B. E. CIVIL ENGINEERING
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV
ANALYSIS OF DETERMINATE STRUCTURES

Course Code	**18CV42**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives: This course will enable students to
1. To understand different forms of structural systems.
2. To understand concept of ILD and moving loads.
3. To determine slopes and deflections of beams and trusses.
4. To analyse arches and cables.

Module-1

Introduction and Analysis of Plane Trusses: Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non linear analysis, Static and kinematic indeterminacies of structural systems.

Influence Lines: Concepts of influence lines-ILD for reactions, SF and BM for determinate beams-ILD for axial forces in determinate trusses and numerical problems.

Module-2

Moving Loads: Reactions, BM and SF in determinate beams, axial forces in determinate trusses for rolling loads using ILD (Max. values and absolute max. values for beams subjected to multiple loads).

Module-3

Deflection of Beams: Moment area method: Derivation, Mohr's theorems, Sign conventions, Application of moment area method for determinate prismatic beams, Beams of varying section, Use of moment diagram by parts. Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams of variable cross sections

Module-4

Energy Principles and Energy Theorems: Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion, Deflection of determinate beams and trusses using total strain energy, Deflection at the point of application of single load, Castig liano's theorems and its application to estimate the deflections of trusses, bent frames, Special applications-Dummy unit load method.

Module-5

Arches and Cable Structures: Three hinged parabolic and circular arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables.

Course Outcomes: After studying this course, students will be able to:
1. Identify different forms of structural systems.
2. Construct ILD and analyse the beams and trusses subjected to moving loads
3. Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and beams.
4. Determine the stress resultants in arches and cables.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbooks:
1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structual Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.

Reference Books:
1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.

2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

B. E. CIVIL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - V			
ANALYSIS OF INDETERMINATE STRUCTURES			
Course Code	**18CV52**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives: This course will enable students to
1. Apply knowledge of mathematics and engineering in calculating slope, deflection, bending moment and shear force using slope deflection, moment distribution method and Kani's method.
2. Identify, formulate and solve problems in structural analysis.
3. Analyze structural system and interpret data.
4. use the techniques, such as stiffness and flexibility methods to solve engineering problems
5. communicate effectively in design of structural elements

Module-1

Slope Deflection Method: Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy$\leq$3.

Module-2

Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy $\leq$3.

Module-3

Kani's Method: Introduction, Concept, Relationships between bending moment and deformations, Analysis of continuous beams with and without settlements, Analysis of frames with and without sway.

Module-4

Matrix Method of Analysis (Flexibility Method) : Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy $\leq$3.

Module-5

Matrix Method of Analysis (Stiffness Method): Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic indeterminacy $\leq$3.

Course Outcomes: After studying this course, students will be able to:
1. Determine the moment in indeterminate beams and frames having variable moment of inertia and subsidence using slope defection method
2. Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method.
3. Construct the bending moment diagram for beams and frames by Kani's method.
4. Construct the bending moment diagram for beams and frames using flexibility method
5. Analyze the beams and indeterminate frames by system stiffness method.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:
1. Hibbeler R C, **" Structural Analysis",** Pearson Publication
2. L S Negi and R S Jangid, **"Structural Analysis",** Tata *McGraw-Hill* Publishing Company Ltd.
3. D S PrakashRao, **"Structural Analysis: A Unified Approach"** , Universities Press
4. K.U. Muthu, H. Narendraetal, **"Indeterminate Structural Analysis",** IK International Publishing Pvt. Ltd.

Reference Books:

1. Reddy C S, **"Basic Structural Analysis",**Tata McGraw-Hill Publishing Company Ltd.
2. Gupta S P, G S Pundit and R Gupta, **"Theory of Structures"**, Vol II, Tata McGraw Hill Publications company Ltd.
3. V N Vazirani and M MRatwani, **"Analysis Of Structures** ", Vol. 2, Khanna Publishers
4. Wang C K, **"Intermediate Structural Analysis",** McGraw Hill, International Students Edition.
5. S.Rajasekaran and G. Sankarasubramanian, **"Computational Structural Mechanics",** PHI Learning Pvt. Ltd.

CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV
CONCRETE TECHNOLOGY

Course Code	**18CV44**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to:
1. To recognize material characterization of ingredients of concrete and its influence on properties of concrete
2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete.
3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.

Module-1

Concrete Ingredients Cement – Cement manufacturing process, steps to reduce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice huskash.

Module-2

Fresh Concrete Workability-factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self- curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.

Module-3

Hardened Concrete Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep –facto rs affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage. Definition and significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carbonation, freezing and thawing. Corrosion, Durability requirements as per IS-456, In situ testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.

Module-4

Concrete Mix Proportioning
Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262:2019.

Module-5

Special Concretes
RMC- manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages. Self-Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and applications, materials, requirements, mix proportion and properties of Geo polymer Concrete, High Strength Concrete and High Performance Concrete.

Course outcomes: After studying this course, students will be able to:
1. Relate material characteristics and their influence on microstructure of concrete.
2. Distinguish concrete behavior based on its fresh and hardened properties.
3. Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes.
4. Adopt suitable concreting methods to place the concrete based on requirement.
5. Select a suitable type of concrete based on specific application.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. Neville A.M. "Properties of Concrete"-4th Ed., Longman.
2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
3. Kumar Mehta. P and Paulo J.M. Monteiro "Concrete-Microstructure, Property and Materials", 4th Edition, McGraw Hill Education, 2014
4. A.R. Santha Kumar, "Concrete Technology", Oxford Un iversity Press, New Delhi (NewEdition).

Reference Books:

1. M L Gambir, "Concrete Technology", McGraw Hill Education,2014.
2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
3. Job Thomas, "Concrete Technology", CENGAGE Learning,2015.
4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC.
5. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House.

DESIGN OF RC STRUCTURAL ELEMENTS

Course Code	18CV53	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives: This course will enable students to
1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading.
2. Follow a procedural knowledge in designing various structural RC elements.
3. Impart the usage of codes for strength, serviceability and durability.
4. Provide knowledge in analysis and design of RC elements.

Module-1

Introduction to working stress and limit State Design: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety and evaluation of design constants for working stress method.

Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.

Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.

Module-2

Limit State Analysis of Beams:
Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear.

Module-3

Limit State Design of Beams: Design of singly and doubly reinforced beams, Design of flanged beams, design for combined bending, shear and torsion as per IS-456.

Module-4

Limit State Design of Slabs and Stairs: Introduction to one way and two way slabs, Design of cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.

Module-5

Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment.

Course outcomes: After studying this course, students will be able to:
1. Understand the design philosophy and principles.
2. Solve engineering problems of RC elements subjected to flexure, shear and torsion.
3. Demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings.
4. Owns professional and ethical responsibility.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.
- The designs are as per IS-456 and SP (16) relevant charts to be provided in the question paper.

Textbooks:
1. Unnikrishnan Pillai and Devdas Menon, " **Reinforced Concrete Design"** , McGraw Hill, New Delhi
2. Subramanian, " **Design of Concrete Structures"** , Oxford university Press
3. H J Shah, **"Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)"** , Charotar Publishing House Pvt. Ltd.

Reference Books:

1. P C Varghese, "Limit State design of reinforced concrete" , PHI, New Delhi.
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publishers.
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications.
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press.
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

BUILDING MATERIALS TESTING LABORATORY

Course Code	18CVL38	CIE Marks	40
Teaching Hours/Week(L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course Learning Objectives: The objectives of this course is to make students to learn:

1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2. Ability to function on multi-disciplinary teams in the area of materials testing.
3. Ability to use the techniques, skills and modern engineering tools necessary for engineering.
4. Understanding of professional and ethical responsibility in the areas of material testing.
5. Ability to communicate effectively the mechanical properties of materials.

Experiments:

1. Tension test on mild steel and HYSD bars.
2. Compression test on mild steel, cast iron and wood.
3. Torsion test on mild steel circular sections.
4. Bending Test on Wood Under two point loading.
5. Shear Test on Mild steel- single and double shear.
6. Impact test on Mild Steel (Charpy & Izod).
7. Hardness tests on ferrous and non-ferrous metals- Brinell's, Rockwell and Vicker's.
8. Tests on Bricks, Tiles and Concrete Blocks.
9. Tests on Fine aggregates-Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking.
10. Tests on Coarse aggregates-Absorption, Moisture content, specific gravity, Bulk density and Sieve analysis.
11. Demonstration of Strain gauges and Strain indicators.

NOTE: All tests to be carried out as per relevant latest BIS Codes

Course Outcomes: After successful completion of the course, the students will be able to:
1. Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
2. Identify, formulate and solve engineering problems of structural elements subjected to flexure.
3. Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

Question paper pattern:

- Group experiments - Tension test, compression test, torsion test and bending test.
- Individual Experiments – Remaining tests.
- Two questions are to be set - One from group experiments and the other as individual experiment.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Reference Books:

1. Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition – McGraw Hill Book Co. New Delhi.
2. M L Gambhir and Neha Jamwal, "Building and construction materials-Testing and quality control", McGraw Hill education (India)Pvt. Ltd.,2014.
3. Fenner, "Mechanical Testing of Materials", George Newnes Ltd. London.
4. Holes K A, "Experimental Strength of Materials", English Universities Press Ltd. London.
5. Suryanarayana A K, "Testing of Metallic Materials", Prentice Hall of India Pvt. Ltd. New Delhi.
6. Kukreja C B, Kishore K. and Ravi Chawla "Material Testing Laboratory Manual", Standard Publishers & Distributors1996.
7. Relevant **latest IS Codes.**

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V
HIGHWAY ENGINEERING

Course Code	**18CV56**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to;
1. Gain knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same in INDIA.
2. Understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economic impact).
3. Get insight to different aspects of geometric elements and train them to design geometric elements of a highway network.
4. Understand pavement and its components, pavement construction activities and its requirements.
5. Gain the skills of evaluating the highway economics by B/C, NPV, IRR methods and also introduce the students to highway financing concepts.

Module -1

Principles of Transportation Engineering: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute.

Highway Development and Planning: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4thtwenty year road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.

Highway Alignment and Surveys: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects.

Module -2

Highway Geometric Design of horizontal alignment elements: Cross sectional elements–width, surface, camber, Sight distances–SSD, OSD, ISD, HSD, Radius of curve, Transition curve, Design of horizontal and vertical alignment–curves, super-elevation, widening, gradients, summit and valley curves.

Module -3

Pavement Materials: Sub grade soil - desirable properties-HRB soil classification-determination of CBR and modulus of sub grade reaction with Problems Aggregates- Desirable properties and tests, Bituminous materials- Explanation on Tar, bitumen, cutback and emulsion-tests on bituminous material Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples.

Module -4

Pavement Construction: Design of soil aggregate mixes by Rothfuch's method. Uses and properties of bituminous mixes and cement concrete in pavement construction. Earthwork; cutting and Filling, Preparation of subgrade, Specification and construction of i) Granular Sub base, ii) WBM Base iii) WMM base,iv) Bituminous Macadam v) Dense Bituminous Macadam vi) Bituminous Concrete,vii) Dry Lean Concrete sub base and PQC viii) concrete roads.

Module -5

Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location.

Highway Economics: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples, Highway financing-BOT-BOOT concepts.

Course Outcomes: After studying this course, students will be able to:
1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
2. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.
3. Design road geometrics, structural components of pavement and drainage.
4. Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:
1. S K Khanna and C E G Justo, "Highway Engineering", Nem Chand Bros, Roorkee.
2. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.
3. R Srinivasa Kumar, "Highway Engineering", University Press.
4. K. P.Subramanium, "Transportation Engineering", SciTech Publications, Chennai.

Reference Books:
1. Relevant IRC Codes.
2. Specifications for Roads and Bridges-MoR T&H, IRC, New Delhi.
3. C. JotinKhisty, B. Kentlal, "Transportation Engineering", PHI Learning Pvt. Ltd. New Delhi.

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V
CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP

Course Code	**18CV51**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(2:2:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to
1. Understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.
2. Inculcate Human values to grow as responsible human beings with proper personality.
3. Keep up ethical conduct and discharge professional duties.

Module -1

Management: Characteristics of management, functions of management, importance and purpose of planning process, types of plans.

Construction Project Formulation: Introduction to construction management, project organization, management functions, management styles.

Construction Planning and Scheduling: Introduction, types of project plans, work breakdown structure, Grant Chart, preparation of network diagram- event and activity based and its critical path-critical path method, PERT method, concept of activity on arrow and activity on node.

Module -2

Resource Management: Basic concepts of resource management, class of lab our, Wages & statutory requirement, Labour Production rate or Productivity, Factors affecting labour output or productivity.

Construction Equipments: classification of construction equipment, estimation of productivity for: excavator, dozer, compactors, graders and dumpers. Estimation of ownership cost, operational and maintenance cost of construction equipments. Selection of construction equipment and basic concept on equipment maintenance

Materials: material management functions, inventory management.

Module -3

Construction Quality , safety and Human Values:

Construction quality process, inspection, quality control and quality assurance, cost of quality, ISO standards. Introduction to concept of Total Quality Management

HSE: Introduction to concepts of HSE as applicable to Construction. Importance of safety in construction , Safety measures to be taken during Excavation , Explosives , drilling and blasting , hot bituminous works , scaffolds / platforms / ladder , form work and equipment operation. Storage of materials. Safety through legislation, safety campaign. Insurances.

Ethics : Morals, values and ethics, integrity, trustworthiness , work ethics, need of engineering ethics, Professional Duties, Professional and Individual Rights, Confidential and Proprietary Information, Conflict of Interest Confidentiality, Gifts and Bribes, Price Fixing, Whistle Blowing.

Module -4

Introduction to engineering economy: Principles of engineering economics, concept on Micro and macro analysis, problem solving and decision making.

Interest and time value of money: concept of simple and compound interest, interest formula for: single payment, equal payment and uniform gradient series. Nominal and effective interest rates, deferred annuities, capitalized cost.

Comparison of alternatives: Present worth, annual equivalent, capitalized and rate of return methods, Minimum Cost analysis and break even analysis.

Module -5

Entrepreneurship: Evolution of the concept, functions of an entrepreneur, concepts of entrepreneurship, stages in entrepreneurial process, different sources of finance for entrepreneur, central and state level financial institutions.

Micro, Small & Medium Enterprises (MSME): definition, characteristics, objectives, scope, role of MSME in economic development, advantages of MSME, Introduction to different schemes: TECKSOK, KIADB, KSSIDC, DIC, Single Window Agency: SISI, NSIC, SIDBI, KSFC.

Business Planning Process: Business planning process, marketing plan, financial plan, project report and feasibility study, guidelines for preparation of model project report for starting a new venture. Introduction to international entrepreneurship opportunities, entry into international business, exporting, direct foreign investment, venture capital.

Course Outcomes: After studying this course, students will be able to:
1. Prepare a project plan based on requirements and prepare schedule of a project by understanding the activities and their sequence.
2. Understand labour output, equipment efficiency to allocate resources required for an activity / project to achieve desired quality and safety.
3. Analyze the economics of alternatives and evaluate benefits and profits of a construction activity based on monetary value and time value.
4. Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:
1. P C Tripathi and P N Reddy, "Principles of Management", Tata McGraw-Hill Education
2. Chitkara, K.K, "Construction Project Management: Planning Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi.
3. Poornima M. Charantimath , "Entrepreneurship Development and Small Business Enterprise", Dorling Kindersley (India) Pvt. Ltd., Licensees of PearsonEducation
4. Dr. U.K. Shrivastava "Construction Planning and Management", Galgotia publications Pvt. Ltd. New Delhi.
5. Bureau of Indian standards – IS 7272 (Part-1)- 1974 : Recommendations for labour output constant for building works:

Reference Books:
1. Robert L Peurifoy, Clifford J. Schexnayder, AviadShapira, Robert Schmitt, "Construction Planning, Equipment, and Methods (Civil Engineering), McGraw-HillEducation
2. Harold Koontz, Heinz Weihrich, "Essentials of Management: An International, Innovation, and Leadership perspective", T.M.H. Edition, NewDelhi
3. Frank Harris, Ronald McCaffer with Francis Edum-Fotwe, " Modern Construction Management", Wiley-Blackwell
4. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw-HillEducation
5. Chris Hendrickson and Tung Au, "Project Management for Construction - Fundamentals Concepts for Owners, Engineers, Architects and Builders", Prentice Hall,Pitsburgh
6. James L.Riggs, David D. Bedworth , Sabah U. Randhawa " Engineerng Economics" 4

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VII
QUALITY SURVEYING AND CONTRACT MANAGEMENT

Course Code	**18CV71**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to;
1. Estimate the quantities of work, develop the bill of quantities and arrive at the Cost of civil engineering Project
2. Understand and apply the concept of Valuation for Properties
3. Understand, Apply and Create the Tender and Contract document.

Module -1

Quantity Estimation for Building: study of various drawing attached with estimates, important terms, units of measurements, abstract, Types of estimates. Estimation of building by Short wall and long wall method - centre line method.
Estimate of R.C.C structures including Slab, beam, column, footings.

Module -2

Estimate of Steel truss, manhole and septic tanks and slab culvert.
Quantity Estimation for Roads: Computation of volume of earthwork fully in banking, cutting, partly cutting and partly Filling by mid-section, trapezoidal and Prismoidal Methods.

Module -3

Specification for Civil Engineering Works: Objective of writing specifications essentials in specifications, general and detail specifications of different items of works in buildings and roads.
Analysis of Rates : Factors Affecting Cost of Civil Works , Concept of Direct Cost , Indirect Cost and Project Cost
Rate analysis and preparation of bills, Data analysis of rates for various items of Works, Sub-structure components, Rate analysis for R.C.C. slabs, columns and beams.

Module-4

Contract Management-Tender and its Process: Invitation to tender, Prequalification, administrative approval & Technical sanction. Bid submission and Evaluation process. Contract Formulation: Letter of intent, Award of contract, letter of acceptance and notice to proceed. Features / elements of standard Tender document (source: PWD / CPWD / International Competitive Bidding – NHAI / NHEPC / NPC).
Law of Contract as per Indian Contract act 1872, Types of Contract, Joint venture.
Contract Forms: FIDIC contract Forms, CPWD, NHAI, NTPC, NHEPC.

Module -5

Contract Management-Post award : Basic understanding on definitions, Performance security, Mobilization and equipment advances, Secured Advance, Suspension of work, Time limit for completion, Liquidated damages and bonus, measurement and payment, additions and alterations or variations and deviations, breach of contract, Escalation, settlement of account or final payment, claims, Delay's and Compensation, **Disputes & its resolution mechanism,** Contract management and administration.
Valuation: Definitions of terms used in valuation process, Purpose of valuation, Cost, Estimate, Value and its relationship, Capitalized value. Freehold and lease hold and easement, Sinking fund, depreciation–methods of estimating depreciation, Outgoings, Process and methods of valuation: Rent fixation, valuation for mortgage, valuation of land.

Course outcomes: After studying this course, students will be able to:
1. Taking out quantities and work out the cost and preparation of abstract for the estimated cost for various civil engineering works.
2. Prepare detailed and abstract estimates for various road works, structural works and water supply and sanitary works.
3. Prepare the specifications and analyze the rates for various items of work.
4. Assess contract and tender documents for various construction works.
5. Prepare valuation reports of buildings.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.

- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. Datta B.N., "Estimating and costing", UBSPD Publishing House, New Delhi.
2. B.S. Patil, "Civil Engineering Contracts and Estimates", Universities Press.
3. M. Chakraborthi; "Estimation, Costing and Specifications", Laxmi Publications.
4. MORTH Specification for Roads and Bridge Works – IRC New Delhi.

Reference Books:

1. Kohli D.D and Kohli R.C, "Estimating and Costing", 12 th Edition, S.Chand Publishers, 2014.
2. Vazirani V.N and Chandola S.P, "Estimating and costing", Khanna Publishers, 2015.
3. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd., 2015.
4. Duncan Cartlidge , "Quantity Surveyor's Pocket Book", Routledge Publishers, 2012.
5. Martin Brook, "Estimating and Tendering for Construction Work", A Butterworth-Heinemann publishers, 2008.
6. Robert L Peurifoy , Garold D. Oberlender , " Estimating Construction Costs" – 5ed , Tata McGraw-Hill , New Delhi.
7. David Pratt, "Fundamentals of Construction Estimating" – 3ed, Edition.
8. PWD Data Book, CPWD Schedule of Rates (SoR). and NH SoR – Karnataka FIDIC Contract forms.
9. B.S. Ramaswamy "Contracts and their Management" 3ed, Lexis Nexis(a division of Reed Elsevier India Pvt Ltd).

B. E. CIVIL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - V			
CONCRETE AND HIGHWAY MATERIALS LABORATORY			
Course Code	**18CVL58**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(0:2:2)	SEE Marks	60
Credits	02	Exam Hours	03

Course Learning Objectives: This course will enable students
1. To learn the procedure of testing concrete ingredients and properties of concrete as per standard code recommendations.
2. To learn the procedure of testing bituminous materials as per standard code recommendations.
3. To relate material characteristics to various application of construction.

Modules

Part A: Concrete Lab

1. Tests on Cement:

   a. Normal Consistency
   b. Setting time
   c. Compressive strength
   d. fineness by air permeability test
   e. specific gravity

2. Tests on Concrete:

   a. Design of concrete mix as perIS-10262
   b. Tests on fresh concrete:
      i. slump,
      ii. compaction factor and
      iii. Vee Bee test
   c. Tests on hardened concrete:
      i. compressive strength test,
      ii. split tensile strength test,
      iii. flexural strength test
   d. NDT tests by re bound hammer and pulse velocity test.

3. Tests on Self Compacting Concrete:

   a. Design of self compacting concrete, As per Is 10262:2019
   b. slump flow test,
   c. V-funnel test,
   d. J-Ring test,
   e. U Box test and
   f. L Box test

Part B: Highway materials Lab

1. Tests on Aggregates

   a. Aggregate Crushing value
   b. Los Angeles abrasion test
   c. Aggregate impact test
   d. Aggregate shape tests(combined index and angularity number)

2. Tests on Bituminous Materials

   a. Penetration test
   b. Ductility test
   c. Softening point test
   d. Specific gravity test
   e. Viscosity test by tarviscometer
   f. Bituminous Mix Design by Marshal Method (Demonstration only)

3. Tests on Soil
   a. Wet sieve analysis
   b. CBR test

Course Outcomes: During this course, students will develop expertise in
1. Able to interpret the experimental results of concrete and highway materials based on laboratory tests.
2. Determine the quality and suitability of cement.
3. Design appropriate concrete mix Using Professional codes.
4. Determine strength and quality of concrete.
5. Evaluate the strength of structural elements using NDT techniques.
6. Test the soil for its suitability as sub grade soil for pavements.
Question paper pattern:
• All are individual experiments
• Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
• All exercises are to be included for practical examination.
Reference Books:
1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
4. Neville AM, "Properties of Concrete", ELBS Publications, London.
5. Relevant BIS codes.
6. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual", Nem Chand Bros, Roorkee.
7. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.

B. E. CIVIL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - III			
STRENGTH OF MATERIALS			
Course Code	**18CV32**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives: This course will enable students
1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To know the development of internal forces and resistance mechanism for one dimensional and two-dimensional structural elements.
3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.
4. To determine slope and deflections of beams.
5. To evaluate the behaviour of torsion members, columns and struts.

Module-1

Simple Stresses and Strain: Introduction, Definition and concept and of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.

Module-2

Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses. Theory of failures: Max. Shear stress theory and Max. principal stress theory.

Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution.

Module-3

Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.

Module-4

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre (only concept).

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft.

Module-5

Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment-curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.

Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

Course outcomes: After studying this course, students will be able;
1. To evaluate the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To evaluate the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.
3. To analyse different internal forces and stresses induced due to representative loads on structural elements.
4. To evaluate slope and deflections of beams.
5. To evaluate the behaviour of torsion members, columns and struts.

Question paper pattern:
• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of four sub- questions) from each module.
• Each full question will have sub- question covering all the topics under a module.
• The students will have to answer five full questions, selecting one full question from each module.

Textbooks:
1. B.S. Basavarajaiah, P. Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition,2010
2. Ferdinand P. Beer, E. Russell Johnston and Jr. John T. De Wolf "Mechanics of Materials", Tata McGraw-Hill, Third Edition, SI Units

Reference Books:
1. D.H. Young, S.P. Timoshenko "Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint2014).
2. R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010.
3. S.S. Rattan "Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint2013).
4. Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.

ADVANCED DESIGN OF RC STRUCTURES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I

Subject Code	**18CSE12**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites: An undergraduate course on Design of RC structures.

Course objectives:

The objective of this course is to make students to learn principles of Structural Design, to design different types of structures and to detail the structures. To evaluate performance of the structures

Modules	Teaching Hours	RBT Level
Module-1		
• Design of R C slabs by yield line method • Design of flat slabs	**10 Hours**	**L1, L2, L3, L4, L5**
Module-2		
• Design of grid or coffered floors • Design of continuous beams with redistribution of moments	**10 Hours**	**L1, L2, L3, L4, L5**
Module -3		
• Design of R C Chimneys	**10 Hours**	**L1, L2, L3, L4,**
Module -4		
• Design of R C silos • Design of R C bunkers	**10 Hours**	**L1, L2, L4, L5**
Module -5		
Formwork: Introduction, Requirements of good formwork, Materials for forms, choice of formwork, Loads on formwork, Permissible stresses for timber, Design of formwork, Shuttering for columns, Shuttering for slabs and beams, Erection of Formwork, Action prior to and during	**10 Hours**	**L1, L2**

concreting, Striking of forms. Recent developments in form work.		

Course outcomes:

On completion of this course, students are able to:
1. Achieve Knowledge of design and development of problem solving skills
2. Understand the principles of Structural Design.
3. Design and develop analytical skills.
4. Summarize the principles of Structural Design and detailing
5. Understands the structural performance.

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. A Park and Paulay,, "Reinforced Reinforced and Prestressed Concrete"
2. Bungale. S. Taranath., "Structural Analysis and Design of Tall Buildings", McGraw Hill Book Company,New York, 1999
3. Hsu T. T. C. and Mo Y. L., "Unified Theory of Concrete Structures", John Wiley & Sons, 2010
4. Krishnamurthy, K.T., Gharpure S.C. and A.B. Kulkarni – "Limit design of reinforced concrete structures",Khanna Publishers, 1985
5. UnnikrishnaPillai and Devdas Menon., "Reinforced concrete Design', Tata McGraw Hill PublishersCompany Ltd., New Delhi, 2006
6. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, 2007
7. Varghese. P. C., "Advanced Reinforced Concrete Design", Prentice-Hall of India, New Delhi, 2000
8. Krishna Raju. N., "Advanced Reinforced Concrete Design", CBS Publishers & Distributors
9. Pillai S. U. and Menon D., "Reinforced Concrete Design", Tata McGraw-Hill, 3rd Ed, 1999
10. Shah.H.J, "Reinforced Concrete", Vol-1 and Vol-2, Charotar, 8th Edition – 2009 and 6th Edition – 2012 respectively.
11. Gambhir.M.L, "Design of Reinforced Concrete Structures", PHI Pvt. Ltd, New Delhi, 2008

STRUCTURAL DYNAMICS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I

Subject Code	**18CSE14**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites: Basics of Mechanics, Strength of Materials, Structural Analysis

Course objectives:

The objective of this course is to makestudents to learn principles ofStructural Dynamics, To implement these principles through different methods and to apply the same for free and forced vibration of structures. To evaluate the dynamic characteristics of thestructures

Modules	Teaching Hours	RBT Level
Module-1		
Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principleof virtual displacement and energy principles . Dynamics of Single degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems including methods for evaluation ofdamping.	**10 Hours**	L_1, L_2, L_5
Module-2		
Response of Single-degree-of-freedom systems to harmonic loading including support motion, vibration isolation, transmissibility. Numerical methods applied to Single-degree-of-freedom systems – Duhamel integral. Principle of vibration measuring instruments– seismometer and accelerometer.	**10 Hours**	L_3, L_4, L_5
Module -3		
Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building	**10 Hours**	L_1, L_2, L_4, L_5

concept, free vibration of undamped multi-degree-of-freedom systems – Natural frequencies and mode shapes – Orthogonality of modes.		
Module -4		
Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach.	**10 Hours**	L_3, L_4, L_5
Module -5		
Approximate methods: Rayleigh's method, Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Flexural vibration of beams with different end conditions. Stiffness matrix, mass matrix (lumped and consistent).	**10 Hours**	L_2, L_4

Course outcomes:

On completion of this course, students are ableto:

- AchieveKnowledgeofdesignanddevelopmentofproblemsolvingskills.
- Understand the principles of StructuralDynamics
- Design and develop analyticalskills.
- Summarize the Solution techniques for dynamics of Multi-degree freedom systems
- Understand the concepts of damping instructures.

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. Dynamics of Structures – "Theory and Application toEarthquakeEngineering"- 2nd ed., Anil K. Chopra, Pearson Education.
2. Earthquake Resistant Design ofBuildingStructures,Vinod Hosur, WILEY (India)
3. Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH
4. Structural Dynamics- Mario Paz: CBS publishers.
5. Structural Dynamics- Clough & Penzien: TMH
6. Vibration Problems in Engineering Timoshenko, S, Van-Nostrand Co.

STRUCTURAL ENGINEERING LAB-1
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – I

Subject Code	**18CSEL16**	CIE Marks	40
Number of Lecture Hours/Week	03	SEE Marks	60
Total Number of Lecture Hours	42	Exam Hours	03
CREDITS – 02			

Prerequisites: Concrete Technology, Special Concrete, Structural Analysis, Structural Dynamics

Course objectives:
The objective of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements. To evaluate the different testing methods and equipments.

Modules	Teaching Hours	RBT Level
1. Experiments on Concrete, including Mix design	**12 Hrs**	
2. Testing of beams for deflection, flexure and shear	**12 Hrs**	
3. Experiments on vibration of multi storey frame models for Natural frequency and modes.	**12 Hrs**	**L1, L2, L3, L4, L5, L6**
4. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Profometer	**06Hrs**	

Course outcomes: On complete of this course the students will able to

- Achieve Knowledge of design and development of experimenting skills.
- Understand the principles of design of experiments
- Design and develop analytical skills.
- Summarize the testing methods and equipment's.

ADVANCED DESIGN OF STEEL STRUCTURES
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – II

Subject Code	**18CSE21**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites:

- Engineering Mechanics
- Strength of Materials
- Structural Analysis
- Design of Steel structures

Course objectives: This course will enable students to

1. Understand the background to the design provisions for hot-rolled and cold-formed steel structures, including the main differences between them.

2. Proficiency in applying the provisions for design of columns, beams, beam-columns

3. Design structural sections for adequate fireresistance

Modules	Teaching Hors	RBT Level
Module-1		
Laterally Unrestrained Beams: Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of Cantilever beams, continuous beams, beams with continuous and discretelateralrestraints,Mono-symmetricandnon-uniformbeams – Design Examples. Concepts of -Shear Center, Warping, Uniform and Non-Uniform torsion.	**10 Hours**	**L1,L2**
Module-2		
Beam- Columns in Frames: Behaviour of Short and Long Beam - Columns, Effects of Slenderness Ratio and Axial Force on Modes of Failure, Biaxial bending, Strength of Beam Columns, Sway and Non-Sway Frames,Strength and Stability of rigid jointed frames, Effective Length of Columns-, Methods in IS 800 –	**10 Hours**	**L2,L3,L4**

Examples		
Module -3		
Steel Beams with Web Openings: Shape of the web openings, practical guide lines, and Force distribution and failure patterns. Analysis of beams with perforated thin and thick webs, Design of laterally restrained castellated beams for given sectional properties. Vierendeel girders (design for given analysis results)	**10 Hours**	**L3,L4**
Module -4		
Cold formed steelsections: Techniques and properties, Advantages, Typical profiles, Stiffened and unstiffened elements, Local buckling effects, effective section properties, IS 801& 811 code provisions-numerical examples, beam design, column design.	**10 Hours**	**L2,L3,L4**
Module -5		
Fire resistance: Fire resistance level, Period of Structural Adequacy, Properties of steel with temperature, Limiting Steel temperature, Protected and unprotected members, Methods of fire protection, Fire resistance Ratings. Numerical Examples.	**10 Hours**	**L4,L5**

Course outcomes:

After studying this course, students will be able to:

- Able to understand behavior of Light gauge steel members
- Able to understand design concepts of cold formed/unrestrained beams
- Able to understand Fire resistance concept required for present days.
- Able to analyze beam column behavior

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. N. Subramanian, "Design of Steel Structures", Oxford, IBH
2. Duggal,S.K. Design of Steel Structures, TataMcGraw-Hill
3. IS 800: 2007, IS 801-2010 , IS 811-1987
4. BS5950 Part- 8,
5. INSDAG Teaching Resource Chapter 11 to 20:www.steel-insdag.org

6. SP 6 (5)-1980

FINITE ELEMENT METHOD OF ANALYSIS
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – II

Subject Code	**18CSE22**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites:

- Computational structural Mechanics
- Theory of Elasticity

Course objectives:

- To provide the fundamental concepts of the theory of the finite element method
- To develop proficiency in the application of the finite element method (modeling, analysis, and interpretation of results) to realistic engineering problems through the use of softwares

Modules	Teaching Hors	RBT Level
Module-1		
Basic concepts of elasticity, Kinematic and Static variables for various types of structural problems, Approximate methods of structural analysis – Rayleigh–Ritz method, Finite difference method, Finite element method. Variation method and minimizationof Energy approach of element formulation, Principles offinite element method, advantages and disadvantages, Finite element procedure, Finite elements used for one, two and three dimensional problems, C0, C1 and C2 type elements, Element aspect ratio, Mesh refinement vs. higher order elements,Numbering of nodes to minimize bandwidth.	**10 Hours**	**L1, L2**

Module-2		
Nodal displacement parameters, Convergence criterion, Compatibility requirements, Geometric invariance, Shape function,Polynomial form of displacement function, Generalized and Natural coordinates,Lagrangianinterpolation function, shape functions for one, two &three dimensional elements.	**10 Hours**	**L1, L2, L4, L5**
Module -3		
Isoparametric elements, Internal nodes and higher order elements, Serendipity and Lagrangianfamily of Finite Elements, Sub-parametric and Super-parametric elements, Condensation of internal nodes, Jacobian transformation Matrix, Development of strain-displacement matrix and stiffness matrix, consistent load vector, numericalintegration.	**10 Hours**	**L1, L2, L4, L5**
Module -4		
Application of Finite Element Method for the analysis of one & two dimensional problems: Analysis of plane trusses and beams, Application to planestress/strain, Axisymmetric problems using CST and Quadrilateral Elements	**10 Hours**	**L1, L2, L3, L4, L5**
Module -5		
Application to Plates and Shells, Non-linearity: material, geometric and combined non- linearity, Techniques for Non-linear Analysis.	**10 Hours**	**L1, L2**

Course Outcome:

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

- Explain the basic theory behind the finite element method.
- Formulate force-displacements relations for 2-D elements
- Use the finite element method to analyze real structures.
- Use a Finite Element based program for structural analysis

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. Zeinkeiwich, O.C. and Tayler, R.L., The Finite Element Method for Solid and Structural Mechanics, Butterworth-Heinemann,2013
2. Krishnamoorthy,C.S.,FiniteElementAnalysis: Theory andprogramming, Tata McGraw Hill Publishing Co. Ltd., 2017
3. Desai, C., and Abel, J. F., Introduction to the Finite Element Method: A Numerical method for Engineering Analysis, East West Press Pvt. Ltd.,1972
4. Cook, R.D., Malkas, D.S. and Plesha., M.E., Concepts and applications of Finite Element Analysis, John Wiley and Sons., 2007
5. Reddy, J., An Introduction to Finite Element Methods, McGraw Hill Co., 2013
6. Bathe K J, Finite Element Procedures in Engineering Analysis, Prentice Hall
7. Shames,I.H.andDym,C.J.,EnergyandFiniteElementMethodsinStructural Mechanics, McGraw Hill, New York,1985

EARTHQUAKE RESISTANT STRUCTURES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – II

Subject Code	**18CSE23**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Prerequisites:

- Structural Dynamics

Course objectives:

The objective of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures

Modules	Teaching Hors	RBT Level
Module-1		
Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.	**10 Hours**	**L1, L2**
Module-2		
The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design. Computation of seismic forces in multi-storied buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.	**10 Hours**	**L2, L3, L4, L5**

Module -3		
Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings duringearthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.	**10 Hours**	**L2, L4, L5**
Module -4		
Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings. Confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS1893. Structural behavior, design and ductile detailing of shear walls.	**10 Hours**	**L2, L4, L5**
Module -5		
Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.	**10 Hours**	**L2, L5, L6**

Course Outcome: On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of engineering seismology
- Design and develop analytical skills.
- Summarize the Seismic evaluation and retrofitting of structures.
- Understand the concepts of earthquake resistance of reinforced concrete buildings.

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. Dynamics of Structures – Theory and Application to Earthquake Engineering-

2nd ed. – Anil K. Chopra, Pearson Education.

2. Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)

3. Earthquake Resistant Design of Structures, Duggal, Oxford University Press.

4. Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India.

5. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993

6. Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.

7. Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons.

STRUCTURAL ENGINEERING LAB-2				
[As per Choice Based Credit System (CBCS) scheme]				
SEMESTER – II				
Subject Code	**18CSEL26**	CIE Marks		40
Number of Lecture Hours/Week	03	SEE Marks		60
Total Number of Lecture Hours	42	Exam Hours		03
CREDITS – 02				

Prerequisites: Structural Analysis, Structural Dynamics and Design of RC structures

Course objectives:

The objective of this course is to make students

To analyze the structure using FE based Software

To learn principles of design

To investigate the performance of structural elements.

To design the structural components using excel sheets

Modules	Teaching Hours	RBT Level
1. Static and Dynamic analysis and design of Multistory Building structures using any FE based software	**12 Hrs**	
2. Design of RCC and Steel Tall structures using any FE based software	**12 Hrs**	**L1, L2, L3, L4, L5, L6**
3. Analysis of folded plates and shells using any FE software.	**06 Hrs**	
4. Preparation of EXCEL sheets for structural design	**12 Hrs**	

Course outcomes: On complete of this course the students will able to

- Achieve Knowledge of design and development of programming skills.
- Understand the principles of structural analysis and design
- Design and develop analytical skills.
- Summarize the performance of structures for static and dynamic forces.

SPECIAL CONCRETE
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – I

Subject Code	**18CSE15**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites: Knowledge of Material Science and Concrete Technology

Course objectives:

The objective of this course is to make students to:

- Provides a comprehensive treatment of the constituent materials of concrete
- Learn the principles of Concrete mix design, and assess the performance of various cement-based materials including normal and high strength concrete as well as special cement composites.
- To differentiate between different types of concrete and Learn characterize and predict the behaviour of special concrete

Modules	Teaching Hours	RBT Level
Module-1		
Constituent materials: Role of constituents, Components of modern concrete, Rheology, Mineral and Chemical admixtures and their effect on properties of concrete **Special cements:** Need, Classifications, Blended cements, modified hydraulic cements, calcium aluminate cements, calcium sulphate based binders, calcium sulfo aluminate cements, shrinkage compensating (or) expansive cements, macro defect-free cements, phosphate cements, fast setting cements, their Performance and prescriptive specifications, Methods of mix proportioning: IS method, ACI method and BS method	**10 Hours**	**L1, L2, L5**
Module-2		
Light Weight concrete: Introduction, classification, strength and elastic properties, durability, mix proportioning.	**10 Hours**	**L1, L2**

High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.Self-compacting Concrete (SCC), General characteristics, Properties, microstructure. Robustness and methods of mix proportioning and applications		
Module -3		
Other concretes for special properties: High-volume fly ash concretes, geo-polymer concrete, pervious concrete, aerated concrete, ultrahigh performance concretes, Reactive powder concrete, Bacterial concrete, Heat resistant and refractory concrete. Their significance, materials, general consideration strength and durability aspects. Mixture proportioning and parameters in the development of Special concreting operations: Guniting and shotcreting, pre-placed aggregate, anti-washout concretes, concrete pumping, tremie placement for underwater applications.	**10 Hours**	**L1, L2, L5**
Module -4		
Fibre reinforced concrete: Fibre materials, mix proportioning, distribution and orientation, interfacial bond, properties in fresh state, Toughness and impact resistance, Elastic modulus, creep, and drying shrinkage, strength and behaviour in tension, compression and flexure, crack arrest and toughening mechanism, durability, applications. **Ferro cement:** Materials, mechanical properties, cracking of ferrocement, Types and methods of construction, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, durability, and applications.	**10 Hours**	**L1, L2, L5**
Module -5		
High strength concretes: Materials and mix proportion, Microstructure, stress-strain relation, fracture, drying shrinkage, and creep. Mass concrete and Roller compacted concrete: Constituents, mix proportioning, properties in fresh and	**10 Hours**	**L1, L2**

hardened states, applications and limitations.		
Different NDT techniques for performance evaluation of structures: Rebound hammer, Ultrasonic pulse velocity meter, Profometer, Ground Penetrating Radar (GPR), Core test, Carbonation and Corrosion assessment		

Course outcomes:

On completion of this course, students are able to:

- Identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy
- Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete for special properties.
- Evaluate the effect of the environment on service life performance, properties and failure of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete structure.
- Understand the concepts, mix proportioning and methods of special concreting operations.

Question paper pattern:
The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. Neville A.M, "Properties of Concrete" Pearson Education Asia,2000
2. P. Kumar Mehta, Paul J.N. Monterio,ONCRETE:Microstructure,Properties and Materials", Tata McGraw Hill
3. A.R.Santhakumar, (2007) "Concrete Technology"-Oxford University Press, New Delhi, 2007
4. Gambhir "Concrete Technology" TMH.
5. Short A and Kinniburgh.W, "Light Weight Concrete"- Asia Publishing House, 1963
6. Aitcin P.C. "High Performance Concrete"-E and FN, Spon London 1998 7. Rixom.R. and Mailvaganam.N., "Chemical admixtures in concrete"- E and FN, Spon London 1999
7. Rudnai.G., "Light Weight concrete"-Akademiaikiado, Budapest, 1963 9. http://qcin.org/CAS/RMCPC/
8. http://nptel.ac.in

MECHANICS OF DEFORMABLE BODIES
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – I

Subject Code	**18CSE13**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites: Strength of Materials

Course objectives:

Course objectives: The objective of this course is to make students to learn principles of Analysis of Stress and Strain, To predict the stress-strain behaviour of continuum. To evaluate the stress and strain parameters and their inter relations of the continuum

Modules	Teaching Hours	RBT Level
Module-1		
Theory of Elasticity: Introduction: Definition of stress and strain and strain at a point, components of stress and strain at appoint of Cartesian and polar coordinates. Constitutive relations, equilibrium equations, compatibility equations and boundary conditions in 2-D and 3-D cases.	**10 Hours**	**L1, L2**
Module-2		
Transformation of stress and strain at a point,Principal stresses and principal strains, invariants ofstress and strain, hydrostatic and deviatric stress,spherical and deviatric strains max. shear strain.	**10 Hours**	**L2, L3**
Module -3		
Plane stress and plane strain: Airy's stress function approach to 2-D problems of elasticity, simple problems of bending of beams. Solution of axisymmetric problems, stress concentration due to the presence of a circular hole in plates.	**10 Hours**	**L2, L3**
Module -4		

Elementary problems of elasticity in three dimensions, stretching of a prismatic bar by its own weight, twist of circular shafts, torsion of non-circular sections, membrane analogy, Propagation of waves in solid media. Applications of finite difference equations in elasticity.	**10 Hours**	**L2, L3, L4**

Module -5

Theory of Plasticity: Stress – strain diagram in simpletension, perfectly elastic, Rigid – Perfectly plastic, Linear work – hardening, Elastic Perfectly plastic, Elastic Linear work hardening materials, Failure theories, yield conditions, stress – space representation of yield criteria through Westergard stress space, Tresca and Von-Mises criteria of yielding	**10 Hours**	**L1, L2**

Course outcomes:

On completion of this course, students are able to:
- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of stress-strain behaviour of continuum
- Design and develop analytical skills.
- Describe the continuum in 2 and 3- dimensions
- Understand the concepts of elasticity and plasticity

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. Timoshenko &Goodier, "Theory of Elasticity", McGraw Hill
2. Srinath L.S., Advanced Mechanics of Solids, 10th print, Tata McGraw Hill Publishing company, New Delhi, 1994.
3. Sadhu Singh, "Theory of Elasticity", Khanna Publishers
4. Verma P.D.S, "Theory of Elasticity", Vikas Publishing Pvt. Ltd
5. Chenn W.P and Hendry D.J, "Plasticity for Structural Engineers", Springer Verlag
6. Valliappan C, "Continuum Mechanics Fundamentals", Oxford IBH Publishing Co.Ltd.
7. Sadhu Singh, "Applied Stress Analysis", Khanna Publishers
8. Xi Lu, "Theory of Elasticity", John Wiley.

COMPUTATIONAL STRUCTURAL MECHANICS
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – I

Subject Code	**18CSE11**	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Prerequisites:

- Engineering Mechanics
- Strength of Materials
- Structural Analysis
- Matrix Algebra

Course objectives:

- To understand basic concepts of Matrix Methods of Structural Analysis
- To analyse the behavior of plane trusses, continuous beams, and portal frames

Modules	Teaching Hours	RBT Level
Module-1		
Basic concepts of structural analysis and methods of solving simultaneous equations: Introduction, Types of framed structures, Static and Kinematic Indeterminacy, Equilibrium equations, Compatibility conditions, Principle of superposition, Energy principles, Equivalent joint loads, Methods of solving linear simultaneous equations- Gauss elimination method, Cholesky method and Gauss-Siedal method.	**10 Hours**	**L1, L2, L3**
Module-2		
Fundamentals of Flexibility and Stiffness Methods: Concepts of stiffness and flexibility, Local and Global coordinates,Development of element flexibility and element stiffness matrices for truss, beam and grid elements, Force-transformation matrix,Development of global flexibility matrix for continuous beams, plane trusses and	**10 Hours**	**L1, L2, L3 L4, L5**

rigid plane frames, Displacement-transformation matrix, Development of global stiffness matrix for continuous beams, plane trusses and rigid plane frames.		
Module -3		
Analysis using Flexibility Method (including secondary effects): Continuous beams, plane trusses and rigid plane frames	**10 Hours**	**L1, L2, L3 L4, L5**
Module -4		
Analysis using Stiffness Method (including secondary effects): Continuous beams, plane trusses and rigid plane frames	**10 Hours**	**L1, L2, L4, L5**
Module -5		
Direct Stiffness Method: Stiffness matrix for truss element in local and global coordinates, Analysis of plane trusses, Stiffness matrix for beam element, Analysis of continuous beams and orthogonal frames.	**10 Hours**	**L1, L2, L5**

Course outcomes:

Upon completing this course, the students will be able to:

- Formulate force displacement relation by flexibility and stiffness method
- Analyze the plane trusses, continuous beams and portal frames by transformation approach
- Analyse the structures by direct stiffness method

Question paper pattern:

The question paper will have ten questions; each question carries equal marks, there will be two full questions or with a maximum of four sub questions from each module, students will have to attend five full questions from each module.

Reference Books:

1. Weaver, W., and Gere, J.M., *Matrix Analysis of Framed Structures*, CBS Publishers and distributors pvt. Ltd., 2004.
2. Rajasekaran, S., and Sankarasubramanian, G., *Computational Structural Mechanics*, PHI, New Dehi, 2001.
3. Martin, H, C., *Introduction to Matrix Methods of Structural Analysis*, McGraw-Hill, New York, 1966.
4. Rubinstein, M.F., *Matrix Computer Analysis of Structures,* Prentice-Hall, Englewood Cliffs, New Jersey, 1966.
5. Beaufait, F.W., Rowan, W. H., Jr., Hoadely, P. G., and Hackett, R. M.,

Computer Methods of Structural Analysis, Prentice-Hall, Englewood Cliffs, New Jersey, 1970.

6. Kardestuncer, H., *Elementary Matrix Analysis of Structures*, McGraw-Hill, New York, 1974.

SOFTWARE ENGINEERING			
(Effective from the academic year 2018 -2019)			
SEMESTER – III			
Course Code	**18CS35**	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	03
CREDITS –3			

Course Learning Objectives: This course (18CS35) will enable students to:

- Outline software engineering principles and activities involved in building large software programs.Identify ethical and professional issues and explain why they are of concern to software engineers.
- Explain the fundamentals of object oriented concepts
- Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation. Differentiate system models, use UML diagrams and apply design patterns.
- Discuss the distinctions between validation testing and defect testing.
- Recognize the importance of software maintenance and describe the intricacies involved in software evolution.Apply estimation techniques, schedule project activities and compute pricing.
- Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved.

Module 1	Contact Hours
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes**: Models: Waterfall Model **(Sec 2.1.1)**, Incremental Model **(Sec 2.1.2)** and Spiral Model **(Sec 2.1.3)**. Process activities. **Requirements Engineering**: Requirements Engineering Processes **(Chap 4)**. Requirements Elicitation and Analysis **(Sec 4.5).** Functional and non-functional requirements **(Sec 4.1)**. The software Requirements Document **(Sec 4.2)**. Requirements Specification **(Sec 4.3)**. Requirements validation **(Sec 4.6)**. Requirements Management **(Sec 4.7)**. **RBT: L1, L2, L3**	08
Module 2	
What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. **Introduction, Modelling Concepts and Class Modelling:** What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models; **Textbook 2: Ch 1,2,3.** **RBT: L1, L2 L3**	08
Module 3	
System Models: Context models **(Sec 5.1)**. Interaction models **(Sec 5.2)**. Structural models **(Sec 5.3)**. Behavioral models **(Sec 5.4)**. Model-driven engineering **(Sec 5.5)**. **Design and Implementation**: Introduction to RUP **(Sec 2.4)**, Design Principles **(Chap 7)**. Object-oriented design using the UML **(Sec 7.1)**. Design patterns **(Sec 7.2)**. Implementation issues **(Sec 7.3)**. Open source development **(Sec 7.4)**. **RBT: L1, L2, L3**	08

Module 4	
Software Testing: Development testing **(Sec 8.1)**, Test-driven development **(Sec 8.2)**, Release testing **(Sec 8.3)**, User testing **(Sec 8.4)**. Test Automation **(Page no 212)**. **Software Evolution**: Evolution processes **(Sec 9.1)**. Program evolution dynamics **(Sec 9.2)**. Software maintenance **(Sec 9.3)**. Legacy system management **(Sec 9.4)**. **RBT: L1, L2, L3**	08
Module 5	
Project Planning: Software pricing **(Sec 23.1)**. Plan-driven development **(Sec 23.2)**. Project scheduling **(Sec 23.3)**: Estimation techniques **(Sec 23.5)**. **Quality management**: Software quality **(Sec 24.1)**. Reviews and inspections **(Sec 24.3)**. Software measurement and metrics **(Sec 24.4)**. Software standards **(Sec 24.2)** **RBT: L1, L2, L3**	08

Course Outcomes: The student will be able to :

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Use the techniques, skills, and modern engineering tools necessary for engineering practice
- Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.

Reference Books:

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India

<table>
<tr><td colspan="5" align="center">DESIGN AND ANALYSIS OF ALGORITHMS
(Effective from the academic year 2018 -2019)
SEMESTER – IV</td></tr>
<tr><td>Course Code</td><td>18CS42</td><td>CIE Marks</td><td>40</td></tr>
<tr><td>Number of Contact Hours/Week</td><td>3:2:0</td><td>SEE Marks</td><td>60</td></tr>
<tr><td>Total Number of Contact Hours</td><td>50</td><td>Exam Hours</td><td>03</td></tr>
<tr><td colspan="5" align="center">CREDITS –4</td></tr>
<tr><td colspan="5">Course Learning Objectives: This course (18CS42) will enable students to:</td></tr>
</table>

- Explain various computational problem solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

Module 1	Contact Hours
Introduction: What is an Algorithm? **(T2:1.1),** Algorithm Specification **(T2:1.2),** Analysis Framework **(T1:2.1),** **Performance Analysis**: Space complexity, Time complexity **(T2:1.3).** **Asymptotic Notations:** Big-Oh notation (*O*), Omega notation (Ω), Theta notation (*Θ*), and Little-oh notation (*o*), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples **(T1:2.2, 2.3, 2.4). Important Problem Types:** Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries. **(T1:1.3,1.4).** **RBT: L1, L2, L3**	10
Module 2	
Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum **(T2:3.1, 3.3, 3.4)**, Merge sort, Quick sort **(T1:4.1, 4.2)**, Strassen's matrix multiplication **(T2:3.8)**, Advantages and Disadvantages of divide and conquer. **Decrease and Conquer Approach:** Topological Sort. **(T1:5.3).** **RBT: L1, L2, L3**	10
Module 3	
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines **(T2:4.1, 4.3, 4.5). Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm **(T1:9.1, 9.2)**. **Single source shortest paths:** Dijkstra's Algorithm **(T1:9.3)**. **Optimal Tree problem:** Huffman Trees and Codes **(T1:9.4)**. **Transform and Conquer Approach:** Heaps and Heap Sort **(T1:6.4)**. **RBT: L1, L2, L3**	10
Module 4	
Dynamic Programming: General method with Examples, Multistage Graphs **(T2:5.1, 5.2)**. **Transitive Closure:** Warshall's Algorithm, **All Pairs Shortest Paths:** Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((**T1:8.2, 8.3, 8.4**), Bellman-Ford Algorithm **(T2:5.4)**, Travelling Sales Person problem **(T2:5.9)**, Reliability design **(T2:5.8)**. **RBT: L1, L2, L3**	10
Module 5	
Backtracking: General method **(T2:7.1)**, N-Queens problem **(T1:12.1)**, Sum of subsets problem **(T1:12.1)**, Graph coloring **(T2:7.4)**, Hamiltonian cycles **(T2:7.5)**. **Programme and Bound:** Assignment Problem, Travelling Sales Person problem **(T1:12.2)**, **0/1 Knapsack problem (T2:8.2, T1:12.2):** LC Programme and Bound solution **(T2:8.2)**, FIFO Programme and Bound solution **(T2:8.2)**. **NP-Complete and NP-Hard problems:** Basic concepts, non-	10

deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes **(T2:11.1)**.
RBT: L1, L2, L3

Course Outcomes: The student will be able to :

- Describe computational solution to well known problems like searching, sorting etc.
- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design strategies for problem solving.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education).

MICROCONTROLLER AND EMBEDDED SYSTEMS			
(Effective from the academic year 2018 -2019)			
SEMESTER – IV			
Course Code	**18CS44**	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	03
CREDITS –3			

Course Learning Objectives: This course (18CS44) will enable students to:

- Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.
- Program ARM controller using the various instructions
- Identify the applicability of the embedded system
- Comprehend the real time operating system used for the embedded system

Module 1	Contact Hours
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table , Core Extensions **Text book 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5** **RBT: L1, L2**	08
Module 2	
Introduction to the ARM Instruction Set : Data Processing Instructions , Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants **ARM programming using Assembly language:** Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs **Text book 1: Chapter 3:Sections 3.1 to 3.6 (Excluding 3.5.2), Chapter 6(Sections 6.1 to 6.6)** **RBT: L1, L2**	08
Module 3	
Embedded System Components: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, stepper motor, Keyboard, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components. **Text book 2:Chapter 1(Sections 1.2 to 1.6),Chapter 2(Sections 2.1 to 2.6)** **RBT: L1, L2**	08
Module 4	
Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes ,non-operational quality attributes, Embedded	08

Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling, embedded firmware design and development **Text book 2: Chapter-3, Chapter-4, Chapter-7 (Sections 7.1, 7.2 only), Chapter-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only)** **RBT: L1, L2**	
Module 5	
RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Multiprocessing and Multitasking, Task Communication (without any program), Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques, target hardware debugging, boundary scan. **Text book 2: Chapter-10 (Sections 10.1, 10.2, 10.3, 10.4 , 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Chapter 12, Chapter-13 (block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)** **RBT: L1, L2**	08

Course Outcomes: The student will be able to :
- Describe the architectural features and instructions of ARM microcontroller
- Apply the knowledge gained for Programming ARM for different applications.
- Interface external devices and I/O with ARM microcontroller.
- Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Develop the hardware /software co-design and firmware design approaches.
- Demonstrate the need of real time operating system for embedded system applications

Question Paper Pattern:
- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:
1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.
2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.

Reference Books:
1. Raghunandan..G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication,2019
2. The Insider's Guide to the ARM7 Based Microcontrollers, Hitex Ltd.,1st edition, 2005.
3. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.
4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.

COMPUTER NETWORKS AND SECURITY			
(Effective from the academic year 2018 -2019)			
SEMESTER – V			
Course Code	**18CS52**	**CIE Marks**	40
Number of Contact Hours/Week	3:2:0	**SEE Marks**	60
Total Number of Contact Hours	50	**Exam Hours**	03
CREDITS –4			

Course Learning Objectives: This course (18CS52) will enable students to:

- Demonstration of application layer protocols
- Discuss transport layer services and understand UDP and TCP protocols
- Explain routers, IP and Routing Algorithms in network layer
- Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Illustrate concepts of Multimedia Networking, Security and Network Management

Module 1	Contact Hours
Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables, Socket Programming: creating Network Applications: Socket Programming with UDP, Socket Programming with TCP. **T1: Chap 2** **RBT: L1, L2, L3**	10
Module 2	
Transport Layer : Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control, TCP Congestion Control: Fairness. **T1: Chap 3** **RBT: L1, L2, L3**	10
Module 3	
The Network layer: What's Inside a Router?: Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast. **T1: Chap 4: 4.3-4.7** **RBT: L1, L2, L3**	10

Module 4	
Network Security:Overview of Network Security:Elements of Network Security , Classification of Network Attacks ,Security Methods ,Symmetric-Key Cryptography :Data Encryption Standard (DES),Advanced Encryption Standard (AES) , Public-Key Cryptography :RSA Algorithm ,Diffie-Hellman Key-Exchange Protocol , Authentication :Hash Function , Secure Hash Algorithm (SHA) , Digital Signatures , Firewalls and Packet Filtering ,Packet Filtering , Proxy Server . **Textbook2: Chapter 10** **RBT: L1, L2, L3**	10
Module 5	
Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks Voice-over-IP :Limitations of the Best-Effort IP Service ,Removing Jitter at the Receiver for Audio ,Recovering from Packet Loss Protocols for Real-Time Conversational Applications , RTP , SIP **Textbook11: Chap 7** **RBT: L1, L2, L3**	10

Course Outcomes: The student will be able to :

- Explain principles of application layer protocols
- Recognize transport layer services and infer UDP and TCP protocols
- Classify routers, IP and Routing Algorithms in network layer
- Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Describe Multimedia Networking and Network Management

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .
2. Nader F Mir, Computer and Communication Networks, 2nd Edition, Pearson, 2014.

Reference Books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition
2. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER
3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson
4. Mayank Dave, Computer Networks, Second edition, Cengage Learning

DATABASE MANAGEMENT SYSTEM			
(Effective from the academic year 2018 -2019)			
SEMESTER – V			
Course Code	**18CS53**	**CIE Marks**	40
Number of Contact Hours/Week	3:2:0	**SEE Marks**	60
Total Number of Contact Hours	50	**Exam Hours**	03
CREDITS –4			

Course Learning Objectives: This course (18CS53) will enable students to:

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.

Module 1	Contact Hours
Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. **Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10** **RBT: L1, L2, L3**	10
Module 2	
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping. **SQL:** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. **Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5** **RBT: L1, L2, L3**	10
Module 3	
SQL : Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. **Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. **Internet Applications:** The three-Tier application architecture, The presentation layer, The Middle Tier **Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.** **RBT: L1, L2, L3**	10
Module 4	
Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational	10

Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms **Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6** **RBT: L1, L2, L3**	
Module 5	
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols:** Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures **Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7.** **RBT: L1, L2, L3**	10

Course Outcomes: The student will be able to :

- Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
- Use Structured Query Language (SQL) for database manipulation.
- Design and build simple database systems
- Develop application to interact with databases.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

Reference Books:

1. Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013.
2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

APPLICATION DEVELOPMENT USING PYTHON [(Effective from the academic year 2018 -2019) SEMESTER – V			
Course Code	**18CS55**	**IA Marks**	40
Number of Lecture Hours/Week	03	**Exam Marks**	60
Total Number of Lecture Hours	40	**Exam Hours**	03
CREDITS – 03			

Course Learning Objectives: This course (18CS55) will enable students to

- Learn the syntax and semantics of Python programming language.
- Illustrate the process of structuring the data using lists, tuples and dictionaries.
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object Oriented Programming concepts in Python.
- Appraise the need for working with various documents like Excel, PDF, Word and Others.

Module – 1	Teaching Hours
Python Basics, Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program,**Flow control,** Boolean Values, Comparison Operators, Boolean Operators,Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules,Ending a Program Early with sys.exit(), **Functions,** def Statements with Parameters, Return Values and return Statements,The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number **Textbook 1: Chapters 1 – 3** **RBT: L1, L2**	08
Module – 2	
Lists, The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples,References, **Dictionaries and Structuring Data,** The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, **Manipulating Strings,** Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup **Textbook 1: Chapters 4 – 6** **RBT: L1, L2, L3**	08
Module – 3	
Pattern Matching with Regular Expressions, Finding Patterns of Text Without Regular Expressions, Finding Patterns of Text with Regular Expressions,More Pattern Matching with Regular Expressions, Greedy and Nongreedy Matching, The findall() Method, Character Classes, Making Your Own Character Classes, The Caret and Dollar Sign Characters, The Wildcard Character, Review of Regex Symbols, Case-Insensitive Matching, Substituting Strings with the sub() Method, Managing Complex Regexes, Combining re .IGNORECASE, re .DOTALL, and re .VERBOSE, Project: Phone Number and Email Address Extractor, **Reading and Writing Files,** Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the pprint.pformat() Function, Project: Generating Random Quiz Files, Project: Multiclipboard, **Organizing Files,** The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates,Project: Backing Up a Folder into a ZIP File, **Debugging,** Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE's Debugger. **Textbook 1: Chapters 7 – 10**	08

RBT: L1, L2, L3	
Module – 4	
Classes and objects, Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, **Classes and functions,** Time, Pure functions, Modifiers, Prototyping versus planning, **Classes and methods,** Object-oriented features, Printing objects, Another example, A more complicated example,The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation,**Inheritance,** Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation **Textbook 2: Chapters 15 – 18** **RBT: L1, L2, L3**	08
Module – 5	
Web Scraping, Project: MAPIT.PY with the webbrowser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive, HTML, Parsing HTML with the BeautifulSoup Module, Project: "I'm Feeling Lucky" Google Search,Project: Downloading All XKCD Comics, Controlling the Browser with the selenium Module, **Working with Excel Spreadsheets,** Excel Documents, Installing the openpyxl Module, Reading Excel Documents, Project: Reading Data from a Spreadsheet, Writing Excel Documents, Project: Updating a Spreadsheet, Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns, Charts, **Working with PDF and Word Documents,** PDF Documents, Project: Combining Select Pages from Many PDFs, Word Documents, **Working with CSV files and JSON data,** The csv Module, Project: Removing the Header from CSV Files, JSON and APIs, The json Module, Project: Fetching Current Weather Data **Textbook 1: Chapters 11 – 14** **RBT: L1, L2, L3**	08

Course Outcomes: After studying this course, students will be able to

- Demonstrate proficiency in handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving regular expressions and file system.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Determine the need for scraping websites and working with CSV, JSON and other file formats.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Al Sweigart,**"Automate the Boring Stuff with Python",**1stEdition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/) (Chapters 1 to 18)
2. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above links)

Reference Books:

1. Gowrishankar S, Veena A, **"Introduction to Python Programming",** 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

2. Jake VanderPlas, **"Python Data Science Handbook: Essential Tools for Working with Data"**, 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058
3. Charles Dierbach, **"Introduction to Computer Science Using Python",** 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014
4. Wesley J Chun, **"Core Python Applications Programming",** 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365

WEB TECHNOLOGY AND ITS APPLICATIONS			
(Effective from the academic year 2018 -2019)			
SEMESTER – VI			
Course Code	**18CS63**	**CIE Marks**	40
Number of Contact Hours/Week	3:2:0	**SEE Marks**	60
Total Number of Contact Hours	50	**Exam Hours**	03
CREDITS –4			
Course Learning Objectives: This course (18CS63) will enable students to:			

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Infer Object Oriented Programming capabilities of PHP
- Examine JavaScript frameworks such as jQuery and Backbone

Module 1	**Contact Hours**
Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling. **Textbook 1: Ch. 2, 3** **RBT: L1, L2, L3**	10
Module 2	
HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks. **Textbook 1: Ch. 4,5** **RBT: L1, L2, L3**	10
Module 3	
JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions **Textbook 1: Ch. 6, 8** **RBT: L1, L2, L3**	10
Module 4	
PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling **Textbook 1: Ch. 9, 10** **RBT: L1, L2, L3**	10
Module 5	
Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone	10

MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.
Textbook 1: Ch. 13, 15,17
RBT: L1, L2, L3

Course Outcomes: The student will be able to :

- Adapt HTML and CSS syntax and semantics to build web pages.
- Construct and visually format tables and forms using HTML and CSS
- Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
- Appraise the principles of object oriented development using PHP
- Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Randy Connolly, Ricardo Hoar, **"Fundamentals of Web Development",** 1stEdition, Pearson Education India. (**ISBN:**978-9332575271)

Reference Books:

1. Robin Nixon, **"Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5",** 4thEdition, O'Reilly Publications, 2015. (**ISBN:**978-9352130153)
2. Luke Welling, Laura Thomson, **"PHP and MySQL Web Development",** 5th Edition, Pearson Education, 2016. (**ISBN:**978-9332582736)
3. Nicholas C Zakas, **"Professional JavaScript for Web Developers",** 3rd Edition, Wrox/Wiley India, 2012. (**ISBN:**978-8126535088)
4. David Sawyer Mcfarland, **"JavaScript & jQuery: The Missing Manual",** 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

Mandatory Note:

Distribution of CIE Marks is a follows (Total 40 Marks):

- 20 Marks through IA Tests
- 20 Marks through practical assessmen

Maintain a copy of the report for verification during LIC visit.

Posssible list of practicals:

1. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
2. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
3. Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.
4. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
   a. Parameter: A string
   b. Output: The position in the string of the left-most vowel

    c.   Parameter: A number

    d.   Output: The number with its digits in the reverse order

5. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Programme, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

6. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

7. Write a PHP program to display a digital clock which displays the current time of   the server.

8. Write the PHP programs to do the following:

    a.   Implement simple calculator operations.

    b.   Find the transpose of a matrix.

    c.   Multiplication of two matrices.

    d.   Addition of two matrices.

9. Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:

    a.   Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.

    b.   Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList.

    c.   Search for a word in states that begins with M and ends in s. Store this   word   in element 2 of the list.

    d.   Search for a word in states that ends in a. Store this word in element 3 of the list.

10. Write a PHP program to sort the student records which are stored in the database using selection sort.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(Effective from the academic year 2018 -2019)
SEMESTER – VII

Course Code	18CS71	CIE Marks	40
Number of Contact Hours/Week	4:0:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	03

CREDITS –4

Course Learning Objectives: This course (18CS71) will enable students to:
- Explain Artificial Intelligence and Machine Learning
- Illustrate AI and ML algorithm and their use in appropriate applications

Module 1	Contact Hours
What is artificial intelligence?, Problems, problem spaces and search, Heuristic search techniques **Texbook 1: Chapter 1, 2 and 3** **RBT: L1, L2**	10
Module 2	
Knowledge representation issues, Predicate logic, Representaiton knowledge using rules. Concpet Learning: Concept learning task, Concpet learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm. **Texbook 1: Chapter 4, 5 and 6** **Texbook2: Chapter 2 (2.1-2.5, 2.7)** **RBT: L1, L2, L3**	10
Module 3	
Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorith. Aritificil Nueral Network: Introduction, NN representation, Appropriate problems, Perceptrons, Backpropagation algorithm. **Texbook2: Chapter 3 (3.1-3.4), Chapter 4 (4.1-4.5)** **RBT: L1, L2, L3**	10
Module 4	
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Navie Bayes classifier, BBN, EM Algorithm **Texbook2: Chapter 6** **RBT: L1, L2, L3**	10
Module 5	
Instance-Base Learning: Introduction, k-Nearest Neighbour Learning, Locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning. **Texbook 1: Chapter 8 (8.1-8.5), Chapter 13 (13.1 – 13.3)** **RBT: L1, L2, L3**	10

Course Outcomes: The student will be able to :
- Appaise the theory of Artificial intelligence and Machine Learning.
- Illustrate the working of AI and ML Algorithms.
- Demonstrate the applications of AI and ML.

Question Paper Pattern:
- The question paper will have ten questions.
- Each full Question consisting of 20 marks

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Tom M Mitchell,**"Machine Lerning",**1st Edition, McGraw Hill Education, 2017.
2. Elaine Rich, Kevin K and S B Nair, **"Artificial Inteligence",** 3rd Edition, McGraw Hill Education, 2017.

Reference Books:

1. Saroj Kaushik, Artificial Intelligence, Cengage learning
2. Stuart Rusell, Peter Norving , Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
3. AurÈlienGÈron,"Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
5. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press
6. Srinvivasa K G and Shreedhar, " Artificial Intelligence and Machine Learning", Cengage

BIG DATA AND ANALYTICS				
(Effective from the academic year 2018 -2019)				
SEMESTER – VII				
Course Code	**18CS72**	**CIE Marks**	40	
Number of Contact Hours/Week	4:0:0	**SEE Marks**	60	
Total Number of Contact Hours	50	**Exam Hours**	03	
CREDITS –4				
Course Learning Objectives: This course (18CS72) will enable students to:				
• Understand fundamentals of Big Data analytics • Explore the Hadoop framework and Hadoop Distributed File system • Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data • Employ MapReduce programming model to process the big data • Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.				

Module 1	**Contact Hours**
Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies. **Text book 1: Chapter 1: 1.2 -1.7** **RBT: L1, L2, L3**	10
Module 2	
Introduction to Hadoop (T1): Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. **Hadoop Distributed File System Basics (T2):** HDFS Design Features, Components, HDFS User Commands. **Essential Hadoop Tools (T2):** Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase. **Text book 1: Chapter 2 :2.1-2.6** **Text Book 2: Chapter 3** **Text Book 2: Chapter 7 (except walk throughs)** **RBT: L1, L2, L3**	10
Module 3	
NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases. **Text book 1: Chapter 3: 3.1-3.7** **RBT: L1, L2, L3**	10
Module 4	
MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig. **Text book 1: Chapter 4: 4.1-4.6** **RBT: L1, L2, L3**	10

Module 5	
Machine Learning Algorithms for Big Data Analytics: Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Itemsets and Association Rule Mining. **Text, Web Content, Link, and Social Network Analytics:** Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics: **Text book 1: Chapter 6: 6.1 to 6.5** **Text book 1: Chapter 9: 9.1 to 9.5**	10

Course Outcomes: The student will be able to:

- Understand fundamentals of Big Data analytics.
- Investigate Hadoop framework and Hadoop Distributed File system.
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
- Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
- Use Machine Learning algorithms for real world big data.
- Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Raj Kamal and Preeti Saxena, "**Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning",** McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966
2. Douglas Eadline, **"Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem",** 1st Edition, Pearson Education, 2016. ISBN-13: 978-9332570351

Reference Books:

1. Tom White, "**Hadoop: The Definitive Guide",** 4th Edition, O'Reilly Media, 2015.ISBN-13: 978-9352130672
2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, **"Professional Hadoop Solutions",** 1st Edition, Wrox Press, 2014ISBN-13: 978-8126551071
3. Eric Sammer, **"Hadoop Operations: A Guide for Developers and Administrators",** 1st Edition, O'Reilly Media, 2012.ISBN-13: 978-9350239261
4. Arshdeep Bahga, Vijay Madisetti, **"Big Data Analytics: A Hands-On Approach",** 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577

PYTHON APPLICATION PROGRAMMING				
(OPEN ELECTIVE)				
(Effective from the academic year 2018 -2019)				
SEMESTER – VI				
Course Code	**18CS752**	**IA Marks**	40	
Number of Lecture Hours/Week	3:0:0	**Exam Marks**	60	
Total Number of Lecture Hours	40	**Exam Hours**	03	
CREDITS – 03				

Course Learning Objectives: This course (18CS752) will enable students to

- Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python
- Build Web Services and introduction to Network and Database Programmingin Python.

Module – 1	**Teaching Hours**
Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions **Textbook 1: Chapters 1 – 4** **RBT: L1, L2, L3**	08
Module – 2	
Iteration, Strings, Files **Textbook 1: Chapters 5– 7** **RBT: L1, L2, L3**	08
Module – 3	
Lists, Dictionaries, Tuples, Regular Expressions **Textbook 1: Chapters 8 - 11** **RBT: L1, L2, L3**	08
Module – 4	
Classes and objects, Classes and functions, Classes and methods **Textbook 2: Chapters 15 – 17** **RBT: L1, L2, L3**	08
Module – 5	
Networked programs, Using Web Services, Using databases and SQL **Textbook 1: Chapters 12– 13, 15** **RBT: L1, L2, L3**	08

Course Outcomes: After studying this course, students will be able to

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks

- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:
1. Charles R. Severance, **"Python for Everybody: Exploring Data Using Python 3",** 1st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf)
2. Allen B. Downey, **"Think Python: How to Think Like a Computer Scientist",** 2nd Edition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Download pdf files from the above links)

Reference Books:
1. Charles Dierbach, **"Introduction to Computer Science Using Python",** 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014
2. Gowrishankar S, Veena A, **"Introduction to Python Programming",** 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
3. Mark Lutz, **"Programming Python",** 4th Edition, O'Reilly Media, 2011.ISBN-13: 978-9350232873
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, **"Data Structures and Algorithms in Python",** 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176
5. Reema Thareja, **"Python Programming Using Problem Solving Approach",** Oxford university press, 2017. ISBN-13: 978-0199480173

INTERNET OF THINGS **(Effective from the academic year 2018 -2019)** **SEMESTER – VIII**		
Course Code	**18CS81**	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	03

CREDITS –3

Course Learning Objectives: This course (18CS81) will enable students to:

- Assess the genesis and impact of IoT applications, architectures in real world.
- Illustrate diverse methods of deploying smart objects and connect them to network.
- Compare different Application protocols for IoT.
- Infer the role of Data Analytics and Security in IoT.
- Identifysensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

Module 1	Contact Hours
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack. **Textbook 1: Ch.1, 2** **RBT: L1, L2, L3**	08
Module 2	
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies. **Textbook 1: Ch.3, 4** **RBT: L1, L2, L3**	08
Module 3	
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods. **Textbook 1: Ch.5, 6** **RBT: L1, L2, L3**	08
Module 4	
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment **Textbook 1: Ch.7, 8** **RBT: L1, L2, L3**	08
Module 5	
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT	08

Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples. **Textbook 1: Ch.12** **Textbook 2: Ch.7.1 to 7.4, Ch.8.1 to 8.4, 8.6** **RBT: L1, L2, L3**	

Course Outcomes: The student will be able to :

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,**"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things",** 1stEdition, Pearson Education (Cisco Press Indian Reprint). (**ISBN:** 978-9386873743)
2. Srinivasa K G, **"Internet of Things",**CENGAGE Leaning India, 2017

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, **"Internet of Things (A Hands-on-Approach)",** 1stEdition, VPT, 2014. (**ISBN:** 978-8173719547)
2. Raj Kamal, **"Internet of Things: Architecture and Design Principles",** 1st Edition, McGraw Hill Education, 2017. (**ISBN:** 978-9352605224)

Mandatory Note:

Distribution of CIE Marks is a follows (Total 40 Marks):

- 20 Marks through IA Tests
- 20 Marks through practical assessment

Maintain a copy of the report for verification during LIC visit.

Posssible list of practicals:

1. Transmit a string using UART
2. Point-to-Point communication of two Motes over the radio frequency.
3. Multi-point to single point communication of Motes over the radio frequency.LAN (Sub-netting).
4. I2C protocol study
5. Reading Temperature and Relative Humidity value from the sensor

CONTROL SYSTEMS

Course Code	: **18EC43**	CIE Marks : 40
Lecture Hours/Week : 3		SEE Marks : 60
Total Number of Lecture Hours : 40 (8 Hrs/Module)		Exam Hours: 03
CREDITS – 03		

Course Learning Objectives: This course will enable students to:
* Understand the basic features, configurations and application of control systems.
* Understand various terminologies and definitions for the control systems.
* Learn how to find a mathematical model of electrical, mechanical and electro- mechanical systems.
* Know how to find time response from the transfer function.
* Find the transfer function via Masons' rule.
* Analyze the stability of a system from the transfer function.

Module – 1
Introduction to Control Systems: Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems –Mechanical Systems, Electrical Systems, Electromechanical systems, Analogous Systems.
L1, L2, L3

Module – 2
Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra and Signal Flow graphs.
L1, L2, L3

Module – 3
Time Response of feedback control systems: Standard test signals, Unit step response of First and Second order Systems. Time response specifications, Time response specifications of second order systems, steady state errors and error constants. Introduction to PI, PD and PID Controllers (excluding design). **L1, L2, L3**

Module – 4
Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh stability criterion, Relative stability analysis: more on the Routh stability criterion.
Introduction to Root-Locus Techniques, The root locus concepts, Construction of rootloci.

Frequency domain analysis and stability: Correlation between time and frequency response, Bode Plots, Experimental determination of transfer function.

<div align="right">**L1, L2, L3**</div>

Module – 5

Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, (Systems with transportation lag excluded)

Introduction to lead, lag and lead- lag compensating networks (excluding design).

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

<div align="right">**L1, L2, L3**</div>

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

1. Develop the mathematical model of mechanical and electrical systems.
2. Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method.
3. Determine the time domain specifications for first and second order systems.
4. Determine the stability of a system in the time domain using Routh-Hurwitz criterion and Root-locus technique.
5. Determine the s stability of a system in the frequency domain using Nyquist and bode plots.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Book:

1. J. Nagarath and M. Gopal, "Control Systems Engineering", New Age International(P) Limited, Publishers, Fifth edition- 2005, ISBN: 81 - 224 - 2008-7.

Reference Books:
1. "Modern Control Engineering", K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002. ISBN 978 - 81 - 203 - 4010 - 7.
2. "Automatic Control Systems", Benjamin C. Kuo, John Wiley India Pvt. Ltd., 8th Edition, 2008.
3. "Feedback and Control System," Joseph J Distefano III et. al., Schaum's Outlines, TMH, 2nd Edition 2007.

SIGNALS AND SYSTEMS

Course Code	: **18EC45**	CIE Marks : 40
Lecture Hours/Week : 03		SEE Marks : 60
Total Number of Lecture Hours : 40 (8 Hours / Module)		Exam Hours : 03
CREDITS – 03		

Course Learning Objectives: This course will enable students to:

- Understand the mathematical description of continuous and discrete time signals and systems.
- Analyze the signals in time domain using convolution sum and Integral.
- Classify signals into different categories based on their properties.
- Analyze Linear Time Invariant (LTI) systems in time and transform domains.

Module-1

Introduction and Classification of signals: Definition of signal and systems, communication and control system as examples Classification of signals.

Basic Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shift and time reversal.

Elementary signals/Functions: Exponential, sinusoidal, step,impulse and ramp functions. Expression of triangular, rectangular and other waveforms in terms of elementary signals.,

L1, L2, L3

Module -2

System Classification and properties: Linear-nonlinear, Time variant -invariant, causal-noncausal, static-dynamic, stable-unstable, invertible.

Time domain representation of LTI System: Impulse response, convolution sum, convolution integral. Computation of convolution sum and convolution integral using graphical method for unit step and unit step, unit step and exponential, exponential and exponential, unit step and rectangular, and rectangular and rectangular.

L1, L2, L3

Module-3

LTI system Properties in terms of impulse response: System interconnection, Memory less, Causal, Stable, Invertible and Deconvolution, and step response.

Fourier Representation of Periodic Signals: CTFS properties and basic problems.

L1, L2, L3

Module -4

Fourier Representation of aperiodic Signals: Introduction to Fourier Transform & DTFT, Definition and basic problems.

Properties of Fourier Transform: Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on properties of Fourier Transform.

L1, L2, L3

Module -5

The Z-Transforms: Z transform, properties of the region of convergence, properties of the Z-transform, Inverse Z-transform, Causality and stability, Transform analysis of LTI systems.   **L1, L2, L3**

Course Outcomes: At the end of the course, students will be able to:
1. Analyze the different types of signals and systems.
2. Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems.
3. Evaluate the convolution sum and integral.
4. Represent continuous and discrete signals & systems in frequency domain using Fourier representations.
5. Analyze discrete time signals and systems using Z-transforms.

Question paper pattern:
- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Book:
1. Simon Haykin and Barry Van Veen, "Signals and Systems", 2nd Edition, 2008, Wiley India.   ISBN 9971-51-239-4.

Reference Books:
1. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd edition, Tata McGraw-Hill, 2010, ISBN 978-0-07-070221-9.
2. **Alan V Oppenheim, Alan S Willsky and S Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
3. **H.P Hsu, R. Ranjan,** "Signals and Systems", Schaum's outlines, TMH, 2006.
4. **B. P. Lathi,** "Linear Systems and Signals", Oxford University Press, 2005.
5. **Ganesh Rao and Satish Tunga,** "Signals and Systems", Pearson/ Sanguine.

MICROCONTROLLER

Course Code	: **18EC46**	CIE Marks : 40
Lecture Hours/Week : 03		SEE Marks : 60
Total Number of Lecture Hours : 40 (8 Hours / Module)		Exam Hours:03

CREDITS – 03

Course Learning Objectives: This course will enable students to:

- Understand the difference between a Microprocessor and a Microcontroller and embedded microcontrollers.
- Familiarize the basic architecture of 8051 microcontroller.
- Program 8051microprocessor using Assembly Level Language and C.
- Understand the interrupt system of 8051 and the use of interrupts.
- Understand the operation and use of inbuilt Timers/Counters and Serial port of 8051.
- Interface 8051 to external memory and I/O devices using its I/O ports.

Module-1

8051 Microcontroller: Microprocessor vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

L1, L2

Module -2

8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.

L1, L2

Module-3

8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops.

Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.   **L1, L2, L3**

Module -4

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin. 8051 Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.   **L1, L2, L3**

Module -5

8051 Interrupts and Interfacing Applications: 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming.

L1, L2, L3

Course outcomes: At the end of the course, students will be able to:
1. Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
2. Write 8051 Assembly level programs using 8051 instruction set.
3. Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
4. Write 8051 Assembly language programs to generate square wave on 8051 I/O port pin using interrupt and C Programme to send & receive serial data using 8051 serial port.
5. Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.

Question paper pattern:
- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/ Cengage Learning.

Reference Books:

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

MICROCONTROLLER LABORATORY

Laboratory Code : **18ECL47**	CIE Marks : 40	SEE Marks : 60

Lecture Hours/Week : 02 Hours Tutorial (Instructions) + 02 Hours Laboratory

RBT Levels : L1, L2, L3   Exam Hours : 03

CREDITS 02

Course Learning Objectives: This laboratory course enables students to

- Understand the basics of microcontroller and its applications.
- Have in-depth knowledge of 8051 assembly language programming.
- Understand controlling the devices using C programming.
- The concepts of I/O interfacing for developing real time embedded systems.

Laboratory Experiments
I. PROGRAMMING

1. Data Transfer: Block Move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX.
7. Programs to generate delay, Programs using serial port and on-Chip timer/counter.

II. INTERFACING

1. Interface a simple toggle switch to 8051 and write an ALP to generate an interrupt which switches on an LED (i) continuously as long as switch is on and (ii) only once for a small time when the switch is turned on.
2. Write a C program to (i) transmit and (ii) to receive a set of characters serially by interfacing 8051 to a terminal.
3. Write ALPs to generate waveforms using ADC interface.
4. Write ALP to interface an LCD display and to display a message on it.
5. Write ALP to interface a Stepper Motor to 8051 to rotate the motor.
6. Write ALP to interface ADC-0804 and convert an analog input connected to it.

Course Outcomes: On the completion of this laboratory course, the students will be able to:
1. Enhance programming skills using Assembly language and C.
2. Write Assembly language programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051.
3. Interface different input and output devices to 8051 and control them using Assembly language programs.
4. Interface the serial devices to 8051 and do the serial transfer using C programming.
5. Develop applications based on Microcontroller 8051.

Conduct of Practical Examination:
- All laboratory experiments are to be included for practical examination.
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

DIGITAL SIGNAL PROCESSING

Course Code : **18EC52**	CIE Marks : 40
Lecture Hours/Week : 03 + 2 (Tutorial)	SEE marks : 60
Total Number of Lecture Hours : 50 (10 Hrs / Module)	Exam Hours : 03

CREDITS : 04

Course Learning Objectives: This course will enable students to
- Understand the frequency domain sampling and reconstruction of discrete time signals.
- Study the properties and the development of efficient algorithms for the computation of DFT.
- Realization of FIR and IIR filters in different structural forms.
- Learn the procedures to design of IIR filters from the analog filters using impulse invariance and bilinear transformation.
- Study the different windows used in the design of FIR filters and design appropriate filters based on the specifications.
- Understand the architecture and working of DSP processor

Module-1

Discrete Fourier Transforms (DFT): Frequency domain sampling and Reconstruction of Discrete Time Signals, The Discrete Fourier Transform, DFT as a linear transformation, Properties of the DFT: Periodicity, Linearity and Symmetry properties, Multiplication of two DFTs and Circular Convolution, Additional DFT properties.
[Text 1],   **L1,L2,L3**

Module-2

Linear filtering methods based on the DFT: Use of DFT in Linear Filtering, Filtering of Long data Sequences.
Fast-Fourier-Transform (FFT) algorithms: Efficient Computation of the DFT: Radix-2 FFT algorithms for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms.
[Text 1],   **L1,L2, L3**

Module-3

Design of FIR Filters: Characteristics of practical frequency –selective filters, Symmetric and Antisymmetric FIR filters, Design of Linear-phase FIR filters using windows - Rectangular, Hamming, Hanning, Bartlett windows. Design of FIR filters using frequency sampling method. Structure for FIR Systems: Direct form, Cascade form and Lattice structures**.
[Text1],   **L1, L2, L3**

IIR Filter Design: Infinite Impulse response Filter Format, Bilinear Transformation Design Method, Analog Filters using Lowpass prototype transformation, Normalized Butterworth Functions, Bilinear Transformation and Frequency Warping, Bilinear Transformation Design Procedure, Digital Butterworth Filter Design using BLT. Realization of IIR Filters in Direct form I and II.

[Text 2],   **L1,L2,L3**

Module-5

Digital Signal Processors: DSP Architecture, DSP Hardware Units, Fixed point format, Floating point Format, IEEE Floating point formats, Fixed point digital signal processors, Floating point processors, FIR and IIR filter implementations in Fixed point systems**.**

[Text 2],   **L1, L2, L3**

Course Outcomes: After studying this course, students will be able to:
1.   Determine response of LTI systems using time domain and DFT techniques.
2.   Compute DFT of real and complex discrete time signals.
3.   Compute DFT using FFT algorithms and linear filtering approach.
4.   Design and realize FIR and IIR digital filters.
5.   Understand the DSP processor architecture.

Question paper pattern:
- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60

Text Book:
1.   Proakis & Manolakis, "Digital Signal Processing – Principles Algorithms & Applications", 4th Edition, Pearson education, New Delhi, 2007. ISBN: 81-317-1000-9.
2.   Li Tan, Jean Jiang, "Digital Signal processing – Fundamentals and Applications", Academic Press, 2013, ISBN: 978-0-12-415893.

Reference Books:

1.   Sanjit K Mitra, "Digital Signal Processing, A Computer Based Approach", 4th Edition, McGraw Hill Education, 2013,
2.   Oppenheim & Schaffer, "Discrete Time Signal Processing" , PHI, 2003.
3.   D.Ganesh Rao and Vineeth P Gejji, "Digital Signal Processing" Cengage India Private Limited, 2017, ISBN: 9386858231

PRINCIPLES OF COMMUNICATION SYSTEMS

Course Code	: **18EC53**	CIE Marks : 40
Lecture Hours/Week : 03 + 2 (Tutorial)		SEE marks : 60
Total Number of Lecture Hours : 50 (10 Hrs / Module)		Exam Hours : 03
CREDITS : 04		

Course Learning Objectives: This course will enable students to
- Understand and analyse concepts of Analog Modulation schemes viz; AM, FM, Low pass sampling and Quantization as a random process.
- Understand and analyse concepts digitization of signals viz; sampling, quantizing and encoding.
- Evolve the concept of SNR in the presence of channel induced noise and study Demodulation of analog modulated signals.
- Evolve the concept of quantization noise for sampled and encoded signals and study the concepts of reconstruction from these samples at a receiver.

Module-1
AMPLITUDE MODULATION: Introduction, Amplitude Modulation: Time & Frequency Domain description, Switching modulator, Envelop detector. **(3.1 – 3.2 in Text)**

DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION: Time and Frequency Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing. **(3.3 – 3.4 in Text)**

SINGLE SIDE–BAND AND VESTIGIAL SIDEBAND METHODS OF MODULATION: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing,Theme Example: VSB Transmission of Analog and Digital Television. **(3.5 – 3.8 in Text)**

L1, L2, L3

Module-2
ANGLE MODULATION: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Superheterodyne Receiver **(4.1 – 4.6 of Text)**

L1, L2, L3

Module-3

[Review of Mean, Correlation and Covariance functions of Random Processes. (No questions to be set on these topics)]

NOISE - Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth **(5.10 in Text)**

NOISE IN ANALOG MODULATION: Introduction, Receiver Model, Noise in DSB-SC receivers. Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM **(6.1 – 6.6 in Text)**

L1,L2,L3

Module-4

SAMPLING AND QUANTIZATION: Introduction, Why Digitize Analog Sources?, The Low pass Sampling process Pulse Amplitude Modulation. Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves.**(7.1 – 7.7 in Text)**

L1,L2,L3

Module-5

SAMPLING AND QUANTIZATION (Contd): The Quantization Random Process, Quantization Noise, Pulse–Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing; Delta Modulation **(7.8 – 7.10 in Text)**,

Application examples - (a) Video + MPEG **(7.11 in Text)** and (b) Vocoders **(refer Section 6.8 of Reference Book 1)**.

L1,L2,L3

Course Outcomes: After studying this course, students will be able to:
1. Analyze and compute performance of AM and FM modulation in the presence of noise at the receiver.
2. Analyze and compute performance of digital formatting processes with quantization noise.
3. Multiplex digitally formatted signals at Transmitter.
4. Demultiplex the signals and reconstruct digitally formatted signals at the receiver.
5. Design /Demonstrate the use of digital formatting in Multiplexers, Vocoders and Video transmission.

Question paper pattern:
- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.

- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Book:
1.   "Communication Systems", Simon Haykin & Moher, 5th Edition, John Wiley, India Pvt. Ltd, 2010, ISBN 978 – 81 – 265 – 2151 – 7.

Reference Books:
1.   Modern Digital and Analog Communication Systems, B. P. Lathi, Oxford University Press, 4th edition.
2.   An Introduction to Analog and Digital Communication, Simon Haykin, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5.
3.   Principles of Communication Systems, H.Taub & D.L.Schilling, TMH, 2011.
4.   Communication Systems, Harold P.E, Samy A. Mahmoud, Lee Elliott Stern, Pearson Edition, 2004.

DIGITAL SIGNAL PROCESSING LABORATORY

Course Code : **18ECL57**	CIE Marks : 40	SEE Marks : 60

Lecture Hours/Week: 02 Hours Tutorial (Instructions) + 02 Hours Laboratory

RBT Level : L1, L2, L3   Exam Hours : 03

CREDITS – 02

Course Learning Objectives: This course will enable students to
- Simulate discrete time signals and verification of sampling theorem.
- Compute the DFT for a discrete signal and verification of its properties using MATLAB.
- Find solution to the difference equations and computation of convolution and correlation along with the verification of properties.
- Compute and display the filtering operations and compare with the theoretical values.
- Implement the DSP computations on DSP hardware and verify the result.

Laboratory Experiments

Following Experiments to be done using MATLAB / SCILAB / OCTAVE or equivalent:

1. Verification of sampling theorem (use interpolation function).

2. Linear and circular convolution of two given sequences, Commutative, distributive and associative property of convolution.

3. Auto and cross correlation of two sequences and verification of their properties

4. Solving a given difference equation.

5. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum (using DFT equation and verify it by built-in routine).

6. (i) Verification of DFT properties (like Linearity and Parseval's theorem, etc.)
   (ii) DFT computation of square pulse and Sinc function etc.

7.   Design and implementation of Low pass and High pass FIR filter to meet the desired specifications (using different window techniques) and test the filter with an audio file. Plot the spectrum of audio signal before and after filtering.

8.   Design and implementation of a digital IIR filter (Low pass and High pass) to meet given specifications and test with an audio file. Plot the spectrum of audio signal before and after filtering.

Following Experiments to be done using DSP kit
9.   Obtain the Linear convolution of two sequences.
10.   Compute Circular convolution of two sequences.
11.   Compute the N-point DFT of a given sequence.
12.   Determine the Impulse response of first order and second order system.
13.   Generation of sine wave and standard test signals

Course Outcomes:
On the completion of this laboratory course, the students will be able to:
1.   Understand the concepts of analog to digital conversion of signals and frequency domain sampling of signals.
2.   Model the discrete time signals and systems and verify its properties and results.
3.   Implement discrete computations using DSP processor and verify the results.
4.   Realize the digital filters using a simulation tool and analyze the response of the filter for an audio signal.
5.   Write programs using Matlab / Scilab/Octave to illustrate DSP concepts.

Conduct of Practical Examination:
1.   All laboratory experiments are to be included for practical examination.
2.   Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
3.   Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.

Reference Books:
1.   Vinay K Ingle, John G Proakis, Digital Signal Processing using MATLAB, Fourth Edition, Cengage India Private Limited, 2017.

B. E. 2018 Scheme Sixth Semester Syllabus (EC)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER – VI
DIGITAL COMMUNICATION

Course Code	: 18EC61	CIE Marks : 40
Lecture Hours/Week	: 03 + 2 (Tutorial)	SEE marks : 60
Total Number of Lecture Hours : 50 (10 Hrs / Module)		Exam Hours : 03
CREDITS : 04		

Course Learning Objectives: This course will enable students to:
- Understand the mathematical representation of signal, symbol, and noise.
- Understand the concept of signal processing of digital data and signal conversion to symbols at the transmitter and receiver.
- Compute performance metrics and parameters for symbol processing and recovery in ideal and corrupted channel conditions.
- Compute performance parameters and mitigate channel induced impediments in corrupted channel conditions.

Module-1
Bandpass Signal to Equivalent Low pass: Hilbert Transform, Pre-envelopes, Complex envelopes, Canonical representation of bandpass signals, Complex low pass representation of bandpass systems, Complex representation of band pass signals and systems **(Text 1: 2.8, 2.9, 2.10, 2.11, 2.12, 2.13).**

Line codes: Unipolar, Polar, Bipolar (AMI) and Manchester code and their power spectral densities **(Text 1: Ch 6.10).**
Overview of HDB3, B3ZS, B6ZS **(Ref. 1: 7.2)**

L1,L2,L3

Module-2
Signaling over AWGN Channels- Introduction, Geometric representation of signals, Gram-Schmidt Orthogonalization procedure, Conversion of the continuous AWGN channel into a vector channel, Optimum receivers using coherent detection: ML Decoding, Correlation receiver, matched filter receiver **(Text 1: 7.1, 7.2, 7.3, 7.4).**

L1,L2,L3

Module – 3
Digital Modulation Techniques: Phase shift Keying techniques using coherent detection: generation, detection and error probabilities of BPSK and QPSK, M–ary PSK, M–ary QAM **(Relevant topics in Text 1 of 7.6, 7.7).**

Frequency shift keying techniques using Coherent detection: BFSK generation, detection and error probability **(Relevant topics in Text 1 of 7.8).**
Non coherent orthogonal modulation techniques: BFSK, DPSK Symbol representation, Block diagrams treatment of Transmitter and Receiver, Probability of error (without derivation of probability of error equation) **(Text 1: 7.11, 7.12. 7.13).**

<div align="right">

L1,L2,L3

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Module-4

Communication through Band Limited Channels: Digital Transmission through Band limited channels: Digital PAM Transmission through Band limited Channels, Signal design for Band limited Channels: Design of band limited signals for zero ISI–The Nyquist Criterion (statement only), Design of band limited signals with controlled ISI-Partial Response signals, Probability of error for detection of Digital PAM: Probability of error for detection of Digital PAM with Zero ISI, Symbol–by–Symbol detection of data with controlled ISI **(Text 2: 9.1, 9.2, 9.3.1, 9.3.2).**
Channel Equalization: Linear Equalizers (ZFE, MMSE), **(Text 2: 9.4.2).**

<div align="right">

L1,L2,L3

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Module-5

Principles of Spread Spectrum: Spread Spectrum Communication Systems: Model of a Spread Spectrum Digital Communication System, Direct Sequence Spread Spectrum Systems, Effect of De-spreading on a narrowband Interference, Probability of error (statement only), Some applications of DS Spread Spectrum Signals, Generation of PN Sequences, Frequency Hopped Spread Spectrum, CDMA based on IS-95 **(Text 2: 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.4.2).**

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L1,L2,L3

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Course Outcomes: At the end of the course, the students will be able to:
1. Associate and apply the concepts of Bandpass sampling to well specified signals and channels.
2. Analyze and compute performance parameters and transfer rates for low pass and bandpass symbol under ideal and corrupted non band limited channels.
3. Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels.

4. Demonstrate that bandpass signals subjected to corruption and distortion in a bandlimited channel can be processed at the receiver to meet specified performance criteria.
5. Understand the principles of spread spectrum communications.

Question paper pattern:
- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:
1. Simon Haykin, "Digital Communication Systems", John Wiley & sons, First Edition, 2014, ISBN 978-0-471-64735-5.
2. John G Proakis and Masoud Salehi, "Fundamentals of Communication Systems", 2014 Edition, Pearson Education, ISBN 978-8-131-70573-5.

Reference Books:
1. B.P.Lathi and Zhi Ding, "Modern Digital and Analog communication Systems", Oxford University Press, 4th Edition, 2010, ISBN: 978-0-198-07380-2.
2. Ian A Glover and Peter M Grant, "Digital Communications", Pearson Education, Third Edition, 2010, ISBN 978-0-273-71830-7.
3. Bernard Sklar and Ray, "Digital Communications - Fundamentals and Applications", Pearson Education, Third Edition, 2014, ISBN: 978-81-317-2092-9.

EMBEDDED SYSTEMS

Course Code	: 18EC62	CIE Marks : 40
Lecture Hours/Week	: 03 + 2 (Tutorial)	SEE marks : 60
Total Number of Lecture Hours : 50 (10 Hrs / Module)		Exam Hours : 03
CREDITS : 04		

Course Learning Objectives: This course will enable students to:
- Explain the architectural features and instructions of 32 bit microcontroller -ARM Cortex M3.
- Develop Programs using the various instructions of ARM Cortex M3 and C language for different applications.
- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Develop the hardware software co-design and firmware design approaches.
- Explain the need of real time operating system for embedded system applications.

Module 1
ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, Debugging support, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence **(Text 1: Ch-1, 2, 3)**

L1,L2

Module 2
ARM Cortex M3 Instruction Sets and Programming: Assembly basics, Instruction list and description, Thumb and ARM instructions, Special instructions, Useful instructions, CMSIS, Assembly and C language Programming **(Text 1: Ch-4, Ch-10.1 to 10.6)**

L1,L2,L3

Module 3
Embedded System Components: Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Elements of an Embedded System (Block diagram and explanation),
Differences between RISC and CISC, Harvard and Princeton, Big and Little Endian formats, Memory (ROM and RAM types), Sensors, Actuators, Optocoupler, Communication Interfaces (I2C, SPI, IrDA, Bluetooth, Wi-Fi, Zigbee only)

(Text 2: All the Topics from Ch-1 and Ch-2 (Fig and explanation before 2.1) 2.1.1.6 to 2.1.1.8, 2.2 to 2.2.2.3, 2.3 to 2.3.2, 2.3.3.3, selected topics of 2.4.1 and 2.4.2 only).

<div align="right">L1, L2</div>

Module 4

Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational and non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modeling (excluding UML), Embedded firmware design and development (excluding C language). **Text 2: Ch-3, Ch-4 (4.1, 4.2.1 and 4.2.2 only), Ch-7 (Sections 7.1, 7.2 only), Ch-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only)**

<div align="right">L1,L2,L3</div>

Module 5

RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Preemptive Task scheduling techniques, Task Communication, Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques **(Text 2: Ch-10 (Sections 10.1, 10.2, 10.3, 10.5.2 , 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Ch-12, Ch-13 (a block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)**

<div align="right">L1,L2,L3</div>

Course Outcomes: After studying this course, students will be able to:
1.   Describe the architectural features and instructions of 32 bit microcontroller ARM Cortex M3.
2.   Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
3.   Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
4.   Develop the hardware software co-design and firmware design approaches.
5.   Explain the need of real time operating system for embedded system applications.

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Question paper pattern:
- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:
1. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd Edition, Newnes, (Elsevier), 2010.
2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, 2nd Edition.

Reference Books:
1. James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008, ISBN: 978-0-471-72180-2.
2. Yifeng Zhu, "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", 2nd Ed. Man Press LLC ©2015 ISBN: 0982692633 9780982692639.
3. K.V. K. K Prasad, Embedded Real Time Systems, Dreamtech publications, 2003.
4. Rajkamal, Embedded Systems, 2nd Edition, McGraw hill Publications, 2010.

EMBEDDED SYSTEMS LABORATORY

Course Code : **18ECL66**	CIE Marks : 40	SEE Marks : 60

Lecture Hours/Week: 02 Hours Tutorial (Instructions) + 02 Hours Laboratory

RBT Level : L1, L2, L3	Exam Hours : 03

CREDITS– 02

Course Learning Objectives: This course will enable students to:

- Understand the instruction set of ARM Cortex M3, a 32 bit microcontroller and the software tool required for programming in Assembly and C language.
- Program ARM Cortex M3 using the various instructions in assembly level language for different applications.
- Interface external devices and I/O with ARM Cortex M3.
- Develop C language programs and library functions for embedded system applications.

Laboratory Experiments

Conduct the following experiments on an ARM CORTEX M3 evaluation board to learn ALP and using evaluation version of Embedded 'C' & Keil uVision-4 tool/compiler.

PART A:

1. ALP to multiply two 16 bit binary numbers.
2. ALP to find the sum of first 10 integer numbers.
3. ALP to find the number of 0's and 1's in a 32 bit data
4. ALP to find determine whether the given 16 bit is even or odd
5. ALP to write data to RAM

PART B:

6. Display "Hello world" message using internal UART
7. Interface and Control the speed of a DC Motor.
8. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
9. Interface a DAC and generate Triangular and Square waveforms.
10. Interface a 4x4 keyboard and display the key code on an LCD.
11. Demonstrate the use of an external interrupt to toggle an LED On/Off.
12. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay.
13. Measure Ambient temperature using a sensor and SPI ADC IC.

Course outcomes: After studying this course, students will be able to:

1. Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
2. Develop assembly language programs using ARM Cortex M3 for different applications.
3. Interface external devices and I/O with ARM Cortex M3.
4. Develop C language programs and library functions for embedded system applications.
5. Analyze the functions of various peripherals, peripheral registers and power saving modes of ARM Cortex M3

Conduction of Practical Examination:

- One Question from PART A and one Question from PART B to be asked in the examination.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - IV

ELECTRIC MOTORS

Course Code	**18EE44**	CIE Marks	40
Number of Lecture Hours/Week	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:
- To study the constructional features of Motors and select a suitable drive for specific application.
- To study the constructional features of Three Phase and Single phase induction Motors.
- To study different test to be conducted for the assessment of the performance characteristics of motors.
- To study the speed control of motor by a different methods.
- Explain the construction and operation of Synchronous motor and special motors. ∎

Module-1

DC Motors: Classification, Back emf, Torque equation, and significance of back emf, Characteristics of shunt, series & compound motors. Speed control of shunt, series and compound motors. Application of motors. DC motor starters – 3 point and 4 point.
Losses and Efficiency- Losses in DC motors, power flow diagram, efficiency, condition for maximum efficiency. ∎

Module-2

Testing of DC Motors: Direct & indirect methods of testing of DC motors-Brake test, Swinburne's test, Retardation test, Hopkinson's test, Field's test, merits and demerits of tests.
Three Phase Induction Motors: Review of concept and generation of rotating magnetic field, Principle of operation, construction, classification and types; squirrel-cage, slip-ring (No question shall be set from the review portion). Slip, Torque equation, torque-slip characteristic covering motoring, generating and braking regions of operation, Maximum torque, significance of slip. ∎

Module-3

Performance of Three-Phase Induction Motor: Phasor diagram of induction motor on no-load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the circle diagram and equivalent circuit. Cogging and crawling. High torque rotors-double cage and deep rotor bars. Equivalent circuit and performance evaluation of double cage induction motor. Induction motor working as induction generator.∎

Module-4

Starting and Speed Control of Three-Phase Induction Motors: Need for starter. Direct on line, Star-Delta and autotransformer starting. Rotor resistance starting. Speed control by voltage,frequency, and rotor resistance methods
Single-Phase Induction Motor: Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors. Comparison of single phase motors and applications. ∎

Module-5

Synchronous Motor: Principle of operation, phasor diagrams, torque and torque angle, Blondel diagram, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condenser, hunting and damping. Methods of starting synchronous motors.
Other Motors: Construction and operation of Universal motor, AC servomotor, Linear induction motor and stepper motors. ∎

Course Outcomes: At the end of the course the student will be able to:
- Explain the construction, operation and classification of DC Motor, AC motor and Special purpose motors.
- Describe the performance characteristics & applications of Electric motors.
- Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.
- Control the speed of DC motor and induction motor.
- Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors. ∎

Question paper pattern:
- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1	Electric Machines	D. P. Kothari, I. J. Nagrath	McGraw Hill	4th edition, 2011
2	Theory of Alternating Current Machines	Alexander Langsdorf	McGraw Hill	2nd Edition, 2001
3	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2nd Edition, 2013

Reference Books:

1	Electrical Machines, Drives and Power systems	Theodore Wildi	Pearson	6th Edition, 2014
2	Electrical Machines	M.V. Deshpande	PHI Learning	2013
3	Electric Machinery and Transformers	Bhag S Guru at el	Oxford University Press	3rd Edition, 2012
4	Electric Machinery and Transformers	Irving Kosow	Pearson	2rd Edition, 2012
5	Principles of Electric Machines and	P.C.Sen	Wiley	2nd Edition, 2013
6	Electric Machines	R.K. Srivastava	Cengage Learning	2nd Edition,2013

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V

MICROCONTROLLER				
Course Code	**18EE52**	CIE Marks	40	
Number of Lecture Hours/Week (L:T:P)	3:2:0	SEE Marks	60	
Credits	04	Exam Hours	03	

Course Learning Objectives:
- To explain the internal organization and working of Computers, microcontrollers and embedded processors.
- Compare and contrast the various members of the 8051 family.
- To explain the registers of the 8051 microcontroller, manipulation of data using registers and MOV instructions.
- To explain in detail the execution of 8051 Assembly language instructions and data types
- To explain loop, conditional and unconditional jump and call, handling and manipulation of I/O instructions.
- To explain different addressing modes of 8051, arithmetic, logic instructions, and programs.
- To explain develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic,

Module-1

8051 Microcontroller Basics: Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM.8051 Addressing Modes. ▪

Module-2

Assembly Programming and Instruction of 8051: Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming. ▪

Module-3

8051 Programming in C: Data types and time delay in 8051C, IO programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C, Accessing code ROM space in 8051C, Data serialization using 8051C
8051 Timer Programming in Assembly and C: Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C. ▪

Module-4

8051 Serial Port Programming in Assembly and C: Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in assembly, serial port programming in 8051 C.
8051 Interrupt Programming in Assembly and C: 8051 interrupts, Programming timer, external hardware, serial communication interrupt, Interrupt priority in 8051/52, Interrupt programming in C. ▪

Module-5

Interfacing: LCD interfacing, Keyboard interfacing.
ADC, DAC and Sensor Interfacing: ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.
Motor Control: Relay, PWM, DC and Stepper Motor: Relays and opt isolators, stepper motor interfacing, DC motor interfacing and PWM.
8051 Interfacing with 8255: Programming the 8255, 8255 interfacing, C programming for 8255. ▪

Course Outcomes: At the end of the course the student will be able to:
- Outline the 8051 architecture, registers, internal memory organization, addressing modes.
- Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.
- Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counter programming.
- Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data communication and interrupt programming.
- Program 8051 to work with external devices for ADC, DAC, Stepper motor control, DC motor control, Elevator control. ▪

Question paper pattern:
- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module. ■

Text Book

1	The 8051 Microcontroller and Embedded Systems Using Assembly and C	Muhammad Ali Mazadi	Pearson	2nd Edition, 2008.

Reference Books

1	The 8051 Microcontroller	Kenneth Ayala	Cengage Learning	3rd Edition, 2005
2	The 8051 Microcontroller and Embedded Systems	Manish K Patel	McGraw Hill	2014
3	Microcontrollers: Architecture, Programming, Interfacing and System Design	Raj Kamal	Pearson	1st Edition, 2012

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - V
POWER ELECTRONICS

Course Code	**18EE53**	CIE Marks	40
Number of Lecture Hours/Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives:
- To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics.
- To explain power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
- To explain the techniques for design and analysis of single phase diode rectifier circuits.
- To explain different power transistors, their steady state and switching characteristics andimitations.
- To explain different types of Thyristors, their gate characteristics and gate control requirements.
- To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers.

Module-1

Introduction: Applications of Power Electronics, Types of Power Electronic Circuits, Peripheral Effects, Characteristics and Specifications of Switches.
Power Diodes: Introduction, Diode Characteristics, Reverse Recovery Characteristics, Power Diode Types, Silicon Carbide Diodes, Silicon Carbide Schottky Diodes, Freewheeling diodes ,Freewheeling diodes with RL load.
Diode Rectifiers: Introduction, Diode Circuits with DC Source connected to R and RL load, Single-Phase Full-Wave Rectifiers with R load , Single-Phase Full-Wave Rectifier with RL Load . ■ **T1 & R1**

Module-2

Power Transistors: Introduction, Power MOSFETs – Steady State Characteristics, Switching Characteristics Bipolar Junction Transistors – Steady State Characteristics, Switching Characteristics, Switching Limits, IGBTs, MOSFET Gate Drive, BJT Base Drive, Isolation of Gate and Base Drives, Pulse transformers and Opto-couplers.■ **T1**

Module-3

Thyristors: Introduction, Thyristor Characteristics, Two-Transistor Model of Thyristor, Thyristor Turn-On, Thyristor Turn-Off, A brief study on Thyristor Types, Series Operation of Thyristors, Parallel Operation of Thyristors, *di/dt*Protection, *dv/dt*Protection, DIACs, Thyristor Firing Circuits, Unijunction Transistor.■ **T1**

Module-4

Controlled Rectifiers: Introduction, Single phase half wave circuit with RL Load, Single phase half wave circuit with RL Load and Freewheeling Diode, Single phase half wave circuit with RLE Load, Single-Phase Full Converters with RLE Load, Single-Phase Dual Converters, Principle of operation of Three- Phase duel Converters.
AC Voltage Controllers: Introduction, Principle of phase control & Integral cycle control, Single-Phase Full-Wave Controllers with Resistive Loads, Single- Phase Full-Wave Controllers with Inductive Loads, Three-Phase Full-Wave Controllers. ■ **T1 & R1**

Module-5

DC-DC Converters: Introduction, principle of step down and step up chopper with RL load, performance parameters, DC-DC converter classification**.**
DC-AC Converters: Introduction, principle of operation single phase bridge inverters, three phase bridge inverters, voltage control of single phase inverters, Harmonic reductions, Current source inverters.■ **T1**

Course Outcomes: At the end of the course the student will be able to:
- To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics, power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
- To explain the techniques for design and analysis of single phase diode rectifier circuits.
- To explain different power transistors, their steady state and switching characteristics and limitations.
- To explain different types of Thyristors, their gate characteristics and gate control requirements.
- To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers. ■

Question paper pattern:
- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Text Book				
1	Power Electronics: Circuits Devices and Applications	Mohammad H Rashid,	Pearson	4th Edition, 2014

Reference Books				
1	Power Electronics	P.S. Bimbhra	Khanna Publishers	5th Edition, 2012
2	Power Electronics: Converters, Applications	Ned Mohan et al	Wiley	3rd Edition, 2014
3	Power Electronics	Daniel W Hart	McGraw Hill	1st Edition, 2011
4	Elements of Power Electronics	Philip T Krein	Oxford	Indian Edition, 2008

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - III			
COMPUTER AIDED MACHINE DRAWING			
Course Code	**18ME36A/46A**	CIE Marks	40
Teaching Hours/Week (L:T:P)	1:4:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:
- To acquire the knowledge of CAD software and its features.
- To familiarize the students with Indian Standards on drawing practices.
- To impart knowledge of thread forms, fasteners, keys, joints and couplings.
- To make the students understand and interpret drawings of machine components leading to preparation of assembly drawings manually and using CAD packages.
- To acquire the knowledge of limits, tolerance and fits and indicate them on machine drawings.

Part A

Part A

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap. Conversion of pictorial views into orthographic projections of simple machine parts (with and without section). Hidden line conventions. Precedence of lines.

Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.

Conversion of pictorial views into orthographic projections of simple machine parts. Hidden line conventions. Precedence of lines.

Conversion of pictorial views into orthographic projections of simple machine parts (with section planes indicated on the part).

Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External), BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.

Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

Part B

Keys: Parallel key, Taper key, Feather key, Gib-head key and Woodruff key.
Joints: Cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.
Couplings: Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, and universal coupling (Hooks' Joint).

Part C

Limits, Fits and Tolerances: Introduction, Fundamental tolerances, Deviations, Methods of placing limit dimensions, machining symbols, types of fits with symbols and applications, geometrical tolerances on drawings. Standards followed in industry.

Assembly Drawings: (Part drawings shall be given)
1. Plummer block (Pedestal Bearing)
2. Lever Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool head of shaper

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

    CO1: Identify the national and international standards pertaining to machine drawing.

    CO2: Understand the importance of the linking functional and visualization aspects in the preparation of the part drawings

    CO3: Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies.

    CO4: Interpret the Machining and surface finish symbols on the component drawings.

    CO5: Preparation of the part or assembly drawings as per the conventions.

Scheme of Examination: Two questions to be set from each Part A, part B and Part C. Student has to answer one question each from Part A and Part B for 25 marks each and one question from Part C for 50 marks.

INSTRUCTION FOR COMPUTER AIDED MACHINE DRAWING (15ME36A/46A) EXAMINATION

1. No restriction of timing for sketching/ computerization of solutions. The total duration is 3 hours.
2. It is desirable to do sketching of all the solutions before computerization.
3. Drawing instruments may be used for sketching.
4. For Part A and Part B, 2D drafting environment should be used.
5. For Part C, 3D environment should be used for parts and assembly, and extract 2D views of assembly.
6. Part A and Part B
    25 Marks (15 marks for sketching and 10 marks for computer work)
7. Part C
    50 Marks (20 marks for sketching and 30 marks for computer modelling)

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Machine Drawing	K.R. Gopala Krishna	Subhash Publication	2005
2	Machine Drawing	N.D.Bhat&V.M. Panchal	Charoratar publishing house	2005
Reference Books				
3	A Text Book of Computer Aided Machine Drawing	S. Trymbaka Murthy	CBS Publishers, New Delhi	2007
4	Engineering drawing	P.S.Gill	S K Kataria and Sons	2013
5	Machine Drawing	N. Siddeshwar, P. Kanniah, V.V.S. Sastri	Tata McGraw Hill	2006

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER – III			
MATERIAL TESTING LAB			
Course Code	**18MEL37A/47A**	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	02	Exam Hours	03

Course Learning Objectives:
- To learn the concept of the preparation of samples to perform characterization such as microstructure, volume fraction of phases and grain size.
- To understand mechanical behaviour of various engineering materials by conducting standard tests.
- To learn material failure modes and the different loads causing failure.
- To learn the concepts of improving the mechanical properties of materials by different methods like heat treatment, surface treatment etc.

Sl. No.	Experiments
	PART A
1	Preparation of specimen for Metallographic examination of different engineering materials. To report microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2	Heat treatment: Annealing, normalizing, hardening and tempering of steel. Metallographic specimens of heat treated components to be supplied and students should report microstructures of furnace cooled, water cooled, air cooled, tempered steel. Students should be able to distinguish the phase changes in a heat treated specimen compared to untreated specimen.
3	Brinell, Rockwell and Vickers's Hardness tests on untreated and heat treated specimens.
4	To study the defects of Cast and Welded components using Non-destructive tests like: a) Ultrasonic flaw detection b) Magnetic crack detection c) Dye penetration testing.
	PART B
5	Tensile, shear and compression tests of steel, aluminum and cast iron specimens using Universal Testing Machine
6	Torsion Test on steel bar.
7	Bending Test on steel and wood specimens.
8	Izod and Charpy Tests on Mild steel and C.I Specimen.
9	To study the wear characteristics of ferrous and non-ferrous materials under different parameters.
10	Tensile, shear and compression tests of steel, aluminum and cast iron specimens using Universal Testing Machine
11	Fatigue Test (demonstration only).

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

CO1: Acquire experimentation skills in the field of material testing.

CO2: Develop theoretical understanding of the mechanical properties of materials by performing experiments.

CO3: Apply the knowledge to analyse a material failure and determine the failure inducing agent/s.

CO4: Apply the knowledge of testing methods in related areas.

CO5: Understand how to improve structure/behaviour of materials for various industrial applications.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.

2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.

3. Students can pick one experiment from the questions lot prepared by the examiners.

Scheme of Examination:

ONE question from part -A: 30 Marks

ONE question from part -B: 50 Marks

Viva -Voice: 20 Marks

Total: 100 Marks

B. E. MECHANICAL ENGINEERING				
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)				
SEMESTER – III				
WORKSHOP AND MACHINE SHOP PRACTICE				
Course Code	**18MEL38A/48A**		CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2		SEE Marks	60
Credits	02		Exam Hours	03

Course Learning Objectives:
- To guide students to use fitting tools to perform fitting operations.
- To provide an insight to different machine tools, accessories and attachments.
- To train students into fitting and machining operations to enrich their practical skills.
- To inculcate team qualities and expose students to shop floor activities.
- To educate students about ethical, environmental and safety standards.

	Experiments
Sl. No	PART A
1	Preparation of at least two fitting joint models by proficient handling and application of hand tools- V-block, marking gauge, files, hack saw drills etc.
	PART B
2	Preparation of three models on lathe involving - Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning. Exercises should include selection of cutting parameters and cutting time estimation.
	PART C
3	Cutting of V Groove/ dovetail / Rectangular groove using a shaper. Cutting of Gear Teeth using Milling Machine. Exercises should include selection of cutting parameters and cutting time estimation.
	PART D (DEMONSTRATION ONLY)
	Study & Demonstration of power tools like power drill, power hacksaw, portable hand grinding, cordless screw drivers, production air tools, wood cutter, etc., used in Mechanical Engineering.

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

CO1: To read working drawings, understand operational symbols and execute machining operations.

CO2: Prepare fitting models according to drawings using hand tools- V-block, marking gauge, files, hack saw, drills etc.

CO3: Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.

CO4: Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.

CO5: Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread Cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time.

CO6:Perform machining operations such as plain shaping, inclined shaping, keyway cutting, Indexing and

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.

2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.

3. Students can pick one experiment from the questions lot prepared by the examiners.

4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Scheme of Examination:
One Model from Part-A or Part-C: 30 Marks
One Model from Part-B: 50 Marks
Viva – Voce: 20 Marks
TOTAL: 100 Marks

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - IV			
FOUNDRY, FORGING AND WELDING LAB			
Course Code	18MEL38B/48B	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	02	Exam Hours	03

Course Learning Objectives:
- To provide an insight into different sand preparation and foundry equipment.
- To provide an insight into different forging tools and equipment and arc welding tools and equipment.
- To provide training to students to enhance their practical skills in welding, forging and hand moulding.

Sl. No.	Experiments
	PART A
1	**Testing of Molding sand and Core sand.**
	Preparation of sand specimens and conduction of the following tests:
	1. Compression, Shear and Tensile tests on Universal Sand Testing Machine.
	2. Permeability test
	3. Sieve Analysis to find Grain Fineness Number (GFN) of Base Sand
	4. Clay content determination on Base Sand.
	Welding Practice:
	Use of Arc welding tools and welding equipment
	Preparation of welded joints using Arc Welding equipment
	L-Joint, T-Joint, Butt joint, V-Joint, Lap joints on M.S. flats
	PART B
2	**Foundry Practice:**
	Use of foundry tools and other equipment for Preparation of molding sand mixture.
	Preparation of green sand molds kept ready for pouring in the following cases:
	4. Using two molding boxes (hand cut molds).
	5. Using patterns (Single piece pattern and Split pattern).
	6. Incorporating core in the mold.(Core boxes).
	• Preparation of one casting (Aluminium or cast iron-Demonstration only)
	PART C
3	**Forging Operations:** Use of forging tools and other forging equipment.
	• Calculation of length of the raw material required to prepare the model considering scale loss.
	• Preparing minimum three forged models involving upsetting, drawing and bending operations.

Course Outcomes: At the end of the course the student will be able to:
- Demonstrate various skills in preparation of molding sand for conducting tensile, shear and compression tests using Universal sand testing machine.
- Demonstrate skills in determining permeability, clay content and Grain Fineness Number of base sands.
- Demonstrate skills in preparation of forging models involving upsetting, drawing and bending operations.

Conduct of Practical Examination:
1. All laboratory experiments are to be included for practical examination.
2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Students can pick one experiment from the questions lot prepared by the examiners.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Scheme of Examination:

1. One question is to be set from Part-A: 30 marks. (20 marks for sand testing+ 10 Marks for welding)
2. One question is to be set from either Part-B or Part-C: 50 Marks
3. Viva – Voce: 20 marks

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

CO1: Understand needs, functions, roles, scope and evolution of Management.

CO2: Understand importance, purpose of Planning and hierarchy of planning and also53nalyse its types.

CO3: Discuss Decision making, Organizing, Staffing, Directing and Controlling.

CO4: Select the best economic model from various available alternatives.

CO5: Understand various interest rate methods and implement the suitable one.

CO6: Estimate various depreciation values of commodities.

CO7: Prepare the project reports effectively.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the	Name of the Publisher	Edition and
Textbook/s				
1	Mechanical estimation and costing	T.R. Banga & S.C. Sharma	Khanna Publishers	17th edition 2015
2	Engineering Economy	Riggs J.L	McGraw Hill	4th
3	Engineering Economy	Thuesen H.G	PHI	2002
4	Principles of Management	Tripathy and Reddy	Tata McGraw Hill	3rd edition 2006
Reference Books				
1	Management Fundamentals - Concepts, Application, Skill Development	Robers Lusier Thomson	Pearson Education	
2	Modern Economic Theory	Dr. K. K. Dewett& M. H. Navalur,	Chand Publications	
3	Economics: Principles of Economics	N Gregory Mankiw,	Cengage Learning	
4	Basics of Engineering Economy	Leland Blank & Anthony Tarquin	McGraw Hill Publication (India) Private Limited	

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - V			
DESIGN OF MACHINE ELEMENTS I			
Course Code	**18ME52**	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives:
- To understand the various steps involved in the Design Process.
- To explain the principles involved in design of machine elements, subjected to different kinds of forces, from the considerations of strength, rigidity, functional and manufacturing requirements.
- To understand and interpret different failure modes and application of appropriate criteria for design of machine elements.
- To learn to use national and international standards, standard practices, standard data, catalogs, and standard components used in design of machine elements.
- Develop the capability to design elements like shafts, couplings, welded joints, screwed joints, and power screws.

Module-1

Introduction: Design Process: Definition of design, phases of design, and review of engineering materials and their properties and manufacturing processes; use of codes and standards, selection of preferred sizes.
Review of axial, bending, shear and torsion loading on machine components, combined loading, two- and three dimensional stresses, principal stresses, stress tensors, Mohr's circles.
Design for static strength: Factor of safety and service factor.
Failure mode: definition and types. , Failure of brittle and ductile materials; even and uneven materials; Theories of failure: maximum normal stress theory, maximum shear stress theory, distortion energy theory, strain energy theory, Columba –Mohr theory and modified Mohr's theory. Stress concentration, stress concentration factor and methods of reducing stress concentration.

Module-2

Impact Strength: Introduction, Impact stresses due to axial, bending and torsion loads.
Fatigue loading: Introduction to fatigue failure, Mechanism of fatigue failure, types of fatigue loading, S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit.
Modifying factors: size effect, surface effect, Stress concentration effects Notch sensitivity, Soder berg and Goodman relationships, stresses due to combined loading, cumulative fatigue damage, and Miner's equation.

Module-3

Design of shafts: Torsion of shafts, solid and hollow shaft design with steady loading based on strength and rigidity, ASME and BIS codes for power transmission shafting, design of shafts subjected to combined bending, torsion and axial loading. Design of shafts subjected to fluctuating loads
Design of keys and couplings :Keys: Types of keys and their applications, design considerations in parallel and tapered sunk keys, Design of square and rectangular sunk keys.
Couplings: Rigid and flexible coupling-types and applications, design of Flange coupling, and Bush and Pin type coupling.

Module-4

Design of Permanent Joints: Types of permanent joints-Riveted and Welded Joints.
Riveted joints: Types of rivets, rivet materials, Caulking and fullering, analysis of riveted joints, joint efficiency, failures of riveted joints, boiler joints, riveted brackets.
Welded joints: Types, strength of butt and fillet welds, eccentrically loaded welded joints

Module-5

Design of Temporary Joints: Types of temporary joints- cotter joints, knuckle joint and fasteners. Design of Cotter and Knuckle Joint.
Threaded Fasteners: Stresses in threaded fasteners, effect of initial tension, design of threaded fasteners under static, dynamic and impact loads, design of eccentrically loaded bolted joints.

Power screws: Mechanics of power screw, stresses in power screws, efficiency and self-locking, design of power screws.

Assignment:

Course work includes a **Design project**. Design project should enable a group of students (maximum four in a group) to design a mechanical system (like couplings, screw jack, welded joints, bracket mounting using fasteners, etc.). Student should submit assembly drawing and part drawings, completely dimensioned, indicating the necessary manufacturing tolerances, surface finish symbols and geometric tolerances wherever necessary. Design project must be completed using appropriate solid modeling software. Computer generated drawings must be submitted. Design calculations must be hand written and should be included in the report. Design project should be given due credit in internal assessment.

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

   CO1: Apply the concepts of selection of materials for given mechanical components.

   CO2: List the functions and uses of machine elements used in mechanical systems.

   CO3: Apply codes and standards in the design of machine elements and select an element based on the Manufacturer's catalogue.

   CO4: Analyse the performance and failure modes of mechanical components subjected to combined loading and fatigue loading using the concepts of theories of failure.

   CO5: Demonstrate the application of engineering design tools to the design of machine components like shafts, couplings, power screws, fasteners, welded and riveted joints.

   CO6: Understand the art of working in a team.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the	Edition and Year
Textbook/s				
1	Shigley's Mechanical Engineering Design	Richard G. Budynas, and J. Keith Nisbett	McGraw-Hill Education	10th edition, 2015.
2	Fundamentals of Machine Component Design	Juvinall R.C, and Marshek K.M.	John Wiley & Sons	Third Edition, 2007 student
3	Design of Machine Elements,	V B Bhandari	Tata McGraw Hill	4th Ed., 2016.
4	Design of Machine Elements-I	Dr.M H Annaiah Dr. J Suresh Kumar	New Age International (P)	1s Ed., 2016
Reference Books				
1	Machine Design- an integrated approach	Robert L. Norton	Pearson Education	2nd edition.
2	Design and Machine Elements	Spotts M.F., Shoup T.E	Pearson Education	8th edition,2006
3	Machine Component Design	Orthwein W	Jaico Publishing Co	2003
4	Machine Design	Hall, Holowenko, Laughlin (Schaum's Outline series)	Tata McGraw Hill Publishing	Special Indian Edition, 2008
5	Elements of Machine Design	H.G.Patil, S.C.Pilli, R.R.Malagi, M.S.Patil	IK International	First edition,2019

| 6 | Design of Machine Elements Volume I | T. Krishna Rao | IK international publishing house, | 2012 |
| 7 | Hand book of Mechanical Design | G. M. Maithra and L.V.Prasad | Tata McGraw Hill | 2nd edition, 2004. |

Design Data Hand Book:

[1] Design Data Hand Book, K. Lingaiah, McGraw Hill, 2nd edition, 2003.

[2] Design Data Hand Book, K. Mahadevan and Balaveera Reddy, CBS publication.

[3] Design Data Hand Book, H.G.Patil, I. K. International Publisher, 2010

[4] PSG Design Data Hand Book, PSG College of technology, Coimbatore.

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - VI			
DESIGN OF MACHINE ELEMENTS II			
Course Code	**18ME62**	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives:

- To understand various elements involved in a mechanical system.
- To analyze various forces acting on the elements of a mechanical system and design them using appropriate techniques, codes, and standards.
- To select transmission elements like gears, belts, pulleys, bearings from the manufacturers' catalogue.
- To design a mechanical system integrating machine elements.
- To produce assembly and working drawings of various mechanical systems involving machine elements like belts, pulleys, gears, springs, bearings, clutches and brakes.

Module-1

Springs: Types of springs, spring materials, stresses in helical coil springs of circular and non-circular cross sections. Tension and compression springs, concentric springs; springs under fluctuating loads.
Leaf Springs: Stresses in leaf springs, equalized stresses, and nipping of leaf springs.
Introduction to torsion and Belleville springs.
Belts: Materials of construction of flat and V belts, power rating of belts, concept of slip and creep, initial tension, effect of centrifugal tension, maximum power condition.
Selection of flat and V belts- length & cross section from manufacturers' catalogues. Construction and application of timing belts.
Wire ropes: Construction of wire ropes, stresses in wire ropes, and selection of wire ropes.

Module-2

Gear drives: Classification of gears, materials for gears, standard systems of gear tooth, lubrication of gears, and gear tooth failure modes.
Spur Gears: Definitions, stresses in gear tooth: Lewis equation and form factor, design for strength, dynamic load and wear.
Helical Gears: Definitions, transverse and normal module, formative number of teeth, design based on strength, dynamic load and wear.

Module-3

Bevel Gears: Definitions, formative number of teeth, design based on strength, dynamic load and wear.
Worm Gears: Definitions, types of worm and worm gears, and materials for worm and worm wheel. Design based on strength, dynamic, wear loads and efficiency of worm gear drives.

Module-4

Design of Clutches: Necessity of a clutch in an automobile, types of clutch, friction materials and its properties. Design of single plate, multi-plate and cone clutches based on uniform pressure and uniform wear theories.
Design of Brakes: Different types of brakes, Concept of self-energizing and self-locking of brakes. Practical examples, Design of band brakes, block brakes and internal expanding brakes.

Module-5

Lubrication and Bearings: Lubricants and their properties, bearing materials and properties; mechanisms of lubrication, hydrodynamic lubrication, pressure development in oil film, bearing modulus, coefficient of friction, minimum oil film thickness, heat generated, and heat dissipated. Numerical examples on hydrodynamic journal and thrust bearing design.

Antifriction bearings: Types of rolling contact bearings and their applications, static and dynamic load carrying capacities, equivalent bearing load, load life relationship; selection of deep grove ball bearings from the manufacturers' catalogue; selection of bearings subjected to cyclic loads and speeds;probability of survival.	

Assignment:

Course work includes a **Design project**. Design project should enable the students to design a mechanical system (like single stage reduction gear box with spur gears, single stage worm reduction gear box, V-belt and pulley drive system, machine tool spindle with bearing mounting, C-clamp, screw jack, etc.) A group of students (maximum number in a group should be 4) should submit assembly drawing and part drawings, completely dimensioned, indicating the necessary manufacturing tolerances, surface finish symbols and geometric tolerances wherever necessary. Design project must be completed using appropriate solid modeling software. Computer generated drawings must be submitted. Design calculations must be hand written and should be included in the report. Design project should be given due credit in internal assessment.

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

CO1: Apply design principles for the design of mechanical systems involving springs, belts, pulleys, and wire ropes.

CO2: Design different types of gears and simple gear boxes for relevant applications.

CO3: Understand the design principles of brakes and clutches.

CO4: Apply design concepts of hydrodynamic bearings for different applications and select Anti friction bearings for different applications using the manufacturers, catalogue.

CO6: Apply engineering design tools to product design.

CO7: Become good design engineers through learning the art of working in a team.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

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3	Design of Machine Elements	V. B. Bhandari	Tata Mcgraw Hill	4th Ed 2016.
4	Design of Machine Elements-II	Dr.M H Annaiah Dr. J Suresh Kumar Dr.C N Chandrappa	New Age International (P) Ltd.,	1s Ed., 2016
Reference Books				
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3	Machine design Hall, Holowenko, Laughlin (Schaum's Outline Series	adapted by S.K.Somani	Tata McGraw Hill Publishing Company Ltd	Special Indian Edition, 2008
4	Elements of Machine Design	H.G.Patil, S.C.Pilli, R.R.Malagi, M.S.Patil	IK International	First edition,2019
5	Design of Machine ElementsVolume II	T. Krishna Rao	IK international publishing house	2013
6	Hand book of Mechanical Design	G. M. Maithra and L.V.Prasad	Tata McGraw Hill	2nd edition,2004

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[2] Design Data Hand Book, K.Mahadevan and Balaveera Reddy, CBS publication.
[3] Design Data Hand Book, H.G.Patil, I.K.International Publisher, 2010
[4] PSG Design Data Hand Book, PSG College of technology, Coimbatore

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - VI			
HEAT TRANSFER			
Course Code	**18ME63**	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:2:0	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives:

- Study the modes of heat transfer.
- Learn how to formulate and solve 1-D steady and unsteady heat conduction problems.
- Apply empirical correlations for fully-developed laminar, turbulent internal flows and external boundary layer convective flow problems.
- Study the basic principles of heat exchanger analysis and thermal design.
- Understand the principles of boiling and condensation including radiation heat transfer related engineering problems.

Module-1

Introductory concepts and definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Types of boundary conditions. General three dimensional Heat Conduction Equation: Derivation of the equation in (i) Cartesian, coordinate only. Discussion of three dimensional Heat Conduction Equation in (ii) Polar and (iii) Spherical Co-ordinate Systems.

Steady-state one-dimensional heat conduction problems in Cartesian System: Steady-state one-dimensional heat conduction problems (i) without heat generation and (ii) constant thermal conductivity - in Cartesian system with various possible boundary conditions. Brief Introduction to variable thermal conductivity and heat generation [No numerical on variable thermal conductivity and heat generation] Thermal Resistances in Series and in Parallel. Critical Thickness of Insulation in cylinder and spheres Concept. Derivation

Module-2

Extended Surfaces or Fins: Classification, Straight Rectangular and Circular Fins, Temperature Distribution and Heat Transfer Calculations, Fin Efficiency and Effectiveness, Applications

Transient [Unsteady-state] heat conduction: Definition, Different cases - Negligible internal thermal resistance, negligible surface resistance, comparable internal thermal and surface resistance, Lumped body, Infinite Body and Semi-infinite Body, Numerical Problems, Heisler and Grober charts.

Module-3

Numerical Analysis of Heat Conduction: Introduction, one-dimensional steady conduction and one dimensional unsteady conduction, boundary conditions, solution methods.

Thermal Radiation: Fundamental principles - Gray, White, Opaque, Transparent and Black bodies, Spectral emissive power, Wien's displacement law, Planck's laws, Hemispherical Emissive Power, Stefan-Boltzmann law for the total emissive power of a black body, Emissivity and Kirchhoff's Laws, View factor, Net radiation exchange between parallel plates, concentric cylinders, and concentric spheres, Radiation Shield.

Module-4

Forced Convection: Boundary Layer Theory, Velocity and Thermal Boundary Layers, Prandtl number, Turbulent flow, Various empirical solutions, Forced convection flow over cylinders and spheres, Internal flows –laminar and turbulent flow solutions.

Free convection: Laminar and Turbulent flows, Vertical Plates, Vertical Tubes and Horizontal Tubes, Empirical solutions.

Module-5

Heat Exchangers: Definition, Classification, applications, LMTD method, Effectiveness - NTU method, Analytical Methods, Fouling Factors, Chart Solution Procedures for solving Heat Exchanger problems: Correction Factor Charts and Effectiveness-NTU Charts.

Introduction to boiling: pool boiling, Bubble Growth Mechanisms, Nucleate Pool Boiling, Critical Heat Flux in Nucleate Pool Boiling, Pool Film Boiling, Critical Heat Flux, Heat Transfer beyond the Critical Point, filmwise and dropwise Condensation.

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

CO1: Understand the modes of heat transfer and apply the basic laws to formulate engineering systems.

CO2: Understand and apply the basic laws of heat transfer to extended surface, composite material and unsteady state heat transfer problems.

CO3: Analyze heat conduction through numerical methods and apply the fundamental principle to solve radiation heat transfer problems.

CO4: Analyze heat transfer due to free and forced convective heat transfer.

CO5: Understand the design and performance analysis of heat exchangers and their practical applications, Condensation and Boiling phenomena.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Principals of heat transfer	Frank Kreith, Raj M. Manglik, Mark S. Bohn	Cengage learning	Seventh Edition 2011.
2	Heat transfer, a practical approach	Yunus A. Cengel	Tata Mc Graw Hill	Fifth edition
Reference Books				
1	Heat and mass transfer	Kurt C, Rolle	Cengage learning	second edition
2	Heat Transfer A Basic Approach	M. NecatiOzisik	McGraw Hill, New York	2005
3	Fundamentals of Heat and Mass Transfer	Incropera, F. P. and De Witt, D. P	John Wiley and Sons, New York	5th Edition 2006
4	Heat Transfer	Holman, J. P.	Tata McGraw Hill, New York	9th Edition 2008

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - VI			
HEAT TRANSFER LAB			
Course Code	**18MEL67**	CIE Marks	40
Teaching Hours/Week (L:T:P)	0:2:2	SEE Marks	60
Credits	02	Exam Hours	03

Course Learning Objectives:
- The primary objective of this course is to provide the fundamental knowledge necessary to understand the behavior of thermal systems.
- This course provides a detailed experimental analysis, including the application and heat transfer through solids, fluids, and vacuum.
- Convection, conduction, and radiation heat transfer in one and two dimensional steady and unsteady systems are examined.

Sl. No.	Experiments
	PART A
1	Determination of Thermal Conductivity of a Metal Rod.
2	Determination of Overall Heat Transfer Coefficient of a Composite wall.
3	Determination of Effectiveness on a Metallic fin.
4	Determination of Heat Transfer Coefficient in free Convection
5	Determination of Heat Transfer Coefficient in a Forced Convention
6	Determination of Emissivity of a Surface.
	PART B
7	Determination of Stefan Boltzmann Constant.
8	Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers.
9	Experiments on Boiling of Liquid and Condensation of Vapour.
10	Performance Test on a Vapour Compression Refrigeration.
11	Performance Test on a Vapour Compression Air – Conditioner.
12	Experiment on Transient Conduction Heat Transfer.
	PART C (OPTIONAL)
13	Analysis of steady and transient heat conduction, temperature distribution of plane wall and cylinder using Numerical approach (ANSYS/CFD package).
14	Determination of temperature distribution along a rectangular and circular fin subjected to heat loss through convection using Numerical approach (ANSYS/CFD package).

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

CO1: Determine the thermal conductivity of a metal rod and overall heat transfer coefficient of composite slabs.

CO2: Determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values.

CO3: Evaluate temperature distribution characteristics of steady and transient heat conduction through solid cylinder experimentally.

CO4: Determine surface emissivity of a test plate and Stefan Boltzmann constant

CO5: Estimate performance of a refrigerator and effectiveness of a fin and Double pipe heat exchanger

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.

2. Breakup of marks and the instructions printed on the cover page of answer script to be strictly adhered by the examiners.

3. Students can pick one experiment from the questions lot prepared by the examiners.

4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made

Scheme of Examination:

One Question from Part A - 40 Marks

One Question from Part B - 40 Marks

Viva-Voce - 20 Marks

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER – VII			
Professional Elective 3			
MECHATRONICS			
Course Code	**18ME744**	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To acquire a strong foundation in science and focus in mechanical, electronics, control, software, and computer engineering, and a solid command of the newest technologies.
- To understand the evolution and development of Mechatronics as a discipline.
- To substantiate the need for interdisciplinary study in technology education
- To understand the applications of microprocessors in various systems and to know the functions of each element.
- To demonstrate the integration philosophy in view of Mechatronics technology
- To be able to work efficiently in multidisciplinary teams.

Module-1

Introduction: Scope and elements of mechatronics, mechatronics design process, measurement system, requirements and types of control systems, feedback principle, Basic elements of feedback control systems, Classification of control system. Examples of Mechatronics Systems such as Automatic Car Park system, Engine management system, Antilock braking system (ABS) control, Automatic washing machine.

Transducers and sensors: Definition and classification of transducers, Difference between transducer and sensor, Definition and classification of sensors, Principle of working and applications of light sensors, Potentiometers, LVDT, Capacitance sensors, force and pressure sensors, Strain gauges, temperature sensors, proximity switches and Hall Effect sensors.

Module-2

Signal Conditioning: Introduction – Hardware – Digital I/O, Analog to digital conversions, resolution, Filtering Noise using passive components – Registers, capacitors, amplifying signals using OP amps. Digital Signal Processing – Digital to Analog conversion, Low pass, high pass, notch filtering. Data acquisition systems (DAQS), data loggers, Supervisory control and data acquisition (SCADA), Communication methods.

Electro Mechanical Drives: Relays and Solenoids – Stepper Motors – DC brushed motors – DC brushless motors – DC servo motors – 4-quadrant servo drives, PWM's – Pulse Width Modulation.

Module-3

Microprocessor & Microcontrollers: Introduction, Microprocessor systems, Basic elements of control systems, Microcontrollers, Difference between Microprocessor and Microcontrollers.

Microprocessor Architecture: Microprocessor architecture and terminology-CPU, memory and address, I/O and Peripheral devices, ALU, Instruction and Program, Assembler, Data Registers, Program Counter, Flags, Fetch cycle, write cycle, state, bus interrupts. Intel's 8085A Microprocessor.

Module-4

Programmable Logic Controller: Introduction to PLCs, Basic structure of PLC, Principle of operation, input and output processing, PLC programming language, ladder diagram, ladder diagrams circuits, timer counters, internal relays, master control, jump control, shift registers, data handling, and manipulations, analogue input and output, selection of PLC for application.

Application of PLC control: Extending and retracting a pneumatic piston using latches, control of two pneumatic pistons, control of process motor, control of vibrating machine, control of process tank, control of conveyer motor etc.

Module-5

Mechatronics in Computer Numerical Control (CNC) machines: Design of modern CNC machines - Machine Elements: Different types of guide ways, Linear Motion guideways. Bearings: anti-friction bearings,

hydrostatic bearing and hydrodynamic bearing. Re-circulating ball screws. Typical elements of open and closed loop control systems. Adaptive controllers for machine tools. **Mechatronics Design process: S**tages of design process – Traditional and Mechatronics design concepts – Case studies of Mechatronics systems – Pick and place Robot – Automatic car park barrier.	

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

    CO1: Illustrate various components of Mechatronics systems.

    CO2: Assess various control systems used in automation.

    CO3: Design and conduct experiments to evaluate the performance of a mechatronics system or component with

    respect to specifications, as well as to analyse and interpret data.

    CO4: Apply the principles of Mechatronics design to product design.

    CO5: Function effectively as members of multidisciplinary teams.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Mechatronics-Principles Concepts and Applications	Nitaigour Premchand Mahalik	Tata McGraw Hill	1stEdition, 2003
2	Mechatronics–Electronic Control Systems in Mechanical and Electrical Engineering,	W.Bolton	Pearson Education	1stEdition, 2005
Reference Books				
1	Mechatronics	HMT Ltd	Tata Mc Graw Hill	1st Edition, 2000 ISBN:9780074636435
2	Mechatronics: Integrated Mechanical Electronic Systems	K.P. Ramachandran, G.K. Vijayaraghavan, M.S. Balasundaram.	Wiley India Pvt. Ltd. New Delhi	2008
3	Introduction to Mechatronics and Measurement Systems	David G. Aldatore, Michael B. Histand	McGraw-Hill Inc USA	2003
4	Introduction to Robotics: Analysis, Systems, Applications.	Saeed B. Niku,	Person Education	2006
5	Mechatronics System Design	Devdas Shetty, Richard A. kolk	Cengage publishers.	second edition

Scheme of Examination:
One question from Part A: 40 marks
One question from Part B: 40 Marks
Viva voce: 20 Marks
Total: 100 Marks

B. E. MECHANICAL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - VIII

ENERGY ENGINEERING

Course Code	**18ME81**	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:
- Understand energy scenario, energy sources and their utilization
- Learn about energy conversion methods
- Study the principles of renewable energy conversion systems.

Module-1

STEAM GENERATORS Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures, LaMount, Benson, Velox, Loeffer, Schmidt steam generators, Cooling towers and Ponds, Accessories such as Superheaters, De-superheater, Economizers, Air preheaters.

Module-2

Solar Energy: Introduction, Solar radiation at the earth's surface, Solar radiation measurements, Flat plate collectors, Focussing collectors, Solar pond, Solar electric power generation-Solar photovoltaics.
Biomass Energy: Photosynthesis, photosynthetic oxygen production, energy plantation. Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, Bio gas plants-KVIC, Janta, Deenbhandu models, factors affecting bio gas generation. Thermal gasification of biomass, updraft and downdraft

Module-3

Geothermal Energy: Forms of geothermal energy, Dry steam, wet steam, hot dry rock and magmatic chamber systems.
Tidal Energy: Tidal power, Site selection, Single basin and double basin systems, Advantages and disadvantages of tidal energy.
Wind Energy: Wind energy-Advantages and limitations, wind velocity and wind power, Basic components of wind energy conversion systems, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor, Applications of wind energy.

Module-4

Hydroelectric plants: Advantages & disadvantages of water power, Hydrographs and flow duration curves-numericals, Storage and pondage, General layout of hydel power plants- components such as Penstock, surge tanks, spill way and draft tube and their applications, pumped storage plants, Detailed classification of hydroelectric plants, water hammer.
Ocean Thermal Energy: Ocean thermal energy conversion, Principle and working of Rankine cycle, Problems associated with OTEC.

Module-5

NUCLEAR ENERGY Principles of release of nuclear energy-Fusion and fission reactions. Nuclear fuels used in the reactors, Chain reaction, Moderation, breeding, Multiplication and thermal utilization factors. General components of a nuclear reactor and materials, Brief description-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shielding, Nuclear waste, Radioactive waste disposal.

Course Outcomes: At the end of the course the student will be able to:
   CO1: Understand the construction and working of steam generators and their accessories.

CO2: Identify renewable energy sources and their utilization.

CO3: Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, nuclear, hydel and tidal.

Question paper pattern:
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Power Plant Engineering	P. K. Nag	Tata McGraw Hill Education Private Limited, New Delhi	Third Edition, 2012.
2	Power Plant Engineering	Arora and Domkundwar	Dhanpat Rai & Co. (P) Ltd.	Sixth Edition, 2012.
3	Non-conventional Sources of Energy	G.D.Rai	Khanna Publishers, New Delhi	Fifth Edition, 2015.
4	Non-conventional energy resources	B H Khan	McGraw Hill Education	3rd Edition
Reference Books				
1	Power Plant Engineering	R. K. Rajput	Laxmi publication New Delhi	
2	Principles of Energy conversion	A. W. Culp Jr	McGraw Hill	1996
3	Power Plant Technology	M.M. EL-Wakil	McGraw Hill International	1994
4	Solar Energy: principles of Thermal Collection and Storage	S.P. Sukhatme	Tata McGraw-Hill	1984

MARKETING MANAGEMENT

Course Code	20MBA15	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives
1. Make students have an understanding of the fundamental concepts of marketing & the environment in which marketing system operates.
2. To analyze the motives influencing buying behaviour & Describe major bases for segment marketing, target marketing, and market positioning.
3. Identify a Conceptual framework, covering basic elements of the marketing mix.
4. To understand fundamental premise underlying market driven strategies.
5. Giving them hands on practical approach to subject study.

Module-1 Introduction to Marketing	9 hours

Marketing V/s Selling, Customer value, Components of customer value and components of customer cost. Marketing Ethics- green marketing and green economy. Marketing Myopia.Marketing Environment - Components of Environment to be analysed- Micro/ Macro Environment, Technological environment, Socio-cultural environment, Economic Environment, Legal Environment, Consumer/demographic environment, Government policies, Political environment. Techniques used in Environment Analysis. Contemporary Indian Marketing Environment. Cause and Social Marketing alternate concepts like 3V concepts of Nirmalaya Kumar Social Responsibility of marketing- new marketing realities, new responsibilities, new-age marketing, societal marketing concept, Corporate Social Responsibility. Emerging areas- Neuro Marketing , Sensory Marketing-concepts only. **Assignment:** Contemporary Indian Marketing Environment

Module -2 Analysing Consumer Behaviour	9 hours

Connecting with consumers and consumer in sighting, Factors influencing Consumer Behaviour, Consumer characteristics influencing buying behaviour- personal factors and cultural factors. Consumer Buying Decision Process, Buying Roles, Buying Motives. The black box model of consumer behaviour. Psychological Processes underlying consumer behaviour. **Market Segmentation:** Concept of Market Segmentation, Benefits, Requisites of Effective Segmentation, Bases for Segmenting Consumer Markets, Market Segmentation Strategies. Segmentation method – Geographic segmentation and Demographic segmentation, psychographic segmentation, behavioural segmentation, volume segmentation, deep segmentation. Indian Consumer- Features about consumer India, Classifying Indian consumer by Income B2B marketing Vs Consumer Marketing. **Assignment- Live projects on Consumer Behaviour.**

Module -3 Product, Brand Equity, Services Marketing	9 hours

Product Management- fundamentals, primary objective of product management, product hierarchy, product line, product mix, product mix strategies, Appraisal of product lines, products and brands. Managing PLC of product/brand, New Product Development, packing as a marketing tool, Role of labelling in packing. Main tasks in product management. Components of Product personality. Brand- selecting brand name, selecting logo, brand extension- effects. Introducing new product, innovations, new product development, stages in new product development, pricing strategy for new product. Branding - Concept of Branding, Types, Brand Equity, Branding strategies.Services Marketing & its Characteristics- tasks involved in service marketing, differentiating, positioning and brand building in services, premiumisation in service marketing.Market Segmentation, Targeting & Positioning (STP): Targeting - Bases for identifying target Customer target Marketing strategies, Positioning - Meaning, Product Differentiation Strategies, Tasks involved in Positioning. Monitoring brands performance and positioning.

Module -4 Pricing , Marketing Channels	7 hours

Pricing decisions: Significance of pricing, factor influencing pricing (Internal factor and External factor), objectives, Pricing Strategies-Value based, Cost based, Market based, Competitor based, Pricing Procedure.
Marketing Channels: Roles and purpose of Marketing Channels, Factors Affecting Channel Choice, Channel Design, Channel Management Decision, Channel Conflict, Designing a physical Distribution System, Network Marketing. Contemporary Channels and Retailing in India.**Product Distribution Logistics:** Product distribution Concept. Distinction between distribution logistics and Supply Chain Management..

Module -5 Direct Marketing & Digital Marketing:	9 hours

Concept and scope of direct marketing, concept and components of digital marketing. Digital marketing communications, digital marketing in India. **Promotions-** Marketing communications- Integrated Marketing

Communications (IMC)-communication objectives, steps in developing effective communication, Stages in designing message. Advertising: Advertising Objectives, Advertising Budget, Advertising Copy, AIDA model, Traditional Vs Modern Media- Online and Mobile Advertising, Social Media for Advertising. Customer Relationship Management- components. Significance of Marketing Research- importance of data

Module - 6 Sales Promotion, Marketing Planning and Rural Marketing	7 hours

Sales Promotion: Tools and Techniques of sales promotion, Push-pull strategies of promotion. Personal selling. Steps/process involved in Personal Selling. Publicity/Public Relation-word of mouth, sponsorships. Database marketing: Basic concepts of e-commerce, e-marketing, m-Commerce, m-marketing, e-networking, CRM, MkIS.
Marketing Planning: Meaning, Steps involved in Marketing planning. Marketing Audit- Meaning, components of Marketing Audit. Market Share analysis, Marketing cost analysis, Marketing Strategic Planning Process.
Concept of Rural Marketing: Flumist (HBR) and Saffola Journey- Case Studies
Classroom Exercise: Brand Communication (create and enact a commercial)

Course outcomes:
At the end of the course the student will be able to:
1. Develop an ability to assess the impact of the environment on marketing function.
2. To formulate marketing strategies that incorporate psychological and sociological factors which influence buying .
3. Understand concept of Branding, development of product and significance of market segmentation , targeting and positioning.
4. Identifying marketing channels and the concept of product distribution.
5. Identifying techniques of sales promotion , significance of marketing research.
6. Synthesize ideas into a viable marketing plan for various modes of marketing

Practical Components:
- Understanding Contemporary Indian Marketing Environment.
- Understanding and demonstrating their exposure on consumer behaviour
- Effectively using their skill in creating and enacting a commercial on brand communication.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X		X		
CO2	X	X	X		X
CO3	X	X	X		
CO4	X	X			X
CO5	X			X	
CO6	X			X	X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Marketing Management- Indian Context, Global Perspective.	Ramaswamy & Namakumari	SAGE	6th Edition

#		Author	Publisher	Edition
2	Marketing Management: A South Asian Perspective.	Kotler, Keller, Koshy & Jha	Pearson Education	Latest edition
3	New Product Management	Merle Crawford and Anthony Di Benedetto	McGraw-Hill	Latest Editon
4	Advertisement Brands & Consumer Behaviour	Ramesh Kumar	Sage Publications	2020
Reference Books				
1	Marketing in India: Text and Cases	Neelamegham S	Vikas	Latest edition
2	Marketing	Lamb, Hair, Mc Danniel	Cengage Learning	Latest edition
3	Fundamentals of Marketing Management,	Etzel M J BJ Walker & William J Stanton	Tata Macgraw Hill	Latest edition

HUMAN RESOURCE MANAGEMENT		CIE Marks	40
Course Code	20MBA21	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives

1. The student will be able to recite the theories and various functions of Human Resources Management
2. The student will be able to describe and explain in her/his own words, the relevance and importance of Human Resources Management at workplace
3. The student will be able to apply and solve the workplace problems through Human Resources Management intervention
4. The student will be able to classify and categorise in differentiating between the best method to solve the problem
5. The student will be able to compare and contrast different approaches of HRM for solving the complex issues and problems at the workplace
6. The student will be able to design and develop an original framework and model in dealing with the problems in the organization.

Module-1 Introduction   7 hours

Human Resource Management and Personnel Management, The Importance of Human Resource Management, Models of Human Resource Management, Evolution of Human Resource Management, HRM in India, The Factors Influencing Human Resource Management , Human Resource Management and Line Managers, The HR Competencies, Human Resource Management and Firm Performance.

Module -2 Human Resource Planning   9 hours

Importance of HR Planning, Manpower Planning to HR Planning, Factors Affecting HR Planning, Benefits of HR Planning, HRP Process, Tools for Demand Forecasting, Attributes of an Effective HR Planning, Barriers to HR Planning, The Challenges for HR, Process of Job Analysis and Job Evaluation.

Recruitment and Selection: Importance of Recruitment, Recruitment Policies, Factors Influencing Recruitment, Recruitment Process, Sources, Evaluation of Recruitment Process, Recruitment Strategy ; Selection, Future Trends in Recruitment; Selection Process; Selection Tests; Factors Influencing Selections, Challenges in Selection, Application Tracking System using MS-Excel

Learning, Training, and Development: Training, Learning and Development, Learning Theories, The Future of Training, Learning, and Development: Crystal Gazing into the Future, World of Learning. Process of training and Techniques of Training

Module -3 Performance Management and Appraisal   9 hours

Objectives of Performance Management, Performance Management and Performance Appraisal, Common Problems with Performance Appraisals, Performance Management Process, Types of Performance Rating Systems, Future of Performance Management.

Compensation and Benefits

Introduction, Definitions, Total Compensation, Total Rewards System, Forms of Pay, Theories of Compensation, External Factors, Internal Factors, Establishing Pay Rates, Employee Benefits.

Industrial Relations

Decent Workplace: International Labor Organisation, Industrial Relations, The Objectives of Industrial Relations, Approaches of Industrial Relations Systems, The Actors in Industrial Relations, Indian Context, Industrial Relations and Human Resource Management.

Employment Relations - The Definition, Traditional Employment Relations, Actors in the Fray: Role-taking, The New Frameworks for Employment Relations, The Future of Employee Relations.

Module -4 Human Resource Management in Small and Medium Enterprises   9 hours

Definition of SMEs, Human Resource Management and Performance in SMEs, The Difference in Adoption of Human Resource Management: SMEs and Large Firms, Indian Experience, Impact of Weak Adoption of Human Resource Management in SMEs, Factors Influencing the Adoption of Human Resource Management Practices in SMEs, Future of Human Resource. Management in SMEs.

Human Resource Management in the Service Sector

Introduction, The Emergence of the Services Sector, Implications for Human Resource, Management Function, Differences Between Services Sector and the Manufacturing Sector, Difference in Human Resource Management

Practices in Services and Manufacturing Sectors, Human Resource Management and Service Quality Correlation, Some Specific Industries in Services Sector, Trade Unions in Services Sector, Models of Union Strategies.
Case Study on "Training Program at ABC Cement". .

	9 hours

Module -5 Human Resource Management Innovations

Introduction, Human Resource Management and Innovations, Factors Affecting the Innovation Process in Organisations, Characteristics of Human Resource Management Innovations, Conditions Necessary for Successful HRMI Implementation, Current Trends in Human Resource Management Innovations, Innovative Human Resource Management Practices in India, How Human Resource Management Practices Contribute to Organisational Innovation, How to Make Human Resource Management Innovations Sustainable.

	7 hours

Module - 6   HR Leadership and Organisation Transformation

Future of Human Resource Management: The next generation HR professionalism, Critical HR Issues of Today and Tomorrow, Changing Mental Models: HR's Most Important Task, HR roles critical for business survival, HR profession in today's changeful workplace, HR and Technology.

Course Outcomes:

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

1. Gain practical experience in the field of Human Resource Concepts, functions and theories.
2. Acquire the conceptual insight of Human Resource and various functions of HR.
3. Apply personnel, managerial and welfare aspects of HR.
4. Develop a greater understanding about HR practices, analyse the trends in the field of HR.

Practical Component:

- An visit to Organisation and interact with HR Manager and list out the roles played by HR manager.
- Meet Recruitment Manager and ask- 10 questions one asks during Interview.
- Meet Training and Development Manager and list out various training given to employees; basis of training program; Need analysis.
- Visit any Service Organisation and observe HR functions; List them.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X	X	X		X
CO2	X	X		X	
CO3	X	X	X		
CO4	X			X	

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Human Resource Management: Theory and Practices,	R. C. Sharma, Nipun Sharma	Sage Publication India Pvt. Ltd.,	2019
2	Human Resource Management: Concepts	Amitabha Sengupta	Sage Publication India Pvt. Ltd.	2019

				2016
3	Leadership: Theory and Practices	Peter G. Northouse	Sage Publication	
4	**Human Resources Management**	T.P RenukaMurthy	HPH.	2015
Reference Books				
1	The HR Scorecard: Linking People, Strategy, and Performance	Brian Becker, Dave Ulrich, and Mark A. Huselid	Harvard Business School Press	2001
2	The HR Answer Book: An Indispensable Guide for Managers and Human Resources Professionals	Shawn Smith and Rebecca Mazin	AMACOM	2011
3	Performance Management and Appraisal Systems HR Tools for Global Competitiveness	T. V. Rao		First Edition, 2004
4	Human Resource Management	Appasaba L.V and Kadakol A M	College Book House	2016
5	Human Resource Management	V.S.P Rao		2014

FINANCIAL MANAGEMENT

Course Code	20MBA22	CIE Marks	40
		SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives:
1. To familiarize the students with basic concepts of financial management and financial system.
2. To understand concept of time value of money and its implication.
3. To evaluate the investment proposals.
4. To understand the management of working capital in an organization.
5. To analyze capital structure and dividend decision.

Module-1 Introduction
9 hours

Meaning and objectives of Financial Management, changing role of finance managers. Interface of Financial Management with other functional areas. Indian Financial System: Financial markets, Financial Instruments, Financial institutions and financial services. Emerging issues in Financial Management: Risk Management, Behavioural Finance, Financial Engineering, Derivatives (Theory).

Module-2 Time value of money
9 hours

Meaning of Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity. Simple interest & Compound interest, Capital recovery & loan amortization. (Theory & Problem). Case Study on Loan amortization. Computer lab for calculation of future value, present value and loan amortisation in MS excel.

Module-3
9 hours

Sources of Financing: Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity, Warrants and convertibles (Theory Only). **Cost of Capital:** Basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model) - Cost of retained earnings - Determination of Weighted average cost of capital (WACC) and Marginal cost of capital. (Theory & Problem). Case Study on WACC.

Module-4 Investment Decisions
9 hours

Capital budgeting process, Investment evaluation techniques – [Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted payback period, accounting rate of return Problem). Risk analysis in capital budgeting-Case Study on replacement of capital project. (Numerical problems). Computer lab for calculation of NPV, IRR, PI, Payback period, ARR in MS excel.

Module-5 Working Capital Management
7 hours

Factors influencing working capital requirements - Current asset policy and current asset finance policy- **Determination of operating cycle and cash cycle on Excel**- Estimation of working capital requirements of a firm. (Does not include Cash, Inventory & Receivables Management). Case study on Working Capital Determination and the impact of negative working capital Amazon-negative working capital and profitability. Computer lab for calculation of working capital cycle and operating cycle in MS excel.

Module-6 Capital structure and dividend decisions
7 hours

Capital structure and dividend decisions – Planning the capital structure-Governance of Equity and Debt, Fall in interest rates and perils of Debt funding. Leverages, EBIT and EPS analysis. ROI & ROE analysis. Capital structure policy. Dividend policy – Factors affecting the dividend policy - Dividend Policies- Stable Dividend, Stable Payout (No dividend theories to be covered). Case Study on EBIT-EPS analysis & Leverages.

Course outcomes:
At the end of the course the student will be able to:
1. Understand the basic financial concepts
2. Apply time value of money
3. Evaluate the investment decisions
4. Estimate working capital requirements
5. Analyze the capital structure and dividend decisions

Scanned with OKEN Scanner

Practical Components:
- Identifying the small or medium sized companies and understanding the Investment evaluation techniques used by them.
- Using the annual reports of selected companies, students can study the working capital management employed by them. Students can also compare the working capital management of companies in the same sector.
- Students can choose the companies that have gone for stock split and Bonus issue in the last few years and study the impact of the same on the stock price.
- Students can study any five companies capital structure
- Students can do Company analysis for select companies using profitability and liquidity ratios.

CO-PO MAPPING

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

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 40 percent theory and 60 percent problems in the SEE.

Textbooks

Sl. No.	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Financial Management	Khan M. Y.& Jain P. K,	TMH	7/e,
2	Financial Management	Prasanna Chandra	TMH	9/e,
3	Financial Management	Prahlad Rathod ,Babitha Thimmaiah and Harish Babu	HPH	1/e, 2015
4	Financial Management: A Strategic Perspective	Nikhil Chandra Shil & Bhagaban Das	Sage Publications	1/e, 2016

Reference Books

1	Financial Management	I M Pandey	Vikas Publishing	11/e, 2012
2	Principles of Corporate Finance	Brealey, Myers, Allen & Mohanty	McGraw Hill Education	11/e, 2014
3	Cases in Financial Management	I.M.Pandey & Ramesh Bhat	McGraw Hill Education	3/e, 2015
4	Corporate Finance	Vishwanath S. R.	Sage Publications	3/e, 2019

MARKETING RESEARCH & ANALYTICS

Course Code	20MBAMM304		
Teaching Hours/Week (L:T:P)	3:0:2	CIE Marks	40
Credits	04	SEE Marks	60
		Exam Hours	03

Course Objectives
1. To provide an understanding of the basics of marketing research process.
2. To orient on the theoretical and practical aspects of marketing research.
3. Encourage the students to take up analytical thinking through research.
4. To highlight importance marketing research for enhancing marketing strategies.

Module-1 Marketing Research Dynamics
9 hours

Meaning of Marketing research; when marketing research is unnecessary; Nature and Scope of Marketing Research; Marketing Research in the 21st Century (Indian Scenario); limitations of Marketing Research; threats to marketing research; Introduction to marketing intelligence: concept of marketing intelligence (MI), components, need for MI, Domains of MI. Ethics in marketing research. Design of consumer experiments using Conjoint Analysis. Case Study on Marketing Research Dynamics.

Module -2 Marketing Research Projects
7 hours

Design and implementation of Marketing Research Projects, defining research questions, identifying respondents, sampling accuracy and sufficiency. Issues around studying human subjects.
Lab on socially acceptable responses- managing

Module -3 Decision Support System
9 hours

Marketing Decision Support System-meaning, Use of Decision Support Systems in Marketing Research, Data base & Data warehousing. The three Vs: Volume, Velocity & Varity, The Fourth V: Value. Elements of data base, types of data base, using marketing data base for marketing intelligence, ways to gather consumer data.

Module -4 Applications of Marketing Research
9 hours

Applications of Marketing Research: Introduction, Consumer Market Research, Business-to-Business Market Research, Product Research, Pricing Research, Motivational Research, Distribution Research, Advertising Research, Media research, Sales Analysis and Forecasting.
Live project & Assignment: Agriculture Marketing or B2B marketing

Module -5 Predictive analysis
9 hours

Meaning of predictive analysis, how good are models at predictive behavior, benefits of predictive models and applications of predictive analysis, reaping the benefits, avoiding the pitfalls, importance of predictive model, process of predictive analytics. Predictive Analytics, Data Mining and Big Data_ Myths, Misconceptions and Methods by Steven Finlay.

Module - 6 Product Research
7 hours

Product Research- Analysis of Diffusion of products, Adoption decisions, Product – services tradeoffs, evaluating prototypes, Luxury and Lifestyle products.
Live project: New Product adoption

Course outcomes:
The student should be able to:
1. Comprehend the objectives of Market research & its application in solving marketing problems.
2. Appreciate the use of different data collection methods, sampling design techniques, measurement methods to analyze the data.
3. Generalize and interpret the data with the help of various measurement techniques.
4. To understand the emergence of new trends in research.

Practical Component:
- Choose 5 successful products or services and identify the insight behind them through a field survey.
- Do a comprehensive essay on the difference between consumers vs. trade vs. Competition insights & how best to exploit them.
- Take 5 recent digital innovations like twitter or face book and identify the insights.
- Running case with real data Dell, Comprehensive critical thinking case Baskin-Robbins.
- Data Analysis case with real data IBM.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X		X		
CO2	X	X		X	
CO3	X		X		X
CO4	X			X	X

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Marketing Research- An Applied Orientation	Naresh K Malhotra & SatyaBhushan Dash	Pearson	7th Edition
2	Marketing Analytics Using Excel	.Ajithab Dash	Sage publications	2019
3	Essentials of Marketing Research	William G Zikmund et. al	Cengage Learning	7/e
4	Marketing Research	V Kumar	Sage Publications	1/e, 2015

Reference Books

1	Market Research: Text and cases	Rajendra Nargundkar	Mc Graw Hill	3rd Edition
2	The Effective Use of Market Research: How to drive and focus better business decisions	Robin J Birn	Viva	4th Edition
3	Marketing Research: Methodological Foundations	Gilbert A Churchill & Dawan Lacobucci		8th Edition

CONSUMER BEHAVIOUR

Course Code	20MBAMM305	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives

1. To understand the concept of consumer behaviour, decision making by consumers, behavioural variables and its influences on consumer behaviour.
2. To comprehend the social and cultural dimensions of consumer behaviour.
3. To provide an insight of the psychological and behavioural concepts of consumers.

Module-1 Introduction   **7 hours**

Meaning of Consumer Behaviour; Difference between Consumer & Customer; Nature & characteristics of Indian Consumers; Consumerism: meaning; Consumer Movement in India; Rights & Responsibilities of consumers in India; Benefits of consumerism. Research on Consumer Behaviour; Consumer Behaviour and Society.

Module -2 Models of Consumer Behaviour   **9 hours**

Input-Process-Output Model, Nicosia Model, Howard Sheth Model, Engel-Kollat-Blackwell Models of Consumer Behaviour, Internal Influences, External Influences.
Consumer Decision Making: Consumer Buying Decision Process, Levels of Consumer Decision Making – Four views of consumer decision making. On-line Decision Making: Meaning & Process/Stages.
Situational Influences- Nature of Situational Influence, Situational Characteristics and consumption behaviour.
Class Exercise: Conducting consumer experiments.

Module -3 Individual Influences on Consumer Behaviour and CRM Part –I   **9 hours**

a) **Motivation:** Basics of Motivation, Needs, Goals, Positive & Negative Motivation, Rational Vs Emotional motives, Motivation Process, Arousal of motives, Selection of goals. Motivation Theories and Marketing Strategy - Maslow's Hierarchy of Needs, McGuire's Psychological Motives.
b) **Personality:** Basics of Personality, Theories of Personality and Marketing Strategy (Freudian Theory, Neo-Freudian Theory, Trait Theory), Applications of Personality concepts in Marketing, Personality and understanding consumer diversity, Brand Personality, Self and Self-Image.
c) **Perception:** Basics of Perception & Marketing implications, Elements of Perception, Dynamics of Perception, Influence of perception on CB, Consumer Imagery, Perceived price, Perceived quality, price/quality relationship, Perceived Risk, Types of risk. How to consumers' handle risk.

Module -4 Individual Influences on Consumer Behaviour and CRM Part –II   **9 hours**

d) **Learning:** Elements of Consumer Learning, Marketing Applications of Behavioural Learning Theories, Classical Conditioning – Pavlovian Model, Neo-Pavlovian Model, Instrumental Conditioning.
e) **Attitude:** Basics of attitude, the nature of attitude, Models of Attitude and Marketing Implication, (Tri-component Model of attitude, Multi attribute attitude models. Elaboration Likelihood Model).
Persuasive Communication: Communications strategy, Target Audience, Media Strategy, Message strategies, Message structure and presentation

Module -5 External Influences on Consumer Behaviour   **9 hours**

Social Class: Social Class Basics, What is Social Class? (Social class & Social status, the dynamics of status consumption, Features of Social Class, Five Social-Class Categories in India.
Culture: Basics, Meaning, Characteristics, Factors affecting culture, Role of customs, values and beliefs in Consumer Behaviour. Subculture: Meaning, Subculture division and consumption pattern in India, Types of subcultures. Cross Culture - Cross-cultural consumer analysis - Cross-cultural marketing strategy: Cross-cultural marketing problems in India, Strategies to overcome cross-cultural problems.
Groups: Meaning and Nature of Groups, Types Family: The changing structure of family, Family decision making and consumption related roles, Dynamics of husband-wife decision making, The family life cycle & marketing strategy, Traditional family life cycle & marketing implications, Reference Groups: Understanding the power & benefits of reference groups, Factors that affect reference group influence, Types of reference group, Reference Group Appeals.

Module - 6 Consumer Influence and Diffusion of Innovations   **7 hours**

Opinion Leadership: Dynamics of opinion leadership process, Measurement of opinion leadership, Market Mavens, Opinion Leadership & Marketing Strategy, Creation of Opinion Leaders.
Diffusion of Innovations: Diffusion Process, Adoption Process: Stages, categories of adopters, Post Purchase Processes.

Customer Relationship Management- Meaning & Significance of CRM, Types of CRM Strategies for building relationship marketing. e-CRM, Meaning, Importance of e-CRM. Difference Between CRM & e-CRM
Case Study: Pillsbury Cookie Challenge.

Course outcomes:
At the end of the course the student will be able to:
1. Explain the background and concepts vital for understanding Consumer Behaviour.
2. Identify the role of variables that determines Consumer Behaviour in Social & cultural domain.
3. Identifying the psychological and behavioural practices adopted by organizations to enhance the Consumer Behaviour.

Practical Components:
- Students can go to malls and unorganized retail outlets and observe the behaviour of consumers of different demographic segments while buying different category of goods. The students need to present the findings / observations followed with a group discussion.
- Students have to prepare a questionnaire and conduct the survey on consumer buying behaviour and present the findings in the class.
- Find three advertisements that appeal to the need for power, affiliation and achievement. Discuss their effectiveness. Rewrite these for persons in different levels of Maslow's Hierarchy?
- Meet your friends and conduct a survey to find what are the important factors in their purchase of mobiles, shoes, bags etc.
- Conduct a study on advertisements regarding a specific product and find out how consumer deal with the information overload.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X		X	X	
CO3	X				X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Texbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Consumer Behaviour	Leon Schiffman, Leslie	Pearson	Latest Edition
2	Consumer Behaviour: A Managerial Perspective	Dr.Dheeraj Sharma, Jagdish N Sheth, Banwari Mittal	Cengage Learning	Latest Edition
3	Consumer Behaviour	Sethna	Sage Publications	4/e, 2018
4	Advertisement Brands & Consumer Behaviour- Case Book	Ramesh Kumar	Sage Publications	2017

Reference Books

1	Consumer Behaviour in Indian Perspective	Suja Nair	Himalaya Publications	2015
2	Consumer Behaviour: Building Marketing Strategy	Dell, Hawking & others	Tata McGraw Hill	Latest Edition
3	Consumer Behaviour	Satish K Batra & S H H Kazmi	Excel Books	Latest Edition

RETAIL MANAGEMENT		CIE Marks	40
Course Code	20MBAMM306	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives
1.To provide an understanding of the concepts, techniques and approaches in Sales Management
2. To emphasize on the Sales Manager's problems and dilemmas.
3.To develop skills for generating, evaluating and selecting sales strategies.
4.To develop an understanding of the contemporary retail management, issues, strategies and trends.
5.To highlight the importance of retailing and its role in the success of modern business.
6.To acclimatize with the insights of retailing, key activities and relationships.

Module-1 Sales Management	**7 hours**

Meaning, Personal Selling, the sales management process Emerging Trends in Sales Management, Qualities and Responsibilities of a sales manager. Selling skills & selling strategies: selling and buying styles, selling situations, selling skills, selling process.

Module -2 Management of Sales Territory & Sales Quota	**7 hours**

Sales territory, meaning, size, designing, sales quota, procedure for sales quota. Types of sales quota, Methods of setting quota. Recruitment and selection of sales force, Training of sales force.

Module -3 Retail Management	**10 hours**

Introduction and Perspectives on Retailing World of Retailing, Retail management, introduction, meaning, characteristics, emergence of organizations of retailing - Types of Retailers (Retail Formats) - Multichannel Retailing -Customer Buying Behaviour, role of retailing, trends in retailing, FDI in Retail - Problems of Indian Retailing - Current Scenario. **Assignment: History and current trends including Indian retail FDI Policy.**

Module-4 Setting up Retail organization	**10 hours**

Size and space allocation, location strategy, factors Affecting the location of Retail, Retail location Research and Techniques, Objectives of Good store Design. Retail Market Strategy - Financial Strategy Human Resource Management, Information Systems and supply chain management & Logistics.
Store Layout and Space planning: Types of Layouts, role of Visual Merchandiser, Visual Merchandising Techniques, Controlling Costs and Reducing Inventories Loss, Exteriors, Interiors.
Store Management: Responsibilities of Store Manager, Store Security, Parking Space Problem at Retail Centers, Store Record and Accounting System, Coding System, Material Handling in Stores, Management of modern retails stores.
Assignment: *Merchandise Planning and Category Management, Mall Management-key aspects*

Module -5 Retail Pricing	**9 hours**

Retail Pricing: Factors influencing retail pricing, Retail pricing strategies, Retail promotion strategies
Relationship Marketing in Retailing: Management & Evaluation of Relationships in Retailing, Retail **Research in Retailing:** Importance of Research in Retailing, Trends in Retail Research, Areas of Retail Research. Customer Audits, Brand Management in retailing Retail Audit and ethics in Retailing Undertaking an audit, responding to a retail Audit, problems in conducting a retail audit
Retail Analytics Case Study: Customer Analytics at Big Basket.

Module – 6 Internationalization of Retailing	**7 hours**

Evolution of International Retailing, Motives of International Retailing, International Retail Environment – Socio-Cultural, Economic, Political, Legal, Technological and issues in international retailing.

Course Outcomes:
1.Career development in the field of sales
2.Management of sales
3.Find out the contemporary retail management, issues, and strategies.
4.Evaluate the recent trends in retailing and its impact in the success of modern business.
5.Relate store management and visual merchandising practices for effective retailing.

Practical Component:
* Interview a salesperson in a retail store and write a brief report about what they like and dislike about their jobs, their salary, travelling allowances, sales quotas, why they chose a sales career, and what does it take to

succeed in this profession.

- Go to a kirana store and a supermarket and compare the following: a) store arrangement b) No of brands carried c) pricing policies – are discounts given? d) Service – personal or impersonal? Etc.
- Go to at least three kirana stores in your neighbourhood (around 2 kms) and discuss with them the importance of location, pricing, credit policy, etc. What percentages of goods are sold 'loose' in each locality and compare this with the approximate income range of the customers? What are the retailer's losses when a customer defaults in payment? Does he make up for it by increasing his prices to other customers?
- Ask your friends if they would buy certain goods like groceries, vegetables, socks, mobile, pens etc from the roadside vendor as against a regular shop. Group the products into low risk and high risk ones. Does this buying behavior also depend on the personality of the individual doing the buying? Or the one doing the selling?
- Student can make a presentation on any product or the services of student choice, covering selling strategies and one day work exposure towards merchandising in any big retail outlets of respective places where institute is operating. Rural colleges can send the students to the city nearby to observe the merchandising planning in retail outlets and to make a small report.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X		X	X	
CO2	X		X	X	
CO3	X				X

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 perecent theory in the SEE.

Texbooks

1	Sales & Distribution Management	Tapan K. Panda & Sunil Sahadev,	6/e, Oxford University Press	2012
2	Managing of Sales Force	Spiro Stanton Rich	TMH	2003.
3	Sales Management	Charles M. Futrell		2012
4	Retail Management	Levy &Weitz	McGraw Hill	Latest Edition
5	Retail Management	Chetan Bajaj	Oxford University	
3	Retail Management-A Global Perspective: Text and Cases	Dr.Harjit Singh	S.Chand	Reprint 2018

Reference Books

	Sales & Distribution Management	Gupta S. L	Excel Books	2010
2	Retail Marketing Management	Dravid Gilbert,	Pearson Education	Latest Edition
3	Retail Management: A Strategic Approach	Barry Berman, Joel R. Evans	Pearson Education	Latest Edition

FINANCE SPECIALISATION COURSES
INVESTMENT MANAGEMENT

Course Code	20MBAFM303	CIE Marks	40
		SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives
1. To understand the capital market and various instruments for investment.
2. Learn valuation of equity, debt and mutual funds.
3. To learn theories of portfolio management.
4. To learn diversification of securities for risk return trade off in capital market.
5. To lean portfolio construction for retail investors, high net worth individuals, mutual funds.

Module -1 Introduction to Investment   **7 hours**

Investment Avenues, Attributes, Investor V/s speculator, Features of a good Investment, Investment Process. Financial Instruments: Money Market Instruments, Capital Market Instruments, Derivatives. **Securities Market:** Primary Market, Secondary Market. Stock Market Indicators- Indices of Indian Stock Exchanges (only Theory).

Module -2   **7 hours**

Return and Risk Concepts: Concept of return, individual security returns, rate of return, Concept of Risk, Causes of Risk, Types of Risk- Systematic risk- Market Price Risk, Interest Rate Risk, Purchasing Power Risk, Unsystematic Risk- Business risk, Financial Risk, Insolvency Risk, Risk-Return Relationship, Concept of diversifiable risk and non-diversifiable risk. Calculation of Return and Risk of Individual Security (Theory & Problems).

Module -3 Valuation of Securities   **9 hours**

Bond features, Types of Bonds, Determinants of interest rates, Bond Valuation, Bond Duration, Bond Management Strategies. Preference Shares- Concept, Features, Valuation. Equity Shares- Concept, Valuation, Dividend Valuation Models, P/E Ratio valuation model. (Theory & Problems).

Module -4   **7 hours**

Macro-Economic and Industry Analysis: Fundamental analysis-EIC Frame Work, Economy Analysis, Industry Analysis, Company Analysis- Financial Statement Analysis.
Market Efficiency: Efficient Market Hypothesis, Forms of Market Efficiency, Empirical test for different forms of market efficiency.
Technical Analysis – Concept, Theories- Dow Theory, Eliot Wave theory. Charts-Types, Trends and Trend Reversal Patterns. Mathematical Indicators –Moving Average Convergence-Divergence, Relative Strength Index (Theory only).

Module -5 Modern Portfolio Theory   **11 hours**

Markowitz Model- Diversification, Portfolio Return, Portfolio Risk, Efficient Frontier. Sharpe's Single Index Model, Capital Asset Pricing Model: Assumptions, CAPM Equation, Capital Market Line, Security Market Line, CML V/s SML. Sharpe's Optimum Portfolio Construction. Arbitrage Pricing Theory: Equation, Assumption, CAPM V/s APT (Theory & Problems).

Module-6 Portfolio Management Strategies and Performance Evaluation   **9 hours**

Portfolio Management Strategies: Active and Passive Portfolio Management strategy. Portfolio Revision: Portfolio Revision Strategies – Objectives, Performance plans. **Mutual Funds:** Concept of Mutual Funds, Participants in Mutual Funds, Advantages of Investment in Mutual Fund, Measure of Mutual Fund Performance. **Portfolio performance Evaluation:** Measures of portfolio performance (Theory & Problems).

Course outcomes:
At the end of the course the student will be able to:
1. The student will understand the capital market and various Instruments for Investment.
2. The learner will be able to assess the risk and return associated with investments and methods to value securities.
3. The student will be able to analyse the Economy, Industry and Company framework for Investment Management.
4. The student will learn the theories of Portfolio management and also the tools and techniques for efficient portfolio management.

CO-PO MAPPING

Practical Components:
- Each student will be given a virtual cash of Rs.10 Lakhs and they will be asked to invest in equity shares based on fundamental analysis throughout the semester. At the end the best investment will be awarded based on the final net worth. Virtual on line trading account can be opened for the student and every week 2 hours can be allotted to invest, monitor and evaluate.
- Students should study the stock market pages from business press and calculate the risk and return of selected companies.
- Students can do a macro economy using GDP growth.
- Students' are expected to do Industry analysis for specific sectors.
- Students can do Company analysis for select companies using profitability and liquidity ratios.
- Practice technical analysis using Japanese candle sticks.

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X			X	X
CO3	X				X
CO4	X			X	

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 40 percent theory and 60 percent problems in the SEE.

Textbook/ Textbooks

Sl. No.	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Investment Analysis and Portfolio management	Prasanna Chandra	Tata McGraw Hill Education	3/e, 2010
2	Investments	ZviBodie, Kane, Marcus & Mohanty	Tata McGraw Hill Education	8/e, 2010
3	Security Analysis & Portfolio Management	J Kevin	Tata McGraw Hill Education	2014

Reference Books

1	Analysis of Investments & Management	Reilly & Brown	Cengage Publications,	10e/2017
2	Security Analysis & Portfolio Management	Punithavathy Ehavathy Pandian	Vikas Publications	2/e, 201/8
3	Investment management (Security Analysis and & Portfolio Management)	Bhalla V.K.	Vikas Publications	19/e, 2018

BANKING & FINANCIAL SERVICES		CIE Marks	40
		SEE Marks	60
Course Code	20MBAFM305		
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives:
1. To understand the structure and functions of central and Commercial banking in India.
2. To learn the functions of various financial services in India.

Module-1 Structure of Banking in India — 7 hours

Structure of Banking in India: Functions of RBI, Monetary system, Sources of funds, Quantitative and qualitative measures of credit control. Banking sector reforms, Bank performance analysis and Future of Banking.(Theory)

Module -2 Commercial Banking — 9 hours

Commercial Banking: Structure, Functions - Primary & secondary function, Role of commercial banks in socio-economic development, Services rendered. Banking Technology- Concept of Universal Banking-Home banking—ATMs-Internet Banking— Mobile Banking-Core Banking Solutions—Debit, Credit and Smart Cards— Electronic Payment systems-MICR- Cheque Truncation-ECS- EFT – NEFT-RTGS. (Theory)

Module -3 Merchant Banking — 9 hours

Merchant Banking: Categories, Services offered, Issue management – Pre and Post issue management, Issue pricing, preparation of prospectus, Issue Management, Underwriting, Private Placement, Book Building Vs. Fixed price issues.(Theory)

Module -4 NBFCs; Micro-finance; Leasing & Hire Purchase Banking — 9 hours

A. NBFCs: An Overview -Types of NBFCs in India-Regulatory framework.
B. Micro-finance: Models, Services, Challenges.
C. Leasing & Hire Purchase: Concept, Types, Evaluation. Problems in Evaluation of Leasing & Hire Purchase. (Theory& Problems)

Module -5 Credit Rating; Venture Capital; Depository System & Securitisation of Debt — 9 hours

A. Credit Rating: Meaning, Process, Methodology, Agencies And Symbols.
B. Venture Capital: Concept, Features, Process. Stages, Performance of Venture Capital Funded Companies In India.(Theory)
C. Depository System: Objectives, Activities, NSDL& CDSL. Process of Clearing and Settlement.
D. Securitization of Debt: Meaning, process, Types, Benefits. (Theory)

Module-6 Mutual Funds — 7 hours

Meaning, Structure, Functions, Participants, Types of Funds, Types of Schemes, Performance of Mutual Funds, Regulations for Mutual Funds.

Course outcomes:
At the end of the course the student will be able to:
1. The Student will be acquainted to various Banking and Non-Banking financial services in India.
2. The Student will understand the activities of Merchant Banking and credit rating.
3. The Student will be equipped to understand micro financing and other financial services in India.
4. The Student will understand how to evaluate and compare leasing & hire purchase.

Practical Components:
- Study and compare the performance of Public and private sector banks.
- Issue management: Study the recent public issues.
- Factoring and forfeiting business in India.
- Venture capital funding and start up challenges.
- Status of securitization in India

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X			X	
CO3	X				X
CO4	X			X	

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 80 percent theory and 20 percent problems in the SEE.

Textbook/ Textbooks

Sl. No.	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Financial services	Khan M Y	McGraw Hill	6/e
2	Banking and Financial Services	Mukund Sharma	Himalaya Publishing House	2015
3	Financial Services in India: Concept and Application	Rajesh Kothari	Sage Publications	1/e, 2010

Reference Books

1	Financial Markets and Services	Gordon & Natarajan	Himalaya Publishing House	7/, 2011
2	Merchant Banking & Financial	Vij & Dhavan	McGraw Hill	1/e, 2011
3	Investment Banking	Pratap G Subramanyam	Tata McGraw Hill	2012
4	Behavioural Finance	Sujata Kapoor & Jaya Mamta Prosad	Sage Publications	1/ e, 2019

ADVANCED FINANCIAL MANAGEMENT		CIE Marks	40
Course Code	20MBAFM306	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives
1. To understand the concept capital structure and capital structure theories.
2. To assess the dividend policy of the firm.
3. To be aware of the management of working capital and its financing.
4. To understand the techniques of managing different components of working capital.

Module -1 Capital Structure Decisions   **9 hours**

Capital structure & market value of a firm. Theories of capital structure – NI approach, NOI approach, Modigliani Miller approach, Traditional approach. Planning the capital structure: EBIT and EPS analysis. ROI & ROE analysis. (Theory and Problems).

Module -2 Dividend Policy   **9 hours**

Dividend policy – **Theories of dividend policy:** relevance and irrelevance dividend decision. Walter's & Gordon's model, Modigliani & Miller approach. Dividend policies – stable dividend, stable payout and growth. Bonus shares and stock split corporate dividend behavior. (Theory and Problems).

Module -3 Working Capital Management Policy   **9 hours**

Working capital management – Determination of level of current assets. Sources for financing working capital. Bank finance for working capital. (No problems on estimation of working capital). Working capital financing: Short term financing of working capital, long term financing of working capital. Working capital leverage. (Theory).

Module -4 Inventory Management   **7 hours**

Inventory Management: Determinations of inventory control levels: ordering, reordering, danger level. EOQ model. Pricing of raw material. Monitoring and control of inventories, ABC Analysis. (Theory and problems)

Module -5 Receivables Management   **7 hours**

Receivables Management – Credit management through credit policy variables, marginal analysis, Credit evaluation: Numerical credit scoring and Discriminate analysis. Control of accounts receivables, Problems on credit granting decision. (Theory and Problems)

Module-6 Cash Management   **9 hours**

Cash Management – Forecasting cash flows – Cash budgets, long-term cash forecasting, monitoring collections and receivables, optimal cash balances – Baumol model, Miller-Orr model, Strategies for managing surplus fund. (Theory and Problems)

Course outcomes:
At the end of the course the student will be able to:
1. Get an overview of capital structure theories.
2. Understand and assess the dividend policy of the firm.
3. Realize the importance of management of working capital in an organization.
4. Be aware of the techniques of cash, inventory and receivables management

Practical Component:
• Study the working capital financing provided by a Bank and submit the report on the same.
• Study the annual report of any two companies and prepare a cash budget for next year.
• Study dividend policy of companies and its impact on shareholders' wealth.
• Study implications of bonus issues/stock splits of companies.

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CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X			X	
CO3	X				
CO4	X				X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 40 percent theory and 60 percent problems in the SEE.

Textbooks

Sl. No.	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Financial Management	M.Y.Khan & P.K.Jain	TMH	6/e, 2011
2	Financial Management	Prasanna Chandra	TMH	8/e, 2011
3	Corporate Finance-Text and Cases	Vishwanath S.R.	Sage Publishing	3/e, 2019

Reference Books

1	Financial Management & Policy	Vanhorne	Pearson	12/e,
2	Financial Planning: Theory and Practice	Sid Mittra, Shailendra Kumar Rai, Anandi P Sahu & Harry Starn, Jr.	Sage Publishing	1/e, 2015
3	Financial Management-A	Rajesh Kothari	Sage Publishing	2/e, 2017

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RECRUITMENT AND SELECTION

		CIE Marks	40
Course Code	20MBAHR303	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives
1. The student will be able to recite the theories and various steps involved in Recruitment and Selection
2. The student will be able to describe and explain in her/his own words, the relevance and importance of Recruitment and Selection in the Organization
3. The student will be able to apply and solve the workplace problems through Recruitment and Selection intervention
4. The student will be able to classify and categorize in differentiating between the best method to be adopted by organization related to Recruitment and Selection
5. The student will be able to compare and contrast different approaches of Recruitment and Selection framework for solving the complex issues and problems
6. The student will be able to design and develop an original framework and framework in dealing with the problems in the organization.

Module-1 Workforce Planning and Recruitment Analytics	**9 hours**

Concept of Work, Organisation's Work and Jobs; Millennials at the work place; Key Characteristics of Millennials; Types of Millennial; The Evolution of Work Structure; Organising the Work; Strategic Job Redesign and Its Benefits; Strategic Issues in Recruitment; What make Bad Recruitment; Overview of the Hiring Process; Recruitment Metrics; Factors Affecting Recruitment; Recruitment Strategy: An Internal Approach; Recruitment Strategy: An External Approach; Legal and Ethical Considerations; Organisational Best Practices.

Module -2 Job Analysis, Job Description and Job Design	**9 hours**

Identify the Job to Examine; Determine Appropriate Information Sources and Collect Job-Related Data; Job Description; Competency and Competency Ice Berg Model; Why Competency Based Recruitment; Sources of Recruitment; Different steps of job search; Motivational Job Specification; Creation of Functional Specification; Creation of Behavioural Specification; Employer branding; Social Media; Job Design.

Module -3 Job Evaluation	**7 hours**

The Job Evaluation Process; Obtain Job KSAOs, Qualifications, Working Conditions, and Essential Duties; Examine Compensable Factors Using the Rating/Weighting Evaluation Method; Determine Overall Job Value; Hay Group—Pioneer in Job Evaluation; Determining Compensation using Job Evaluation Data; Legal and Ethical Considerations for Job Evaluation; Online Salary Survey.

Module -4 Selection and Interview Strategy	**9 hours**

Interview Strategy and Process; Millennials shaping the Recruitment landscape in the organizations; Strategies for recruiting and selecting Generation Y into the workforce Developing Effective. Interviewers; Interviewing Techniques; Legal and Ethical Considerations in the Interview Process; The overall BEI Process; Assessment Centre's: Simulations.

Module -5 Testing and Assessment	**9 hours**

Testing in Occupational Selection; Test related to Assessment of Knowledge, Skills, and Abilities; Personality Assessment; The Birkman method and MBTI® comparison; FIRO-B; Honesty and Integrity Assessment; Various Non-Interviewing Methods; Graphology; Skills Assessment; Games and Group Activity for Leadership Assessment; Administration of Tests and Assessments; Key Interviewer Skills.

Module – 6 Making the Hire; Assessment of Candidate and Job Fit	**7 hours**

Unique Recruitment strategies; Biodata and Application Forms; Implications of Using Social Media Content in Hiring Decisions; Background Checks; Reference Checks; Pre-employment Testing; Making a Job Offer; Transitioning from Job Candidate to Employee; Induction; Placement.

Course outcomes:

At the end of the course the student will be able to:
1. Gain the practical insight of various principles and practices of recruitment and selection.
2. Acquire knowledge of latest conceptual framework used in recruitment and selection process and procedure applied in various industries.

3. Illustrate the application of recruitment and selection tools and techniques in various sectors.
4. Develop a greater understanding about strategies for workforce planning and assessment, analyse the hiring management system followed in various industries.

Practical Component:
- Design and Job Advertisement and Calculate the Cost; Paper Print mode; Social Media formalities.
- Meet a Manager (which ever stream), interact and design and JD for that role.
- Meet HR Manager / Officer, and ask Best 10 Interview Questions they ask during Candidate interaction.
- Visit HR department, and take part on shortlisting/ Scrutiny the CV.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X			X	
CO3	X				X
CO4	X		X	X	

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	How to Recruit, Incentives and Retain Millennials.	Rohtak	Sage Publications	2019
2	Recruitment and Selection- Strategies for Workforce Planning & Assessment	Carrie A. Picardi	Sage Publication	2019
3	Human Resource Management	R. C. Sharma	Sage Publication	2019

Reference Books

1	Human Resource Management:	Amitabha Sengupta	Sage Publication	2018
2	Leadership: Theory and Practices	Peter G. Northouse	Sage Publication India Pvt. Ltd	7/e, 2016
3	Performance Management and	T. V Rao	Response Books	2004

INDUSTRIAL RELATIONS AND LABOUR LAWS			
Course Code	20MBAHR305	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Course Objectives

1. The student will be able to describe and Identify the application of Labour Laws regulating Industrial Relations in Organisation
2. The student will be able to describe and explain in her/his own words, the relevance and importance of Labour Laws and Industrial Relations in Organisation
3. The student will be able to apply and solve the workplace problems through Labour Laws
4. The student will be able to classify and categorise different Laws and Codes
5. The student will be able to create and reconstruct Industrial Relations System to be adopted in the Organisation
6. The student will be able to appraise and judge the practical applicability of Labour Laws regulating Industrial Relations in Organisation

Module-1 Fundamental Aspects of Industrial Relations — 9 hours

Introduction, Nature of Industrial Relations, Approaches to Industrial Relations, Trade Unions: The Participants of Industrial Relation Activities, State and Employer/Management. The Participants of Industrial Relation Activities, **Evolution of Labour Legislation in India** - History of Labour Legislation in India, Objectives of Labour Legislation, Types of Labour Legislations in India, Constitutional Provisions for the Protection of Labour Workforce in India, Rights of Woman Workers, The Present Labour Laws and Codes

Module -2 Factories Act, 1948 — 7 hours

Introduction, Objectives, Scope and Important Definitions, Approval, Licensing and Registration of Factories, Health and Safety of Workers, Provisions Related to Working Conditions, Hazardous Processes, Employee Welfare and Working Hours, Employment of Young Persons and Women, Annual Leaves with Wages, Penalties and Contingence of Offences

Module -3 Social Security Act — 9 hours

The Employees' Compensation Act, 1923
Introduction, Objectives, Scope and Important Definitions of the Act, Eligibility, Rules for Workmen's Compensation, Amount and Distribution of Compensation, Notice, Claims and Other Important Provisions, Enforcement of Act and Provisions for Penalty

The Employees' State Insurance Act, 1948
Introduction, Objectives, Scope and Important Definitions, Administration of the Act, Finance and Audit, Contribution, Benefits, Obligations of Employers under the Act, Adjudication of Disputes, Claims and Penalties, Exemptions

The Maternity Benefit Act, 1961
Introduction, Objectives, Scope and Important Definitions, Provisions Related to Maternity, Benefits, Enforcement of the Act, Penalties and Offences, Miscellaneous Provisions of the Act

The Employees' Provident Funds and Miscellaneous Provisions Act, 1952
Introduction, Objectives, Scope and Important Definitions, Administration of the Schemes under the Act, Administration of the Act, Calculation of Money Due from Employers, Their Recovery and Employees', Provident Funds Appellate Tribunal, Enforcement of the Act, Penalties and Offences, Miscellaneous Provisions of the Act

The Payment of Gratuity Act, 1972
Introduction, Objectives, Scope and Important Definitions, Payment and Forfeiture of Gratuity and Exemption, Compulsory Insurance and Protection of Gratuity, Determination and Recovery of Gratuity, Enforcement of the Act, Penalties and Offences.

Module -4 Wages Act — 9 hours

The Payment of Wages Act, 1936
Introduction, Objectives, Scope and Important Definitions, Provisions for Payment of Wages, Deductions from Wages, Enforcement of the Act, Penalties and Offences, Miscellaneous, Provisions of the Act

The Minimum Wages Act, 1948
Introduction, Objectives, Scope and Important Definitions, Fixation and Revision of Wages, Payment of

Minimum Wages, Enforcement of the Act, Penalties and Offences, Miscellaneous, Provisions of the Act

The Payment of Bonus Act, 1965

Introduction, Objectives, Scope and Important Definitions of the Act, Eligibility, Disqualification and Amount of Bonus, Calculation of Bonus, Special and Miscellaneous Provisions, Dispute, Penalties and Offences

9 hours

Module -5 Regulating Employer-Employee Relations Act

The Industrial Disputes Act, 1947

Introduction, Objectives, Scope and Important Definitions, Procedure for Settlement of Industrial Disputes and Authorities under the Act, (Chapter II), Notice of Change in Conditions of Service (Chapter II-A), References of Disputes to Boards, Courts or Tribunals and Voluntary References (Chapter III) Award and Settlements, Strikes and Lockouts (Chapter V), Layoff and Retrenchment (Chapters V-A and V-B), Transfer and Closing Down of Undertakings, Special Provisions Related to Layoff, Retrenchment and Closure (Chapter V-B), Unfair Labour Practices (Chapter V-C), Miscellaneous Provisions of the Act (Chapter VII)

The Industrial Employment (Standing Orders) Act, 1946

Introduction, Objectives, Scope and Important Definitions of the Act, Procedure for Certification of Standing Orders, Other Provisions Relating to Standing Orders, Miscellaneous Provisions of the Act, Penalties and Offences

The Trade Unions Act, 1926

Introduction, Objectives, Scope and Important Definitions, Registration and Cancellation of Registration of Trade Unions, Rights and Duties of Registered Trade Unions, Amalgamation and Dissolution of Trade Union, Penalties

7 hours

Module – 6 Contract Labour (Regulation and Abolition) Act, 1970

Contract Labour (Regulation and Abolition) Act, 1970

Introduction, Objectives, Scope and Important Definitions, Registration of Establishments Employing Contract Labour, The Advisory Boards, Prohibition of Employment of Contract Labour, Appointment of Licensing Officer and Licensing of Contractors, Welfare and Health of Contract Labour, Offences by Companies

The Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959

Introduction, Objectives, Scope and Important Definitions, Notification of Vacancies, Penalties Miscellaneous Provisions, The Employment Exchanges (Compulsory Notification of Vacancies) Amendment Bill, 2013

Course outcomes:

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

1. Gain practical experience related to labour legislations in India across various sectors.
2. Acquire conceptual knowledge of Industrial relations and labour laws followed within industries.
3. Develop the greater understanding of IR concepts and its application in solving various issues in IR.
4. Apply the IR and labour laws concepts in various industries in India.

Practical Component:

- Visit Any Organisation and discuss the applicability of Laws at the workplace
- Meet HR Manager and discuss the statutory and non-statutory measure
- Visit Labour Dept, Government, and Interact with Labour Commissioner

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X			X	
CO3	X		X		X
CO4	X		X		

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Texbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Industrial Relations and Labour Laws for Managers	Parul Gupta	Sage Publication India Pvt. Ltd	2019
2	The SAGE Handbook of Industrial Relations	Paul Blyton, Edmund Heery, Nicolas Bacon, Jack Fiorito	SAGE Publications	2008
3	Labour and Industrial Laws	P. K. PADHI	Prentice Hall India Pvt., Limited	2017

Reference Books

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Bare Acts, Ministry of Labour	GOI	GOI	2019
2	The Idea of Labour Law	Guy Davidov, Brian Langille	The Oxford University Press	2011
3	Labour and Industrial Laws	PADHI, P. K	PHI Learning Pvt. Ltd	2019

COMPENSATION MANAGEMENT AND REWARD SYSTEM		CIE Marks	40
Course Code	20MBAHR306	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:2	Exam Hours	03
Credits	04		

Course Objectives

1. The student will be able to describe and Identify the application of Compensation Management in the Organisation
2. The student will be able to describe and explain in her/his own words, the relevance and importance of Compensation Management in the Organisation
3. The student will be able to apply and solve the workplace problems through application of Compensation Management
4. The student will be able to classify and categories different models and approaches of Compensation Management adopted in the Organisation
5. The student will be able to formulate and prepare Compensation Management to be adopted in the Organisation
6. The student will be able to design and develop an original framework and model in dealing with compensation problems in the organisation.

Module-1 Compensation	**7 hours**

Compensation, Meaning of compensation, Total Compensation/Reward and Its Components and Types, Importance of the Total Compensation Approach, Wages/Salaries, Some Other Terms, Theories of Wages, Does Compensation Motivate Behaviour?, Compensation Philosophy, Compensation Strategy, Compensation Policy, Base of Compensation Management, The Psychological Contract, Compensation and Legal Issues in Compensation Management, Factors Affecting Employee Compensation/Wage Rates/Wage Structure/Levels of Pay.

Module -2 Compensation Management	**7 hours**

Meaning of Compensation Management, Methods of Wage Payment, Essentials of a Satisfactory Wage System, National Wage Policy in India, Wage Policy at the Organisational Level, Wage Problems in India, Components/Functions of Compensation Management/W&S Admin, Divergent Systems and Institutions for Wage Fixation in India.

Module -3 Wage Determination Practices in India	**9 hours**

Divergent Systems for Wage Determination in Practice in Indian Organisations
Introduction, Management's Strategy, Reward Policy, Reward Management Processes, Reward Management Procedures, Pay Reviews, Planning and Implementing Pay Reviews, Procedures for Grading Jobs and Pay, Rates Fixation, Controlling Payroll Costs, Evaluation of Reward Processes, Some Other Trends, Boardroom Pay; Divergent Systems and Institutions for Wage Fixation in Practice in India, Management Strategy; Fringe Benefits, Fringe Benefits and Current Practices, Internal Audit of Compensation and Benefits; Different types of Direct and Indirect compensation include: Base Pay / Base pay; Commissions; Overtime Pay; Bonuses, Profit Sharing, Merit Pay; Stock Options; Travel/Meal/Housing Allowance; Benefits including: dental, insurance, medical, vacation, leaves, retirement, taxes; Merit pay; Incentive Pay; Deferred Pay ; Pay for time; Recreational facilities.

Module -4 Contingent Pay, Pay for Performance, Competence	**9 hours**

Competency-Based Pay, Skill-Based Pay, Team-Based Rewards, Gainsharing, Profit-Sharing Profit-Related Pay and Beyond Other Cash Payments and Allowances Overtime Payments Attendance Bonuses, Shift Pay, Clothing Allowances, Honoraria, Payments for Qualifications, Pay for Person, Pay for Excellence, Managerial Compensation and Rewards, Sales Force Incentive Programmes, Competency based Pay- Framework, Model and Challenges; Pay for Performance : Steps involved in the design for pay for performance - Intent ; Eligibility; Participation; Performance and Goal Criteria-Measurements ; Funding; Pay Outs and Timing; Benefits Impact & Administration; Evaluation.

Module -5 Administration & Controlling Salary Costs and Salary Review	**9 hours**

Salary Survey data, Salary Costs, Salary Planning, Salary Budget, Salary Control, Salary Reviews, Guidelines for Salary Review Process, Responding to Negative Salary Review, Five Key Steps: Manager's Guide to Annual Salary Review, Fixing of Salary, Method of Paying Salary, Flexibility, Process of Wage and Salary Fixation.

Module - 6 Operating, Non-financial Benefits(Intrinsic and Relational Rewards)	**9 hours**

on, Role of Non-financial Benefits/Rewards on Employee Motivation, Types of Non-financial Benefits/Rewards, Planning the Non-financial Benefits/Rewards, A Few Most Effective Non-financial Benefits/Rewards to Motivate Employees, Heineken's Refreshing Approach to Reward, Non-financial Metrics Intellectual Capital Assessment and Market Implications of Human Capital, Recognition, Praise, Learning and Development, Achievement, Value Addition in Personality Others.

Course outcomes:
At the end of the course the student will be able to:
1. Gain insights of various conceptual aspects of Compensation and Benefits to achieve organizational goals.
2. Determine the performance based compensation system for business excellence and solve various cases.
3. Designing the compensation strategies for attraction, motivation and retaining high quality workforce.
4. Understand the Legal & Administrative Issues in global compensation to prepare compensation plan, CTC, wage survey and calculate various bonus.

Practical Component:
- To understand the theoretical and practical aspects in the area of compensation and benefits.
- Exposure to MS-Excel or HRIS packages recommended.
- Acquire knowledge of compensation and reward system policies, processes and procedure.
- Apply the concepts of compensation administration and intrinsic and extrinsic reward system in national and global perspective.
- Analyse the divergent system and wage determination practices followed in various sectors.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				X
CO2	X	X	X		
CO3	X	X			
CO4	X			X	X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks				
Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Compensation Management	R. C. Sharma, Sulabh Sharma	Sage Publication India Pvt. Ltd	2019
2	Compensation and Benefit Design	Biswas, Bashker, D	Pearson	2013
3	Managing Employees Performance and Rewards	Shields	Cambridge Press	2007

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Course Code	20MBAMM402	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Objectives
1. To understand the basic concepts, processes and key elements of a supply chain.
2. To understand the elements and scope of logistics in supply chain management
3. To provide insights for establishing efficient, effective, and sustainable supply chains.
4. To comprehend the role of warehouse management
5. To gain knowledge about Inventory Management
6. To provide insights into International Logistics
7. To explain the role of technology in supply chain planning, visibility, and execution.

Module-1 Supply Chain — 7 hours

Concept, significance and key challenges. Scope of SCM- historical perspective, essential features, decision phases – process view, supply chain framework, key issues in SCM and benefits.
Definition and scope of Logistics. Elements of Logistics, types, incremental value delivery through Logistics management. Innovations in Supply Chain. Estimating customer demand, forecasting in Supply Chain.
Case Study.

Module -2 Warehouse Management System — 7 hours

Warehousing – scope, primary functions. Efficient Warehouse Management. Types of Warehouse. Warehouse Layout Design, criteria. Warehouse Management System,
Distribution Management, Designing the distribution network, role of distribution, factors influencing distribution, design options, distribution networks in practice, network design in the supply chain, factors affecting the network design decisions. HUB & SPOKE vs Distributed Warehouses. **Case Study**

Module -3 Inventory Management — 7 hours

Concept, various costs associated with inventory, EOQ, buffer stock, lead time reduction, reorder point / re-order level fixation, ABC analysis, SDE/VED Analysis. Goals, need, impact of inventory management on business performance. Types of Inventory, Alternative approach for classification of inventories, components of inventory decisions, inventory cost management, business response to stock out, replenishment of inventory, material requirements planning.
Dealing with demand uncertainty in Supply Chain- managing uncertainty in Supply Chain, (Bullwhip Effect) ,Impact of uncertainties. **Case Study**

Module -4 Transportation — 5 hours

Role, functions, mode of transportation and criteria of decision. Transportation Infrastructure. Factors impacting road transport cost, hazards in transportation, State of Ocean Transport, global alliances.
Packaging Issues in Transportation, role of containerisation. **Case Study**

Module -5 Logistics Management — 7 hours

Logistics of part of SCM, logistics costs, logistics, sub-systems, inbound and out bound logistics bullwhip effects in logistics, distribution and warehousing management. Demand Management and Customer Service: Demand Management, CPFRP, customer service, expected cost of stock outs.
Recent Issues in SCM: Role of computer/ IT in supply chain management, CRM Vs SCM, Benchmarking concept, features and implementation, outsourcing – basic concepts, value addition in SCM.
Case Study

Module - 6 International Logistics — 7 hours

Logistics and Environment, Methods and tools facilitating International Logistics, challenges, Integrated Supply Chain and Logistics Value Chain, Supply Chain Security Initiatives in the USA, Logistics Industry in India. Sourcing Decisions in Global SCM- Logistics, trends, Key issues in Global sourcing, Factors influencing Outsourcing. Performance Management in Supply Chain introduction. **Case Study**

Course outcomes:
The student should be able to:
1. Demonstrate knowledge of the functions of logistics and supply chain management.
2. To relate concepts and activities of the supply chain to actual organizations.
3. Highlight the role of technology in logistics and supply chain management.
4. Evaluate cases for effective supply chain management and its implementation.

Practical Components:
- Students are expected to choose any four Indian Organizations and study their supply chain in terms of drivers of the Supply chain and submit a report.
- Students should visit different logistics companies and understand the services provided by them and submit a report.
- Students should identify any product/service and study the type of distribution system used and understand the reason for using that particular type and present it in the class.
- Students should identify the various types of IT applications employed by Indian Organizations in their Supply chain

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X		X	X	
CO3	X				X
CO4	X			X	

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in SEE

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	A Logistic approach to Supply Chain Management	Coyle, Bardi, Longley	Cengage Learning	Latest edition
2	Integrated Supply Chain and Logistics Management	Rajat K. Baisya	Sage	2020
3	Supply Chain Management- Text and Cases	Janat Shah	Pearson	Latest edition
4	Supply Chain Management- Strategy, Planning and Operation	Sunil Chopra, Peter Meindl, D.V.Kalra	Pearson	Latest edition
5	Marketing Channels	Anne Coughlan, Anderson, Stern and El-Ansary		

Reference Books

1	The Box	Marc Levinson		
2	Essentials of Supply Chain Management	Michaael H Hugos		
3	Logistics and Supply Chain	Martin Christopher	FT Publishing	5th Editon
4	Supply chain Logistics Management	Donald J Bowersox,	Mc Graw Hill	4th Edition

DIGITAL MARKETING MANAGEMENT		CIE Marks	40
		SEE Marks	60
Course Code	20MBAMM403	Exam Hours	03
Teaching Hours/Week (L:T:P)	3:0:0		
Credits	03		

Course Objectives
1. To understand the important concepts related to e-marketing
2. To learn the use of different electronic media for designing marketing activities.
3. To acquaint the students with the latest techniques of e-marketing.

Module-1 Introduction to Digital Marketing — 7 hours

Concept of Digital Marketing, Origin, traditional versus Digital Marketing. Digital Marketing Strategy- The P-O-E-M Framework, Segmenting and customising Messages, Digital Landscape. Digital advertising Market in India. Skills required in Digital Marketing, Digital Marketing Plan

Module -2 Display Advertising — 7 hours

Concept of Display Advertising, types of display ads, buying models, display plan Targeting- contextual targeting placement targeting, remarketing, interest categories, geographc and language tagging, demographics, mobile, other targeting methods. Programmatic digital advertising, You Tube Advertising.

Module -3 Search Engine Advertising — 7 hours

Understanding Ad Placement, Understanding Ad Ranks, Creating First Ad Campaign, Performance Reports. Social Media Marketing: Building a successful Strategy

Live Project: Create a digital marketing plan

Module -4 Social Media Marketing — 7 hours

Face Book Marketing: Facebook for business & facebook insights
LinkedIn Marketing: LinkedIn Strategy, LinkedIn Analytics
Twitter Marketing: Building Content Strategy, twitter usage , Twitter Analytics
Instagram & Snanpchat: Objectives of Instagram, Hashtags. What is Snanpchat. Digital Public Relations

Module -5 Mobile Marketing — 7 hours

Mobile Usage, Mobile Advertising- Mobile Advertising Models, advantages of Mobile advertising, Mobile Marketing Toolkit, Mobile Marketing features- Location based services, Social marketing on mobile, QR Codes, Augmented Reality, Gamification.**Tracking mobile campaigns-** Mobile Analytics.

Live Project: Create a mobile advertising project..

Module – 6 Search Engine Optimization — 5 hours

Search Engine Optimization: How search engines work, concept of search engine optimisation (SEO), On Page Optimisation, Off Page Optimisation, Social media Reach, Maintenance- SEO tactics, Google Search Engine, Web Analytics- Key Metrics- concepts only

Course outcomes:
At the end of the course the student will be able to:
1. Recognize appropriate e-marketing objectives.
2. Appreciate the e-commerce framework and technology.
3. Illustrate the use of search engine marketing, online advertising and marketing strategies.
4. Develop social media strategy's to solve business problems.

Practical Components:
- Students will learn to create a digital marketing plan.
- Students will learn to create a mobile advertising project.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X	X			
CO3	X		X	X	
CO4	X		X		X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Digital Marketing	Seema Gupta	McGraw Hill Education	2017
2	Markeing 4.0: Moving from Traditinal to Digital	Philip Kotler, Hermawan Kartajaya, Iwan Setiawan	Wiley	2017
3	Fundamentals of Digital Marketing	Puneet Bhatia	Pearson	2/e, 2014
4	Social Media Marketing	Tracy L Tuten, Michael R Solomon	Sage Publications	3/e, 2020

Reference Books

1	Digital Marketing	Swaminathan T N, Karthik Kumar	Cengage Learning India Pvt. Ltd	2019
2	Digital Marketing	Hanlon	Sage Publications	2/e, 2017
3	Digital Marketing	Ian Dodson	Wiley	2016

HUMAN RESOURCE SPECIALISATION COURSES

ORGANISATIONAL LEADERSHIP

		CIE Marks	40
Course Code	20MBAHR401	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:0	Exam Hours	03
Credits	03		

Course Objectives
1. The student will be able to describe and Identify the application of Leadership styles and practices followed in the Organisation
2. The student will be able to describe and explain in her/his own words, the relevance and importance of various Leadership practices and style followed in the Organisation
3. The student will be able to apply and solve the workplace problems through Leadership practices
4. The student will be able to classify and categories different Leadership practices and styles followed in the Organisation
5. The student will be able to create and reconstruct Leadership required to manage the Human Resources in the Organisation
6. The student will be able to appraise and judge the practical applicability of Leadership practices followed in the Organisation

Module-1 Introduction — 5 hours

Concept of Leadership, Ways of Conceptualizing Leadership, Definition and Components, Leadership Described, Trait Versus Process Leadership, Assigned Versus Emergent Leadership. Leadership and Power, Leadership and Coercion, Leadership and Management.

Module -2 Model of Leadership - Part A — 7 hours

Trait Approach
Description, Intelligence, Self-Confidence, Determination, Integrity, Sociability, Five-Factor Personality Model and Leadership, Emotional Intelligence, How Does the Trait Approach Work?
Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Skills Approach
Description, Three-Skill Approach, Technical Skill, Human Skill, Conceptual Skill, Summary of the Three-Skill Approach, Skills Model, Competencies, Individual Attributes, Leadership, Outcomes, Career Experiences, Environmental Influences, Summary of the Skills Model, How Does the Skills Approach Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Behavioral Approach
Description, The Ohio State Studies, The University of Michigan Studies, Blake and Mouton's Managerial (Leadership) Grid, Authority–Compliance (9,1), Country-Club Management (1,9) Impoverished Management (1,1), Middle-of-the-Road Management (5,5), Team Management (9,9), Paternalism/Maternalism, Opportunism, How Does the Behavioral Approach Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Situational Approach
Description, Leadership Styles, Development Levels, How Does the Situational Approach Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Module -3 Model of Leadership - Part B — 7 hours

Path–Goal Theory
Description, Leader Behaviors, Directive Leadership, Supportive Leadership, Participative Leadership, Achievement-Oriented Leadership, Follower Characteristics, Task Characteristics How Does Path–Goal Theory Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Leader–Member Exchange Theory
Description, Early Studies, Later Studies, Leadership Making, How Does LMX Theory Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Transformational Leadership
Description, Transformational Leadership Defined, Transformational Leadership and Charisma, A Model of Transformational Leadership, Transformational Leadership Factors, Transactional Leadership Factors, Non-leadership Factor, Other Transformational Perspectives Bennis and Nanus, Kouzes and Posner, How Does the Transformational Approach Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Authentic Leadership

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Description, Authentic Leadership Defined, Approaches to Authentic Leadership, Practical Approach, Theoretical Approach, How Does Authentic Leadership Theory Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Psychodynamic Approach

Description, The Clinical Paradigm, History of the Psychodynamic Approach, Key Concepts and Dynamics Within the Psychodynamic Approach,

1. Focus on the Inner Theatre
2. Focus on the Leader-Follower Relationships

Social Defense Mechanisms, Mirroring and Idealizing, Identification With the Aggressor

3. Focus on the Shadow Side of Leadership Narcissism

How Does the Psychodynamic Approach Work? Strengths, Criticisms, Application, Case Studies, Leadership Instrument

Module -4 Leadership Instrument	7 hours

Description, Culture Defined, Related Concepts, Ethnocentrism, Prejudice, Dimensions of Culture, Uncertainty Avoidance, Power Distance, Institutional Collectivism, In-Group, Collectivism, Gender Egalitarianism, Assertiveness, Future Orientation, Performance Orientation, Humane Orientation, Clusters of World Cultures, Characteristics of Clusters, Anglo, Confucian Asia, Eastern Europe, Germanic Europe, Latin America, Latin Europe, Middle East, Nordic Europe, Southern Asia, Sub-Saharan Africa, Leadership Behavior and Culture, Clusters, Eastern Europe Leadership Profile, Latin America Leadership Profile, Latin Europe Leadership Profile, Confucian Asia Leadership Profile, Nordic Europe Leadership Profile, Anglo Leadership Profile, Sub-Saharan Africa Leadership Profile, Southern Asia Leadership Profile, Germanic Europe Leadership Profile, Middle East Leadership Profile, Universally Desirable and Undesirable Leadership Attributes, Strengths, Criticisms, Application, Case Studies on Leadership Instrument

Module -5 Ethical Leadership	7 hours

Description, Ethics Defined ;Level 1. Preconventional Morality ;Level 2. Conventional Morality; Level 3. Postconventional Morality; Ethical Theories, Centrality of Ethics to Leadership, Heifetz's Perspective on Ethical Leadership; Burns's Perspective on Ethical Leadership, The Dark Side of Leadership, Principles of Ethical Leadership, Ethical Leaders Respect Others, Ethical Leaders Serve Others, Ethical Leaders Are Just, Ethical Leaders Are Honest, Ethical Leaders Build CommModuley, Strengths, Criticisms, Application, Case Studies, Leadership Instrument.

Module – 6 Leadership Practices	7 hours

Select Case of Successful Leadership Practices; TATA Group; Reliance; Infosys; WIPRO; and Organisations which are listed as Fortune Companies. Survey Report analysis of NHRD; NIPM; CII; FICCI; Conference Board; CCL - Centre of Creative Leadership.

Course Outcomes:

1. Understand the fundamental concepts and principles, theories of Organizational Leadership.
2. Analyze the organizational leadership style, approaches and traits, its impact on the followers by using leadership theories and instruments.
3. Developing better insight in understanding the leadership traits that influence them to work effectively in group.
4. Demonstrate their ability to apply of their knowledge in organizational leadership.

Practical Components:

- Meet any Leader- Organisation or Academic and ask 10 questions related to Leadership. Than analysis the type of leadership style adopted.
- Meet 4-5 Leaders from different roles and compare - contrast the different style son leadership.
- Meet Gender specific leaders and try analysing who makes the best leader in which type of set-up.

Note: Faculty can either identify the organizations/ leaders/job profile or students can be allowed to choose the same.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X		X	X	X
CO3	X		X	X	
CO4	X		X		X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Leadership: Theory and Practices Leadership for Organisations	Peter G. Northouse	Sage Publication	7/e, 2016
2	Management: Leading People and Organisations in the 21st Century	Gary Dessler	Prentice Hall	2001
3	Charismatic Leadership in Organisations	Jay A. Conger, Rabindra N. Kanungo	Sage Publications	1998

Reference Books

1	Leadership: Theory and Practice	Peter G. Northouse	Sage	2010
2	Management: Leading People and Organisations in the 21st Century	Gary Dessler	Prentice Hall	2001
3	The Leadership Code: Five Rules to Lead	Dave Ulrich, Norm Smallwood, Kate Sweetman	Harvard Business Pres	2008
4	Leadership for Organisations	David A. Waldman, Charles O'Reilly	Sage Publications	2019

PERSONAL GROWTH AND INTERPERSONAL EFFECTIVENESS

		CIE Marks	40
Course Code	20MBAHR402	SEE Marks	60
Teaching Hours/Week (L:T:P)	3:0:0	Exam Hours	03
Credits	03		

Course Objectives
1. The student will be able to describe and Identify the application of various PG and IE framework
2. The student will be able to describe and explain in her/his own words, the relevance and importance of various PG and IE to be adopted in the Organisation
3. The student will be able to apply and improve the workplace effectiveness through various PG and IE
4. The student will be able to classify and categorise different PG and IE practices and to be followed in the Organisation
5. The student will be able to create and reconstruct Leadership required to manage the Human Resources in the Organisation
6. The student will be able to appraise and judge the practical applicability of various PG and IE practices to be followed in the Organisation

Module-1 Dynamics of Personal Growth	**4 hours**

Dynamics of Personal Growth Meaning, nature and scope of personal growth. Self-awareness and self-esteem, life roles, social roles and organisational roles, role clarity and role boundaries. Ego states- Id, ego and super ego and defense mechanism. Developing a self-improvement plan.

Module -2 Interpersonal Trust	**4 hours**

Openness, confidentiality, blind spot and unknown part of personality. Self-disclosure, seeking feedback, self-reflection and practicing new behaviors. Discovering facets of interpersonal trust through Johari Window.

Module -3 Understanding Human Personality and Neuro Functioning	**7 hours**

Personality theories, Carl Jung's theory of personality types and Myers Briggs Type Indicator test (MBTI), Trait theories- Guilford Peogut, PF 16 and Type A and B, Emotional intelligence. **Basic functions of mind:** Creativity and innovation. Blocks to creativity. Creativity processes and tools- convergent and divergent thinking. Six thinking Hats, Neuro Linguistic Programming.

Module -4 Attitudes, Beliefs, Values and their impact on Behaviour	**7 hours**

Personal change meaning, nature and requisites. Social adjustments and habit formation. Locus of control. Habits of personal effectiveness. Seven habits of highly effective people.

Module -5	**9 hours**

Interpersonal relations and personal growth: Interpersonal needs for openness, inclusion and control. Discovering the interpersonal orientation through FIRO-B. Conflict resolution and negotiation, time management and honouring the commitments

Module – 6 Transactional Analysis	**9 hours**

Ego states, types of transactions and time structuring. Life position, scripts and games; T-group sensitivity training, encounter groups, appreciative enquiry and group relations conference (students may go through three days personal growth lab for experiential learning)

Course Outcomes:
1. Have in-depth understanding the various personality traits which promotes personal growth.
2. Analyze the concepts of human personality, behaviour and functioning of mind
3. Learn and apply the psychometrics tests in understanding the personality traits.
4. Develop the greater insight of self, and others through various theories and prepare the developmental plan for interpersonal effectiveness.

Practical Components:
- Students are expected to conduct an in-depth study about various personality traits & TA and submit a detailed report.
- Students must undergo psychometric test like MBTI, FIRO-B, Big Five etc, conduct SWOT analysis and prepare a personal growth plan based on the results
- Ask the individual students to seek multisource feedback about their interpersonal effectiveness from peers, teachers, and parents; understand and reflect the feedback and prepare a development plan for interpersonal

effectiveness.
- Discuss a Johari Window case in the class to identify how it can help each individual student to promote his/her personal growth.
- Organize a workshop on MBTI for the students to know their type and to understand the type dynamics.
- Organize a Neuro linguistic programming workshop for the participation of all HR students.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X		X		
CO2	X		X	X	X
CO3	X	X	X		
CO4	X	X	X		X

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have 8 full questions carrying equal marks.
- Each full question is for 20 marks.
- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Organisational Behaviour: Human Behaviour at work	John W. Newstrom and Keith Davis	Tata McGraw Hill	11/e, 2003
2	Human Relations in organisations	Robert N. Lussier	Mc- Graw Hill Education	6/e
3	Development of Management Skills	Whetten & Cameron	PHI	7/e
4	Competency Mapping Assessment and Growth	Naik G. P	IIHRM	2010

Reference Books

1	Understanding OB	Udai Pareek	Oxford University Press	
2	Theories of Personality	Calvin S Hall	Wiley India Pvt. Ltd	4/e
3	Seven habits of highly effective people	Stephen R Covey	Pocket Books.	
4	Training in interpersonal Skills	Stephen Robbins	Pearson Education	

RESEARCH METHODOLOGY				
Course Code	20MBA23	CIE Marks	40	
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	60	
Credits	04	Exam Hours	03	

Course Objectives:
1. To understand the basic components of research design.
2. To Gain an insight into the applications of research methods.
3. To equip students with various research analytical tools used in business research.
4. To equip students with necessary critical thinking skills using excel.

Module-1 Business Research	9 hours

Business Research: Meaning, types, process of research- management problem, defining the research problem, formulating the research Hypothesis, developing the research proposals, research design formulation, sampling design, planning and collecting the data for research, data analysis and interpretation. Research Application in business decisions, Features of good research study.

Module -2 Business Research Design	9 hours

Meaning, types and significance of research design. Exploratory and Conclusive Research Design.
Exploratory Research: Meaning, purpose, methods- Literature search, experience survey, focus groups and comprehensive case methods. Conclusive Research Design - Descriptive Research - Meaning, Types – Cross sectional studies and longitudinal studies.
Experimental Research Design – Meaning and classification of experimental designs- formal and informal, Pre experimental design, Quasi-experimental design, True experimental design, statistical experimental design.

Module -3 Sampling	7 hours

Sampling: Concepts- Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling -Non Probability Sampling –convenience sampling- judgemental sampling, snowball sampling- quota sampling - Errors in sampling.

Module -4 Data Collection	9 hours

Meaning of Primary and Secondary data, Primary data collection methods - observations, survey, interview and Questionnaire, Qualitative Techniques of data collection, Questionnaire design – Meaning - process of designing questionnaire. Secondary data -Sources – advantages and disadvantages.
Measurement and Scaling Techniques: Basic measurement scales-Nominal scale, Ordinal scale, Interval scale, Ratio scale. Attitude measurement scale - Likert's Scale, Semantic Differential Scale, Thurstone scale, Multi-Dimensional Scaling. Case Study as per the chapter needs.

Module -5	7 hours

Data Analysis and Report Writing: Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation- Report writing and presentation of results: Importance of report writing, types of research report, report structure, guidelines for effective documentation.

Module – 6	9 hours

Advanced Excel and real time application: V Look Up, H Look up, Sort and filter, concatenate, Conditional Formatting., Pivot Table, If statement, Nested If, Charts. Statistical tests and how to interpret statistical outputs.

Course outcomes:
At the end of the course the student will be able to:
1. Understand various research approaches, techniques and strategies in the appropriate in business.
2. Apply a range of quantitative / qualitative research techniques to business and day to day management problems.
3. Demonstrate knowledge and understanding of data analysis, interpretation and report writing.
4. Develop necessary critical thinking skills in order to evaluate different research approaches in Business using excel in particular

Practical components:
• To identify research problem and collect relevant literatures for data analysis.
• To write the research design by using Exploratory and Descriptive Research methods.
• To conduct Market survey and to investigate consumer perception towards any FMCG and to conduct the data analysis using excel and need to submit a small report.

• To demonstrate Report writing and Presentation methods.

CO-PO MAPPING

CO	PO				
	PO1	PO2	PO3	PO4	PO5
CO1	X			X	
CO2	X			X	
CO3	X	X	X		X
CO4	X		X	X	X

Question paper pattern:
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- Each full question will have sub question covering all the topics under a Module.
- The students will have to answer five full questions; selecting four full question from question number one to seven and question number eight is compulsory.
- 100 percent theory in the SEE.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Research Methodology	C R Kothari	Viswa Prakasam Publication	2014
2	Business Research Methods	S. N. Murthy & U. Bhojanna	Excel Books	3e, 2016
3	Research Methods	M MMunshi & K Gayathri Reddy	HPH	2015

Reference Books

1	Research Methodology	Ranjit Kumar	Sage Publications	
2	Excel for dummies	Harvey .G	John Wiley & Sons	2016
3	Research Methodology	Deepak Chawla and Neena Sondhi	Vikas Publications	2014