Rashtreeya Sikshana Samithi Trust

R. V. COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belagavi)

R.V Vidyaniketan Post, Mysore Road

Bengaluru-560 059

Scheme & Syllabus

VII & VIII Semester B.E

Industrial Engineering and Management

(2012 Scheme)

R.V.College of Engineering, Bengaluru-59
(An Autonomous Institution affiliated to VTU,Belagavi)
Department of Electrical & Electronics Engineering
SCHEME OF TEACHING & EXAMINATION

Department of Industrial Engineering and Management
R V College of Engineering, Bengaluru

Vision

Imparting innovation and value based education in Industrial Engineering and Management for steering organizations to global standards with an emphasis on sustainable and inclusive development.

Mission

- To impart scientific knowledge, engineering and managerial skills for driving organizations to global excellence.
- To promote a culture of training, consultancy, research and entrepreneurship interventions among the students.
- To institute collaborative academic and research exchange programs with national and globally renowned academia, industries and other organizations.
- To establish and nurture centers of excellence in the niche areas of Industrial and Systems Engineering.

Program Educational Objectives (PEOs)

PEO1 :	Conceive, design, implement and operate integrated man – machine systems, focus on appropriate measures of performance at strategic, tactical and operational levels.
PEO2 :	Exhibit competency to adapt to changing roles for achieving organizational excellence.
PEO3 :	Design and develop sustainable technologies and solutions for betterment of society, at large.
PEO4 :	Pursue entrepreneurial venture with a focus on creativity and innovation for developing newer products, processes and systems.

Program Outcomes (POs)

PO 1	Exhibit knowledge of basic sciences and engineering and manufacturing processes.
PO 2	Demonstrate the ability to accomplish the integration of systems using appropriate analytical, computational and application practices and procedures.
PO 3	Demonstrate the ability to apply knowledge of probability and statistics, optimization techniques, simulation modeling, engineering economic analysis and cost control, and other technical sciences and specialties necessary in the field of industrial engineering and management.
PO 4	Be able to identify, formulate, solve problems and implement solutions for engineering, managerial and societal requirements.
PO 5	Possess skills related to design / re-design and conduct experiments, analyze and interpret data through systems thinking and modeling approaches
PO 6	Demonstrate knowledge of values and professional ethics in their areas of work.
PO 7	Develop an ability to adapt and continuously learn to pursue successful careers in chosen professional field
PO 8	Manage projects in various sectors of economy with a focus on conceptual, technical and human aspects

Department of Industrial Engineering and Management
R.V. College of Engineering, Bengaluru – 59
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SEVENTH SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lecture	**Tutorials**	**Practicals**	**Self study**	
1	12IM71	Facilities Planning and Design	IEM	4	0	1	0	5
2	12IM72	Supply Chain and Logistics Management	IEM	3	1	1	0	5
3	12HSC73*	Legal Studies & Professional Ethics for Engineers	HSS	2	0	0	0	2
4	12IM74	Minor Project	IEM	0	0	2	0	2
5	12IM7EX	Elective E	IEM	4	0	0	0	4
6	12GF7XX	Elective F	Respect-ive BoS	4	0	0	0	4
7	12GG7XX	Elective G	Respect-ive BoS	3	0	0	0	3
		Credit Total		**20**	**1**	**4**	**0**	**25**
		No. of Hours		**20**	**2**	**8**	**0**	**30**

HSS – Humanities & Social Sciences IEM – Industrial Engineering and Management
*12HSC73 is a mandatory Audit course for Lateral Entry Diploma students

LIST OF DEPARTMENT ELECTIVE SUBJECTS

Stream of Specialization	**Professional Core Elective – Group E**	**Global Electives** 12GF7XX	**Global Electives** 12GG7XX
Manufacturing	12IM7E1- Product Design and Development	To be opted from electives offered by other Departments, please see the list in following pages	To be opted from electives offered by other Departments , please see the list in following pages
Industrial & Systems Engg.	12IM7E2- Engineering Systems Design		
Optimization Techniques	12IM7E3- Principles of Soft Computing		
Management	12IM7E4-Retail Supply Chain Management		
Information System Design	12IM7E5 – Data Warehousing and Data Mining		

EIGHTH SEMESTER								
Sl. No	**Course Code**	**Course Title**	**BoS**	**CREDIT ALLOCATION**				**Total Credits**
				Lectur	**Tutori**	**Pract**	**Self**	

				e	**als**	**icals**	**stud y**	
1	12IM81	Project Work	IEM	0	0	18	0	18
2	12IMS82	Technical Seminar	IEM	0	0	01	0	01
3	12HSS83	Innovation and Social Skills	IEM	0	0	01	0	01
				0	**0**	**20**	**0**	**20**
		No. of Hours				*****		**40**

* - the student has to do Project work in industry / college for 36 hrs/ week and the same has to be documented by the project team and certified by the guides and the project monitoring committee

LIST OF GLOBAL ELECTIVE SUBJECTS FOR SEVENTH SEMESTER

Sl. No	**BoS**	**Group F**			**Group G**		
		Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
1	BT	12GF701	Nonmaterial: Process and Applications	4	12GG701	Bioinformatics	3
2	CH	12GF702	Green Technology	4	12GG702	Industrial safety & risk management	3
3	CS	12GF703	Mobile Application Development	4	12GG703	Intelligent Systems	3
4	CV	12GF704	Disaster Management	4	12GG704	Solid Waste Management	3
5	EC	12GF705	Artificial Neural Networks	4	12GG705	Automotive Electronics	3
6	EE	12GF706	Design of Renewable Energy Systems	4	12GG706	Industrial electronics	3
7	IM	12GF707	Optimization Techniques	4	12GG707	Systems Engineering	3
8	IM	12GF708	Project Management	4			
9	IS	12GF709	Java & J2EE	4	12GG708	Cloud Computing	3
10	IT	12GF710	Virtual instrumentation	4	12GG709	MEMS	3
11	ME	12GF711	Automotive Engineering	4	12GG710	Mechatronics	3
12	TE	12GF712	Telecommunication Systems	4	12GG711	Space Technology and Applications	3
13	Science				12GG712	Linear Algebra	3
14		12GF713	Thin Films and Surface Engineering	4			

15		12GF714	Engineering Materials for Advanced Technology	4			
16	HSS	12GF715	Applied Psychology for Engineers	4			

FACILITIES PLANNING AND DESIGN

Course Code	**:**	**12IM71**	**CIE Marks**	**:**	**100 + 50**
Hrs/Week	**:**	**L: T: P: S: 4:0:2:0**	**SEE Marks**	**:**	**100 + 50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 + 3 Hrs**

Course Learning Objectives: student is expected to

1. Understand the importance of Facilities Planning Processes and Material Handling Systems.
2. Define and analyze various types of layouts and their linkages to design of product, process and systems.
3. Solve facility design problems through analyzing layout models and computer aided layout designs.
4. Design and develop an integrated facilities layout and material handling systems for various Industrial Applications.

Unit – I **09 Hrs**

Introduction: Facilities planning definition, significance of facilities planning, objectives of facilities plan, facilities planning process, strategic planning process, developing facilities planning strategies, examples of inadequate planning.

Unit – II **09 Hrs**

Designing of Material flow, Activity relationship and space requirement: product design, process design schedule design, facilities design flow system, Material flow system, Departmental planning, activity relationships and space requirement

Unit – III **10 Hrs**

Materials Handling Systems: Introduction, scope and definition of material handling, material handling principles, designing material handling systems, unit load design, material handling equipment, estimating material handling costs, safety considerations.

Unit – IV **10 Hrs**

Layout planning models and design algorithms: Basic layout types, layout procedures, algorithmic approaches, departmental shapes and mail aisles, simulated annealing and Genetic algorithms, multi floor layout packages, commercial facility layout packages, developing layout alternatives.

Unit-V **10 Hrs**

Facility design for various facilities functions: warehouse operations facility location models, special facility layout models, machine layout models, conventional storages models, automated storage and retrieval systems, order picking systems, fixed path material handling models, simulation models

Unit – VI

(Practicals)

1. Redesigning of Material Flow using Charts, Diagrams and Models.
2. Designing of Product Layout using Assembly Line Balancing techniques.
3. Development of Layout plans using Systematic Layout Planning technique.
4. Evaluating alternative layout proposals using qualitative, simulation and other quantitative approaches.
5. Designing and Developing Layouts using mathematical models.
6. Designing of Layout corresponding to typical types of Standard Flows
7. Assessing Layout performance using efficiency indices.
8. Preparation and Presentation of Actual Layout for various organizations including manufacturing, warehouses, service and administration operations

Course Outcomes:

After going through this course the student will be able to

CO1: Understand the factors influencing decisions related to plant location, layout and Material Handling Systems.

CO2: Recognize the influences of product and process design as well as analyze their effects on the facility layout design problems.

CO3: Develop systematic facility layout plans using mathematical models and algorithmic approaches.

CO4: Evaluate alternative facilities planning and design solutions.

CO5: Create an integrated facilities plan for various applications.

Reference Books:

1. James A Tompkins, John A. White, Yavuz A. Bozer, "Facilities Planning", Wiley India, 3rd Edition 2009, ISBN- 978-81-265-1781-7.
2. James M Apple, "Plant Layout and Material Handling", Krieger Pub Co., 3rd Edition, January 1991, ISBN-13: 978-0894645457.
3. Francies R.L. and White J.A. "Facility layout and Location", Prentice Hall of India, 2nd Edition, 1998, ISBN: 8120314603.
4. Sunderesh Heragu, "Facilities Design", PWS Publishing Company, 4th Edition 2006, ISBN-0-595 359388.

Scheme of Continuous Internal Evaluation (CIE):

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination (SEE):

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Continuous Internal Evaluation (CIE) for Lab:

CIE consists of 50 marks out of which 40 marks for maintaining record and 10 marks for internal test.

Scheme of Semester End Evaluation (SEE) for Lab:

Experiment from Part – I	: 30 Marks
Experiment from Part – II	: 10 Marks
Viva Voce	: 10 Marks
Total	**: 50 Marks**

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	**1, 2, 3**
2.	**1, 2, 3**
3.	**1, 2, 3**
4.	**2, 3, 4**
5.	**2, 3, 4**

SUPPLY CHAIN AND LOGISTICS MANAGEMENT

Course Code	**:**	**12IM72**	**CIE Marks**	**:**	**100 + 50**
Hrs/Week	**:**	**L: T: P: S: 3: 2: 2: 0**	**SEE Marks**	**:**	**100 + 50**
Credits	**:**	**05**	**SEE Duration**	**:**	**3 + 3 Hrs**

Course Learning Objectives: student is expected to

1. Understand the Building Blocks, Major Functions, Business Processes, and their relevance to Decisions in a Supply Chain Management.
2. Design and analyze the linkages between Supply Chain Structures and Logistical Capabilities of a firm or supply chain.
3. Develop Quantitative models to ensure effective Decision Making by analyzing the supply chain issues.

Unit – I — 07 Hrs

Building a Strategic Frame Work to Analyse Supply Chains:
Definition and Objective of Supply Chain, The importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process View of Supply Chains. Competitive and Supply Chain Strategies, Achieving Strategic fit, Expanding Strategic Scope. Drivers of Supply Chain Performance, Frame work for Structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing, Pricing, Obstacles to Achieving Fit.

Unit – II — 07 Hrs

Designing The Supply Chain Network: The Role of Distribution in the Supply Chains, Factors influencing Distribution Network design, Design Options for a Distribution Network, e-Business and the Distribution network, Distribution Networks in practice. Factors influencing network design decisions, Framework for Network design decisions, Models for Facility location and Capacity allocation, The role of IT in Network design. The impact of uncertainty on network design, Discounted cash flow analysis, Representations of Uncertainty, Evaluating Network Design Decisions Using Decisions Trees, Risk Management and Network Design, Mumbai Dabbawalla Case Study, **Problems**.

Unit – III — 07 Hrs

Planning and Managing Inventories in a Supply Chain: The Role of Cycle inventory in a Supply Chain, Economies of Scale to Exploit Fixed costs, Economies of Scale to Exploit Quantity Discounts, Short-Term Discounting, Trade Promotions, Managing Multi-echelon Cycle Inventory. The Role of Safety Inventory in a Supply Chain, Determining appropriate level of Safety inventory, Impact of supply Uncertainty on Safety inventory, Impact of aggregation on safety inventory, impact of replenishment policies on safety inventory, Managing Safety Inventory in a Multi-echelon Supply Chain, The Role of IT in inventory management. The importance of the level of product Availability, Factors affecting optimal level of Product Availability, Managerial levers to improve supply chain Profitability, **Problems**.

Unit – IV **08 Hrs**

Designing And Planning Transportation Networks: The role of transportation in a Supply chain, Modes of transportation and their performance characteristics, Transportation infrastructure and policies, Design options for a transportation network, Trade-offs in transportation design, Tailored transportation, The role of IT in transportation, **Problems.**

Managing Cross-Functional Drivers In A Supply Chain: The role of sourcing in a supply chain, in-house or outsource, Third-and Fourth-party logistics providers, Supplier scoring and assessment, Supplier selection-Auctions and Negotiations, Contracts and supply chain performance, Design Collaboration, The procurement process, sourcing planning and analysis, the role of IT in sourcing.

Unit – V **07 Hrs**

Managing Cross-Functional Drivers In A Supply Chain: The role of IT in a supply chain, The supply chain in IT framework, The supply chain macro processes, Lack of Supply Chain co-ordination and the Bullwhip effect, managerial levers to achieve coordination, continuous replenishment and vendor-managed inventories, collaborative planning, forecasting and replenishment (CPFR), **Problems**.

Sustainability and the Supply Chain: The role of sustainability in a Supply Chain, Key Metrics for sustainability, Sustainability and Supply Chain drivers, Closed-loop supply chains.

Tutorials: 12 hours of tutorials classes to be conducted pertaining to the course

Unit – VI (Practicals)

Part – I

1. Exercises on designing supply chain networks: Facility location models, Network optimization models.
2. Exercises on planning demand and supply in a supply chain: Demand forecasting using time series methods, Aggregate planning problem.
3. Planning supply chain inventory and sensitivity analysis: Cycle inventory, Safety inventory and Product availability, Inventory aggregation.

Part – II

4. Exercises on transportation design: Transportation cost and inventory cost trade off, Customer response and transportation cost trade off, Routing and scheduling.
5. Exercises on Designing Marketing Campaign, Customer Service and Customer Order Processing.
6. Demonstration Exercises on the beer game, illustrating bullwhip effect; Risk Pool Game; Auctions
7. Demonstration Exercises using SCM Simulator.

Recommended Software Packages: MS Excel Software, SCM Simulator, OR Packages, OPEN TAPS.

Note: A minimum 12 experiments to be conducted covering the entire syllabus in Unit 6.

Course Outcomes: After going through this course the student will be able to

CO1: Understand supply chain concepts, systemic and strategic role of SCM in global competitive environment.

CO2: Evaluate alternative supply and distribution network structures using optimization models.

CO3: Develop optimal sourcing and inventory policies in the supply chain context.

CO4: Select appropriate information technology frameworks for managing supply chain processes.

Reference Books:

1. Sunil Chopra, Peter Meindl & D V Kalra: "Supply Chain Management - Strategy, Planning & Operation"; Pearson Education Asia; 5th Edition 2013, ISBN: 978-0-13-274395-2.
2. Sarika Kulkarni & Ashok Sharma: "Supply Chain Management – Creating Linkages for Faster Business Turnaround", TATA Mc Graw hill, 2004, 1st Edition, ISBN: 0-07-058135--5
3. David Simchi Levi, Philip Kaminsky, Edith Simchi Levi & Ravi Shankar; "Designing & Managing the Supply Chain – Concepts Strategies and Case Studies"; Mc Graw Hill, 2008,3rd Edition, ISBN: 978- 0-07-066698-6
4. Jeremy F Shapiro, Duxbury; "Modelling the Supply Chain", Thomson Learning, 2002, ISBN 0-534-37363.

Scheme of Continuous Internal Evaluation (CIE):

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination (SEE):

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Continuous Internal Evaluation (CIE) for Lab:

CIE consists of 50 marks out of which 40 marks for maintaining record and 10 marks for internal test.

Scheme of Semester End Evaluation (SEE) for Lab:

Exercise from Part – I	:	30 Marks
Exercise from Part – II	:	10 Marks
Viva Voce	:	10 Marks
Total	:	50 Marks

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	**1, 2, 3**
2.	**1, 2, 3**
3.	**1, 2, 3**
4.	**2, 3, 4**

LEGAL STUDIES & PROFESSIONAL ETHICS FOR ENGINEERS

Course Code	**:**	**12HSC73**	**CIE Marks**	**:**	**50**
Hrs/Week	**:**	**L: T: P: S: 2: 0: 0: 0**	**SEE Marks**	**:**	**50**
Credits	**:**	**02**	**SEE Duration**	**:**	**2 Hrs**

Course Learning Objectives

- Understanding of ethical and legal aspects of advertising, consumer problems and their redressal mechanism related to product and service standards.
- Discuss the knowledge of substantive Labor law and to develop skills for legal reasoning and statutory interpretations.
- Apply the knowledge of the constitutional literacy to become aware of the fundamental rights and duties in their role as Engineers
- Appraise the knowledge of consumer rights, responsibilities and socio-legal framework of protection of consumer interest
- Evaluate individual role, responsibilities and emphasize on professional/ engineering ethics in shaping professions

UNIT – I **06 Hrs**

Salient features of Indian Constitution: Preamble to the Constitution of India. Scope & Extent of Fundamental Rights under Part III. Constitutional Provisions relating to Right to Education under Article 21-A: Right to Information Act with Case studies

UNIT – II **06 Hrs**

Significance of Directive Principles of State Policy under Part – IV. Executive of the Union and State, Parliament & State Legislature. Anti-defection law, Union Judiciary & State Judiciary, Ombudsman-concept and need, Lokpal and Lokayukta.

UNIT-III **04 Hrs**

Consumer Protection Law- concept, definition and scope, object of C P Act, 1986, Rights of Consumers .Unfair Trade Practice, Restriction Trade Practice, Defect in goods, Deficiency in service: Medical, Lawyering, Electricity, Housing, Postal services etc. Enforcement of Consumer Rights- Consumer Forum

UNIT-IV **04 Hrs**

Introduction to Labour Legislations - Industrial Relation, Labour Problem and Labour Policy in India, Labour Welfare- Factories Act, 1948**,** Hazardous process, Safety and Welfare, Working Hours of Adults, Employment of young persons, Industrial Dispute Act, 1947**,** Reference of Disputes to Boards, Courts or Tribunals

UNIT – V **04 Hrs**

Scope and aims of engineering ethics (NSPE Code of Ethics), Responsibility of Engineers, Impediments to responsibility. Honesty, Integrity and reliability, Risks, Safety and Liability in Engineering. Corporate Social Responsibility. Statutory Provision regarding prohibition and prevention of Ragging and Sexual Harassment.

Course Outcome:

CO1. Understanding process of ethical and moral analysis in decision making scenarios and inculcate ethical behavior as a trait for professional development

CO2. Identify the conflict management in legal perspective and judicial systems pertaining to professional environment.

CO3. Apply engineering & ethical knowledge gained during their professional career to protect the interests of society and carry out their duties with integrity.

CO4. Demonstrate the consumer responsibility and capability to take affirmative action as an aware citizen, to defend their rights.

References:

1. Dr. J. N Pandey, Constitutional Law of India, Central Law Agency, 44th Edition, 2010.
2. S.C. Srivastava: Industrial Relation and Labour,Vikas Publishing House, ISBN: 8125918310
3. Avtar Singh: Law of Consumer Protection: Principles and Practice, 4th Edition, Eastern Book Company, 2005, ISBN 8170128544, 9788170128540
4. Jr. Charles E Harris, Michael. S. Pritchard and Michael J Rabins, Engineering Ethics, Thompson Asia, 2003–08-05

Scheme of CIE: (50 Marks)

CIE consists of two tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of one will be considered. The tests component will have a weightage of 45 marks in CIE. In additional there will have one seminar on new topics / model presentation for 05 marks.

Scheme of SEE: (50 Marks)

The question paper consists of Part A and Part B. Part A is for 10 marks covering the complete syllabus and is compulsory and of objective type. Part B is for 40 marks and shall consists of 5 questions carrying 08 max marks each without any sub questions. All 5 questions from Part B will have internal choice and one of the two have to be answered compulsorily.

MINOR PROJECT

COURSE CODE	**:**	**12IM74**	**CIE Marks**	**:50**
HOURS / WEEK :L:T:P:S	**:**	**0:0:4:0**	**SEE Marks**	**: 50**
Credits	**:**	**02**	**SEE Duration**	**: 03**

Course Learning Objectives (CLOs):

1. Create interest in innovative developments and preferably interdisciplinary field.
2. Apply the basic knowledge gained in previous semesters for hardware and software integrated design.
3. Inculcate the skills for good presentation and improve the Technical Report writing skills.
4. Demonstrate management principles and apply these to one's own work, as a member and leader in a team.
5. Recognize the need for, planning, preparation, management and financial budgeting.

Mini Project Guidelines:

1. Each project group will consist of minimum two and maximum of four students.
2. Each group has to select a current topic that will use the technical knowledge of their program of study after intensive literature survey.
3. Allocation of the guides is according with the expertise of the faculty.
4. The mini project would be implemented on hardware.

5. The implementation of the project must be preferably carried out using the resources available in the department/college.
6. The CIE evaluation will be done by the committee constituted by the department. The committee shall consist of respective guide & two senior faculty members as examiner.

Course Outcomes

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

1. Define specifications, Conceptualize, Design and implement a project.
2. Communicate the work carried out as a technical report and orally.
3. Work in a team and contribute to team work.
4. Prepare budgetary estimates and project management.
5. Indulge in self-learning and be motivated for lifelong learning.

Scheme of Continuous Internal Examination (CIE):

Evaluation will be carried out under three Phases:

Phase	Activity	Weightage
I	Synopsis submission, Preliminary seminar for the approval of selected topic and Objectives formulation	25%
II	Mid-term seminar to review the progress of the work and documentation	25%
III	Submission of project report , Final seminar and demonstration	50%

During CIE Evaluation following weightage will be given for the various components of the project.

- Selection of the topic & formulation of objectives 10%
- Design and simulation/ algorithm development 30%
- Implementation and testing 30%
- Demonstration & Presentation 20%
- Report 10%

Scheme of Semester End Evaluation (SEE):

- Write up depicting Design, Requirements & Specifications 20%
- Demonstration, Presentation & Results 60%
- Related Questions & Answers 20%

DEPARTMENTAL ELECTIVES

PRODUCT DESIGN & DEVELOPMENT

Course Code	**:**	**12IM7E1**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L: T: P: S: 4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**04**	**SEE Duration**	**:**	**3 Hrs**

Prerequisites:

Design of Machine Elements –I, Manufacturing Processes

Course Learning Objectives: student is expected to

1. To understand the structured product development processes
2. To understand the contributions and role of multiple organizational functions for creating a new product
3. To apply engineering knowledge for the development of innovative and market acceptable products.
4. To expose the tenets of design and development of a manufacturing process that builds the product at the scales and quality as demanded by the customer and the market.
5. To develop an ability to coordinate multiple, interdisciplinary tasks in order to achieve the mission and goals of the product development organizations.

Unit – I **09 Hrs**

Introduction: Definition of product design, design by evolution, design by innovation, Essential factors of Product design, Characteristics of successful product development, The Morphology of Design (The seven phases), who Designs and develops products, duration and cost of product development, the challenges of product development.

Development Processes and Organizations: A generic development process, concept development: the front-end process, adapting the generic product development process, the AMF development process, product development organizations, the AMF organization.

Product Planning: The product planning process, identify opportunities. Product strategies, Analysis of a product, The three S's, Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect on the results and the process.

Unit – II **09 Hrs**

Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process. Quality Function Deployment.

Product Specifications: What are specifications, Basic design considerations and constraints,
Various types of specification, when are specifications established, establishing target specifications, setting the final specifications.

Concept Generation: The activity of concept generation, clarify the problem, search externally, search internally, Benchmarking, explore systematically, reflect on the results and the process**.**

Unit – III **10 Hrs**

Concept Selection: Overview of methodology, concept screening, concept scoring, caveats.

Concept Testing: Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the result, reflect on the results and the process.

Product Architecture: What is product architecture, implications of the architecture, establishing the architecture, variety and supply chain considerations, platform planning, related system level design issues.

Unit – IV **10 Hrs**

Industrial Design: Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, assessing the

quality of industrial design. Problems faced by Industrial design Engineer.

Design for Manufacturing: Definition, Approach to design, Production Requirements, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, VCP, Overview of Design for production - Metal parts, Designing with plastics, Rubber, ceramics and wood, Impact of DFM & DFX on other factors. Concurrent engineering, reasons for adopting concurrent engineering, factors preventing the adoption of Concurrent engineering.

Unit – V **10 Hrs**

Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes.

Product Development Economics: Elements of economic analysis, base case financial mode. Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis.

Managing Projects: Understanding and representing task, baseline project planning, accelerating projects, project execution, post-mortem project evaluation.

Course Outcomes:

After going through this course the student will be able to

CO1: Explain the structured approaches to Product design and development projects.

CO2: Understand the challenges facing product designers and appreciate the need for adapting a development mind set.

CO3: Develop the capability to work in teams and apply the structured product design and development methodologies for solving problems.

CO4: Analyze the need for integrated product design and process development frameworks.

CO5: Create product solutions and develop prototypes of concepts generated.

Reference Books:

1. Karl.T.Ulrich, Steven D Eppinger, Product Design and Development: Tata McGrawHill-2008,edition 2009, ISBN – 0-07058513-X.
2. A C Chitale and R C Gupta, Product Design and Manufacturing, PHI, Year 2007, 4th Edition, ISBN: 9788120333178.
3. Timjones, New Product Development, Butterworth Heinmann, Oxford. UCI, 1997,ISBN – 0750624273.
4. Geoffery Boothroyd, Peter Dewhurst and Winston A Knight, Product Design for Manufacture and Assembly, M. Dekker, 1994, 3rd edition, ISBN 0824791762.
5. Kevin Otto and Kristen Wood, Product Design: Pearson Education-2001, 1st edition, ISBN-10: 0130212717.

Scheme of Continuous Internal Evaluation (CIE):

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination (SEE):

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	1, 2, 3
2.	1, 2, 3
3.	1, 2, 3
4.	2, 3, 4
5.	2, 3, 4

ENGINEERING SYSTEMS DESIGN

Course Code	**:**	**12IM7E2**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L: T: P: S:4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**04**	**SEE Duration**	**:**	**3 Hrs**

Prerequisites:
Engineering Mathematics

Course Learning Objectives: student is expected to

1. To explain life cycle approaches for the development, design and integration of the engineering systems.
2. To understand the importance of systems engineering through the relationship between various phases of systems life cycle.
3. To develop the architecture for a given problem situation using engineering system design framework.

Unit – I

Introduction to Systems Engineering: Introduction, Overview of the Engineering of Systems, Software System Engineering Analogies, Introducing the Concept of Architectures, Requirements, System's Life Cycle, Design and Integration Process, Overview on Large system design **10Hrs**

Overview of the Systems Engineering Design Process: Introduction, Design Process - Key terms, Design, Integration and Qualification; Key Systems Engineering Concepts - Operational Concept, External System Diagram, Objectives Hierarchy, Requirements, Functions, Items, Components, Interfaces, Verification, Validation, Acceptance, Use of CORE – Classes, Relations, Documents.

Modeling and Process Modeling: Introduction, Models and Modeling, IDEFO Background, IDEFO Semantics or Elements, IDEFO Diagram Syntax, IDEFO Model Syntax, IDEFO Advanced Concepts, Systems Engineering use of IDEFO models.

Unit – II

Discrete Mathematics: Sets, Relations, and Functions: Introduction, Sets- Writing Set Membership, Describing Members of a Set, Special Sets, Operations on Sets, Partitions, Power Set, Relations – Ordered Pairs and Cartesian Products, Unary and Binary Relations, Properties of Unary Relations on A, Partial Ordering, Equivalence Relations, Functions – Definitions, Composition, problems on sets, relations and functions. **10Hrs**

Graphs and Directed Graphs (Digraphs): Introduction, Terminology, Paths and Cycles, Connectedness, Adjacency and Reachability, Unary Relations and Digraphs, Ordering Relations, Isomorphism's, Trees – Spanning Trees, Directed Trees, Forest.

Requirements and Defining the Design Problem: Introduction, Requirements, Definitions, Originating Requirements, Development: Defining the Design Problem, Requirements Categories, Requirements Partition, Originating Requirements Document (ORD), Characteristics of Sound Requirements, Writing Requirements, Operational Concept, External Systems Diagram, Objectives Hierarchy for performance Requirements, Prototyping and Usability Testing, Defining the Originating Requirement – Input / Output Requirements, System – Wide and Technology Requirements, Trade-off Requirements, Requirements management.

Unit – III

Functional Architecture Development: Introduction, Defining Terminology for a Functional Architecture, Functional Architecture Development: Functional Architecture Process Model, Decomposition versus composition, Defining a system's functions: Approaches for defining functions, typical functional decompositions by Life cycle phase, feedback and control in functional design, evaluation of a functional hierarchy, development of the functional decomposition, Finishing the functional architecture, Tracing requirements to elements of the functional architecture. **10 Hrs**

Physical Architecture Development: Introduction, Generic versus Instantiated Physical Architectures, overview of physical architecture development, creativity techniques: Morphological box, Option creation techniques, Graphic representations of the physical architecture, issues in physical architecture development; Major concepts for physical architectures, use of redundancy to achieve fault tolerance.

Unit – IV

Operational Architecture Development: Introduction, Overview, Allocate functions to components, trace non-input/output requirements and derive requirements: Derive Internal Input / Output Requirements, Trace System – wide requirements and derive subsystem – wide requirements, Trace Trade off requirements and derive subsystem trace qualification requirements and derive subsystem qualification requirements, Define and analyse functional activation and control structure, conduct performance and risk analyses, document architecture and obtain approval, document subsystem specifications. **09 Hrs**

Unit – V

Interface Design: Introduction, Overview to Interface Development, Interface Architectures, Message Passing Architectures, Shared Memory Architecture, Network Architectures, Standards, Open System Interconnection Architecture, Common Object Request Broker Architecture, Interface Design Process, Problems. **09 Hrs**

Integration and Qualification: Introduction, Distinctions among Acceptance, validation and verification testing, Overview of integration, Alternate integration processes, Qualification planning during design, qualification methods, acceptance testing, design what to test, usability, problems.

Course Outcomes:

After going through this course the student will be able to

CO1: Understand design and integration of engineering systems

CO2: Explain relationship between various phases of system life cycle.

CO3: Formulate the problems for solutions using engineering systems design frameworks.

CO4: Develop system architectures for engineering systems.

Reference Books:

1. Dennis M Buede; The Engineering Design of Systems – Models and Methods; Wiley India; 1st Edition, 2006, ISBN: 81-265-0801-9.
2. Jack W Lewis, Modelling Engineering System, Eagle Rock V A, 1993 ISBN – 1878707086
3. Otto K & Wood K, Production Design: Techniques in Reverse Engineering and New Product Development, Prentice Hall,2001, 1st edition, ISBN: 0130212717

Scheme of Continuous Internal Evaluation (CIE):

CIE consists of three tests, each for 45 Marks, (15 Marks for Quiz + 30 Marks for Descriptive – inclusive of case studies) out of which, the best two will be considered. In addition, there will be one seminar on emerging topics in Management and Organizational Behavior for 10 Marks.

Scheme of Semester End Examination (SEE):

The question paper consists of Part A and Part B. Part A will be for 20 Marks covering the complete syllabus and is compulsory. Part B will be for 80 Marks and will consist of five questions, inclusive of case studies, carrying 16 Marks each. All five questions from Part B will have an internal choice and one of the two have to be answered compulsorily.

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	**1, 2, 3**
2.	**1, 2, 3**
3.	**1, 2, 3**
4.	**2, 3, 4**

PRINCIPLES OF SOFT COMPUTING

Course Code	**:**	**12IM7E3**	**CIE Marks**	**:**	**100**
Periods/Week	**:**	**L: T: P: S:4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**04**	**SEE Duration**	**:**	**3 Hrs**

Prerequisites:

Operations Research

Course Learning Objectives: student is expected to

1. To explain the principles and components of soft computing.
2. To understand fundamentals of non-traditional technologies and approaches to solving hard wired problems.
3. To appreciate the programming and software environment required for soft computing.
4. To formulate problems and develop solutions for real time problems using soft computing techniques.

Unit – I — 09 Hrs

Introduction: Intelligent systems, Knowledge based systems, Knowledge representation and processing, Soft computing, problems.

Unit – II — 10 Hrs

Fundamentals of Fuzzy Logic Systems: Introduction, background, fuzzy sets, fuzzy logic operations, generalized fuzzy operations, implication, definitions, fuzziness and fuzzy resolution, fuzzy relations, composition and interference.

Fuzzy logic control: Introduction, background, basics of fuzzy control, defuzzification, fuzzification, fuzzy control architectures, properties of fuzzy control, robustness and stability.

Unit – III **10 Hrs**

Fundamentals of Artificial Neural Networks: Introduction, learning & acquisition of knowledge, features of artificial neural networks (ANN), fundamentals of connectionist modeling.

Major classes of Neural Networks: Introduction, the multilayer perceptron, radial basis function network, Kohonen's self organizing network, the Hopfield network., industrial and commercial applications of ANN.

Unit – IV **09 Hrs**

Evolutionary computing: Introduction, overview of evolutionary computing, genetic algorithms (GA) and optimization, the schema theorem, GA operators, integration of GA with neural networks, integration of GA with fuzzy logic, known issues in GA, Population based incremental learning, evolutionary strategies, ES applications.

Unit – V **10 Hrs**

Tools of soft computing in real world applications: Case studies of expert parameter tuning of DC motor controller, stabilizing control of a high-order power system by neural adaptive feedback linearization, soft computing tools for solving a class of facilities layout planning problem, mobile position estimation using an RBF network in CDMA cellular systems, learning-based resource optimization in ATM networks and other Industrial applications.

Course Outcomes: After going through this course the student will be able to

CO1: Understand the tools and techniques for problem solving using soft computing.
CO2: Explain the functioning of intelligent systems through case studies, simulation examples and experimental methods.
CO3: Apply the principles of soft computing for solving problems in engineering domain.
CO4: Develop algorithms using soft computing for solving various real-world problems.
CO5: Evaluate and compare solutions obtained through various soft computing approaches.

Reference Books:

1. Fakhreddine O Karray & Clarence De Silva, "Soft Computing and Intelligent Systems Design – Theory Tools and Applications", PEARSON Education, 2009, ISBN: 978-81-317-2324-1.
   It is first level course introduced and the units are from the following chapters:

Unit No	I	II	III	IV	V
Chapter No	1	2,3	4,5	8	10

2. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", Wiley India (P) Ltd., 1st Edition, 2007, ISBN: 10:81-265-1075-7.
3. J S R Jang, C-T Sun, E Mizatani, Neurp – "Fuzzy and Soft Computing; a computational approach to Learning and Machien intelligence", Prentice Hall, 1997, ISBN: 10:0132610663.
4. K A Thev & RR Aliev, "Soft Computing and its Applications", 2001, ISBN: 98102 47001.

Scheme of Continuous Internal Evaluation (CIE):

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination (SEE):
The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	1, 2, 3
2.	1, 2, 3
3.	1, 2, 3
4.	2, 3, 4
5.	2, 3, 4

RETAIL SUPPLY CHAIN MANAGEMENT

Course Code	**:**	**12IM7E4**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L: T: P:S: 4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**04**	**SEE Duration**	**:**	**3 Hrs**

Prerequisite : Operations Management

Course Learning Objectives: student is expected to

1. To explain the concepts and drivers of the retail supply chain.
2. To identify the market need and market value to customers in retail supply chains.
3. To apply tools and techniques for improving the retail supply chain processes.
4. To evaluate and select among alternate retail formats for various applications.

Unit – I — 09 Hrs

Introducing Retail Supply Chain: Supply chain & logistics, retail supply chain management & its elements, strategic, tactical, operational & execution view of retail supply chain.

Category Management and Merchandise Budgeting: Category management definition, category management process, challenges in category management and merchandise types, hierarchy, forecasting & budgeting.

Unit – II — 10 Hrs

Assortment and Space Management: Assortment management framework, assortment objectives, selection & plan, role of data & IT in assortment and store clustering.

Retail Pricing: Retail pricing challenges, managing the retail pricing life cycle, managing retail promotions, managing retail markdowns and promotion management maturity model.

Retail Product Lifecycle Management: Product design, private labels, retail packaging, green design & packaging and IT for retail product life cycle management.

Unit – III — 10 Hrs

Retail Distribution, Replenishment and Logistics: Retail distribution & replenishment and retail transport & warehousing.

Retail Supplier Relationship Management: Retail sourcing, merchandise procurement, global sourcing, green sourcing, sourcing measures and IT for sourcing.

Retail Customer Relationship Management: Introduction to Retail customer relationship management, customer service, order management, multi channel retailing, retail return & reverse logistics, retail loyalty programs and retail kiosk.

Unit – IV **10 Hrs**

Food and Grocery Retailing Supply Chain: Food & grocery retailing, food & grocery supply chain characteristics, fresh fruit and vegetable supply chain, managing cold chain, food safety, food processing and fresh food retailing.

Apparel and Footwear Retailing Supply Chain: Apparel and Footwear Retailing, apparel retailing supply chain, supply chain characteristics and pre pack planning.

Other Category Retailing Supply Chain: Consumer electronics retailing supply chain characteristics, jewellery retailing, home furnishing retailing, health & beauty retailing and pharma retailing.

Unit – V **09 Hrs**

Managing Supply Chains of Different Retail Formats: Classification of retailers, organized B2C retail chain formats, organized B2B cash and carry formats, rural retail formats, airport retailing, cooperative stores, non store based retail formats, online shopping / E tailing and service retailing.

Retail Technology: Retail technology maturity model, Bar coding, RFID, retail ERP, retail analytics, point of sales solutions and mobile applications.

Course Outcomes:

After going through this course the student will be able to

CO1: Explain the building blocks of a typical retail supply chain.

CO2: Understand the functionalities of retail supply chain processes.

CO3: Analyze various types and formats of retail supply chains.

CO4: Evaluate and select appropriate technologies for managing retail supply chain processes.

Reference Books:

1. Rajesh Ray, Supply Chain Management for Retailing, Tata McGraw Hill, 2009, ISBN : 978-0-07-014504-7
2. James B Ayers, Mary Ann Odegaard, Retail Supply Chain Management, Auerbach publications, 2007, 1st edition,ISBN:978-0-8493-9052-4
3. NarendraAgarwal, Stephen A.Smith, Retail Supply Chain Management, quantitative models and empirical studies, Springer publications, 2009, ISBN:978-0-387-78902-6

Scheme of Continuous Internal Evaluation (CIE):

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination (SEE):

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	1, 2
2.	1, 2, 3
3.	1, 2, 3
4.	2, 3, 4

Course Code : 12IM7E5 **CIE Marks : 100**
Hrs/Week : L:T:P :S: 4:0:0:0 **SEE Marks : 100**
Credits : 04 **SEE Duration: 03 Hrs**

Prerequisite : Management Information System

Course Learning Objectives: student is expected to

1. To analyse the organization's business, and its requirements using current and historical data.
2. To understand the various concepts needed to design and develop a data warehouse.
3. To apply data mining and other tools for identifying pattern in large data sets.

Unit – I **09 Hrs**

The fundamentals of Data Warehousing: Inherent risks, converting data into information, the data warehouse phenomenon, definition of a data warehouse, users and frame work.

The Data warehouse architecture: Architectural challenge, essential components, Scoping, assessing architectural risk, data base design, Star schema, Snow Flake Schema.

Unit – II **10 Hrs**

Meta Data Management: Internal and external metadata, challenge of meta data, sources of metadata, types of metadata users

Introduction to Data Mining: What is data mining, Data mining functionalities, classification of data mining systems.

Unit – III **10 Hrs**

Data preprocessing: Why Preprocess the data, Data Cleaning, Data Integration and Transformation, Data Reduction, discretization and Concept hierarchy generation.

Association Analysis:

Apriori, FP-Growth algorithm, Mining various kinds of association rules, from association mining to correlation analysis, constraint based association mining.

Unit – IV **09 Hrs**

Classification and Prediction: What is classification? Prediction, Classification by Decision tree Induction, Bayesian Classification, classification by back propagation, other classification methods, prediction.

Unit – V **10 Hrs**

Cluster Analysis: Overview, K-means, Hierarchical clustering, DBSCAN, Outlier Analysis.

Applications in Industrial Engineering: Inventory, Procurement, Order Management, CRM, Transportation, Health Care, Electronic Commerce

Course outcomes:

After going through this course the student will be able to

CO1: Explain different methods of preprocessing data.
CO2: Design and implement a simple data warehouse.
CO3: Develop simple data cubes for online analytical processing.
CO4: Evaluate data mining tools for various engineering applications.

Reference Books

1. Sean Kelly; Data Warehousing in Action; 1st Edition; Wiley India;2007; ISBN:81-265-1186-9 (Chapters:1,4,6,9)
2. Jiawei Han and Micheline Kamber; Data Mining – Concepts and Techniques; 3rd Edition; Morgan Kaufmann Publishers Inc, 2011; ISBN 9789380931913 (Chapters:3,6,8,9,10)

3. Ralph Kimball, Margy Ross ; The Data warehouse Tool Kit;, 2nd Edition ;Wiley India; 2009; ISBN: 9780470479575(Chapters:3,4,5,6,11,13,14)
4. Pang-Ning Tan,Vipin Kumar, Michael Steinbach;Introduction to Data Mining , Pearson , ISBN:9788131714720

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

Mapping of POs with CO's

Course Outcome	Program Outcomes
1.	**1, 2, 3**
2.	**1, 2**
3.	**1, 2, 3**
4.	**2, 3, 4**

Global Electives for 7th semester – 2012 Scheme

Sl. No	BoS	Group F			Group G		
		Course Code	Course Title	Credits	Course Code	Course Title	Credits
1	BT	12GF701	Nonmaterial: Process and Applications	4	12GG701	Bioinformatics	3
2	CH	12GF702	Green Technology	4	12GG702	Industrial safety & risk management	3
3	CS	12GF703	Mobile Application Development	4	12GG703	Intelligent Systems	3
4	CV	12GF704	Disaster Management	4	12GG704	Solid Waste Management	3
5	EC	12GF705	Artificial Neural Networks	4	12GG705	Automotive Electronics	3
6	EE	12GF706	Design of Renewable Energy Systems	4	12GG706	Industrial electronics	3
7	IM	12GF707	Optimization Techniques	4	12GG707	Systems Engineering	3
8	IM	12GF708	Project Management	4			
9	IS	12GF709	Java & J2EE	4	12GG708	Cloud Computing	3

10	IT	12GF710	Virtual instrumentation	4	12GG709	MEMS	3
11	ME	12GF711	Automotive Engineering	4	12GG710	Mechatronics	3
12	TE	12GF712	Telecommunication Systems	4	12GG711	Space Technology and Applications	3
13	BS				12GG712	Linear Algebra	3
14	BS	12GF713	Thin Films and Surface Engineering	4			
15	BS	12GF714	Engineering Materials for Advanced Technology	4			
16	HSS	12GF715	Applied Psychology for Engineers	4			

SYLLABUS FOR GLOBAL ELECTIVES GROUP: F

NANOMATERIALS : PROCESS AND APPLICATIONS
(Offered by BoS: Biotechnology)

Course Code : 12GF701 **CIE Marks : 100**
Hrs/Week : L:T:P:S : 4:0:0:0 **SEE Marks : 100**
SEE Duration: 3 Hrs
Credits : 04

Prerequisites: Basic knowledge of Physics, Chemistry, Biology, Mechanical engineering and electronics.

Course Learning Objectives:

- Understand fundamentals of nanomaterials and the process.
- Describe methods by which nanoscale manufacturing and characterization can be enabled.
- Learn about Nano sensors and their applications in mechanical, electrical, electronic, Chemical Engineering
- Bring awareness about the nanoscale products and their importance in multidisciplinary fields.

Unit I

Introduction to Nanomaterials: History of Nanotechnology, Introduction & overview of Quantum concepts. Overview of 1st, 2nd and 3rd generation biomaterials, structures and properties of carbon based, metal based, bionanomaterails and hybrids: Bucky Ball, Nanotubes, Diamond like carbon(DLC),Quantum Dots, Magnetic, Nano Shells, Dendrimers, Nanocarriers, Nanocrystals, Nanowires, Nanomembranes, Thin films, hybrid biological/inorganic, protein & DNA based nanostructures. Nanosafety Issues: Toxicologyhealth effects caused by nanoparticles. **10 Hrs**

Unit II

Characterization of Nanostructures: Spectroscopy: UV-Visible spectroscopy, Fourier Transform infrared spectroscopy (FTIR), Raman Spectroscopy, X-ray spectroscopy. **Electron microscopy**: Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).**Scanning probe microscopy**: Atomic Force microscopy (AFM), Scanning tunnel microscopy (STM). **10 Hrs**

Nano Synthesis and Fabrication: Introduction & overview of Nanofabrication: Bottom up and Top down approaches using processes like Ball milling, Sol-gel Process, Chemical Vapour deposition (CVD), Plasma or flame spraying synthesis, Ion-Bean sculpting, electrodeposition and various lithography techniques (Hard & Soft lithography).

Unit III

Nanosensors: Overview of nanosensors, prospects and market. Types of Nanosensors and their applications. Electromagnetic nanosensors: Electronic nose and electronic tongue, Magnetic nanosensors. Mechanical nanosensors: Cantilever Nanosensors, Mechanics of CNTs, Biosensors: Biosensors in modern medicine. **08 Hrs**

UNIT IV

Micro & Nano-Electromechanical systems **and Microfluidics**: MEMS/NEMS: Magnetic, Chemical and Mechanical Transducers –Sensing and Actuators. Microfludics: Laminar flow, Hagen-Peouiselle equation, basic fluid ideas, Special considerations of flow in small channels, mixing, microvalves & micropumps. **08 Hrs**

UNIT V

Applications of Nanotechnology: Molecular electronics, molecular switches, mechanical cutting tools, machine components, magnets, DLC coated grinding wheels. Electrical, electronic, solar cells, Batteries, fuel cells, Nanofilters. Medical nanotechnology: in Diagnostics, Therapeutics, Drug delivery and Nanosurgery. **08 Hrs**

Course Outcome:

After completion of the course the student will be able to:

CO1. Understand, and apply knowledge of nanomaterials, nanotransducers & NEMs for various engineering applications.

CO2. Classify, analyze and validate Nanosensors, in electronics, mechanical, chemical, and biological systems.

CO3. Evaluate and create nano Design, Devices and Systems in various disciplines.

CO4. Interpret and experiment with implementation and characterization processes..

Reference Books:

1. B.S. Murty., P. Shankar., B.Raj, B..B. Rath, and J. Murday, Textbook of Nanosciences and Nanotechnology, Springer, Co-publication with University Press (India) Pvt. Ltd. VCH, XII. 2013, ISBN- 978-3-642-28030-6.
2. V. K. Khanna, Nanosensors:, Physical, Chemical and Biological, CRC press, 2013, ISBN 9781439827123 .
3. C. C. Kock., Nanostructured materials, Nanostructured materials, William Andrew Publishing, 2007, ISBN 0-8155-1534-0.
4. M .Wilson., K. Kannangara., G.Smith., M.Simmons., B. Raguse., Nanotechnology, , overseas Press (India) Private Ltd., 2005,ISBN 81-88689-20-3.

Scheme of Continuous Internal Evaluation:

CIE will consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition 10 marks are reserved for laboratory work which will be considered for CIE only and there will be no SEE.

Scheme of Semester End Examination:

The question paper will consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

GREEN TECHNOLOGY
(Offered by BoS: Chemical Engineering)

Course Code : 12GF702 **CIE Marks: 100**

Hrs/Week L:T:P:S 4:0:0:0 **SEE Marks: 100**

Credits: 04 **SEE Duration: 03**

Course Learning Objectives:

- Learn the tools of green technology
- Know various forms of renewable energy
- Study the environmental consequences of energy conservation

- Understand energy audits, Environmental impact assessments and management systems
- Understand the application of green technology in various industries

Unit I

Introduction to Green Technology: Fundamentals of energy and its impact on society and the environment. The mechanics, advantages and disadvantages of current and future renewable, green and nonrenewable energy sources. Residential energy audits. Concept of Atom economy, Tools of Green technology, zero waste technology. **08 Hrs**

Unit II

Solar Radiation and Its Measurement: Solar Constant, Solar Radiation at the Earth's Surface, Solar Radiation Geometry, Solar Radiation Measurements. **08 Hrs**

Applications of Solar Energy: Introduction, Solar Water Heating, Space-Heating (or Solar Heating of Buildings), Space Cooling (or solar Cooling of Building), Solar Thermal Electric Conversion, Agriculture and Industrial Process Heat, Solar Distillation, Solar pumping, Solar Cooking.

Geothermal Energy: Introduction, estimates of geothermal power, Nature of geothermal fields, Geothermal sources-hydrothermal convective systems-dry steam and wet steam fields Hot water fields Geopressure resources, Hot dry rocks, Magma resources, Volcanoes

Unit III

Energy From Biomass (Bio-Energy) : Introduction, Biomass Conversion Technologies, Wet Processes, Dry Processes, Biogas Generation, Factors Affecting Biodigestion or Generation of Gas , Classification of Biogas Plants, Advantages and Disadvantages of floating Drum Plant, Advantages, Advantages and Disadvantages of Fixed Dome Type Plant. Types of Biogas plants (KVIC Model & Janata Model), Selection of site for biogas plant. **06Hrs**

Bio Energy (Thermal Conversion): Methods for Obtaining energy from Biomass, Thermal Gasification of Biomass, Classification of Biomass Gasifiers, Chemistry of the Gasification Process, Applications of the gasifiers.

Bio Fuels- different types of Bio fuels-Biodiesel- Introduction, sources of biodiesel, production methods, Application of Biodiesel, Prospects of biodiesel in India

Unit IV

Wind Energy: Introduction, Basic Components of WECS (Wind Energy Conversion system), Classification of WEC Systems, Types of Wind Machines (Wind Energy Collectors), Horizontal-Axial Machines, Vertical Axis Machines. **06 Hrs**

Energy From Tides: Basic Principles of Tidal Power, Components of Tidal power Plants, Operation Methods of Utilization of Tidal energy, Advantages and Limitation of tidal Power Generation

Energy from waves: Operation Methods of Utilization of wave energy

Unit V

Hydrogen, Hydrogen Energy: introduction, methods of Hydrogen production (principles only), storage transportation, utilization of Hydrogen gas, Hydrogen as alternative fuel for motor vehicle, safety and management, Hydrogen technology development in India, **Fuel cell, (in brief)** **08 Hrs**

Application of Green Technology in: Solid Waste Management, Electronic wastes, Power sectors, Bioprocesses, Fossil fuel Processes, Composite materials, Construction Technology

Course Outcomes:

After completion of the course the student will be able to:

CO1. Remember various attributes of different forms of energy

CO2. Apply the concept of zero waste, atom economy for waste management

CO3. Analyze the various forms of energy and evaluate the apply for various applications

CO4. Formulate green methods of waste management in various industries.

Reference Books:

1. G.D.Rai, "Non-Conventional Energy Sources", Khanna Publications, 4th Edition, Second Reprint, 1997.
2. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai and Sons, 10th Edition, 3rd Reprint, 1995.
3. Boyle, Godfrey, "Renewable Energy" Oxford University Press, 2nd Edition, 2004, ISBN: 0-19-926178-4.
4. Boyle, Godfrey, Bob Everett, and Janet Ramage, "Energy Systems and Sustainability: Power for a Sustainable Future". Oxford University Press, 1st edition, 2004,ISBN: 0-19-926179-2

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

Mobile Applications Development
(Offered by BoS: Computer Science and Engineering)

Sub Code: 12GF703 **CIE Marks: 100**

L:T:P:S : 4:0:0:0 **SEE Marks: 100**

Credits:4 **Duration of SEE:3Hrs**

Prerequisite: Fundamental Java / C++ programming, Clear understanding of all the Native application API, Basics on data communication and working model of various networks.

Course Learning Objectives:

- Understand the working of the android and windows life cycle.
- Write a simple and complex programs for android and windows OS.
- Present different Google Map APIs.
- Perform behavioural analysis of system under test and understand the Network, wi-fi API.
- Introduce the Concept of sharing the data across network.
- Establish adequate research interest in topics Device driver and developing the emulator.

Unit-I

An Overview of Android: Introducing Android, The Open Handset Alliance, Android Platform differences, Android Platform. Configuring Your Development environment, **9 Hrs**

Exploring Android software development Kit, Writing first android application.

Understand the Anatomy of an android application: The life Cycle of android application, manifest file, Defining android application using the manifest file, Creating First android application, Type of Android application.

UNIT-II

Managing Application Resources: Resources, Working with resources. Referencing the system resources, Managing multiple Application Configuration, Configurations. **9Hrs**

Exploring User Interface Screen Elements : Introducing Android view ,Widgets and Layouts, Displaying Text to user, Getting the text from the user, Using Buttons, checkbox and Radio groups, Getting Dates and times user, Indicating the information to the user.

Unit-III

Working in the Background : Introducing Services, Creating and Controlling Services, Using background thread, introducingloaders, Manual thread creation and thread synchronization. **9Hrs**

Using Android Data and Storage API: Working with application Prefernces, Working with files and Directories, Storing the Structured data using SQLlite Databases, Implementing query(),insert(),update() and getType (), Updating the Manifest file, Working with Live Folder.maps.

Unit-IV

Windows Mobile Programming: Introducing the Microsoft .NET Framework, Introducing the .NET Compact Framework ,.NET Compact Framework Type System. **9Hrs**

Smartphone Application Development: Developing Your First Smartphone Application, UI Design with Forms and Controls ,Smartphone UI Design, Keyboard Input and Input Mode.

Unit-V

Data Access with SQL Server Mobile : Microsoft SQL Server 2005 Mobile Edition,Writing SQL Server Mobile Applications,Setting Up the SQL Server Mobile Server Environment . **9Hrs**

Networking: Web Access,TCP Servers and Clients,NetworkSockets,Creating E-mail Applications with Managed APIs ,Accessing PIM Data,Using SMS

Course Outcomes:

CO1. Develop mobile applications using third party application tools.
CO2. Modify and test existing applications for mobile use.
CO3. Design, customize and enhance mobile applications.
CO4. Modify existing mobile apps for better performance.

Reference Books:

1. Reto Meier, Professional Android 4 Application Development, Wrox Publication,3rd edition ,2012,ISBN : 978-1-1181-0227-5.
2. Baijian Yang, Pei Zheng, Lionel M. Ni, Professional Microsoft Smartphone Programming, Wrox Publication,7th edition ,2007,ISBN : 978-0-471-76293-5.
3. Shane Conder, Lauren Darcey, Android Wireless Application Development, Addison Wesley, 3rd Edition, 2009,ISBN-13: 978-0-321-61966-2.
4. ZigurdMednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, Programming Android, O'Reilly Publication, 2nd Edition, 2012, ISBN: 978-1-4493-1664-8.

Scheme of Continuous Internal Evaluation:
CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.
Scheme of Semester End Examination:
The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

DISASTER MANAGEMENT
(Offered by BoS: Civil Engineering)

Course Code: 12GF704 **CIE Marks: 100**
Hrs/Week:L:T:P:S: 4:0:0:0 **SEE Marks: 100**
Credits: 04 **Exam Hours : 3 Hrs**

Course Learning Objectives:

- Study the environmental impact of natural and manmade calamities
- Learn to analyse and assess risk involved due to disasters.
- Understand the role of public participation.
- Learn the management tools and mitigation techniques.

Unit – I

Natural disasters and Disaster management **10Hrs**

Introduction to natural and Industrial Hazards- floods, landslides, earthquakes, volcanoes, avalanche, cyclones, drought, fire, release of effluents, harmful gases, Blast etc. Prediction and perception.

Environmental risk due to project activities. Preparation of on-site and off-site disaster management plans - Pre disaster, actual disaster, Post disaster plans. Relief camp organization. Role of voluntary organization and armed forces during disasters.

Unit – II

Risk analysis and assessment: **09Hrs**

Basic concept. Purpose of risk analysis. Analytical techniques and tools of risk assessment. Toxicology. Significance of risk. Risk characterization. Risk communication and Management..

Unit – III

Environmental Impact Assessment (EIA): **09Hrs**

Definition, Basic concepts and principles of EIA. Regulatory framework in India. Environmental inventory. Base line studies. Over view of EIA studies.

Unit – IV

Assessment and Methodologies: **10Hrs**

Physical, Biological, Natural resources, Socio economic and cultural environmental assessment. EIA methodologies- Adhoc, Matrix, Checklist approaches. Economic evaluation of impacts- cost benefits of EIA. Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement. Decision methods for evaluation of alternatives

Unit – V

Disaster Mitigation and Management:

Introduction, types, modes of disaster management, tools and techniques, primary and secondary data. Natural disasters its causes and remedies-Earthquake hazards-Causes and remedies, Flood and Drought assessment, causes and remedies, Landslides-causes and remedies. Fire hazards in buildings, Fire hazard management, Traffic management, Cyclones and hurricanes, inter department cooperation. Regional and global disaster mitigation. **10Hrs**

Course outcomes:

After completing this course the student will be able to:

1. Explain the different types of disasters and manage the pre and post disaster situation.
2. Estimate and communicate the risk by conducting the risk assessment and Environmental Impact Assessment.
3. Identify the methods of disaster mitigation based on the basis of the risk assessment.
4. Analyze and evaluated the impact of measures adopted to mitigate the impacts.

Reference Books

1. John G Rau and David C Wooten —Environmental Impact Analysis Hand Book, McGraw Hill, Edition:2013, ISBN:978-0070512177.
2. John Glasson, RikiTherivel, Andrew Chadwick. Introduction to environmental Impact assessment, Research Press, Edition: 2012, ISBN:000-0415664705.
3. Girish K Mishrta, G C Mathew (eds) Natural Disaster Reduction. Reliance Publishing House, New Delhi,Edition:2005
4. Thomas M. Lillisand and R.W. Keifer, Remote Sensing and Image Interpretation, John Wiley, 6th edition: , 2002, ISBN:9780470052457.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily

ARTIFICIAL NEURAL NETWORKS

(Offered by BoS: Electronics and Communication)

Course Code: 12GF705 **CIE Marks: 100**

Hrs/Week: L:T:P:S: 4:0:0:0 **SEE Marks: 100**

Credits: 04 **SEE Hrs: 03**

Course Learning Objectives(CLOs):

The student will be able to:

- Define neural network and model of a neuron.
- Analyze learning tasks with and without teacher and implement learning algorithms.
- Analyze and compare various types of perceptrons and develop MLP with 2 hidden layers.
- Develop: Delta learning rule of the output layer and basis function network.

UNIT – I

Introduction to Neural Networks **09 Hrs**

Neural Network, Human Brain, Models of Neuron, Neural networks viewed as directed graphs, Biological Neural Network, Artificial neuron, Artificial Neural Network architecture, ANN learning, analysis and applications, Historical notes.

UNIT – II

Learning Processes **09 Hrs**

Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.

UNIT – III

Single layer Perception **09 Hrs**

Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception.

UNIT – IV

Multi-Layer Perceptron Networks **09 Hrs**

Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm.

UNIT – V

Radial Basis Function Networks **09 Hrs**

Introduction, Least square estimator, Linear neuron, Recursive least square algorithm, Basis function network, RBF techniques, Gaussian radial basis function, RBF as interpolation networks, RBF as approximation networks, GRBF network training. Application to approximation, MLP vs RBF

Reference Books:

1. Simon Haykins, "Neural Network- A Comprehensive Foundation", Pearson Prentice Hall, 2nd Edition, 1999, ISBN.-13: 978-0-13-147139-9
   ISBN-10:0-13-147139-2
2. Zurada and Jacek M, "Introduction to Artificial Neural Systems", West Publishing Company, 1992, ISBN: 053495460X,9780534954604
3. Vojislav Kecman,"Learning & Soft Computing", Pearson Education, 1st Edition, 2004, ISBN.: 0-262-11255-8
4. M T Hagan, H B Demoth, M Beale, "Neural Networks Design", Thomson Learning, Edition: 2002, ISBN-10:0-9717321-1-6

Course Outcomes:

After completion of the course the student should be able to demonstrate:

CO1. Ability to comprehend Neural Network, Neuron and to analyze ANN learning, and its applications.

CO2. Perform Pattern Recognition, Linear classification.

CO3. Develop different single layer/multiple layer Perception learning algorithms.

CO4. Develop detailed mathematical treatment of another class of layered networks: radial basis function networks.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five

questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

DESIGN OF RENEWABLE ENERGY SYSTEMS

Course Code: 12GF706 **CIE Marks: 100**
Hrs/Week: L:T:P:S 4:0:0:0 **SEE Marks: 100**
Credits: 04 **SEE : 3 Hrs**

Course Learning Objectives:

- To provide opportunity for students to work on multidisciplinary projects.
- To familiarize the students with the basic concepts of nonconventional energy sources and allied technological systems for energy conversion
- To impart skill to formulate, solve and analyze basic Non – conventional energy problems and prepare them for graduate studies.
- To enable the student to design primarily solar and wind power systems.
- To expose the students to various applications of solar, wind and tidal systems.

Unit – I **09Hrs**

An introduction to energy sources: Industry overview, incentives for renewable , utility perspective, Relevant problems discussion, current positions of renewable energy conditions

Unit – II **10 Hrs**

PV Technology: photovoltaic power, PV projects, Building-integrated PV system, PV cell technologies, solar energy maps, Technology trends, **Photovoltaic Power Systems**: PV cell, Module and Array, Equivalent electrical circuit, open-circuit voltage and short-circuit current, i-v and p-v curves , Array design(different methodologies), peak-power operation,
system components ,

Unit – III **10 Hrs**

Wind Speed and Energy: speed and power relations, power extracted from the wind, Air density, Global wind patterns, wind speed distribution(parameters calculations) , wind speed prediction, **Wind Power Systems :** system components , turbine rating , power vs. speed and TSR, maximum energy capture , maximum power operation , system-design trade-offs , system control requirements , environmental aspects**,**
(already existed in the methodology)

Unit – IV **09Hrs**

Geothermal and ocean energy: Geothermal power, geo pressured sources ,Geothermal well drilling ,advantages and disadvantages, Comparision of flashed steam and total flow concept ,**Energy from ocean**: OTEC power generation ,OPEN and CLOSED cycle OTEC
Estimate of Energy and power in simple single basin tidal and double basin tidal system

Unit – V **10 Hrs**

Stand alone system: PV stand-alone, Electric vehicle, wind stand-alone , hybrid systems(case study) , system sizing , wind farm sizing ,
Grid-Connected Systems : introduction**,** interface requirements , synchronizing with the grid , operating limit ,
Energy storage and load scheduling**,** Grid stability issues **,** distributed power generation

Course outcomes:

- Demonstrate an understanding of the scientific principles of methodology of Non-conventional energy.
- Acquire working knowledge of different Renewable energy science-related topics.
- Ability to analyze the system related concepts effectively in the wind energy designining.
- Students will be able to decide the appropriate procedures to ensure that the working model has developed properly.

Reference Books

1. Mukund R Patel "wind and solar power systems Design ,Analysis andoperation"Taylor and Francis publishers ,2nd edition,2006, ISBN 978-0-8493-1570-1
2. G.D.Rai, "Non-Conventional sources of energy", Khanna Publishers, 4th edition, 2007.
3. Sukhatme, "Solar Energy", 2nd edition, TMH, 2006.
4. Renewable energy sources- Twiddle Elbs, 3rd Edition, 2006, ISBN-10: 0419253203.
5. Solar energy hand book – edited by William.C. Dikkinson ASISES, Network, ISBN -13: 978-0865716216.
6. Partain, L. D., "Solar Cells and Their Applications". John Wiley & Sons, 3rd edition, 2003, ISBN:9780470539675.
7. Green, M.A., et al. Solar Cell Efficiency Tables (Version 30). 2007. Prog. Photovolt: Res. Appl. 15:425-430.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

JAVA & J2EE
(Offered by BoS: Information Science & Engineering)

Course Code: 12GF709 **CIE Marks: 100**
L:T:P:S: 4:0:0:0 **SEE Marks: 100**
Credits: 04 **SEE Duration: 3 Hrs**

Course Learning Objectives:

- Comprehend the fundamentals of object-oriented programming in Java, including elements of Java programming such as variables, conditional and iterative execution, defining classes, invoking methods, using class libraries, etc.
- Comprehend the essentials of the threads and exceptions, Event driven Graphical User Interface (GUI) programming and Applet Programming.
- Understand and develop applications in java to access databases in java using JDBC driver.
- Analyze the role of J2EE in development of enterprise software in Java language, and to understand how J2EE facilitates integration of java components with non-Java systems including databases using servlets and Java Server Pages(JSP).

Unit - I

Introduction **8Hrs**

An Overview of Java, Introduction to Class - object, A Closer Look at Methods and Classes, Inheritance, Packages and Interfaces. Enumerations, Autoboxing, and Annotations

Unit – II

Advanced features -I **9Hrs**

Exception Handling, Multithreaded Programming, String Handling, Introduction to streams classes.

Unit – III

Advanced features –II **9Hrs**

Applets: Architecture, Applet Lifecycle, repaint ( ), HTML APPLET Tags, passing parameters to Applets; Introduction to Swings

Unit – IV

Overview: J2EE and J2SE. **9Hrs**

Java Database Connectivity:JDBC introduction, JDBC Driver Types, JDBC process, Creating and executing SQL statement - Statement Object, ResultSet Object

Unit – V

Server side programming

Overview:JSP, Servlets and Tomcat, Model View Controller (MVC) **9Hrs**

Servlets: Life Cycle of Servlet, Handling GET and POST requests, The Servlet API, The Javax.servlet Package, Reading Servlet Parameter, The Javax.servlet.http package, Handling HTTP Requests and Responses, Using Cookies, Session Tracking

Course Outcomes

CO1. Understand the basic concepts of Java Standard Edition and Enterprise Edition.

CO2. Use the Java SDK environment to create, debug and run Java standalone and applet programs.

CO3. Design and build robust and maintainable web applications by creating dynamic HTML content with Servlets.

CO4. Promote and be open to creative solutions applying Servlets.

References:

1. Herbert Schildt; "Java The Complete Reference"; McGraw Hill Osborne Media; 8th Edition, 2011; ISBN: 9781259002465
2. Y. Daniel Liang; "Introduction to Java Programming"; Prentice Hall; 8th Edition; 2010; ISBN: 0132130807.
3. Jim Keogh; "J2EE - The Complete Reference"; Tata McGraw Hill; 1st Edition; 2002; ISBN: 9780070529120.
4. Bruce Eckel; "Thinking in Java"; Pearson Education; 4th Edition, 2006; ISBN 0131872486

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

VIRTUAL INSTRUMENTATION
(Offered by BoS: Electronics & Instrumentation Engineering)

Course Code: 12GF710 **CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:0:0 **SEE Marks: 100**
Credits: 04 **SEE Duration: 3 Hrs**

Course Learning Objectives:

- Understand the basic components and concepts of LabVIEW programming Language.
- Apply the programming concepts to build virtual application.
- Provide the concepts of interfacing Peripherals.
- Create a virtual system for Real Time applications.

Unit I

Fundamentals of Virtual Instrumentation: Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. **09 Hrs**

Software Overview: Lab VIEW , Graphical user interfaces - Controls and Indicators Data types - Data flow programming - Editing - Debugging and Running Virtual instrument - Graphical programming pallets - and their configuration VIs and sub-VIs Typical examples-VIs.

Unit II

Programming Structure: FOR loops, WHILE loop, CASE structure, formula node, Sequence structures **09 Hrs**

Introduction to Arrays and Clusters: Array operations Cluster Functions, Graphs and charts, local and global variables.

Unit III

File Input/Output: Introduction, File Formats, File I/O Functions, Sample VIs to Demonstrate File WRITE and READ Function **09 Hrs**

String Handling: Introduction, String Functions, LabVIEW String Formats, Typical examples.

Unit IV

Basics of Data Acquisition: Introduction to data acquisition Classification of Signals, Analog Interfacing Connecting signal to board , Analog Input/output techniques digital I/O. **09 Hrs**

DAQ Hardware configuration: Introduction, Measurement and Automation Explorer, DAQ Assistants, Analysis Assistants, Instrument Assistant.

Unit V

Interfacing Instruments: GPIB and RS232 : Introduction, RS232 Vs. GPIB, Handshaking, GPIB Interfacing, Standard commands for Programmable Instruments, VISA**.** **09 Hrs**

Use of analysis tools and application of VI: Fourier transforms Power spectrum, Correlation methods, windowing & flittering. Inter-Process Communication, Notifier, Queue, Semaphore, Data Sockets, Programmatically Printing Front Panel.

Course outcomes:

After going through this course the student will be able to

CO1: Understand the fundamentals of Virtual Instrumentation
CO2: Apply the concepts to realize the theoretical design.
CO3: Create a VI system to solve real time problems.
CO4: Analyze and evaluate the performance of Virtual System.

Reference Books:

1. Sanjay Gupta & Joseph John**,** Virtual Instrumentation Using Lab View, Tata Mc Graw Hill Publisher Ltd. New Delhi, 2nd Edition, 2010, ISBN : 978-0070700284
2. Lisa. K. Wills**, "**LabVIEW for Everyone**"** Prentice Hall of India, 2nd Edition, 2008, ISBN : 978-0132681940
3. Garry Johnson, Richard Jennings, LabVIEW Graphical Programming, McGraw Hill Professional, 4thEdition , 2006 ,ISBN: 978-1259005336.
4. Jovitha Jerome, "Virtual instrumentation Using LabVIEW", PHI Learning Pvt.Ltd., 4th Edition, 2010, ISBN: 978-8120340305.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

MODERN AUTOMOTIVE ENGINEERING
(Offered by BoS: Mechanical Engineering)

Course Code : 12GF711 **CIE Marks: 100**
Hrs/Week: L: T: P: S: 4: 0:0: 0 **SEE Marks: 100**
Credits :04 **SEE Duration :3 Hrs**

Course Learning Objectives

- Introduce different sub-systems in a automotive system
- Describe the functions of each of the sub-systems and its effect on the complete system
- Discuss fuel injection, transmission, braking, steering, suspension
- Explain the importance of selection of suitable sub-system for a given performance requirement

UNIT – I

Automotive Engines: Engine types and operation, Subsystems of automotive engines, Supercharger and turbo charges, Radiators and Cooling systems. **08Hrs**

Fuels and Emission: Conventional fuels, alternative fuels:- LPG, CNG, Hydrogen and Biofuels, Solar, Electrical and hybrid drives, Engine emission and its controls,

UNIT – II

Power Transmission: Clutches and its types, Torque converter and fluid coupling, Geared transmission and automatic transmission, Propeller shaft and differential. **08Hrs**

Braking systems: Braking fundamentals, Brake system components, Antilock braking systems, Components and control logic, Electronic stability programs

UNIT-III

Steering systems: **Steering basics, Ackerman Steering Mechanism, conventional mechan**ism, Electronically controlled power steering, **10Hrs**

Suspension Systems: Basics, types: Mcpherson Strut Independent suspension system and front & rear axle suspension system.

UNIT-IV

Vehicle body Engineering: Vehicle body details and classification (Car and Bus), visibility and method of improving visibility and space in car. **08Hrs**

Seating and Safety system: Seating system, material for seating, Traction control system, Air bags and immobilizer system, Vehicle crashworthiness tests.

UNIT – V

Automotive Electricals: Energy systems:- Starter, Generator and start-stop systems, battery. **08Hrs**

Automotive Electronics: Electronic Control Unit, sensors and actuators, Panel display, Infotainment systems.

Course Outcome:

On completion of the course the student will be able to:

CO1. Illustrate the basic knowledge of advanced automobile systems and subsystems
CO2. Apply the engineering technology to design automotive systems
CO3. Analyse the performance of automotive systems to match with present scenario
CO4. Adapt newer technology to develop efficient and nature friendly vehicles

References:

1. Dr N.K Giri, "Automotive Technology", Khanna Publishers, 5th Edition, 2000, BN.No.81-7409-178-5.
2. "Automotive Hand Book", SAE publications, 9th Edition, 2014. ISBN.No. 978-0-7680-8152-7
3. William B. Ribbens, Understanding Automotive Electronics, 6th Edition, 2014 ISBN. No-13: 978-0750675994
4. Barry Hollemback, "Automotive Electricity, Electronics & Computer Controls", 1st Edition, 1998, ISBN No. 13: 978-0827365667

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

TELECOMMUNICATION SYSTEMS

(Offered by BoS: Telecommunication Engineering)

Sub. Code: 12GF712 **CIE Marks:100**
Hrs / Week: L:T:P:S:4:0:0:0 **SEE Marks:100**
Total credits: 04 **SEE Duration :03 Hrs**

Course Learning Objectives (CLO):

- Comprehend various communication system and identify its components
- Understand modulation and multiple access schemes for a communication system.
- Classify different telecommunication services, sub-systems and systems..
- Learn about the features, benefits, applications and operation of wireless and optical technologies.

UNIT I

Introduction to Electronic Communication **(09 Hrs)**

The Significance of Human Communication, Communication Systems, Types of Electronic Communication, Modulation and Multiplexing, The Electromagnetic Spectrum, Bandwidth, A Survey of Communication Applications.

The Fundamentals of Electronics: Gain, Attenuation, and Decibels.

Radio Receivers: Super heterodyne receiver.

UNIT II

Modulation Schemes: Qualitative discussions with practical examples of AM, FM and PM, PCM, Line Codes, ASK, FSK, PSK, and QAM. **(08 Hrs)**

Wideband Modulation: Spread spectrum, FHSS, DSSS – Block Diagram approach.

Telephone and Cable Modems.

UNIT III

Multiplexing and Multiple Access Techniques: Block diagram approach of Frequency division multiplexing, Time division multiplexing, Duplexing; Multiple access: FDMA, TDMA, CDMA,. **(10 Hrs)**

Satellite Communication Systems, Satellite Subsystems, Ground Stations, Satellite Applications, Global Positioning System.

UNIT IV

Optical Communication: Optical Principles, Optical Communication Systems, Fiber-Optic Cables, Optical Transmitters and Receivers, Wavelength- Division Multiplexing, Passive Optical Networks. **(09 Hrs)**

UNIT V

Cell Phone Technologies: Cellular concepts, Frequency allocation, Frequency reuse. **(09 Hrs)**

Introduction to 2 G, 2.5 G, and 3G standards and their features.

Wireless Technologies

Introduction to Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks, Wi-MAX and Wireless Metropolitan-Area Networks.

Course Outcome

After going through this course the student will be able to:

CO1. Understand the processes employed in communication systems.

CO2. Explain the importance of multiplexing, modulation and multiple access for various applications in communication systems.

CO3. Compare the different wired and wireless technologies .

CO4. Apply the concepts of different components and sub-system in advanced communication standards.

Reference Books

ENGINEERING MATERIALS FOR ADVANCED TECHNOLOGY
(Offered by BoS: Basic Sciences)

Subject Code: 12GF714 **CIE Marks:100**
Hrs / Week: L:T:P : 4:0:0 **SEE Marks:100**
Credits-04 **SEE Duration:03 Hrs**

Course Learning Objectives (CLO):

- Apply the basic concepts of Chemistry to develop futuristic materials for high-tech applications in the area of Engineering.
- Impart sound knowledge in the different fields of material chemistry so as to apply it to the problems in engineering field.
- Develop analytical capabilities of students so that they can characterize, transform and use materials in engineering and apply knowledge gained in solving related engineering problems.

Unit-I

Adhesives: Classification of Adhesives-Natural adhesives, synthetic adhesives-drying adhesives, pressure sensitive adhesives, contact adhesives, hot adhesives. One part adhesives, multi part adhesives. Adhesive Action. Development of Adhesive strength-Physical factors influencing Adhesive Action-surface tension, surface smoothness, thickness of adhesive film, elasticity and tensile strength. Chemical Factors Influencing Adhesive action - presence of polar groups, degree of polymerization, complexity of the adhesive molecules, effect of pH. Adhesive action- specific adhesive action, mechanical adhesive action, fusion adhesion. Development of adhesive strength- adsorption theory and diffusion theory. Preparation, curing and bonding Processes by adhesives-with reference to Epoxy, phenolics, Silicone, Polyurethane, Acrylic adhesives, Poly vinyl alcohol, Polyvinyl acetate . **08Hrs.**

Unit-II

Optoelectronic Materials: Photovoltaic Electricity: The Photon: Energy, Wavelength and Frequency. Classification of solar cells, Structure of an Inorganic Solar Cell, Characteristics of Solar Cells: Short Circuit Current, Open Circuit Voltage, Maximum Power, fill factor. Efficiency of Photovoltaic Solar Cell: Organic Solar Cells. **07 Hrs**

Light Emitting Diodes: Luminance, luminous intensity, luminous flux and luminous efficacy. Inorganic LEDs with device construction, examples and advantages. OLEDs: Introduction, OLED Emission Principle, types of OLEDS-Small molecule OLEDs and Polymer based OLEDs. Classification of OLEDS by Emission Layer Formation Process. OLED materials and their characteristics.

Unit-III

Optical fibre materials : Fiber Optics, Advantages of optical fiber communication over analog communication, Classification based on refractive index of the core- step index and graded index optical fibres, Classification based on core radius-single mode and multimode optical fibres, Fibre fabrication.-Methods to manufacture optical glass fibres. Double crucible method and preform methods. Manufacture of perform-Chemical Vapour Deposition (CVD), Modified vapour deposition (MCVD) Plasma activated vapour deposition (PCVD), Outside vapour deposition (OVD)-Vapour-phase axial deposition (VAD). Drawing the fibres from perform, coating and jacketing process. **08Hrs**

Ion exchange resins and membranes: Ion exchange resins-Introduction, Types-cation and anion exchange resins, examples, physical properties, chemical properties-capacity, swelling, kinetics, stability, ion exchange equilibrium, regeneration. Applications of ion exchange resins-softening of water, demineralization of water, advantages and disadvantages of ion exchange resins-calcium sulphate fouling, iron fouling, adsorption of organic matter, bacterial contamination. Ion exchange membranes, Types-anion and cation exchange membranes. Classification of ion exchange membranes based on connection way between charged groups and polymeric matrix-homogeneous and heterogeneous ion exchange membranes, examples. Fabrication of ion exchange cottons- anion exchange cotton and cation exchange cotton. Application of ion exchange membranes in purification of water by electro dialysis method.

layer deposition (ALD) and its Importance.

Unit – IV

Characterization of Thin Film Properties **09 Hrs**

Film thickness measurement: Quartz crystal thickness monitor for process monitoring and control - Stylus method – Optical interference methods.

Film Adhesion: Testing and evaluation methods. Annealing and its influence on film properties.

Surface morphology and topography - Composition of thin films – Film structure by X-ray diffraction and Raman studies – Electrical characterization – Optical characterization – Spectrophotometers – Mechanical and tribological studies.

Unit – V

Thin Film Applications: Electrodes, Transparent conducting (electrodes) Oxides (TCO) Thin Film Transistors (TFT), Sensors, Sensors, Solar cells, Solar Thermal Absorbers, Integrated Circuits, MEMS,NEMS etc. - Decorative Coatings, Optical Coatings, Corrosion and Wear resistant coatings, Bio-Medical coatings, Coatings for telecommunication application, Smart Coatings, etc. **09 Hrs**

Course outcomes :

After going through the course students will be able to

- Acquire adequate knowledge of thin film preparation and characterization
- Develop various thin film based devices.

References:

1. Vacuum Technology by A. Roth, 3 rd Edition, Elsevier Publishers, ISBN-978-0-444-88010
2. Thin Film Phenomenon by K.L. Chopra, reprint, Mc Graw Hill, ISBN-10: 0070107998,
3. Materials Science of Thin Films by Milton Ohring, 2nd Edition, Acadmic Press, ISBN-10: 0125249756, ISBN-13: 978-0125249751.
4. Thin-Film Deposition: Principles and Practice by Donald Smith, Illustrated Edition, Mc Graw Hill Professional, ISBN-10: 0070585024, ISBN-13: 978-0070585027.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

Applied Psychology for Engineers
(Offered by BoS: Humanities and Social Sciences)

Course Code	**:**	**12GF715**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L: T: P: S: 3:0:1:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3hrs**

Course Learning Objectives:

- Appreciate human behavior and human mind in the context of learner's immediate society and environment.
- Understand the importance of lifelong learning and personal flexibility to sustain personal and professional development as the nature of work evolves.
- Provide students with knowledge and skills for building firm foundation for the suitable engineering professions.
- Prepare students to function as effective Engineering Psychologists in an Industrial, Governmental or consulting organization.
- Enable students to use psychological knowledge, skills, and values in occupational pursuits in a variety of settings that meet personal goals and societal needs.

Unit – I **07Hrs**

Introduction to Psychology: Definition and goals of Psychology: Role of a Psychologist in the Society: Today's Perspectives(Branches of psychology)., Psychodynamic, Behaviouristic, Cognitive, Humanistic, Psychological Research and Methods to study Human Behavior: Experimental, Observation, Questionnaire and Clinical Method

Unit – II **07Hrs**

Intelligence and Aptitude: Concept and definition of Intelligence and Aptitude, Nature of Intelligence. Theories of Intelligence – Spearman, Thurston, Guilford Vernon. Characteristics of Intelligence tests, Types of tests. Measurement of Intelligence and Aptitude, Concept of IQ, Measurement of Multiple Intelligence – Fluid and Crystallized Intelligence.

Unit – III **08Hrs**

Personality: Concept and definition of personality, Approaches of personality-psychoanalytical, Socio- Cultural, Interpersonal and developmental, Humanistic, Behaviorist, Trait and type approaches. Assessment of Personality: Self- report measures of Personality, Questionnaires, Rating Scales and Projective techniques, its Characteristics, advantages & limitations, examples. Behavioral Assessment. Psychological Stress: a. Stress- Definition, Symptoms of Stress, Extreme products of stress v s Burnout, Work Place Trauma. Causes of Stress – Job related causes of stress. Sources of Frustration, Stress and Job Performance, Stress Vulnerability-Stress threshold, perceived control.

Unit – IV **07Hrs**

Application of Psychology in Working Environment: The present scenario of information technology, the role of psychologist in the organization, Selection and Training of Psychology Professionals to work in the field of Information Technology. Distance learning, Psychological consequences of recent developments in Information Technology. Type A and Type B Psychological Counseling - Need for Counseling, Types – Directed, Non- Directed, Participative Counseling.

Unit-V **07Hrs**

Learning: Definition, Conditioning – Classical Conditioning, Basics of Classical Conditioning (Pavlov), the process of Extinction, Discrimination and Generalization. Operant Conditioning (Skinner expt). The basics of operant conditioning, Schedules of reinforcement. Cognitive – Social approaches to learning – Latent Learning, Observational Learning, Trial and Error Method, Insightful Learning.

Experimental Psychology Unit – VI (Practicals)

1 Bhatia's Battery of Performance and intelligence test
2 Multidimensional Assessment of Personality
3 B.K.Passi test of Creativity
4 Test of Non- Verbal Intelligence test (TONI-4)
5 David's Battery of Differential Abilities (Aptitude test)
6 Bilateral Transfer of Training Mirror drawing apparatus with Electronic Digital Reset Error Counter (Performance)
7 Student Stress Scale.

Course Outcomes:

After going through this course the student will be able to:

1 Understand the basic principles and concepts of applied psychology in. mental processes.
2 Develop psychological attributes such as intelligence, aptitude, creativity, resulting in their enhancement.
3 Apply effective strategies for SWOC, self-management and self-improvement.
4 Understand the application of psychology in engineering and technology and develop a route to accomplish goals in their work environment.

Reference Books:

1 Feldman R. S., "Understanding Psychology", McGraw Hill India, 4th edition, 1996
2 Robert A. Baron," Psychology", Prentice Hall India 3rd edition,1995.
3 Stephen P Robbins Organizational Behaviour , Pearson Education Publications, 13th Edition, ISBN – 81-317 – 1132 – 3
4 John W.Newstrem and Keith Davis. Organizational Behavior : Human Behavior at Work Tata McGraw Hill India, 10th edition, ISBN 0-07-046504-5

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. 10 marks are reserved for laboratory, out of which 05 marks for maintaining record and 05 marks for internal test.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

GLOBAL ELECTIVES - GROUP G

Sl.No.	Dept.	Group G		
		Course Code	Course Title	Credits
1	Biotechnology	12GG701	Bioinformatics	3
2	Chemical	12GG702	Industrial safety & risk management	3
3	Comp. Sc. & Engg.	12GG703	Intelligent Systems	3
4	Civil	12GG704	Solid Waste Management	3
5	Elns. & Comm.	12GG705	Automotive Electronics	3
6	Elns. & Elec.	12GG706	Industrial electronics	3
7	Indl. Engg. Mng.	12GG707	Systems Engineering	3
8	Info. Sc. & Engg.	12GG708	Cloud Computing	3
9	Instrumentation	12GG709	MEMS	3
10	Mech. Engg.	12GG710	Mechatronics	3
11	Telecommunication	12GG711	Space Technology and Applications	3
12	Mathematics	12GG712	Linear Algebra	3

BIOINFOMATICS
(Offered by BoS: Biotechnology Engg.)

Course Code : 12GG701 **CIE Marks : 100**
Hrs/Week : L:T:P:S : 4:0:0:0 **SEE Marks : 100**
Credits : 04 **SEE Duration: 3 Hrs**

Prerequisites: : Knowledge of Mathematics and Basics of programming

Course Learning Objectives:

- Understand the principles of Bioinformatics and Programming.
- Learn various Biological Databases and Tools that aid in the analysis.
- Use tools such as Web & standalone tools to interface, analyze and interpret biological data
- Use Perl and BioPerl for the analysis of Biological Data.

Unit I

Biomolecules: Introduction to Biomolecules. Structure, Types and Functions of Carbohydrates, Lipids, Nucleic Acids and Proteins. Genetic code, Codon degeneracy, Genes and Genomes. **8 Hrs**

Bioinformatics & Biological Databases: Introduction to Bioinformatics, Goals, Scope, Applications in biological science and medicine. Biological databases – Sequence, structure, Special Databases and applications: Genome, Microarray, Metabolic pathway, motif, and domain databases. Mapping databases – genome wide maps. Chromosome specific human maps.

Unit II

Sequence Alignment: Introduction, Types - Pairwise and Multiple sequence alignment, Alignment algorithms, Scoring matrices, Database Similarity Searching-Basic Local Alignment Search Tool (BLAST), and FASTA. Next Generation Sequencing – Alignment and Assembly. **9 Hrs**

Molecular Phylogenetics: Phylogenetics Basics. Molecular Evolution and Molecular Phylogenetics – Terminology, Forms of Tree Representation. Phylogenetic Tree Construction Methods - Distance-Based Methods, Character-Based Methods. Methods of Phylogenetic Tree evaluation. Phylogenetic analysis programs.

Unit III

Predictive methods using Nucleic acid sequence: Predicting RNA secondary structure, Finding RNA genes, Detection of functional sites in the DNA and Gene Prediction Algorithms –Exon Chaining. Predictive methods using protein sequence – Algorithms used to predict Protein identity and Physical properties. Structure prediction - Prediction of Secondary and Tertiary structure of Protein. **10 Hrs**

Molecular Modeling and Drug Designing: Introduction to Molecular Modeling, methods of Molecular Modeling and Force Fields used in Molecular Modeling. Drug designing process - deriving Pharmacophore, Receptor Mapping, Estimating biological activities, Receptor-Ligand interactions. Molecular Docking. QSAR, Application of QSAR in Drug Design

Unit IV

Perl: Introduction to Perl, writing and executing a Perl program. Operators, Variables and Special variables. Data Types – Scalar, Array and Associative array. Regular Expressions (REGEX), Components of REGEX - Operators, Meta-characters and Modifiers. Subroutines – types of functions, defining and calling functions in Perl, calling function - call by value and call by reference. Perl Package – writing and calling package. Perl Module – writing and calling module **9 Hrs**

Unit V

BioPerl: Introduction to BioPerl, BioPerl Modules, Applications of BioPerl – Sequence retrieval from Database and submission of sequence to online Database, Indexing and accessing local databases, Transforming formats of database record, Sequence alignments BioPerl and Sequence Analysis - Pair wise and Multiple sequence alignment, Restriction mapping. , Identifying restriction enzyme sites, acid cleavage sites, searching for genes and other structures on genomic DNA, Parsing BLAST and FASTA results. BioPerl and Phylogenetic analysis, BioPerl and Phylogenetic tree manipulation, creating graphics for Sequence display and Annotation. **9 Hrs**

Course Outcomes:

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

CO1. Understand the Architecture and Scheme of online databases including structure of records in these databases.

CO2. Explore the Algorithms, which are used to make prediction in Biology, Chemical Engineering, and Medicine.

CO3. Apply the principles of Bioinformatics and Programming to the problems related to process simulation and process engineering in Biological system.

CO4. Use Bioinformatics tools and Next Generation Technologies to model and simulate biological phenomenon.

Reference Books:

1. T. Christiansen, B. D. Foy, L. Wall, J. Orwant, Programming Perl: Unmatched power for text processing and scripting, O'Reilly Media, Inc., 4th edition, 2012, ISBN-13: 978-0596004927
2. B. Haubold, T. Weihe, Introduction to Computational Biology: An Evolutionary Approach, newagepublishers, Paperback Edition, 2009, ISBN-13: 978-8184890624
3. D. C. Young. Computational Drug Design: A Guide for Computational and Medicinal Chemists,Wiley-Interscience, 1st edition, 2009, ISBN-13: 978-0470126851.
4. JinXiong, Essential Bioinformatics. Cambridge University Press, 2nd Edition, 2006, ISBN-13: 978-0521600828.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

INDUSTRIAL SAFETY AND RISK MANAGEMENT
(Offered by BoS: Chemical Engg.)

Course Code : 12GG702 **CIE Marks: 100**
Hrs/Week L:T:P:S 3:0:0:0 **SEE Marks: 100**
Credits: 03 **SEE: 03**

Course Learning Objectives:

- Select appropriate risk assessment techniques and analyze public and individual perception of risk.
- Relate safety, ergonomics and human factors
- Carry out risk assessment and protection in process industries

Unit I

General: Hazard identification methodologies, risk assessment methods-PHA, HAZOP, MCA, ETA, FTA, Consequence analysis, Profit analysis. Hazards in work places- Nature and type of Work places, Types of hazards, hazards due to improper housekeeping, hazards due to fire in multi floor industries and buildings, guidelines and safe methods in above situations **08 Hrs**

Unit II

Techniques: General, Risk adjusted discounted rate method, Certainty Equivalent Coefficient method, Quantitative Sensitivity analysis, Probability distribution, Coefficient of variation method, Simulation method, Crude Procedures, Payback period, Expected monetary value method, Refined procedures, Shackle approach, Hiller's model, Hertz model, Goal programming **08 Hrs**

Unit III

Risk Management: Emergency relief Systems, Diers program, Bench scale experiments, Design of emergency relief systems, Internal emergency planning, Risk management plan, mandatory technology option analysis, Risk management alternatives, risk management tools, risk management plans, Risk index method, Dowfire and explosion method, Mond index Method. **06 Hrs**

Unit IV

Risk Assurance and Assessment: Property Insurance, Transport insurance, Liability insurance, Precocious insurance, Risk Assessment, Scope Canvey study, Rijimond pilot study, Low Probability high consequence events. Fault tree analysis, Event tree analysis, Zero Infinity dilemma. **06 Hrs**

Unit V

Risk Analysis in Industries: Handling and storage, Process plants, Personnel protection equipments. Environmental risk analysis, International environmental management system, Corporate management system (Case study of a Chemical plant) **08 Hrs**

Course Outcomes

On completion of the course the student will be able to:

CO1. Recall and use risk assessment techniques as well as tools for process industry.
CO2. Identify hazard identification tools for safety management
CO3. Analyze and compare the various tools and safety procedures for protection in process industries
CO4. Formulate the procedures to relate safety, ergonomics and human factors.

Reference Books:

1. Laird Wilson Dough Mc Cutcheon, “Industrial Safety & risk management”, The Univeristy of Alberta pressw, 1 st edition,2003, ISBN:088864-394-2
2. Sincero, A. P. and Sincero, G. A., “Environmental Engineering – A Design Approach”, Prentice Hall of India, 1996, ISBN:0024105643
3. Pandya, C. G., “Risks in Chemical Units”, Oxford and IBH Publishers,1st edition ,1992, ISBN:8120406907
4. Fawcett, H. H., “Safety and Accident Prevention in Chemical Operations by John Wiley & Sons, 2nd edition,1982, , ISBN: 9780471024354

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

INTELLIGENT SYSTEMS
(Offered by BoS: Computer science and Engineering)

Course Code: 12GG703 **CIE Marks: 100**
Hrs/Week: L:T:P:S : 3:0: 0:0 **SEE Marks: 100**
Credits: 03 **SEE : 3 Hrs**

Prerequisite: Artificial Intelligence

Course Learning Objectives:

- Understand fundamental AI concepts and current issues.
- Understand and apply a range of AI techniques including search, logic-based reasoning, neural networks and reasoning with uncertain information.
- Recognize computational problems suited to an Intelligent system solution.
- Identify and list the basic issues of knowledge representation, blind and heuristic search.
- Analyze the design issues inherent in different Intelligent System approaches.

Unit – I

Introduction To Artificial Intelligence : Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms. **07 Hrs**

Unit – II

Representation Of Knowledge: Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge. **07 Hrs**

Unit – III

Knowledge Inference: Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory. **07 Hrs**

Unit – IV

Expert Systems : Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells **07 Hrs**

Unit – V

Intelligent Decision Support Systems: Artificial Intelligence and Expert Systems: Knowledge-Based System - Knowledge Acquisition, Representation, and Reasoning - Advanced Intelligent Systems - Intelligent Systems over the Internet. **07 Hrs**

Course outcomes:

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

CO1. Describe and understand the basic concepts and challenges of Artificial Intelligence.
CO2. Analyze and explain basic intelligent system algorithms to solve problems.
CO3. Apply Artificial Intelligence and various logic-based techniques in research applications.
CO4. Assess their applicability by comparing different Intelligent System techniques.

Reference Books

1. Kevin Night, Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Tata McGraw-Hill Education Private Limited, 3rd edition, 2009, ISBN: 978-0070678163.
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2nd edition, 2007. ISBN, 0132097680
3. Peter Jackson, “Introduction to Expert Systems”, Pearson Education, 3rd edition, 2007. ISBN-13: 978-0201876864
4. Stuart Russel, Peter Norvig , “AI – A Modern Approach”, Pearson Education, 2nd edition, ISBN-13: 978-0137903955

Scheme of Continuous Internal Evaluation:

SOLID WASTE MANAGEMENT
(Offered by BoS: Civil Engineering)

Course Code: 12GG704 **CIE Marks: 100**
Hrs/Week: L:T:P:S :: 3:0:0:0 **SEE Marks: 100**
Credits: 03 **SEE Duration : 3 Hrs**

Course Learning Objectives:

- Impart the knowledge of present methods of solid waste management system and to analyze the drawbacks.
- Understand various waste management statutory rules for the present system.
- Analyze different elements of solid waste management and design and develop recycling options for biodegradable waste by composting.
- Identify hazardous waste, e-waste, plastic waste and bio medical waste and their management systems.

Unit – I

Introduction: Land Pollution. Present solid waste disposal methods. Merits and demerits of open dumping, feeding to hogs, incineration, pyrolysis, composting, sanitary landfill. Scope and importance of solid waste management. Definition and functional elements of solid waste management. **08 Hrs**

Sources: Sources of Solid waste, types of solid waste, composition of municipal solid waste, generation rate, Problems.

Collection and transportation of municipal solid waste: Collection of solid waste- services and systems, Municipal Solid waste (Management and Handling) 2000 rules with amendments. Site visit to collection system.

Unit – II

Composting Aerobic and anaerobic composting - process description, process microbiology, Vermicomposting, Site visit to compost plant, problems. **08 Hrs**

Sanitary land filling: Definition, advantages and disadvantages, site selection, methods, reaction occurring in landfill- Gas and Leachate movement, Control of gas and leachate movement, Site visit to landfill site.

Unit – III

Hazardous waste management: Definitions, Identification of hazardous waste, Classification of hazardous waste, onsite storage, collection, transfer and transport, processing, disposal, hazardous waste (Management and handling) rules 2008 with amendments. Site visit to hazardous landfill site **06 Hrs**

Unit – IV

Bio medical waste management: Classification of bio medical waste, collection, transportation, disposal of bio medical waste, Bio medical waste (Management and Handling) rules 1998 with amendments. Site visit to hospital to see the collection and transportation system and visit to biomedical waste incineration plant. **06 Hrs**

Unit – V

E-waste management: Definition, Components, Materials used in manufacturing electronic **goods,** Recycling and recovery integrated approach. Site visit to e- waste treatment pla **06 Hrs**

Plastic waste management: Manufacturing of plastic with norms. Plastic waste management. Plastic manufacture, sale & usage rules 2009 with amendments.

Course outcomes:

After going through this course the student will be able to:

1 Understand the current solid waste management system.

2 Analyze drawbacks in the present system and provide recycling and disposal options for each type of waste.

3 Distinguish Hazardous waste, Biomedical waste, E waste and to provide scientific management system.

4 Evaluate and monitor the Biomedical waste, Hazardous waste, E waste, Plastic and Municipal waste management as per the rules laid by Ministry of Environment & Forest.

Reference Books

1 George.C. Tchobanoglous, "Integrated Solid Waste Management" – McGraw hill publication. International edition 1993, ISBN 978-0070632370

2 R.E. Hester, Roy M Harrison, "Electronic waste management", Cambridge, UK, RSC Publication, 2009, ISBN 9780854041121

3 Municipal Solid waste (Management & Handling Rules) , Ministry of Environment & Forest Notification, New Delhi, 25th Sept 2000 and amendments on 2013.

4 The Plastic Manufacture, Sale and usage Rules2009. Ministry of Environment and Forest Notification, New Delhi, amendment on February 4, 2011

5 Biomedical waste management (Management & Handling Rules) 20th July 1998. Ministry of Environment & Forest Notification, New Delhi, amendment on February 26, 2013.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

AUTOMOTIVE ELECTRONICS

(Offered by BoS: Electronics and Communications)

Course Code:12GG705 **CIE Marks: 100**

Hrs/Week: L:T:P:S :3:0:0:0 **SEE Marks: 100**

Credits: 03 **SEE Hrs : 03**

Course Learning Objectives(CLO):

1 Understand fundamentals of Automotive electronics and application.

2 Comprehend principles of sensing technology in automotive field, smart sensors and the type of sensor.

3 Apply control systems in the automotive space resulting in application oriented

learning with examples, criticality to real time embedded system like anti wind up function, actuator dithering, etc

4 Understand automotive specific communication protocols and techniques, their significance & benefits.

5 Analyze fault tolerant real time embedded systems, the basics of diagnostics, its method, reporting mechanism and error handling / fault reactions.

UNIT – I **07 Hrs**

Power Train Engineering and Fundamentals of Automotive

Fundamentals of Petrol, diesel and gas engines, electric motors and control systems. Basic Automotive System, System Components, Evolution of Electronics in Automotive. Alternators and charging, battery technology, Ignition systems. Working principles of various electronic components and accessories used in Automotive. Developments in existing engine forms and alternatives. Hybrid designs (solar power, electric/gasoline, LPG, CNG, fuel cells). Basic Transmission systems.

UNIT – II **07 Hrs**

Sensor Technologies in Automotive

In-vehicle sensors: Working principles, Characteristics, limitations and use within the automotive context of the following: Temperature sensing e g. coolant, air intake. Position sensing e.g. crankshaft, throttle plate. Pressure sensing e.g. manifold, exhaust differential, tyre. Distance sensing e.g. anti-Collision, Velocity sensing e.g. speedometer, anti-skid. Torque sensing e.g. automatic transmission. Vibration sensing e.g. Airbags. flow sensing and measurement e.g. fuel injection. Interfacing principles: Operation, topologies and limitations of all sensors covered in the above to in-vehicle processing or communications nodes. Use of Actuators: Types, Working principle, Characteristics, limitations and use within the automotive context of each type.

UNIT – III **07 Hrs**

Automotive Control Systems

Control system approach in Automotive: Analog and Digital control methods, stability augmentation, control augmentation. Transmission control, System components and functions. Cruise control, traction control, actuator limiting, wind-up, gain scheduling, adaptive control. Special Control Schemes: Vehicle braking fundamentals, Antilock systems. Variable assist steering and steering control. Controls for Lighting. Wipers, Air conditioning /heating. Remote keyless Entry and Anti-theft System, Emission Course-system control. Control techniques used in hybrid system. Electronic Engine control: Motion equations, modeling of linear and non-linear systems, numerical methods, system responses Objective of Electronic Engine control. Spark Ignition and Compression Ignition Engines and their electronic controls. Engine management testing: Engine management system strategies and implementation. Simulation and implementation methods. Methods of improving engine performance and efficiency

UNIT – IV **07 Hrs**

Automotive Communication Systems

Communication interface with ECU’s: Interfacing techniques and interfacing with infotainment gadgets. Relevance of internet protocols, such as TCP/IP for automotive applications. Wireless LANs standards, such as Bluetooth, IEEE802.11x. Communication protocols for automotive applications. Automotive Buses: Use of various buses such as CAN, LIN, Flex Ray. Recent trends in automotive buses (Such as OBDI1. MOST, IE, IELI.I, D2B and DSI). Application

of Telematics in Automotive: Global Positioning Systems (GPS) and General Packet Radio Service (GPRS), for use in an automotive environment. Higher End Technology: Comparative Study and applications of ARM Cortex.-Aseries/M-series. ARM 9 and ARM11.

UNIT – V **07 Hrs**

Diagnostics and Safety in Automotive

Fundamentals of Diagnostics: Basic wiring system and Multiplex wiring system. Preliminary checks and adjustments, Self-Diagnostic system. Fault finding and corrective measures. Electronic transmission checks and Diagnosis, Diagnostic procedures and sequence. On board and off board diagnostics in Automotive. Safely in Automotive: Safety norms and standards. Passenger comfort and security systems. Future trends in Automotive Electronics.

Reference Books

1 Williams. B. Ribbens, "Understanding Automotive Electronics", 6th Edition, Elsevier science, Newness publication, , 2003
2 Robert Bosch, "Automotive Electronics Handbook", John Wiley and Sons, 2004
3 Nitaigour Mahalik, "Mechatronics: principles, concepts and Applications", TMH, 2003
4 Uwekiencke and lars Nielsen, "Automotive Control Systems Engine, Driveline and vehicle", 2nd Edition, Springer, 2005

Scheme for Continuous Internal Evaluation (CIE):

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Evaluation for Theory (SEE) (100):

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

INDUSTRIAL ELECTRONICS

Course Code: 12GG706 **CIE Marks: 100**

Hrs/Week: L:T:P:S 3:0:0:0 **SEE Marks: 100**
Credits: 03 **SEE : 3 Hrs**

Course Learning Objectives:

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

1 Assimilate information and techniques for management of electrical energy.
2 Explain the working of power electronic components used in design of electronic circuits of conversion and control of electrical energy in Industry.
3 Apply the strong knowledge base acquired for analyzing and designing electronic circuits which handle the electrical energy efficiently and economically.
4 Sort-out design problems through the practical and industrial exposure acquired.
5 Use basic concepts of practical design and working of electronic circuits for conversion and

control of electrical energy.

6 Make use of the opportunities to work as part of teams on multidisciplinary projects and to discuss industrial problems with regard to application of Power Elecronics.

Unit – I **07 Hrs**

Power semi conductor Devices and static characteristics: Construction, working & characteristics of MOSFET, SCR, IGBT. Comparison of Power BJT, MOSFET, SCR, IGBT. Turn on methods of Power BJT, MOSFET and IGBT. Design of R, R-C, and UJT (pulse train) Gate triggering methods of SCR.

Unit – II **07 Hrs**

Thyristor Dynamic characteristics, Specifications and Protection: Gate characteristics of SCR, Dynamic characteristics of SCR. Design of Snubber circuit for SCR, Line Commutation and Forced Commutation circuits with design, Gate protection & overvoltage protection of SCR.

Unit – III **08 Hrs**

Converters- Single Phase Controlled Convertor- Full wave Half and Fully controlled line commutated bridge converters, Three phase converters –Six pulse converters- with R, RL, RLE load- Active and Reactive power inputs to the convertors with and without Freewheeling diode, Derivation of average load voltage and current, Effect of source inductance, Converter Design.

Unit – IV **07 Hrs**

Converter applications: Industrial Applications of Half and Fully controlled converters to DC drives (Control of DC drives). Dual converters (both single phase and three phase).

Choppers – Step down, Step up Chopper, Step up/Down Chopper, Time ratio control and Current limit control strategies –Derivation of load voltage and currents with R, RL and RLE loads of Step down, Step up Chopper, Step up/Down Chopper – load voltage expression. Design of choppers according to applications.

Unit – V **07 Hrs**

Classification of Choppers and Applications: Type A, Type B, Type C, Type D, Type E choppers and their industrial Applications, Morgan's chopper, Jones chopper and Oscillation chopper (Principle of operation only) , AC Chopper –phase control type.

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter, bridge inverter – Voltage control techniques for inverters Pulse width

modulation techniques. – UPS-online, offline (Principle of operation only).

Course outcomes:

1 Understand the comprehensive working of different devices and their applications.
2 Analyze the application of skills in controlling and conversion of electrical energy.
3 Evaluate and distinguish the performance of converters and inverters.
4 Ability to implement their knowledge and skills in design of applications.

Reference Books

1 M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata Mc Graw – Hill Publishing company, 1998

2 M. H. Rashid, "Power Electronics : Circuits, Devices and Applications", Prentice Hall of India, 2nd edition, 1998

3 P.C.Sen, "Power Electronics", Tata McGraw-Hill Publishing, 1987.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

CLOUD COMPUTING
(Offered by BoS: Information Science & Engineering)

Course Code: 12GG708 **CIE Marks:** 100
L:T:P:S: 3:0:0:0 **SEE Marks:** 100
Credits: 3 **SEE Duration:** 3 Hrs

Course Learning Objectives - CLO:

- Learn advanced and cutting edge state-of-the-art knowledge and implementation in cloud computing.
- read and understand research publications in the technical area of cloud computing, beyond that of the traditional textbook level.
- Get to know about advanced services and applications in stacks of cloud
- Explore the cloud Infrastructure and understand Abstraction & Virtualization in cloud computing

Unit-I

Cloud Computing Fundamental: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, **7 Hrs**

performance, security and disaster recovery; next generation Cloud Applications.

Unit – II

Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages **7 Hrs**

Unit – III

Virtualized Data Center Architecture : Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures **7 Hrs**

Unit – IV

Information Storage Security &Design : Storage strategy and governance; security and regulations. Designing secure solutions; the considerations and implementations involved. Securing storage in virtualized and cloud environments. Monitoring and management; security auditing and SIEM. **7 Hrs**

Unit-V

Storage Network Design: Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations. **7 Hrs**

Working with Twitter API, Flickr API, Google Maps API. Advanced use of JSON and REST.

Management

Planning Business Continuity; Managing availability; Managing Serviceability; Capacity planning; Security considerations

Course Outcomes

On completion of the course the student will be able to:

CO1. Develop the skills to gain a basic understanding of components in cloud computing showing how business agility in an organization can be created

CO2. Explore the functional components of web services from cloud architecture

CO3. Develop and implement a basic consistency of services deployed from a cloud architecture

CO4. Critically analyze case studies to derive the best practice model to apply when developing and deploying cloud based applications

References:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, **"Mastering Cloud Computing"**, Indian Edition: Tata McGraw Hill, Feb 2013, ISBN-13: 978-1-25-902995-0,.
2. Venkata Josyula, "**Cloud Computing: Automating the virtualized Data Center" , Pearson** India 2012, ISBN:1-58720-434-7
3. George Reese, **"Cloud application architectures",** Wiley India 2011, ISBN: 978-0596156367
4. GautamShroff," **Enterprise Cloud Computing Technology Architecture Applications"**Tata McGraw Hill, 2011,ISBN: 978-0521137355

Scheme of Continuous Internal Evaluation:
CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.
Scheme of Semester End Examination:
The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

MICRO ELECTROMECHANICAL SYSTEMS
(Offered by BoS: Electronics & Instrumentation Engg.)

Course Code: 12GG709 **CIE Marks: 100**
Hrs/Week: L:T:P:S : 3:0:0:0 **SEE Marks: 100**
Credits: 03 **SEE Duration: 3 Hrs**

Course Learning Objectives:

- Learn the fundamentals and working principle of MEMs and Microsystem products like Sensors, Actuators etc.
- Understand the Multidisciplinary nature of Microsystems.
- Understand the Scaling Laws in MEMs and Microsystems.
- Select materials for MEMs for fabrication techniques.

Unit I — 07 Hrs

Over view of MEMS & Microsystems and Working Principles of Microsystems: MEMS and Microsystems, Typical MEMS and Microsystem Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystem, Design and Manufacture, Applications of Microsystems in Automotive, Health Care, Aerospace and other Industries.
Working Principle of Microsystems: Biomedical & Biosensors. Microsensors: Acoustic, Chemical, Optical, Pressure, Thermal.

Unit II — 07 Hrs

Microactuation: Using Thermal forces, Shape Memory alloys, Piezoelectric Crystals and Electrostatic forces. MEMS with Microactuators: Microgrippers, Micromotors, Microvalves and Micropumps. Microaccelerometers, Microfluidics.
Introduction to Thermofluid Engineering, Overview of the Basics of Fluid Mechanics in Macro and Mesoscales: Viscosity of fluids, Streamlines and Stream Tubes, Control Volumes and Control Surfaces, Flow Patterns and Reynolds Number. Basic Equations in Continum Fluid Dynamics: The Continuity Equation, The Momentum Equation and the Equation of motion.

Unit III — 07 Hrs

Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Microconduits, Fluid Flow in Submicrometer and Nanoscale, Heatconduction in Multilayered Thin Films. Introduction to Scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces and Scaling in Fluid Mechanics.

Unit IV **07 Hrs**

Materials for MEMS and Microsystems: Substrates and Wafers, Active Substrate Materials, Silicon as a Substrate Material, Silicon Compounds, Silicon Piezoresistors, Galium Arsenide, Quartz, Piezoelectric Crystals, Polymers and Packaging Materials. The three levels of Microsystem Packaging, Die level packaging, Device level packaging, System level packaging. Interfaces in microsystem Packaging. Essential Packaging Technologies: Die preparation, Surface Bonding, Wire Bonding, Sealing. Three dimensional Packaging.

Unit – V **07 Hrs**

Microsystem Fabrication Processes: Introduction to Microsystem Fabrication Process, Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapor Diposition (CVD), Physical Vapor Deposition-Sputtering, Deposition by Epitaxy, Etching, The LIGA Process: General Description of LIGA Process, Materials for Substrates and Photoresists, Electroplating and SLIGA Process.

Course outcomes:

On completion of the course the student will be able to:

CO1. Understand the basic fundamentals of MEMs and Microsystems.
CO2. Apply the concepts to design the MEMs sensors and actuators.
CO3. Analysis and Evaluate the MEMs sensors and actuators
CO4. Design a system with MEMs sensors and actuators using Various fabrication techniques.

Reference Books

1. Tai-ran tsu "MEMS & Microsystems: Design and manufacture." John Wiley and sons Inc, 2nd edition. 2008,
2. P.Rai-Choudhury "MEMS and MOEMS Technology and Applications "PHI,1st Edition 2009,.
3. K.J.Vinoy, G.K.Ananthasuresh, S.Gopalakrishnan, K.N.Bhat, "Micro and Smart Systems",
4. Stevens S. Saliterman. Fundamentals of Bio MEMS and Medical and Micro devices. Wiley Interscience division. 1st edition, 2006, first edition.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

MECHATRONICS
(Offered by BoS: Mechanical Engg.)

Course Code: **12 GG 710** **CIE Marks: 100**
Hours/Week: L:T:P:S : 3:0:0:0 **SEE Marks: 100**
Credits: 03 **SEE Duration: 3 Hours**

Course Learning Objective

- Understand the evolution and development of Mechatronics as a discipline.
- Substantiate the need for interdisciplinary study in technology education.
- Understand the applications of microprocessors in various systems and to know the

functions of each element.

- Identify main parts, hardware forms and internal architecture of PLC.
- Demonstrate the integration philosophy in view of Mechatronics technology.

UNIT-I

Introduction: Definition, Multidisciplinary Scenario, Evolution of Mechatronics, Design of Mechatronics system, Objectives, advantages and disadvantages of Mechatronics. **06 Hrs**

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, proximity switches and Hall effect sensors.

UNIT-II

Microprocessor & Microcontrollers: Introduction, Microprocessor systems, Basic elements of control systems, Microcontrollers, Difference between Microprocessor and Microcontrollers. **06 Hrs**

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**.**

Unit –III

Programmable logic controller: Introduction to PLC's, basic structure, Principle of operation, Programming and concept of ladder diagram, concept of latching & selection of a PLC **06 Hrs**

Integration: Introduction & background, Advanced actuators, Pneumatic actuators, Industrial Robot, different parts of a Robot-Controller, Drive, Arm, End Effectors, Sensor & Functional requirements of robot.

Unit –IV

Mechanical actuation systems: Mechanical systems, types of motion, Cams, Gear trains, Ratchet & Pawl, belt and chain drives, mechanical aspects of motor selection. **06 Hrs**

Electrical actuation systems: Electrical systems, Mechanical switches, Solenoids, Relays, DC/AC Motors, Principle of Stepper Motors & servomotors**.**

Unit –V

Pneumatic and hydraulic actuation systems: Actuating systems, Pneumatic and hydraulic systems, Classifications of Valves, Pressure relief valves, Pressure regulating/reducing valves, Cylinders and rotary actuators. **08 Hrs**

DCV & FCV- Principle & construction details, types of sliding spool valve, solenoid operated, Symbols of hydraulic elements, components of hydraulic system, functions of various units of hydraulic system. Design of simple hydraulic circuits for various applications

Course Outcomes:

1 Define and illustrate various components of Mechatronics systems.
2 Identify, categorize and apply transducers & sensors used in automation, control systems, and instruments
3 Assess various control systems used in automation.
4 Develop mechanical, hydraulic, pneumatic and electrical control systems.

References:
1. Nitaigour Premchand Mahalik , Mechatronics-Principles, Concepts and Applications, Tata McGraw Hill 1st Edition, 2003 ISBN.No. 0071239243, 9780071239240
2. Mechatronics by HMT Ltd. – Tata McGrawHill, 1st Edition, 2000. ISBN:9780074636435
3. W.Bolton-Pearson Education, Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering,1st Edition, 2005 ISBN No. 81-7758-284-4
4. Anthony Esposito, Fluid Power , Pearson Education, 6th Edition, 2011, ISBN No. 9789332518544

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

SPACE TECHNOLOGY AND APPLICATIONS
(Offered by BoS: Telecommunication Engineering)

Sub Code: 12GG711 **CIE Marks:100**
Hrs / Week: L:T:P:S:3:0:0:0 **SEE Marks:100**
Credits: 3 **SEE : 3Hrs**

Course Learning Objectives (CLO):

- Understand the earth environment and its behaviour, launching vehicles for satellites and its associated concepts.
- Differentiate satellites in terms of technology, structure and communications.
- Learn the use of satellite in various applications like communication, remote sensing and metrology.
- Make the learner appreciate space technology, technology mission and advanced space systems to nation's growth.

UNIT I

Earths environment: Atmosphere, ionosphere, Magnetosphere, Van Allen Radiation belts, Interplanetary medium, Solar wind, Solar- Earth Weather Relations. **07Hrs**

Launch Vehicles: Rocketry, Propellants, Propulsion, Combustion, Solid, Liquid and Cryogenic engines, Control and Guidance system, Ion propulsion and Nuclear Propulsion.

UNIT II

Satellite Technology: Structural, Mechanical, Thermal, Power control, Telemetry, Tele-command, Quality and Reliability, Payloads, Space simulation. **07Hrs**

Satellite structure: Satellite Communications, Transponders, Satellite Antennas.

UNIT III

Satellite Communications: LEO, MEO and GEO orbits, Altitude and orbit controls, Link design, Multiple Access Techniques. **08Hrs**

Space applications: Telephony, V-SAT, DBS system, Satellite Radio and TV, Tele-Education, Tele-medicine, Satellite navigation, GPS.

UNIT IV

Remote Sensing: Visual bands, Agricultural, Crop vegetation, Forestry, water Resources, Land use, Land mapping, geology, Urban development resource management, image processing techniques. **09Hrs**

Metrology: Weather forecast (Long term and Short term), weather modeling, Cyclone predictions, Disaster and flood warning, rainfall predictions using satellites.

UNIT V

Satellite payloads: Technology missions, deep space planetary missions, Lunar missions, zero gravity experiments, space biology and International space Missions. **09Hrs**

Advanced space systems: Remote sensing cameras, planetary payloads, space shuttle, space station, Inter-space communication systems.

Course outcomes:

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

CO1: Define different types of satellites, orbit and associated subsystems.

CO2: Describe the earth environment, basics of satellite technology, launching technologies and space applications.

CO3: Identify appropriate applications of satellites in the area of communication, remote sensing, metrology etc.,

Reference Books:

R G Barry, "Atmosphere, weather and climate", Routledge publications, edition,2009, ISBN.
K N Raja Rao, "Fundamentals of Satellite Communication", PHI, 2nd edition, 2012, ISBN:.
Timothy pratt, "Satellite Communication" John Wiley, edition, 1986, ISBN:.
B C Panda, "Remote sensing and applications" VIVA books pvt. Ltd., edition, 2009, ISBN:

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

Linear Algebra
(Offered by BoS; Basic Sciences)

Course Code: 12GG712 **CIE Marks: 100**
Hrs./Week: L:T:P:S : 3:0:0:0 **SEE Marks: 100**
Credits: 03 **SEE : 3 Hrs.**

Course Learning Objectives:

- Use basic terminology of linear algebra in Euclidean spaces, including linear independence, spanning, basis, rank, nullity, subspaces, and linear transformations;
- Apply the abstract notions of vector spaces in analyzing system of equations;
- Find the eigen values and eigenvectors of a matrix of a linear transformation, and using them to diagonalize a matrix;
- Solve an over-determined system of equations via projection concept, analyze and

extend the structure of orthogonal vectors required in signal processing.

- Combine different concepts of Linear Algebra in designing new methods for solving complex engineering problems.

Unit – I

Vector Spaces: Vector Spaces and Subspaces, Linear Independence, Basis, Dimension, The Four Fundamental Subspaces: Row space, Null space, Column Space and Left-Null space. Rank Nullity Theorem (without proof) **08Hrs.**

Unit – II

Linear Transformations: Linear Transformations, Geometric Meaning, Matrix Representations, Rank of a Matrix, Change of Basis, Kernel and Image of a Linear Transformation, Rotation, Projection and Reflection Transformations in 2 dimensions. Geometrical interpretations **07Hrs.**

Unit – III

Eigen Values And Eigen Vectors : Eigen values, The Characteristic Equation, Eigenvectors, Algebraic and Geometric Multiplicity of Eigenvalues, Diagonalizabilitly of a Matrix, Geometric meaning of Eigenvalues and Eigenvectors. Applications of Eigenvalues in Stability analysis of differential equations. **07Hrs.**

Unit – IV

Orthogonality: Orthogonal Vectors and Subspaces, Orthogonal Projections, Orthogonal Bases, Orthogonal/Orthonormal Matrices, Gram–Schmidt Orthogonalization, QR Factorizations, Least Squares Problems. **07Hrs.**

Unit – V

Positive Definite Matrices: Minima, Maxima and Saddle Points.. Definite versus Indefinite. Higher Dimensions. Positive Definiteness. Tests for Positive Definiteness. Positive definite matrices and Least-squares. Semi-definite Matrices. Singular Value Decomposition. **07Hrs.**

Course outcomes:

On completion of the course the student will be able to:

CO1: **Relate and interpret** the concepts of Linear Algebra as applied to various branches of engineering using an axiomatic approach

CO2: **Apply** linear transformations in image processing, CAD and other areas of engineering and **extend**ing to higher dimensions

CO3: **Analyze and correlate** the concepts of eigenvectors and eigenvalues required for image processing and many other fields of engineering

CO4: **Assess and evaluate** the basis vectors as required in signal processing and many other areas of engineering

CO5: **Combine and construct** the SVD applied in image processing and principal component analysis

Reference Books

1. Gilbert Strang, “Linear Algebra and Its Applications”, Cengage Learning India Edition, 4th edition, 2006, ISBN: 978-0980232714.
2. David C Lay, “Linear Algebra and Its Applications”, Pearson Education, 3rd edition, 2003, ISBN: 978-0321780720.
3. Kenneth M Hoffman and Ray Kunze , Linear Algebra, Prentice Hall,2nd edition, 2006, ISBN: 978-0135367971.
4. Howard Anton & Chris Rorres” Elementary Linear Algebra Applications Version”,Wiley , 9th edition, 2011, ISBN: 978-0470432051.

Scheme of Continuous Internal Evaluation:

CIE will consist of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper will consist of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and will be compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

MAJOR PROJECT

COURSE CODE: 12IM81 **CIE Marks : 100**

HOURS/WEEK : L:T:P:S: 0:0:36:0 **SEE Marks : 100**

CREDITS : 18 **SEE Duration: 03 Hrs**

Objectives:

1 ***Knowledge Application:*** Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
2 ***Communication:*** Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to a specific audience in both the written and oral forms.
3 ***Collaboration:*** Students will acquire collaborative skills through working in a team to achieve common goals.
4 ***Independent Learning:*** Students will be able to learn on their own, reflect on their learning and take appropriate action to improve it.
5 ***Management and Finance:*** Students will prepare schedules and budgets, they along with the guide keep track of the progress and expenditure.

Guidelines

1 Students are required to form a project team/batch before the end of 7th semester.
2 The departments must complete the Internal Guide allotment process before the end of 7th semester .
3 The project topic, title and synopsis has to be finalized and submitted to their respective internal guide(s) before the beginning of the 8th semester.
4 The detailed Synopsis (approved by the department ***Project Review Committee***) has to be submitted during the 1st week after the commencement of 8th semester.

Batch Formation:

- Students are free to choose their project partners from within the program or any other program (as interdisciplinary projects are encouraged).
- Each student in the team must contribute towards the successful completion of the project. The project may be carried out In-house / Industry / R & D Institution.
- ***The project work is to be carried out by a team of two to four students , in exceptional cases where a student is placed in a company and offered an internship through the competitive process or student is selected for internship at national or international level through competitive process*****,** the student can work independently.
- ***The students are allowed to do either a project for full 5 days in the industry or full 5 days in the college.***
- ***In case the project work is carried out outside Bengaluru, such students must be available during Project Evaluation process scheduled by the respective departments and they must also interact with their guide regularly through Email / Webinar / Skype etc.***

Project Topic Selection:

The topics of the project work must be in the ***field of respective program areas or in line with CoE's(Centre of Excellence) identified by the college*** or **List of project areas as given by industry/Faculty. The projects as far as possible should have societal relevance with focus on sustainability.**

Place of Project Work:

- The project work should be carried out in the college.
- The project work can also be carried out in the Industry, in case the project is given by the industry ***as internship, provided the department Project Review Committee approves the project*** and the facilities for carrying out such project work are not available in the college.
- In case additional facilities are required for testing etc., students are permitted to visit research labs, where such facilities are available. The HoD should be informed in such cases and No objection obtained.

Attendance Requirement:

- Students are required to satisfy minimum attendance criteria as prescribed by the Institution, i.e. (85%)
- Students who are doing project work in the industries are required to go to the industry for full 5 days.
- Students who are doing project work in the college, are required to come to the college for full 5 days (Monday- Friday) and attendance is mandatory.
- Students are requested to adhere to the schedule of various phases of project work.
- The guides shall be responsible to send attendance details every month through HoD, to the Dean(Student affairs)

Project Evaluation:

- Continuous monitoring of project work will be carried out and cumulative evaluation will be done.
- The students are required to meet their internal guides once in a week to report their progress in project work.

- **Weekly Activity Report** (WAR) has to be maintained in the form of a diary by the project batch and the same has to be discussed with the Internal Guide regularly.
- In case of ***Industry project***, during the course of project work, the internal guides will be in constant touch with external guides and will visit the industry at least thrice during the project period.
- For CIE assessment the project groups must give a final seminar with the draft copy of the project report.
- The presentation by each group will be for 20-30 minutes and every member of the team needs to defend the work done.
- The project team is required to submit Hard copies of the detailed Project Report in the prescribed format to the department and a Soft copy on a CD, to the Central library.
- For CIE 50% weightage should be given to the project guide and 50% weightage to the project evaluation committee.
- The Project team is required to demonstrate the functioning of the modules and the integrated application along with a presentation on the details of the project carried out during the Semester End Examination (SEE) in the department.
- Before the final evaluations the project group is required to produce a No dues certificate from Industry, Central Library and Department.

Course outcomes:

After the successful completion of the course, the students should be able to

CO1. Perform literature review, identify state of the art in that field and be able define the problem.

CO2. Establish a methodology using advanced tools / techniques for solving the problem including project management and finances.

CO3. Design, Develop Analytical models, Perform Numerical Analysis and Interpret the rresults.

CO4. Prepare quality document of project work for publications, patenting and final thesis.

CIE Assessment:

The following are the weightings given for the various stages of the project.

1	Selection of the topic and formulation of objectives	10%
2	Design and Development of Project methodology	25%
3	Execution of Project	25%
4	Presentation, Demonstration and Results Discussion	30%
5	Report Writing	10%

SEE Assessment:

The following are the weightages given during Viva Examination.

1	Written presentation of synopsis	10%	
2	Presentation/Demonstration of the project		30%
3	Methodology and Experimental Results & Discussion	30%	
4	Report		10%
5	Viva Voce	20%	

Calendar of Events for the project Work:

Week	Event
Beginning of 7th Semester	Formation of Project Committee in the Department. Formation of group and approval by the department committee.
7th Semester	Problem selection and literature survey
Last two weeks of 7th Semester	Finalization of project and guide allotment
II Week of 8th Semester	Synopsis submission and preliminary seminar
III Week	First visit of the internal guides to industry (In case of project being carried out in industry)
III to VI Week	Design and development of project methodology
VII to IX Week	Implementation of the project
X Week	Second visit by guide to industry (In case of project being carried out in industry) & submission of draft copy of the project report
XI and XII Week	Third visit by guide to industry for demonstration. Final seminar by Department project Committee and guide for internal assessment. Finalization of CIE.

Evaluation Scheme for CIE and SEE

Scheme of Evaluation for CIE		Scheme of Evaluation for SEE	
Particulars	**%Marks**	**Particulars**	**%Marks**
Project Evaluation I	10%	Project Synopsis (Initial Write up)	10%
Project Evaluation II	25%	Project Demo / Presentation	30%
Project Evaluation III	25%	Methodology and Results Discussion	30%
Project Evaluation Phase-IV (Submission of Draft Project Report for Verification)	30%	Project Work Report	10%
Project Evaluation Phase-V (Project Final Internal Evaluation)	10%	Viva-voce	20%
Total	100	Total	100

TECHNICAL SEMINAR

COURSE CODE: 12IM82 **CIE Marks : 50**

HOURS/WEEK: L:T:P:S: 0:0:2:0 **SEE Marks : 00**
CREDITS: 01 **SEE Duration : NA**

Course Learning Objectives:

1. To create awareness to recognize recent developments in Electronics & Communication and in multidisciplinary fields.
2. To summarize the recent technologies and inculcate the skills for literature survey.
3. To demonstrate good presentation skills.
4. To plan and improve the Technical Report writing skills.
5. To support Group discussion and Team work.

General Guidelines for the Seminar

1. The seminar has to be presented by individual student.
2. The topic of the seminar should be from current thrust area. This is to be decided in consent with internal guide.
3. The topic can be based on standard papers (like IEEE/ACM/CSI etc.) in the thrust area for the selected topic.
4. Each student has to prepare a technical paper out of seminar topic.
5. Presenting/publishing this paper in conference/ Journal will be given weightage in CIE.
6. The student needs to submit both hard & soft copy of the seminar report.

Course Outcome:

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

CO1. Understand and interpret latest advancements through different technical papers, reports, Journals, Data sheets, books etc..
CO2. Communicate his/her ideas with his peers as audience, which will enhance both oral and written communication skills.
CO3. Learn to manage resources effectively.
CO4. Create interest to pursue lifelong learning.

Evaluation of CIE Marks:

1.	Relevance of the topic	:10%
2.	Literature Survey	:10%
3.	Presentation	: 40%
4.	Report	: 20%
5.	Paper Publication	: 20%

INNOVATION & SOCIAL SKILLS

COURSE CODE: 12HSS83

HOURS/WEEK: L:T:P:S : 0:0:2:0

CREDITS: 01

Objectives:

- To provide a platform for the students to exhibit their organizational capabilities, team building, ethical values and extra mural abilities.
- To encourage to carryout innovative ideas and projects.
- Take part in societal and community building activities.
- Make self learning, ethics and lifelong learning a motto.

Guidelines

The HSS will be evaluated individually based on the broad parameters which include the progress made by student during 3^{rd}& 4^{th} year in innovative projects, Seminar, Paper Presentation, Field activity & other Co-curricular activities. Students shall submit a report and documents as a proof his/her achievements.