like flow charts to express the algorithm.**3**Create web pages using HTML.

DEPARTMENT NAME: DEPARTMENT OF MATHEMATICS

VISION: To be a centre of excellence in teaching and research in basic and applied areas of Mathematics.

MISSION: 1: To offer academic programs and courses in contemporary and emerging areas of Mathematics and its applications to develop analytical and problem solving skills.

2: To carryout quality research in emerging areas of Pure and Applied Mathematics.

3: To foster interaction with national and international institutions for enrichment, application and dissemination of knowledge in Mathematics.

Programme Name: M.Sc. in Mathematics

PEOs: 1: To impart advanced theoretical and computational knowledge in the areas of mathematics

2: To provide training and expertise to achieve career goals in academics, research and related

　　　　industry

POs: 1: To demonstrate a mastery over the subject area

2: To apply advanced knowledge in academics and research

3: To develop skills to write and present scientific report(s)

PSOs:1: To acquire advancedlevel theoretical and computational skillsin the area of specialization

Academic Year 2019-20 , 2020-21

Course Outcome (Semester 1)
Presentation and Communication Skills 19M21HS111 1.Develop an in-depth understanding and appreciate the subtle aspects of English as a communication tool. 2.Assess the communication challenges of a diverse, global marketplace.3.Compose and have expertise in different forms of Professional writing.4.Evaluate the effectiveness of Presentations.5.Apply the acquired skills in delivering effective presentations
Ordinary Differential Equations 19M21MA1111.explain the basic theory of ordinary differential equations and solve related problems.2.make use of Frobenius method in solving differential equations.3.apply matrix method to solve a system of homogeneous linear ordinary differential equations.4.explain the concept of existence and uniqueness theorem of initial value problems. 5.make use of orthogonality of functions in solving Sturm-Liouville boundary value problems. 6.explain the phase plane, critical points and paths of nonlinear systems.
Real Analysis 19M21MA112 1.explain the concepts of compact sets, connected sets, metric space and their properties. 2.explain the convergence of sequences, series and their properties. 3.make use of the concepts of continuity, compactness and connectedness of functions in solving related problems.4.explain the Riemann-Stieltjes integral and its properties.5.apply the concepts of sequence and series of functions, their uniform convergence and properties on various problems. 6.solve the problems on Lebesgue integral of functions.
Abstract Algebra 19M21MA113 1.llustrate various types of groups and their properties. 2.explain Cayley, Cauchy, Sylow theorems and solve related problems. 3.explain the concepts of rings, ideals and isomorphism. 4.solve problems on integral domain, principal ideal domains and unique factorization domains (UFD). 5.explain and identify modules, submodules, quotient modules and free modules. 6.explain

and analyze the concepts of fields and their extensions.
General Topology 19M21MA114 1.explain metric space, topological spaces and related concepts.   2.solve problems on different types of topologies.3.explain continuous maps, continuity theorem, homeomorphisms and related concepts. 4.apply the properties of connected spaces and compact spaces in proving various theorems.5.make use of the concepts of countability and separation in various topological spaces.
Mathematical Methods 19M21MA115 1.explain functionals and their variations to optimize various problems.   2.apply different forms of Euler's equation on different variational problems.3.explain and solve different types of integral equations and their eigenvalue problems.4.solve boundary value problems and singular integral equations.5.apply different linear integral transforms in solving differential and integral equations.
Course Outcome (Semester 2)
Linear Algebra 19M21MA116 1.understand the vector spaces and their properties.2.apply various concepts of the linear transformation.3.solve problems related to matrix diagonalization. 4.analyse inner product spaces and its properties.
Complex Analysis 19M21MA117 1.apply the concepts of differentiability and analyticity for functions of complex variables 2.solve the problems of different types of contour integrations.3.explain Taylor's and Laurent's series expansion, singularities, residues and apply it to evaluate complex integrals.4.apply conformal and bilinear transformations to solve related problems.
Computer programming 19M21MA118 1.explain representation of numbers in computer programming 2.explain basic concepts of programming. 3.apply the concepts of programming through functional decomposition.4.construct the pointers for dynamic memory allocation.5.apply the object-oriented programming in solving various problems.
Functional Analysis 19M21MA119 1.explain the concept of normed spaces, Banach spaces and their properties   2.apply concepts of Banach space to prove Hahn-Banach theorem, open mapping theorem and closed graph theorem.   3.explain inner product space, Hilbert spaces, orthonormal basis and Reisz-representation theorem 4.develop the concept of orthonormal systems and solve related problems.5.examine contraction mapping, Banach fixed point theorem and its simple applications.
Computer Programming lab 19M25MA1111.develop C++ programs using the concepts of arithmetic operators, conditional statements and loops.2.construct C++ codes using arrays, structures and functions.3.develop C++ programs using pointers and dynamic memory allocation.4.construct object-oriented programs using constructors, destructor, polymorphism and inheritance.
Partial Differential Equations 19M21MA113 1.classify and solve first order linear and nonlinear partial differential equations (PDE).2.explain Fourier series and Fourier transforms.3.classify second order PDE and solve Laplace equation in cylindrical and spherical polar coordinates.3.solve heat equation in cylindrical and spherical polar coordinates.   4.solve wave equation using separation of variables.5.apply Fourier transforms and solve PDE.

Academic Year 2020 - 21

Course Outcome (Semester 3)
Mathematical Statistics 19M21MA211 1.explain random variables and some standard distributions.2.apply the concepts of random sampling, parametric point and interval estimation.3.apply hypothesis testing for goodness of fit and large sample tests.4.analyse the sample data using ANOVA and regression analysis.
Advanced Matrix Theory 20M22MA211 1.solve the system of linear equations using direct and iterative methods. 2.explain matrix norms, orthogonal complement and apply the revised Gram-Schmidt process in constructing orthonormal basis and Q-R decomposition. 3.construct Gershgorin's circles, quadratic and canonical forms and solve smallest and largest eigenvalue problems, eigen system of Hermitian matrix and singular value decomposition. 4.analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.
Continuum Mechanics 20M22MA212 1.explain stress-strain diagram, stresses and strains on an oblique plane. 2.apply Affine transformation to derive the expressions for principal strains, equations of compatibility and finite deformations.3.apply stress theory to find the maximum normal and shear stresses.4.analyze generalized Hooke's law for isotropic and anisotropic materials.5.evaluate stresses and strains in problems of rotating disk and circular cylinders.
Fuzzy Sets and Applications 20M22MA213 1.explain basic concepts of fuzzy sets and fuzzy relations. 2.explain the relationship between possibility theory and probability theory along with an overview of fuzzy probability theory.3.apply fuzzy mapping and fuzzy rule-based models for function approximation.4.examine fuzzy sets in decision making and multi criteria analysis.5.analyze fuzzy relational data bases and fuzzy queries in crisp databases.
Numerical Analysis 19M21MA212 1.explain concepts of errors and find the roots of algebraic and transcendental equations2.solve the system of linear equations using direct & iterative methods and to find eigenvalues and eigenvectors of matrices3.explain the concept of interpolation4.apply numerical methods to find differentiation and integration of a function5.apply numerical methods to solve ordinary differential equations
Operations Research 19M21MA213 1.construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical, simplex method and its variants.2.utilize duality to analyse the sensitivity of optimal solution of linear programming problems.3.solve transportation, assignment and travelling salesman problems. 4.classify and solve the problems on queuing and inventory models.
Numerical Analysis Lab 19M25MA211 1.understand the basics of MATLAB to find real roots of algebraic/ transcendental equations.2.develop the program to solve system of linear algebraic equations using MATLAB. 3.solve interpolation problems using MATLAB.4.develop the program for derivatives and integrals using MATLAB. 5.construct the program for solutions of ordinary differential equations in MATLAB.
Operations Research Lab 19M25MA212 1.understand the basics of MATLAB to solve linear programming problems. 2.solve dual problem using MATLAB and perform sensitivity analysis of optimal solution of LPP.3.solve transportation problems with the help of MATLAB.4.solve assignment problems with the help of MATLAB.5.solve travelling salesman using MATLAB.

DEPARTMENT NAME: PHYSICS AND MATERIALS SCIENCE AND ENGINEERING

VISION : To be a centre of excellence in teaching and research in Physics and Materials Science & Engineering

MISSION : 1: To offer academic programs and courses in the areas of Physics and Materials Science for nurturing manpower with analytical and independent thinking and scientific temperament.

2: To conduct fundamental and applied research in emerging areas of Physics and Materials Science.

3: To foster interaction and collaboration with national and international bodies and institutions for enrichment, application and transfer of knowledge in Physics and Materials Science.

PROGRAMME NAME: M.Sc. PHYSICS

PEOs:1: To impart advanced theoretical and practical knowledge in the areas of physics

2: To provide training and expertise to achieve career goals in academics, research and related industry

POs: 1: To demonstrate a mastery over the subject area

2: To apply advanced knowledge in academics and research

3: To develop skills to write and present scientific report(s)

PSOs: 1: To acquire advanced level theoretical and experimental skills in the area of specialization

Academic Year 2019-20, 2020-21

Course Outcomes (Semester 1)
Classical Mechanics 19M21PH111 1.Relate terminology and concepts of Newtonian Mechanics, Lagrangian and Hamiltonian approach, Central field, Rotational motion, small oscillations and special theory of relativity.   2.Explain various mechanism, models, derivations and approaches associated with classical mechanics.3.Solve numerical problems for various situations in classical mechanics.4.Analyze the results obtained for various physical problems of classical mechanics.
Mathematical Physics 19M21PH112 1.Recall basics of matrices, complex analysis, differential equations, special functions, Fourier and Laplace transformations etc.2.Explain elements of linear vector space, complex analysis and methods of solving differential equations of various type.3.Apply concepts of matrices, complex analysis, differential equations, Fourier and Laplace transformations, and group theory to physical problems   4.Evaluate solution of physical problems using matrices, complex analysis, differential equations, Fourier and Laplace transformations and group theory
Quantum Mechanics 19M21PH113 1.Recall basic requirement of Quantum Mechanics such as inadequacy of classical physics in black body radiation, photoelectric effect etc.2.Demonstrate the general structure of Quantum Mechanics such as vector space, Dirac's bra-ket notation, operator algebra, angular momentum algebra, uncertainty relation etc.3.Schrödinger equation and its applications as potential well cases, harmonic oscillator, hydrogen atom and in hydrogen like systems etc.4.Analyzing the applicability of different Approximation Techniques such as WKB approximations, perturbation theory, variational methods for anharmonic oscillator, Helium atom, Stark effect etc.
Electronics 19M21PH114 1.Recall the basic concepts of electronics devices like diodes, LEDs, BJT, FET, MOSFET, oscillators, OP-AMPS, digital GATES, and Flip flops.2.Explain the various physical parameters involve in designing and working of electronic devices & circuits.3.Solve various network related problems. Develop design competence in Analog and digital electronics.4.Develop analytical capability to analyse electronics networks, circuits and components.
Laboratory-1 19M25PH1111Recall optics, solid state physics and modern physics principles behind the experiments. 2.Explain the experimental setup and the principals involved behind the experiments performed.   3.Plan the experiment and set the apparatus and take measurements. 4.Analyze the data obtained and calculate the error.5.Interpret and justify the results.
Course Outcomes (Semester 2)

Classical Electrodynamics 19M21PH115 1.Recall the basics of electrostatics, magnetorstatics and lectrodynamics. 2.Explain various physical phenomena and working of devices which involve the basic principles of electrostatics and electrodynamics. 3.Apply the laws of electrostatics and Maxwell's equation to solve boundary value problems and problems related to communication. 4.Analyze complex physical problem of relativistic and nonrelativistic electrodynamics

Atomic, Molecular and Laser Physics 19M21PH116 1.Recall basics of one, two and many electron systems. Normal & anomalous Zeeman, Paschen-Back and Stark effects; L-S and J-J coupling schemes. Hartree-Fock approximation. 2.Explain Born-Oppenheimer approximation. States for hydrogen molecule and molecular ion (H_2, H_2+). Term symbol for simple molecules. 3.Apply concepts of rotational spectra, vibrational spectra, electronic spectra of diatomic molecules; Franck-Condon principle. Raman spectra. Electron Spin
Resonance. Nuclear Magnetic Resonance.4.Analyze spontaneous and stimulated emissions in laser; optical pumping population inversion, rate equations. Different laser systems like Ruby, He-Ne, CO_2 and Nd:YAG lasers

Statistical Mechanics 19M21PH117 1.Define the basic laws and parameters related to Thermodynamics and Statistical Mechanics. 2.Explain the concepts of different Thermodynamic and Statistical Systems and Ensembles.3.Apply the concepts of Thermodynamics and Statistical ensembles to conclude its properties.
4.Evaluating the behaviour of equilibrium, non-equilibrium or a random process on the basis of suitable thermodynamic parameters, distribution functions and phase transition.

Condensed Matter Physics 19B21PH118 1.To recall the basic concept of space lattice, lattice type and crystal structure, Bonding, band diagrams, heat capacity, thermal expansion, thermal and electronic conduction in solids like metals, semiconductors, dielectrics, magnetics and superconductors.2.To Illustrate the Debye and Einstein's model, Croning-Penny model and various physical phenomena with interpretation based on the mathematical expressions involved.3.Apply the concepts/principles to solve the problems related to Solid State Physics.
4.Analyze and examine the crystal structure of solids, thermal, electrical and electronic properties and establish a correlation between structure and properties

Laboratory-2 19M25PH112 1.Recall components of electronic circuits used in the experiments. 2.Explain key applications of electronic circuits and devices used in the experiments. 3.Model the circuits using electronic components and perform the experiments. 4.Analyze the data obtained and calculate the error.5.Interpret and justify the results.

Academic Year 2019-20, 2020-21

Course Outcomes (Semester 3)

Nuclear and Particle Physics 19M21PH211 1.Recall the basic nuclear properties and laws of nuclear and particle physics.2.Understand different phenomenon and concepts of nuclear and particle physics along with their interpretation.3.Apply the concept and principles to solve problems related to nuclear and particle physics.
4.Analyze and examine the solutions of the problems of nuclear and particle physics using physical and mathematical tools involved.

Advanced Quantum Mechanics19M21PH212 1.Recall basic ideas of advanced quantum mechanics
2.Explain various physical phenomena which can be explained only using advanced quantum mechanics
3.Apply time-dependent perturbation methods, quantum collision theory, quantum statistics and relativistic quantum mechanics for quantum mechanical systems.4.Analyze advanced quantum mechanical problems.

Numerical Techniques and Computer Programming19M21PH213 1.Define key concepts used in programming, data structures, Numerical methods.2.Explain basics of programming, data structures, numerical analysis, parallel programming.3.Create programs using C to implement various problems in numerical analysis.
4.Create programs using Mathematica and Matlab to solve various problems in numerical physics.

Advanced Condensed Matter Physics-1 19M21PH214 1.Recall basic concepts related to dielectrics, magnetism, transport phenomena, phase transition and super conductivity.2.Explain the significance and value of condensed matter physics, both scientifically and in the wider community.3.Develop knowledge of conception or notion involved in various theories and models studied in this course.4.Make use of various methods and solve problems related to studied theories.

Optoelectronics 19M21PH215 1.Recall the fundamentals of semiconductor physics, LEDs, Injection Laser diodes 2.Explain basic principle of Optoelectronic detection: photodiodes, photoconducting detectors; Modulators 3.Apply concepts of fibers: step index, graded index, Numerical aperture; Modes: single mode and multimode; V Parameter; evanescent modes; losses in fibers; dispersion in fibers 4.Analyze semiconductor optical amplifiers; Erbium-doped fiber amplifiers; Fiber Raman amplifiers

Laboratory-3 (Solid State Physics) 19M25PH211 1.Explain the principal and working of experimental setup.
2.Plan the experiment and take measurements. 3.Analyze the data obtained and calculate the error.
4.Interpret and justify the results.

Laboratory-3 (Applied Optics) 19M25PH212 1.Recall the principles of Optical Spectroscopy, optical fibers, optoelectronics and Lasers behind the experiments. 2.Explain the experimental setup and the principles involved behind the experiments performed. 3.Plan the experiment and set the apparatus and take measurements.
4.Analyze the data obtained and calculate the error.5.Interpret and justify the results.

Laser and Applications20M22PH211 1.Recall the properties and fundamentals of lasers, laser rate equations and threshold condition 2.Explain pumping processes, Optical resonators, Q switching and Mode locking
3.Apply concepts of solid state lasers, gas lasers, dye laser and semiconductor lasers
4.Analyze applications of lasers in communication, data storage, optical metrology, material processing, defence and medicines

Quantum Optics 20M22PH212 1.Recall basics of field quantization 2.Explain various physical phenomena which fall under the domain of quantum optics 3.Apply the witnesses of quantumness of light on various quantum states to determine their nonclassical properties and applicability 4.Analyze complex problems related to matter field interaction using quantum treatment

Semiconductor and Electronic Devices 20M22PH213 1.Define terminology and concepts of semiconductors in correlation with semiconductor related electronic devices 2.Explain optical, thermal and electronic properties of semiconductor and devices in equilibrium as well as in steady state condition. 3.Apply mathematical equations and laws of semiconductor physics to solve related problems. 4.Analyze and compare different semiconductor and electronic devices for understanding their performances

Quantum Field Theory 20M22PH214 1.Recall basics ideas of field and quantization of scalar field 2.Explain various physical phenomena which can be explained only using quantum field theory 3.Apply rules associated with Feynman diagram and mathematical tricks learned in this course to solve problems of different subdomains of physics 4.Analyze problems of quantum electrodynamics