

# SIES Graduate School of Technology, Nerul

## Program Outcomes (PO's)

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/Development of solutions:** Design solutions for complex engineering problems and design system components, process to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment And Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project Management and Finance:** Demonstrate Knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Lifelong Learnings:** Recognise the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

# **SIES Graduate School of Technology, Nerul**

## **DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION**

### **Program Specific Outcomes (PSO)**

1. Achieve eminence in domains like signal processing, VLSI, embedded IOT, RF & microwave.
2. Become technocrats capable of working in multi-disciplinary fields.

### **Course Outcomes R-2016 UoM Syllabus (Choice Based Credit Grading System)**

#### **SE : III SEM (CBCS)**

##### **Subject: Applied Mathematics III (ECC301)**

CO1: Obtain and invert Laplace transform using standard results and shifting theorems.

CO2: Obtain solution Ordinary Differential Equations using Laplace Transform.

CO3: Expand the periodic function using Fourier series and Convert the time parameter to space/frequency parameter using Fourier transforms.

CO4: Transform the curves of  $z$  - plane to curves in  $w$  - plane using the concept of Bilinear transformation.

CO5: Explain Recurrence relation between the sequences of Bessel's function.

CO6: Perform calculation with operators Gradient, Del and Curl. Solve the examples of laws with both differential and integral form by the theorems like Gauss divergence, Stoke's theorem.

##### **Subject: Electronics Circuits & Devices-I (ECC302)**

CO1: Explain Current Voltage Characteristics of Semiconductor devices.

CO2: Design Rectifier, Filter, Zener diode as voltage regulator.

CO3: Analyze dc biasing circuits of BJT, FET.

CO4: Analyze BJT, FET amplifiers using different types of AC model.

CO5: Evaluate the Time and Frequency response of BJT and FET amplifier.

CO6: Design and analyze amplifier circuit for given specification.

##### **Subject: Digital System Design (ECC303)**

CO1: Apply Digital logic to solve real life Problem.

CO2: Analyze, design and implement combinational logic circuits.

CO3: Classify different semiconductor memories.

CO4: Analyze, design and implement sequential logic circuits.

CO5: Analyze digital system design using PROM, PLA, PAL.

CO6: Implement combinational and sequential circuits using vhdl.

**Subject: Circuit Theory and Network (ECC304)**

CO1: Apply network theorems to analyze circuits with dependent sources.

CO2: Analyze the DC circuits in time & frequency domain.

CO3: Analyze ladder & non Ladder circuits using network functions.

CO4: Analyze two port networks using various parameters.

CO5: Synthesize the network using passive elements.

CO6: Analyze Electrical Networks using Graph theory.

**Subject: Electronic Instrumentation and Control (ECC305)**

CO1: Describe the method and characteristics of measuring instruments.

CO2: Explain principle of operation of various sensors & transducers.

CO3: Describe telemetering & data acquisition system.

CO4: Implement different techniques for finding transfer function of a given system.

CO5: Analyze the stability of a given system in time domain.

CO6: Analyze the stability of a given system in frequency domain.

## SE : IV SEM (CBCS)

### **Subject: Applied Mathematics IV (ECC401)**

CO1: Find Eigen values and eigenvectors of a matrix to diagonalize the Square matrix.

CO2: Analyze the quadratic form of a matrix.

CO3: Evaluate integral using Cauchy's theorem, residue theorem.

CO4: Use Gram Schmidt processes to orthogonalise the vectors.

CO5: Apply method of calculus of variations to find extremal of the functional.

CO6: Maximize or minimize functional by Euler–Lagrange equation.

### **Subject: Electronic Devices & Circuits-II (ECC402)**

CO1: Design and analyze DC biasing circuits.

CO2: Analyze various configurations of BJT and FET multistage amplifier.

CO3: Design BJT and FET multistage amplifiers.

CO4: Analyze and design various power amplifier circuits.

CO5: Compare and analyze different types of feedback amplifiers.

CO6: Analyze and design different types of oscillators.

### **Subject: Linear Integrated Circuits (ECC403)**

CO1: Explain basic configurations of operational amplifier with and without feedback.

CO2: Design and analyze linear applications of op-amp namely amplifiers, converters, filters & oscillators.

CO3: Explain and analyze non linear applications of op-amp.

CO4: Analyze ADC & DAC circuits using op-amp.

CO5: Explain working principle of the special purpose integrated circuits and its applications.

CO6: Describe and design different types of voltage regulators.

**Subject: Signals and Systems (ECC404)**

CO1: Classify and analyze various types of signals and systems.

CO2: Analyze continuous time and discrete time systems in time domain.

CO3: Analyze continuous time and discrete time signals in frequency domain.

CO4: Analyze discrete time LTI systems using Z-transform.

CO5: Apply and analyze state space equations and to realize discrete time structures.

CO6: Explain the applications of signals and systems.

**Subject: Principles of Communication Engineering (ECC405)**

CO1: Explain the basics of communication system and noise.

CO2: Describe amplitude modulation and demodulation and its applications.

CO3: Compare AM, FM and PM and applications of angle modulation.

CO4: Compare different types of radio receivers.

CO5: Prove sampling theorem and compare PAM, PWM and PPM.

CO6: Explain TDM, FDM and its applications.

## TE : V SEM (CBCS)

### **Subject: Microprocessor Peripheral Interfacing (ECC501)**

CO1: Explain the basic concepts of microcomputer system.

CO2: Explain the architecture, pin configuration & organization of 8086 microprocessor.

CO3: Apply the knowledge of instruction sets to write assembly language programs for 8086.

CO4: Explain the interfacing of various peripheral devices with 8086.

CO5: Explain Interfacing of ADC, DAC & 8087 with 8086.

CO6: Design 8086 based system for given specifications.

### **Subject: Digital Communication (ECC 502)**

CO1: Explain probability theory, random variables and random processes

CO2: Apply the concepts of information theory in source coding

CO3: Evaluate the performances of different error control codes and applications

CO4: Compare the performances of different band pass modulations and applications

CO5: Evaluate various methods to eliminate inter symbol interference

CO6: Compare different receiver techniques in terms of error probability.

### **Subject: Electromagnetic Engineering (ECC 503)**

CO1: Derive the expressions of electric field intensity due to different charge configurations, using basic laws of electrostatics.

CO2: Derive the boundary conditions between two mediums and to calculate capacitance and potential.

CO3: Derive the expressions of magnetic field intensity, due to different current filaments, using basic laws of magneto statics and classify magnetic materials.

CO4: Derive and explain the significance of Maxwell's equation and also understand the best suitable medium for propagation of wave.

CO5: Compare wave theory with transmission line theory.

CO6: Explain applications of electromagnetics.

**Subject: Discrete Time Signal Processing (ECC 504)**

CO1: Apply Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT) and its properties for frequency domain analysis.

CO2: Compare analog and digital filters and can design IIR type digital filters.

CO3: Analyze and design FIR type digital filters.

CO4: Analyze the effect of hardware limitations on performance of digital filters.

CO5: Explain architecture of dsp processors.

CO6: Apply the knowledge of dsp processors for various applications.

**Subject: TV and Video Engineering (ECCDLO 5012)**

CO1: Explain fundamentals of tv system.

CO2: Compare monochrome and colour tv.

CO3: Explain various compression techniques used for Digital Video transmission.

CO4: Differentiate various digital video broadcasting techniques.

CO5: Explain Advanced Digital TV systems.

CO6: Compare types of TV displays & explain streaming media device

**Subject: Data Compression & Encryption (ECCDLO 5014)**

CO1: Apply various types of text compression techniques

CO2: Compare various techniques used in image compression.

CO3: Explain various methods of audio compression

CO4: Compare and summarize different ciphers

CO5: Analyze and apply methods of cryptography.

CO6: Apply basic security concepts on real time problems.



## TE: VI SEM (CBCS)

### **Subject: Microcontrollers and Applications (ECC601)**

CO1: Explain the internal architecture of 8051 microcontroller.

CO2: Write assembly language programs using instruction set of 8051 microcontroller.

CO3: Apply the knowledge of interfacing peripheral devices to the microcontroller to design microcontroller based system.

CO4: Explain the internal architecture of ARM7.

CO5: Describe instruction sets for ARM7.

CO6: Write embedded C language program for ARM7.

### **Subject: Computer Communication Network (ECC602)**

CO1. Compare and demonstrate various network applications, hardware, software, models, physical media and multiplexing schemes.

CO2: Compare error control, flow control, congestion control, framing and medium access control methods.

CO3. Demonstrate/illustrate the use of network layer protocol, addressing and subnetting. CO3

CO4. Compare routing algorithms and protocols.

CO5. Compare connectionless and connection oriented services and protocols.

CO6. Demonstrate/illustrate the use of tcp three-way handshaking, connection management, transmission policy and timer management.

### **Subject: Antenna and Radio wave Propagation (ECC603)**

CO1: Explain the fundamentals of antenna theory and summarize antenna parameters and radiation mechanism.

CO2: Derive the field equations for the basic radiating elements and to construct its radiation patterns

CO3: Evaluate and use appropriate antenna array design for given specifications

CO4: Differentiate the fundamentals of aperture and reflector antenna design and its applications.

CO5: Design patch antennas and compare its performance with other antennas.

CO6: Explain the procedure of various antenna parameter measurements and the techniques of wave propagation.

**Subject: Image Processing and Machine Vision (ECC 604)**

CO1: Explain theory and models in image processing.

CO2: Interpret and analyze 2d signals through transforms

CO3: Apply quantitative models of image restoration for various applications

CO4: Apply models of segmentation to various applications and identify regions in the image

CO5: Identify the shape using various representation techniques and classify the object using different classification methods

CO6: Apply image enhancement techniques in spatial and frequency domain to various images

**Subject: Radar Engineering (ECCDLO602)**

CO1: Explain generalized concept of radar.

CO2: Determine various parameters of various radar using radar equation.

CO3 : Compare different types of radar for specific application.

CO4: Explain the concept of tracking radar and its applications.

CO5: Evaluate the design constraints for transmitter.

CO6: Compare different radar displays.

## **BE : VII SEM (CBCS)**

### **Subject: Microwave Engineering (ECC 701)**

CO1: Characterize devices at higher frequencies.

CO2: Analyze waveguide and passive devices.

CO3: Analyze the microwave components and design the tuning and matching networks by using smith chart.

CO4: Design and analyze microwave circuits.

CO5: Analyze amplifiers and oscillators at microwave frequencies.

CO6: Demonstrate skills of planning, design and deployment of microwave networks.

### **Subject: Mobile Communication Systems (ECC702)**

CO1: Design cellular systems and their estimate the coverage and capacity.

CO2: Analyze the link budget and classify different types of propagation models.

CO3: Compare and Analyze mobile communication generations 2G, 2.5G, 3G w.r.t their architectures, frame structures, system capacity, services provided, characteristics and limitations.

CO4: Apply the concepts of 3G technologies of UMTS and CDMA 2000.

CO5: Elaborate the principles of 3GPP LTE.

CO6: Apply the mobile communication concepts to study the emerging technologies required for 4th generation mobile systems such as cognitive radio and MIMO.

### **Subject: Optical Communication (ECC 703)**

CO1: Apply the fundamental principles of optics and light wave to design optical fiber communication systems.

CO2: Differentiate losses in optical fiber link and explain transmission characteristics of optical fiber.

CO3: Describe working principles and characteristics of various sources to develop the optical fiber systems.

CO4: Explain working principles and characteristics of various detectors to develop the optical fiber systems.

CO5: Explain working principles and characteristics of various fiber optic components.

CO6: Calculate parameters for optical link budgeting to design & analyze the optical fiber link.

**Subject: Embedded Systems ( ECCDLO7035)**

CO1: Explain embedded system characteristics, quality attributes, product development life cycle and Create a model for an embedded system using program modeling.

CO2: Compare processor architectures.

CO3: Explain embedded system communication protocols.

CO4: Explain the concepts of operating system, task, process and thread

CO5: Solve scheduling problems in RTOS.

CO6: Design embedded system applications using RTOS.

**Subject: Neural Network & Fuzzy Logic (ECCDLO7031)**

CO1: Describe the concepts of biological neurons and artificial neurons.

CO2: Analyze the feed-forward and feedback neural networks and their learning algorithms.

CO3: Calculate the neural network training and design concepts.

CO4: Analyze the application of neural networks to non linear real world problem.

CO5: Explain the concept of fuzziness involved in various systems, fuzzy set theory and fuzzy logic.

CO6: Design fuzzy logic to real world problems.

**Subject: Product Lifecycle Management (ILO 7011)**

CO1: Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.

CO2: Illustrate various approaches and techniques for designing and developing products.

CO3: Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.

CO4: Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant.

CO5: Illustrate various environment aspects on product design.

CO6: Demonstrate the relevance between life cycle assessment and life cycle cost analysis.

**Subject: Operation Research (ILO7015)**

CO1: Apply the techniques used in operations research to formulate a real-world problem and solve it using various problem solving approaches.

CO2: Develop an integrated framework for strategic thinking and problem solving.

CO3: Identify the situations and appropriate equations and mathematical tools needed to solve optimization problems.

CO4: Identify the characteristics of different situations and apply the appropriate decision making tools to be used in each type.

CO5: Gain the ability to recognize situations in a manufacturing environment that suggests the use of certain quantitative methods to assist in optimizing the solution.

CO6: Plan of national importance structures based upon the previous history.

**Subject: Cyber Security and Laws (ILO7016)**

CO1: Understand the concept of cybercrime and its effect on outside world.

CO2: Understand different cyber offences and cyber-crime on different environment.

CO3: Analyze various tools used in performing cybercrime.

CO4: Understand the legal requirement of cyberspace.

CO5: Distinguish different aspects of cyber law.

CO6: Identify the need for different Information Security Standards compliance during software design and development.

**Subject: Disaster Management and Mitigation Measures (ILO7017)**

CO1: Able to understand the natural & man-made disaster and its relationships with human activities

CO2: To apply the fundamental knowledge of science and engineering to asses disaster and risk management.

CO3: To develop guidelines and procedures for disaster and safety issues obeying the disaster management laws and regulations.

CO4: Acquire skills for scientific problem-solving related mitigation of disaster.

CO5: Explain simple do's and don'ts in such extreme events and act accordingly.

CO6: Plan of national importance structures based upon the previous history.

**Subject: Project-I (ETP701)**

CO1: Analyze the quality of problem selected by applying engineering knowledge.

CO2: Identify the relevance to the specialization/Industrial trends/Societal and environmental needs.

CO3: Plan, design and estimate the cost, feasibility and scope/Techniques/ tools to be used.

CO4: Perform extensive literature survey and provide partial solution to the problem by following ethics.

CO5: Cultivate the habit of working in team along with financial management.

CO6: Prepare, organize and present the documents (Synopsis) and acquired knowledge.

## **BE : VIII SEM (CBCS)**

### **Subject: RF Design (ECC 801)**

CO1: Design Impedance Matching network for different RF Circuits.

CO2: Design passive RF filters.

CO3: Design and appraise RF amplifiers.

CO4: Design and appraise RF oscillators.

CO5: Analyze EMI in RF Circuits.

CO6: Analyze EMC in RF circuits.

### **Subject: Wireless Networks (ECC802)**

CO1: Compare various standards and architectures of wireless network.

CO2: Compare body area network and personal area network.

CO3: Classify different LAN topologies and technologies.

CO4: Design the wireless network by illustrating the fundamentals and architecture of metropolitan area networks.

CO5: Compare various wireless adhoc network based on architecture, traffic related protocols and transmission technology.

CO6: Explain the basic architecture and working of IoT.

### **Subject: Optical Networks (ECCDLO8041)**

CO1: Identify the issues related to signal degradation and need of optical components and networks.

CO2: Compare different first generation and second-generation optical network architectures.

CO3: Explore concepts of packet switching and access networks.

CO4: Compare and analyze various wavelength routing networks.

CO5: Design and analyze the performance of first generation and second-generation optical networks.

CO6: Apply the knowledge developed to control networks, their protection and fault management.

**Subject: Satellite Communication (ECC DLO8043)**

CO1: Describe basics of satellite communication system.

CO2: Explain the satellite internal sub systems for communication applications

CO3: Analyze link budget of satellite signal for proper communication

CO4: Classify earth station technology with design considerations

CO5: Compare different multiple access systems and its utilization

CO6: Compare competitive satellite services and explain architecture and characteristics for satellite networks.

**Subject: Product Management (ILO8021)**

CO1: Gain project management foundation and various organizational structures knowledge.

CO2: Apply selection criteria and select an appropriate project from different options.

CO3: Write work break down structure for a project and develop a schedule based on it.

CO4: Identify opportunities and threats to the project and decide an approach to deal with them strategically.

CO5: Use Earned value technique and determine & predict status of the project.

CO6: Capture lessons learned during project phases and document them for future reference.

**Subject: Finance Management (ILO8022)**

CO1: Explain the importance and components of the Indian Financial System.

CO2: Estimate the risk & returns and present / future value of various investments.

CO3: Describe corporate finance and significance of financial statements & ratio analysis.

CO4: Calculate capital budgeting using various investment appraisal criteria & also the working capital requirements.

CO5: Explain the various sources of finance and capital structure theories & approaches.

CO6: Describe the dividend policy theories & approaches.



**Subject: Digital Business Management (ILO8028)**

CO1: Summarize drivers of digital business.

CO2: Illustrate various approaches and techniques for E-business and management.

CO3: Explain different digital business support services and technologies in E infrastructure.

CO4: Explain various ethics and societal impacts of ecommerce.

CO5: Identify the need of security and summarize various security techniques.

CO6: Develop E-business plan.

**Subject: Environmental Management (ILO8029)**

CO1: Identify environmental Issues relevant to India and Global concerns.

CO2: Understand and apply the concept of Environment Management and Sustainable development.

CO3: Relate to the scope of Environment Management and identify career opportunities.

CO4: Understand the concept of ecology, Ecosystem, its interdependence and food chain.

CO5: Demonstrate awareness of environment related legislations.

CO6: Develop awareness of EMS and ISO-14000.

**Subject: Project-II (ETP801)**

CO1: Simulate and implement their proposed design of the problem.

CO2: Test and troubleshoot their model/prototype.

CO3: Compare the proposed work with the one reported in the literature.

CO4: Present their work through paper publication/presentation/project-exhibition/competition etc.

CO5: Cultivate the habit of working in a team along with financial management.

CO6: Prepare, organize the documents (thesis/black-book) by following ethics.

**SIES Graduate School of Technology, Nerul  
Department of Computer Engineering**

**Program Specific Outcomes (PSO)**

1. To apply computational and logical skills to solve computer engineering problems.
2. To develop interdisciplinary skills and acquaint with cutting edge technologies in software industries.

**Course Outcomes R-2016 UoM Syllabus (Choice Based Credit Grading System)**

**Second Year: Sem III**

**Subject: Applied Mathematics III**

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| CSC301.1 | Student should be able to demonstrate all topics like Laplace Transform, Fourier Series, Complex variable, Z-Transform |
| CSC301.2 | Student should be able to identify, formulate and solve the problems of related topics                                 |
| CSC301.3 | Student should be able to show the understanding of the impact of Engineering mathematics                              |
| CSC301.4 | Student should be able to participate in the competitive exams like GATE, GRE or UPSC                                  |

**Subject: Object Oriented Programming Methodology**

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| CSL304.1 | Student will be able to apply fundamental programming constructs   |
| CSL304.2 | Student will be able to illustrate fundamental features of an object oriented language such as object, classes and libraries of object collections |
| CSL304.3 | Student will be able to develop program that efficiently implements concepts of strings, vectors and arrays.                                       |
| CSL304.4 | Student will be able to explain components of GUI based programming  |
| CSL304.5 | Student will be able to design user defined packages, interfaces and exception handling  |
| CSC304.6 | Student will be able to utilize the concept of multithreading  |

**Subject: Data Structures**

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| CSC305.1 |  |
| CSC305.2 |  |
| CSC305.3 |  |

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near data structure structures like stacks , queues , linked list and perform operations like searching, insertion, deletion, traversing mechanism etc.

Student will be able to explain and analyze various non-linear data structure structures like tree, graph and perform operations like searching, insertion, deletion, traversing mechanism etc.

Student will be able to implement and analyze data structures, operations and algorithms.

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- CSC305.4 Student will be able to explain, implement and analyze various sorting and searching techniques.
- CSC305.5 Student will be able to select appropriate data structure for the given problem and justify
- CSC305.6 Student will be able to design and implement a system to a given real life problem using appropriate data structure and algorithm based on the desired needs and realistic constraints

**Subject: Digital Logic Design and Analysis**

- CSC302.1 Student should be able to perform different number systems conversions
- CSC302.2 Student should be able to analyze and minimize Boolean expressions.
- CSC302.3 Student should be able to design and analyze combination circuits.
- CSC302.4 Student should be able to design and analyze sequential circuits
- CSC302.5 Student should be able to design basic circuit using VHDL
- CSC302.6 Student should be able to compare TTL and CMOS Logic families.

**Subject: Discrete Structures**

- CSC303.1 To infer the notion of logical thinking, mathematical proofs and to apply them in problem solving.
- CSC303.2 Students will be able to explain and apply the properties of relation, digraphs , lattice , functions and their types in problem solving
- CSC303.2 Students will be able to explain and solve probability ,counting, generating & recurring functions
- CSC303.4 Students will be able to explain and solve graphs & its their types and applicability
- CSC303.5 Students will be able to infer varied algebraic structures & group codes their applicability
- CSC303.6 students should be able to work in team/group and enhance communication skill

**Subject: ECCF**

- CSC306.1 Student will be able to understand the use of semiconductor devices in circuits and analyze them.
- CSC306.2 Student will be able to understand importance of oscillators and power amplifiers in communication system.
- CSC306.3 Student will be able to understand basic concepts of operational amplifier and their applications.

- CSC306.4 Student will be able to understand the fundamental concepts of electronic communication
- CSC306.5 Student will be able to apply knowledge of electronic devices and circuits to communication applications.
- CSC306.6 Student will be able to study basic concepts of information theory.

**Subject: Digital Systems Laboratory**

- CSL 301.1 Student should be able to identify various digital components.
- CSL 301.2 Student should be able to design circuit using principles of design of combinational logic and sequential logic circuits using basic components.
- CSL 301.3 Student should be able to recognize the importance of digital systems in computer architecture.

CSL 301.4      Student should be able to design and simulate the basic digital circuit.

**Subject: Data Structure Lab**

CSL 303.1      Students will be able to implement various linear and nonlinear data structures.

CSL 303.2      Students will be able to handle operations like insertion, deletion, searching and traversing on various data structures.

CSL 303.3      Students will be able to implement mini project by selecting appropriate data structure and algorithms.

## Second Year: Sem IV

### Subject: Applied Mathematics IV

- CSC401.1 Student will be able to find Eigen values and eigenvectors of a matrix
- CSC401.2 Student will be able to find the minimal polynomial and diagonalizable the Square matrix
- CSC401.3 Student will be able to evaluate integral using Cauchy's theorem, Residue theorem
- CSC401.4 Student will be able to use Binomial, Poisson and Normal distribution to solve statistical problems
- CSC401.5 Student will be able to analyze the problem by using Large and Small Sampling theory
- CSC401.6 Student will be able to optimize the solution of LPP and NLPP

### Subject: Computer Organization and Architecture

- CSC403.1 Student should be able to explain basic structure of computer, control unit operations and i/o organizations, processor
- CSC403.2 Student should be able to demonstrate the arithmetic algorithms for solving alu operations
- CSC403.3 Student should be able to describe instruction level parallelism and hazards in typical processor pipelines
- CSC403.4 Student should be able to describe superscalar architectures, multi-core architecture and their advantages
- CSC403.5 Student should be able to demonstrate memory mapping techniques
- CSC403.6 Student should be able to develop good communication skills and team work through active learning strategies, seminars on advanced topics of coa and mini projects

### Subject: Computer Graphics

- CSC404.1 Student will be able to explain the basic concepts of Computer Graphics.
- CSC404.2 Student should be able to explore the working principle, utility of various input/output devices.
- CSC404.3 Student will be able to demonstrate various algorithms for scan conversion and filling of basic objects and their
- CSC404.4 Student should be able to apply geometric transformations, viewing and clipping on graphical objects.
- CSC404.5 student should be able to explore solid model representation techniques and projections.
- CSC404.6 Student should be able to describe visible surface detection techniques and illumination models

**Subject: Operating System**

- CSC405.1 Student will be able to understand role of operating system in terms of process, memory, file and i/o management.
- CSC405.2 Student will be able to apply and analyze the concept of a process, thread, mutual exclusion and deadlock.
- CSC405.3 Student will be able to evaluate performance of process scheduling algorithms and ipc



- CSC405.4 Student will be able to apply and analyze the concepts of memory management techniques.
- CSC405.5 Student will be able to evaluate the performance of memory allocation and replacement techniques.
- CSC405.6 Student will be able to apply and analyze different techniques of file and i/o management

**Subject: Open Source Tech Lab**

- CSL405.1 Students will be able to apply basic concepts in python and perl.
- CSL405.2 Students will be able to experiment the programs on contents of files, directories and text processing, data structure using built in functions with python
- CSL405.3 Students will be able to use django web framework for developing python based web application.
- CSL405.4 Students will be able To understand file handling and database handling using perl.
- CSL405.5 Students will be able To explore basics of two way communication between client and server using python and perl.
- CSL405.6 Students will be able To develop good communication skills and teamwork through seminars and mini project.

**Subject: Processor Architecture Laboratory**

- CSL403.1 Student should be able to assemble personal computer
- CSL403.2 student should be able to design the basic building blocks of a computer: arithmetic-logic unit, registers, central processing unit, and memory
- CSL403.3 Student should be able to implement various algorithms like booth"s algorithm for arithmetic operations
- CSL403.4 Student should be able to describe various i/o buses with merits and demerits
- CSL403.5 Student should be able to design ripple carry adder and carry look ahead adder. Student should be able to develop good communication skills, team work and ethics through mini projects
- CSL403.6

**Subject: Operating System Lab**

- CSL404 .1 Students should be able to understand basic operating system commands
- CSL404.2 Students should be able to understand and explore various system calls
- CSL404.3 Students should be able to write shell scripts and shell commands using kernel APIs
- CSL404.4 Students should be able to implement and analyze different process scheduling algorithms and different memory management algorithms
- CSL404.5 Students should be able to evaluate process management techniques and deadlock handling using simulator
- CSL404.6 Students should be able to undertake problem definition related to Operating System and carry out a mini project on it.

**Subject: Analysis of Algorithms Lab**

- CSL401.1 Students should be able to analyze the complexities of various problems in different domains.
- CSL401.2 Students should be able to prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
- CSL401.3 Students should be able to develop the efficient algorithms for the new problem with suitable designing techniques.
- CSL401.4 Students will be able to Implement the algorithms using different strategies.

**Subject: Computer Graphics Lab**

- CSL402.1 Student will be able to explore the working principle, utility of various input/ output devices and graphical tools.
- CSL402.2 Student will be able to implement various output and filled area primitive algorithms using C/ OpenGL
- CSL402.3 Student will be able to apply transformation and clipping algorithms on graphical objects.

CSL402.4 Student will be able to implementation of curve and fractal generation.

CSL402.5 Student will be able to develop a Graphical application based on learned concept

## Second Year: Sem V

### Subject: Microprocessor

- CSC501.1 Student will be able to describe architecture of x86 processors
- CSC501.2 Student will be able to interpret the instructions of 8086 and write assembly and mixed language programs
- CSC501.3 Student will be able to explain the concept of interrupts
- CSC501.4 Student will be able to identify the specifications of peripheral chip
- CSC501.5 Student will be able to design 8086 based system using memory and peripheral chips
- CSC501.6 Student will be able to appraise the architecture of advanced processors

### Subject: Database Management

- CSC502.1 Student will be able to explain the fundamentals of a database system.
- CSC502.2 Student will be able to design and draw ER and EER diagram for the real life problem.
- CSC502.3 Student will be able to convert conceptual model to relational model and formulate relational algebra queries.
- CSC502.4 Student will be able to design and querying database using SQL.
- CSC502.5 Student will be able to analyze and apply concepts of normalization to relational database design.
- CSC502.6 Student will be able to describe the concept of transaction, concurrency and recovery.

### Subject: Computer Network

- CSC503.1 Student will be able to demonstrate the concepts of data communication at physical layer and compare iso - osi model with tcp/ip model.
- CSC503.2 Student will be able to demonstrate the knowledge of networking protocols at data link layer.
- CSC503.3 Student will be able to design the network using ip addressing and sub netting / super netting schemes.
- CSC503.4 Student will be able to analyze various routing algorithms and protocols at network layer.

- CSC503.5 Student will be able to analyze transport layer protocols and congestion control algorithms.
- CSC503.6 Student will be able to utilize protocols at application layer

**Subject: Theory of Computer**

- CSC504.1 Student will be able to identify the central concepts in theory of computation and differentiate between deterministic and nondeterministic automata, also obtain equivalence of nfa and dfa.
- CSC504.2 Student will be able to infer the equivalence of languages described by finite automata and regular expressions.
- CSC504.3 Student will be able to devise regular, context free grammars while recognizing the strings and tokens
- CSC504.4 Student will be able to design pushdown automata to recognize the language and develop an understanding of computation through turing machine
- CSC504.5 Student will be able to develop an understanding of computation through turing machine
- CSC504.6 Student will be able to acquire fundamental understanding of decidability and undecidability

**Subject: Web Technologies Laboratory**

- CPL501.1 Students will be able to describe the core concepts and features of Web Technology
- CPL501.2 Students will be able to Design static web pages using HTML5 and CSS3
- CPL501.3 Students will be able to Apply the concept of client side validation and design dynamic web pages using JavaScript and JQuery.
- CPL501.4 Students will be able to Evaluate client and server side technologies and create Interactive web pages using PHP , AJAX with database connectivity using
- CPL501.5 Students will be able to describe the basics of XML, DTD and XSL and develop web pages using XML / XSLT.
- CPL501.6 Students will be able to Analyze end user requirements and Create web application using appropriate web technologies and web development

**Subject: Multimedia System**

- CPL5011.1 Student will be able to identify basics of multimedia and multimedia system architecture.
- CPL5011.2 Student will be able to explain different multimedia components.
- CPL5011.3 Student will be able to explain file formats for different multimedia components.
- CPL5011.4 Student will be able to analyze the different compression algorithms.
- CPL5011.5 Student will be able to describe various multimedia communication techniques.
- CPL5011.6 Student will be able to apply different security techniques in multimedia environment.

**Subject: Advance Operating System**

- CSDL5012.1 Student will be able to describe design issues of advanced operating systems and compare different types of operating systems.
- CSDL5012.2 Student will be able to analyze design aspects and data structures used for file subsystem, memory subsystem and process subsystem of unix os.
- CSDL5012.3 Student will be able to explain different architectures used in multiprocessor os and analyze the design and data structures used in
- CSDL5012.4 Student will be able to differentiate between threads and processes and compare different processor scheduling algorithms used in multiprocessor
- CSDL5012.5 Student will be able to classify real time os and analyze various real time scheduling algorithms.
- CSDL5012.6 Student will be able to explore architectures and design issues of mobile os, virtual os, cloud os.

**Subject: Advance Algorithm**

- CPL5013.1 Students will be able to Describe analysis techniques for algorithms.
- CPL5013.2 Students will be able to Identify appropriate data structure and design techniques for different problems
- CPL5013.3 Students will be able to Identify appropriate algorithm to be applied for the various application like geometric modeling, robotics, networking, etc.
- CPL5013.4 Students will be able to Apply probability theory and randomization in the analysis of algorithm

- CPL5013.5 Students will be able to Analyze various algorithms.
- CPL5013.6 Student will be able to differentiate polynomial and non deterministic polynomial algorithms

**Subject: Microprocessor**

- CSL501.1 Student will be able to use appropriate instructions to program microprocessor to perform various tasks
- CSL501.2 Student will be able to develop the program in assembly/mixed language for intel 8086 processor
- CSL501.3 Student will be able to demonstrate the execution and debugging of assembly language program
- CSL501.4 Student will be able to demonstrate the interfacing of peripheral device with microprocessor
- CSL501.5 Student will be able to test the use of flag register
- CSL501.6 Student will be able to demonstrate the execution and debugging of mixed language program

**Subject: Computer Network Lab**

- CSL502.1 Student will be able to design and setup networking environment in Linux.
- CSL502.2 Student will be able to simulate using network tools and simulators such as ns2, Wireshark etc. to explore networking algorithms and protocols.
- CSL502.3 Student will be able to implement programs using core programming APIs for understanding networking concepts.
- CSL502.4 Student will be able to design a network case study using CISCO packet tracer.

**Subject: Database & Information System Lab**

- CSL503.1 Student will be able to design and draw ER and EER diagram for the real life problem with software tool.
- CSL503.2 Student will be able to create and update database and tables with different DDL and DML statements.
- CSL503.3 Student will be able to apply /Add integrity constraints and able to provide security to data.
- CSL503.4 Student will be able to Implement and execute Complex queries.
- CSL503.5 Student will be able to apply triggers and procedures for specific module/task
- CSL503.6 Student will be able to demonstrate concurrent transactions and able to access data through front end.

**Sem-VI****Subject: Software Engineering**

- CSC601.1 Student will be able to explain and demonstrate basic knowledge in software engineering
- CSC601.2 Student will be able to identify requirements, analyze and prepare models
- CSC601.3 Student will be able to plan, schedule and track the progress of the projects
- CSC601.4 Student will be able to design and develop the software projects.
- CSC601.5 Student will be able to identify risks, manage the change to assure quality in software projects.
- CSC601.6 Student will be able to apply testing principles on software project and maintenance concepts.

**Subject: System Software and Compiler construction**

- CSC602.1 Student will be able to identify the relevance of different system programs.
- CSC602.2 Student will be able to describe the various data structures and passes of assembler design.
- CSC602.3 Student will be able to identify the need for different features and designing of macros
- CSC602.4 Student will be able to distinguish different loaders and linkers and their contribution in developing efficient user applications.
- CSC602.5 Student will be able to construct different parsers for given context free grammars
- CSC602.6 Student will be able to justify the need of synthesis phase to produce optimized object code in terms of high execution speed and less memory usage



**Subject: Data Warehousing**

- CSC603.1 Student will be able to explain data warehouse fundamentals, data mining principles
- CSC603.2 Student will be able to design data warehouse with dimensional modeling and apply olap operations.
- CSC603.3 Student will be able to identify appropriate data mining algorithms to solve real world problems
- CSC603.4 Student will be able to compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
- CSC603.5 Student will be able to describe complex data types with respect to spatial and web mining.
- CSC603.6 Student will be able to benefit the user experiences towards research and innovation.

**Subject: Cryptography & System Security**

- CSC604.1 Student should be able to explain system security goals and concepts, classical encryption techniques and acquire fundamental knowledge on the concepts of modular arithmetic and number theory
- CSC604.2 Student should be able to compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- CSC604.3 Student should be able to apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- CSC604.4 Student should be able to apply different digital signature algorithms to achieve authentication and design secure applications
- CSC604.5 Student should be able to explain network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like ssl, ipsec, and pgp.
- CSC604.6 Student should be able to analyze and apply system security concept to recognize malicious code.

**Subject: Machine Learning**

- CSDLO6021.1 Student will be able to gain knowledge about basic concepts of machine learning
- CSDLO6021.2 Student will be able to identify machine learning techniques suitable for a given problem
- CSDLO6021.3 Student will be able to solve the problems using various machine learning techniques
- CSDLO6021.4 Student will be able to apply dimensionality reduction techniques.
- CSDLO6021.5 Student will be able to design application using machine learning techniques

CSDLO6021.6 Student will be able to understand concepts of neural networks for machine learning

**Subject: Advance Database System**

CSDLO6022.1 Student will be able to build indexing mechanism for efficient retrieval of information from database

CSDLO6022.2 Student will be able to measure query cost and optimize query execution

CSDLO6022.3 Student will be able to design distributed database for better resource management

CSDLO6022.4 Student will be able to demonstrate the understanding of concepts of document oriented database

CSDLO6022.5 Student will be able to apply appropriate security techniques database systems

CSDLO6022.6 Student will be able to implement advanced data models for real life applications

**Subject: Enterprise Resource Planning**

CSDLO6023.1 Student will be able to understand the basic structure of erp.

CSDLO6023.2 Student will be able to identify implementation strategy used for erp

CSDLO6023.3 Student will be able to apply design principles for various business modules in erp

CSDLO6023.4 Student will be able to apply different emerging technologies for implementation of erp

CSDLO6023.5 Student will be able to analyze security issues in erp

CSDLO6023.6 Student will be able to acquire erp concepts for real world applications

**Subject: System Software Lab**

- CSL602.1 Student will be able to generate machine code by using various databases generated in pass one of two pass assembler
- CSL602.2 Student will be able to construct different databases of single pass macro processor
- CSL602.3 Student will be able to identify and validate different tokens for given high level language code
- CSL602.4 Student will be able to parse the given input string by constructing top down /bottom up parser.
- CSL602.5 Student will be able to implement synthesis phase of compiler with code optimization techniques
- CSL602.6 Student will be able to explore various tools like lex and yacc.

**Subject: System Security Laboratory**

- CSL604.1 To be able to apply the knowledge of symmetric cryptography to implement simple ciphers.
- CSL604.2 To be able to analyze and implement public key algorithms like rsa and el gamal.
- CSL604.3 To analyze and evaluate performance of hashing algorithms.
- CSL604.4 To explore the different network reconnaissance tools to gather information about networks and use of tools like sniffers, port scanners and other related tools for analyzing packets in a network.
- CSL604.5 To be able to set up firewalls and intrusion detection systems using open source technologies and to explore email security.
- CSL604.6 To be able to explore various attacks like buffer-overflow, and web-application attacks.

**Subject: Mini Project**

- CSL605.1 Student will be able to acquire practical knowledge within the chosen area of technology for project development.

- CSL605.2 Student will be able to identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach
- CSL605.3 Student will be able to contribute as an individual or in a team in development of technical projects
- CSL605.4 Student will be able to develop effective communication skills for presentation of project related activities

### **Sem-VII**

#### **Subject: Digital Signal & Image Processing**

- CSC701.1 Student will be able to apply the concept of DT Signal and DT Systems
- CSC701.2 Student will be able to classify and analyze discrete time signals and systems
- CSC701.3 Student will be able to implement Digital Signal Transform techniques DFT and FFT.
- CSC701.4 Student will be able to use the enhancement techniques for digital Image Processing
- CSC701.5 Student will be able to differentiate between the advantages and disadvantages of different edge detection techniques
- CSC701.6 Student will be able to develop small projects of 1-D and 2-D Digital Signal Processin

#### **Subject: Mobile Communication**

- CSC702.1 Student will be able to identify basic concepts and principles in mobile communication & computing, cellular architecture.
- CSC702.2 Student will be able to describe the components and functioning of mobile networking.
- CSC702.3 Student will be able to classify variety of security techniques in mobile network
- CSC702.4 Student will be able to apply the concepts of WLAN for local as well as remote applications
- CSC702.5 Student will be able to describe and apply the concepts of mobility management

CSC702.6 Student will be able to describe Long Term Evolution (LTE) architecture and its interfaces

**Subject: Artificial Intelligence & Soft Computing**

- CSC703.1 Student will be able to identify the various characteristics of Artificial Intelligence and Soft Computing techniques.
- CSC703.2 Student will be able to choose an appropriate problem solving method for an agent to find a sequence of actions to reach the goal state.
- CSC703.3 Student will be able to analyse the strength and weakness of AI approaches to knowledge representation, reasoning and planning.
- CSC703.4 Student will be able to construct supervised and unsupervised ANN for real world applications.
- CSC703.5 Student will be able to design fuzzy controller system.
- CSC703.6 Student will be able to apply Hybrid approach for expert system design.

**Subject: Big Data & Analytics**

- CSDLO7032.1 Students should be able to understand the key issues in big data management and its associated applications for business decisions and strategy.
- CSDLO7032.2 Students should be able to develop problem solving and critical thinking skills in fundamental enabling techniques like Hadoop, Mapreduce and NoSQL in big data analytics
- CSDLO7032.3 Students should be able to collect, manage, store, query and analyze various forms of Big Data analytics
- CSDLO7032.4 Students should be able to interpret business models and scientific computing paradigms and apply software tools for big data analytics
- CSDLO7032.5 Students should be able to adapt adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc
- CSDLO7032.6 Students should be able to solve complex real world problems in various applications like recommender systems, social media applications, health and medical systems, etc.

**Subject: Big Data & Analytics Lab**

- CSL704.1 Students should be able to apply map reduce programming model to any sorts of programs
- CSL704.2 Students should be able to apply and use the ecosystem components to the scenarios applicable

- CSL704.3 Students should be able to implement NoSQL databases and understand its importance
- CSL704.4 Students should be able to implement SPARK and apply the knowledge of SCALA for analytics
- CSL704.5 Students should be able to implement machine learning techniques for big data analytics

**Subject ILO: Cyber Security and Laws**

- ILO 7019.1 Student should be able to understand the concept of cybercrime and its effect on outside world
- ILO 7019.2 Student should be able to understand different cyber offences and cyber crime on different environment
- ILO 7019.3 Student should be able to analyse various tools used in performing cybercrime
- ILO 7019.4 Student should be able to understand the legal requirement of cyberspace
- ILO 7019.5 Student should be able to distinguish different aspects of cyber law
- ILO7019.6 Student should be able to Identify the need for different Information Security Standards compliance during software design and development

**Subject ILO: Product Life cycle management**

- ILO 7011.1 Students should be able to explain the phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
- ILO 7011.2 Students should be able to illustrate various approaches and techniques for designing and developing products.
- ILO 7011.3 Students should be able to apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
- ILO 7011.4 Students should be able to acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
- ILO7011.5 Students should be able to illustrate various environmental aspects in product design
- ILO7011.6 Students should be able to demonstrate the relevance between Understand product lifecycle assessment and life cycle cost analysis.

**Subject ILO : Operation search**

- ILO 7015.1 Student should be able to understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including
- ILO 7015.2 Student should be able to perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data
- ILO 7015.3 Student should be able to solve specialized linear programming problems like the transportation and assignment problems, solve network models like the
- ILO 7015.4 Student should be able to understand the applications of integer programming and a queuing model and compute important performance measures

**Subject ILO: Disaster Management & Mitigation Measures**

- ILO 7017.1 Understanding foundations of hazards, disasters and associated natural/social phenomena
- ILO 7017.2 Familiarity with disaster management theory (cycle, phases)
- ILO 7017.3 Get to know natural as well as manmade disaster and their extent and possible effects
- ILO 7017.4 Plan of national importance structures based upon the previous history.
- ILO 7017.5 Get acquainted with government policies, acts and various organizational structure
- ILO 7017.6 Get to know the simple do's and don'ts in such extreme events and act accordingly

**Subject: Project Phase 1**

- CSP-705.1 Student should be able to identify quality problem on the basis of industry visit, literature survey or current trends
- CSP-705.2 Student should be able to define the problem clearly which will have solution that can be applied to solve real world problems.
- CSP-705.3 Student should be able to formulate the problem which will be specific to certain domain Like machine learning, Data mining ,networking.
- CSP-705.4 Student should be able to clearly define objective and scope of identified problems
- CSP-705.5 Student should be able to position their problem based on identification of gap based on literature survey.

**Subject: Mobile App. Development.**

- CSL702.1 Students should be able to develop and demonstrate mobile applications using various tools
- CSL702.2 Students will articulate the knowledge of GSM, CDMA & Bluetooth technologies and demonstrate it.
- CSL702.3 Students will be able to carry out simulation of frequency reuse , hidden terminal problem
- CSL702.4 Students should be able to develop security algorithms for mobile communication network
- CSL702.5 Students should be able to demonstrate simulation and compare the performance of Wireless LAN
- CSL702.6 Students should be able to implement and demonstrate mobile node discovery and route maintains.

### **Sem-VIII**

#### **Subject: Human Machine Interaction**

- CSC801.1 Students should be able to identify User Interface (UI) design principles.
- CSC801.2 Students should be able to analyze of effective user friendly interfaces.  
Students should be able to apply Interactive Design process in real world applications.
- CSC801.3
- CSC801.4 Students should be able to evaluate UI design and justify
- CSC801.5 Students should be able to create application for social.
- CSC801.6 Students should be able to create application for technical task

#### **Subject: Distributed Computing**

- CSC802.1 Students should be able to demonstrate knowledge of the basic elements and concepts related to distributed system technologies;
- CSC802.2 Students should be able to illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware
- CSC802.3 Students should be able to analyze the various techniques used for clock synchronization and mutual exclusion
- CSC802.4 Students should be able to demonstrate the concepts of Resource and Process management and synchronization algorithms
- CSC802.5 Students should be able to demonstrate the concepts of Consistency and Replication Management
- CSC802.6 Students should be able to apply the knowledge of Distributed File System to analyze various file systems like NFS, AFS and the experience in building large-scale



distributed applications.

**Subject: High Performance Computing**

- CSDLO.1 Students should be able to memorize parallel processing approaches
- CSDLO.2 Students should be able to describe different parallel processing platforms involved in achieving High Performance Computing.
- CSDLO.3 Students should be able to discuss different design issues in parallel programming
- CSDLO.4 Students should be able to design parallel algorithms considering decomposition and Mapping Techniques for Load Balancing
- CSDLO.5 Students should be able to develop efficient and high performance parallel programming
- CSDLO.6 Students should be able to learn parallel programming using message passing paradigm using open source APIs.

**Subject: Natural Language Processing**

- DLO8012.1 Students should have a broad understanding of the field of natural language processing.
- DLO8012.2 Students should have a sense of the capabilities and limitations of current natural language technologies,
- DLO8012.3 Students should be able to model linguistic phenomena with formal grammars.
- DLO8012.4 Students should be able to Design, implement and test algorithms for NLP problems
- DLO8012.5 Students should be able to understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP
- DLO8012.6 Students should be able to apply NLP techniques to design real world NLP applications such as machine translation, text

**Subject: HMI Lab**

- CSL801.1 Students should be able to design user centric interfaces.
- CSL801.2 Students should be able to design innovative and user friendly interfaces.

- CSL801.3 Students should be able to apply HMI in their day-to-day activities.
- CSL801.4 Students should be able to criticize existing interface designs, and improve them.
- CSL801.5 Students should be able to design application for social Task.
- CSL801.6 Students should be able to design application for Technical Tasks

**Subject: Adhoc Wireless Networks**

- DLO8013.1 Students should be able to describe the issues, characteristics and features of Adhoc Wireless Networks.
- DLO8013.2 Students should be able to analyze the comparative performance of the MAC protocols for Adhoc Wireless Networks.
- DLO8013.3 Students should be able to apply and Analyze different routing protocols for Adhoc Wireless Networks.
- DLO8013.4 Students should be able to analyze different transport layer protocol solutions.
- DLO8013.5 Students should be able to analyze security principles for link layer attacks and routing in Adhoc Wireless Networks.
- DLO8013.6 Students should be able to apply the concepts of Adhoc wireless networks in VANETs.

**Subject: Distributed Computing Lab**

- CSL802.1 Students should be able to develop, test and debug RPC/RMI based client-server programs
- CSL802.2 Students should be able to implement the main underline components of Distributed system
- CSL802.3 Students should be able to implement various techniques of synchronization
- CSL802.4 Students should be able to design and implement application programs on distributed systems

**Subject: Cloud Computing Lab**

- CSL803.1** Students should be able to explain the cloud architecture and its services
- CSL803.2** Students should be able to adapt different types of virtualization and increase resource utilization.

- CSL803.3** Students should be able to build a private cloud using open source technologies.
- CSL803.4** Students should be able to analyze security issues on cloud.
- CSL803.5** Students should be able to develop real world web applications and deploy on commercial cloud.
- CSL803.6** Students should be able to demonstrate various service models.

**Subject : Project II**

- CSP805 .1 Student should be able to carry out literature survey/visit industry/analyse current trends in the proposed domain
- CSP805 .2 Student should be able to define the problem based on identification of gaps based on literature survey.
- CSP805 .3 student should be able to formulate the problem, clearly define objectives, investigate the scope of identified problems and design the methodology to solve the
- CSP805 .4 Student should be able to implement the proposed design, specific to certain domain like image processing, machine learning,data mining ,networking using suitable tools.
- CSP805 .5 Student should be able to perform validations,testing and thorough evaluation of the investigation carried out and signify the contributions from the study.
- CSP805 .6 Student should be able to work effectively as an individual or in a team by managing the finance, timeline and produce the documents.

**Subject: Project Management**

- ILO 8021.1 Students should be able to gain project management foundation and various organizational structures knowledge
- ILO 8021.2 Students should be able to apply selection criteria and select an appropriate project from different options
- ILO 8021.3 Students should be able to write work break down structure for a project and develop a schedule based on it.
- ILO 8021.4 Students should be able to identify opportunities and threats to the project and decide an approach to deal with them strategically
- ILO 8021.5 Students should be able to use Earned value technique and determine & predict status of the project
- ILO 8021.6 Students should be able to capture lessons learned during project phases and document them for future reference

**Subject:** Digital Business Management

- ILO 8028.1 Students should be able to summarize drivers of digital business.
- ILO 8028.2 Students should be able to illustrate various approaches and techniques for E-business and management
- ILO 8028.3 Students should be able to explain different digital business support services and technologies in E infrastructure
- ILO 8028.4 Students should be able to explain various ethics and societal impacts of e-commerce
- ILO 8028.5 Students should be able to identify the need of security and summarize various security techniques.
- ILO 8028.6 Students should be able to develop E-business plan

**Subject:** Finance Management System

- ILO 8022.1 Students should be able to explain the importance and components of the Indian Financial System
- ILO 8022.2 Students should be able to estimate the risk & returns and present / future value of various investments
- ILO 8022.3 Students should be able to describe corporate finance and significance of financial statements & ratio analysis
- ILO 8022.4 Students should be able to calculate capital budgeting using various investment appraisal criterias & also the working capital requirements
- ILO 8022.5 Students should be able to explain the various sources of finance and capital structure theories & approaches
- ILO 8022.6 Students should be able to describe the dividend policy theories & approaches

**Subject:** Environmental Management System

- ILO8029.1 Students should be able to Identify environmental Issues relevant to India and Global concerns.
- ILO 8029.2 Students should be able to understand and apply the concept of Environment Management and Sustainable development.
- ILO 8029.3 Students should be able to relate to the scope of Environment Management and identify career opportunities.
- ILO 8029.4 Students should be able to understand the concept of ecology, Ecosystem, its interdependence and food chain.
- ILO 8029.5 Students should be able to demonstrate awareness of environment related legislations.
- ILO 8029.6 Students should be able to develop awareness of EMS and ISO-14000.



**SIES Graduate School of Technology**  
**Department of Information Technology**

**Program Specific Outcomes (PSO)**

1. Students should be able to analyze, design and develop technological solution for a given scenario.
2. Students should be able to involve themselves in life- long learning and cultivate skills for successful career, entrepreneurship and higher studies.

**Course Outcomes (CBCS)**

SEM III

Course Name: Applied Mathematics-III

**Course Outcomes : student should be able to:**

- ITC301.1 Apply Laplace transforms to different applications.
- ITC301.2 Apply Inverse Laplace transforms to different applications.
- ITC301.3 Define variables and also identify the mapping.
- ITC301.4 Apply the Set theory and Relations
- ITC301.5 Apply the Functions and define the recursive functions
- ITC301.6 Identify the Permutations and Combinations

Course Name: Logic Design

**Course Outcomes : student should be able to:**

- ITC302.1 Understand the concepts of various components to design stable analog circuits.
- ITC302.2 Understand different number system and codes and perform arithmetic operations.
- ITC302.3 Minimize the Boolean expression using Boolean algebra and design it using logic gates
- ITC302.4 Analyze and design combinational circuit.
- ITC302.5 Design and develop sequential circuits
- ITC302.6 Examine real world problems into digital logic formulations using VHDL.

Course Name: Data structures and Analysis

**Course Outcomes : student should be able to:**

- ITC303.1 Select appropriate data structures as applied to specified problem definition.
- ITC303.2 Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
- ITC303.3 Students will be able to implement Linear and Non-Linear data structures. 4. Implement appropriate sorting/searching technique for given problem.
- ITC303.4 Implement appropriate sorting/searching technique for given problem.
- ITC303.5 Design advance data structure using Non-Linear data structure.
- ITC303.6 Determine and analyze the complexity of given Algorithms.

Course Name: Database Management System

**Course Outcomes : student should be able to:**

- ITC304.1 Explain the features of database management systems and Relational database.
- ITC304.2 Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
- ITC304.3 Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
- ITC304.4 Retrieve any type of information from a data base by formulating complex queries in SQL.
- ITC304.5 Analyze the existing design of a database schema and apply concepts of normalization

to design an optimal database.

ITC304.6 Build indexing mechanisms for efficient retrieval of information from a database.

Course Name: Principle of communications

**Course Outcomes : student should be able to:**

- ITC305.1 Differentiate analog and digital communication systems.
- ITC305.2 Identify different types of noise occurred, its minimization and able to apply Fourier analysis in frequency & time domain to quantify bandwidth requirement of variety of analog and digital communication systems.
- ITC305.3 Design generation & detection AM, DSB, SSB, FM transmitter and receiver.
- ITC305.4 Apply sampling theorem to quantify the fundamental relationship between channel bandwidth, digital symbol rate and bit rate
- ITC305.5 Explain different types of line coding techniques for generation and detection of signals.
- ITC305.6 Describe Electromagnetic Radiation and propagation of waves.

Course Name: Digital Design

**Course Outcomes : student should be able to:**

- ITL301.1 Minimize the Boolean algebra and design it using logic gate.
- ITL301.2 Analyse and design combinational circuit
- ITL301.3 Realise given function using combinational circuit.
- ITL301.4 Design and develop sequential circuits
- ITL301.5 Implement digital systems using programmable logic devices.
- ITL301.6 Translate real world problems into digital logic formulations using VHDL.

Course Name: Data Structures and Analysis

**Course Outcomes : student should be able to:**

- ITL302.1 Select appropriate data structures as applied to specified problem definition.
- ITL302.2 Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
- ITL302.3 Students will be able to implement Linear and Non-Linear data structures.
- ITL302.4 Implement appropriate sorting/searching technique for given problem.
- ITL302.5 Design advance data structure using Non-Linear data structure.
- ITL302.6 Determine and analyze the complexity of given Algorithms.

Course Name: SQL Lab

**Course Outcomes : student should be able to:**

- ITL303.1 Construct problem definition statements for real life applications and implement a database for the same.
- ITL303.2 Design conceptual models of a database using er modeling for real life applications and also construct queries in relational algebra.
- ITL303.3 Create and populate a rdbms, using sql.
- ITL303.4 Write queries in sql to retrieve any type of information from a data base.
- ITL303.5 Analyze and apply concepts of normalization to design an optimal database.
- ITL303.6 Implement indexes for a database using techniques like b or b+ trees.



Course Name: Java Programming Lab

**Course Outcomes : student should be able to:**

- ITL304.1 Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
- ITL304.2 Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
- ITL304.3 Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
- ITL304.4 Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
- ITL304.5 Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events
- ITL304.6 Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture

SEM IV

Course Name Applied Mathematics-IV

**Course Outcomes : student should be able to:**

- ITC401.1 Apply the Number Theory to different applications using theorem.
- ITC401.2 Apply probability and understand PDF.
- ITC401.3 Understand sampling theory and correlation.
- ITC401.4 Apply the graphs and trees concepts to different applications
- ITC401.5 Understand group's theory.
- ITC401.6 Understand the Lattice theory.

Course Name Computer Network

**Course Outcomes : student should be able to:**

- ITC402.1 CO1. Describe the functions of each layer in OSI and TCP/IP model.
- ITC402.2 CO2.Explain the functions of Application layer and Presentation layer paradigms and Protocols.
- ITC402.3 CO3.Describe the Session layer design issues and Transport layer services
- ITC402.4 CO4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
- ITC402.5 CO5.Describe the functions of data link layer and explain the protocols.
- ITC402.6 CO6.Explain the types of transmission media with real time applications.

Course Name Operating system

**Course Outcomes : student should be able to:**

- ITC403.1 CO1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- ITC403.2 CO2. Describe the process management policies and scheduling of processes by CPU
- ITC403.3 CO3. Evaluate the requirement for process synchronization and coordination handled by operating system
- ITC403.4 CO4. Describe and analyze the memory management and its allocation policies
- ITC403.5 CO5. Identify use and evaluate the storage management policies with respect to different storage management technologies
- ITC403.6 CO6. Identify the need to create the special purpose operating system

Course Name Computer Organization andArchitecture

**Course Outcomes : student should be able to:**

- ITC404.1 CO1.Describe basic organization of computer and the architecture of 8086 microprocessor.
- ITC404.2 CO2.Implement assembly language program for given task for 8086 microprocessor.
- ITC404.3 CO3. Demonstrate control unit operations and conceptualize instruction level parallelism.
- ITC404.4 CO4.Demonstrate and perform computer arithmetic operations on integer and real numbers.

- ITC404.5 CO5.Categorize memory organization and explain the function of each element of a memory hierarchy.
- ITC404.6 CO6.Identify and compare different methods for computer I/O mechanisms.

Course Name Automata Theory

**Course Outcomes : student should be able to:**

- ITC405.1 CO1.Understand, design, construct, analyze and interpret Regular languages, Expression and Grammars.
- ITC405.2 CO2.Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
- ITC405.3 CO3. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.
- ITC405.4 CO4.Design different types of Push down Automata as Simple Parser.
- ITC405.5 CO5.Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine
- ITC405.6 CO6.Compare, understand and analyze different languages, grammars, Automata and Machines and appreciate their power and convert Automata to Programs and Functions

Course Name Networking Lab

**Course Outcomes : student should be able to:**

- ITL401.1 LO1.Execute and evaluate network administration commands and demonstrate their use in different network scenarios
- ITL401.2 LO2.Demonstrate the installation and configuration of network simulator.
- ITL401.3 LO3.Demonstrate and measure different network scenarios and their performance behavior.
- ITL401.4 LO4.Analyze the packet contents of different protocols
- ITL401.5 LO5.Implement the socket programming for client server architecture
- ITL401.6 LO6.Design and setup a organization network using packet tracer

Course Name Unix Lab

**Course Outcomes : student should be able to:**

- ITL402.1 LO1. Identify the basic Unix general purpose commands.
- ITL402.2 LO2. Apply and change the ownership and file permissions using advance Unix commands.
- ITL402.3 LO3. Use the awk, grep, perl scripts.
- ITL402.4 LO4.Implement shell scripts and sed.
- ITL402.5 LO5. Apply basic of administrative task.
- ITL402.6 LO6.Apply networking Unix commands.

Course Name Microprocessor programming lab

**Course Outcomes : student should be able to:**

- ITL403.1 LO1. Apply the fundamentals of assembly level programming of microprocessors.
- ITL403.2 LO2.Build a program on a microprocessor using arithmetic & logical instruction set of 8086.
- ITL403.3 LO3.Develop the assembly level programming using 8086 loop instruction set.

- ITL403.4 LO4. Write programs based on string and procedure for 8086 microprocessor.
- ITL403.5 LO5. Analyze abstract problems and apply a combination of hardware and software to address the problem
- ITL403.6 LO6. Make use of standard test and measurement equipment to evaluate digital interfaces.

**Course Name** Python Lab

**Course Outcomes : student should be able to:**

- ITL404.1 LO1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
- ITL404.2 LO2. Express different Decision Making statements and Functions
- ITL404.3 LO3. Interpret Object oriented programming in Python
- ITL404.4 LO4. Understand and summarize different File handling operations
- ITL404.5 LO5. Explain how to design GUI Applications in Python and evaluate different database operations
- ITL404.6 LO6. Design and develop Client Server network applications using Python

## SEM V

Course Name Microcontroller & Embedded Programming

**Course Outcomes : student should be able to:**

- ITC501.1 CO1.Students will be able to analyse conceptual embedded system for a given purpose
- ITC501.2 CO2.Students will be able to describe architecture of microcontroller 8051 and demonstrate assembly and embedded C programming skills for 8051 microcontroller
- ITC501.3 CO3.Students will be able to Design the interfacing of I/O devices with 8051 microcontroller.
- ITC501.4 CO4.Students will be able to describe architecture of ARM7 and demonstrate assembly programming skills for ARM7 processor
- ITC501.5 CO5.Students will be able to Demonstrate the fundamentals of Real-Time Operating System.
- ITC501.6 CO6.students will be able to select elements for designing any embedded systems application

Course Name Image Processing

**Course Outcomes : student should be able to:**

- ITDLO5012.1 CO1. Students will be able to explain the fundamental concepts of image processing.
- ITDLO5012.2 CO2. Students will be able to explain different Image enhancement techniques
- ITDLO5012.3 CO3. Students will be able to describe and review image transforms
- ITDLO5012.4 CO4. Students will be able to analyze the basic algorithms used for image processing & image compression with morphological image processing.
- ITDLO5012.5 CO5. Students will be able to contrast Image Segmentation and Representation
- ITDLO5012.6 CO6. Students will be able to design & synthesize Color image processing and its real world applications.

Course Name Internet Programming

**Course Outcomes : student should be able to:**

- ITC502.1 Implement interactive web page(s) using HTML,CSS and JavaScript.
- ITC502.2 Design a responsive web site using HTML5 and CSS3.
- ITC502.3 Demonstrate Rich Internet Application .
- ITC502.4 Build Dynamic web site using server side PHP Programming and Database connectivity.
- ITC502.5 Describe and differentiate different Web Extensions and Web Services.
- ITC502.6 Demonstrate web application using Python web Framework-Django

Course Name Advanced Data Management Technology

**Course Outcomes : student should be able to:**

- ITC503.1 CO1. Explain and understand the concept of a transaction and how acid properties are maintained when concurrent transaction occur in a database
- ITC503.2 CO2. Measure query costs and design alternate efficient paths for query execution
- ITC503.3 CO3. Apply sophisticated access protocols to control access to the database
- ITC503.4 CO4. Implement alternate models like distributed databases and design applications using advanced models like mobile, spatial databases
- ITC503.5 CO5. Organize strategic data in an enterprise and build a data warehouse

ITC503.6 CO6. Analyze data using OLAP operations so as to take strategic decisions

Course Name Cryptography & Network Security

**Course Outcomes : student should be able to:**

- ITC504.1 CO1 . Apply the knowledge of symmetric cryptography to implement simple ciphers
- ITC504.2 CO2 . Analyze and implement public key algorithms like rsa and el gamal
- ITC504.3 CO3 . Analyze and evaluate performance of hashing algorithms
- ITC504.4 CO4 . Explore the different network reconnaissance tools to gather information about networks
- ITC504.5 CO5 . Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.
- ITC504.6 CO6 . Apply and set up firewalls and intrusion detection systems using open source technologies and to explore email security.

Course Name Internet Programming Lab

**Course Outcomes : student should be able to:**

- ITL501.1 Design a basic web site using HTML5 and CSS3 to demonstrate responsive web design.
- ITL501.2 Implement dynamic web pages with validation using JavaScript objects by applying different event handling mechanism.
- ITL501.3 Use AJAX Programming Technique to develop RIA
- ITL501.4 Develop simple web application using server side PHP programming and Database Connectivity using MySQL.
- ITL501.5 Build well-formed XML Document and implement Web Service using Java.
- ITL501.6 Demonstrate simple web application using Python Django Framework.

Course Name Security Lab

**Course Outcomes : student should be able to:**

- ITL502.1 Apply the knowledge of symmetric cryptography to implement simple ciphers
- ITL502.2 Analyze and implement public key algorithms like RSA and El Gamal
- ITL502.3 Analyze and evaluate performance of hashing algorithms
- ITL502.4 Explore the different network reconnaissance tools to gather information about networks
- ITL502.5 Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.
- ITL502.6 Apply and set up firewalls and intrusion detection systems using open source technologies and to explore email security.

Course Name OLAP Lab

**Course Outcomes : student should be able to:**

- ITL503.1 1. Implement simple query optimizers and design alternate efficient paths for query execution.
- ITL503.2 2. Simulate the working of concurrency protocols, recovery mechanisms in a database
- ITL503.3 3. Design applications using advanced models like mobile, spatial databases.
- ITL503.4 4. Implement a distributed database and understand its query processing and transaction processing mechanisms

- ITL503.5 5. Build a data warehouse
- ITL503.6 6. Analyze data using OLAP operations so as to take strategic decisions.

Course Name IOT (Mini Project) Lab

**Course Outcomes : student should be able to:**

- ITL505.1 1. Identify the requirements for the real world problems.
- ITL505.2 2. Conduct a survey of several available literatures in the preferred field of study.
- ITL505.3 3. Study and enhance software/ hardware skills.
- ITL505.4 4. Demonstrate and build the project successfully by hardware requirements, coding, emulating and testing.
- ITL505.5 5. To report and present the findings of the study conducted in the preferred domain
- ITL505.6 6. Demonstrate an ability to work in teams and manage the conduct of the research study.

Course Name Business Communication & Ethics

**Course Outcomes : student should be able to:**

- ITL505.1 CO1: Design a technical document using precise language, suitable vocabulary and apt style
- ITL505.2 CO2: Develop the life skills/interpersonal skills to progress professionally by building stronger relationships.
- ITL505.3 CO3 : Demonstrate awareness of contemporary issues , knowledge of professional and ethical responsibility.
- ITL505.4 CO4 :Apply the traits of a suitable candidate for a job/ higher education upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP
- ITL505.5 CO5: Deliver formal presentations effectively implenting the verbal and non-verbal skills.
- ITL505.6 CO6: Demonstrate awareness on intellectual property rights and responsible use of social media.

SEM VI

Course Name Software Engineering with project management

**Course Outcomes : student should be able to:**

- ITC601.1 1. Define various software application domains and remember different process model used in software development
- ITC601.2 2. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques
- ITC601.3 3. Convert the requirements model into the design model and demonstrate use of software and user-interface design principles.
- ITC601.4 4. Distinguish among scm and sqa and can classify different testing strategies and tactics and compare them.
- ITC601.5 5. Justify role of sdlc in software project development and they can evaluate importance of software engineering in plc.
- ITC601.6 6. Generate project schedule and can construct, design and develop network diagram for different type of projects. They can also organize different activities of project as per risk impact factor

Course Name Data Mining and Business Intelligence

**Course Outcomes : student should be able to:**

- ITC602.1 1. Demonstrate an understanding of the importance of data mining and the principles of business intelligence
- ITC602.2 2. Organize and Prepare the data needed for data mining using pre preprocessing techniques
- ITC602.3 3. mPerform exploratory analysis of the data to be used for mining.
- ITC602.4 4. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.
- ITC602.5 5. Define and apply metrics to measure the performance of various data mining algorithms.
- ITC602.6 6. Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support.

Course Name Cloud Computing Services

**Course Outcomes : student should be able to:**

- (ITC603.1) Students should be able to Define Cloud Computing and memorize the different Cloud service and deployment models
- (ITC603.2) Students will be able to describe importance of virtualization along with their technologies.
- (ITC603.3) Students will be able to Use and Examine different cloud computing services
- (ITC603.4) Students will be able to Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing
- (ITC603.5) Students will be able to Describe the key components of Amazon web Service
- (ITC603.6) Students will be able to Design & develop backup strategies for cloud data based on features.

Course Name Wireless Network

**Course Outcomes : student should be able to:**



- ITC604.1 1. explain the basic concepts of wireless network and wireless generations.
- ITC604.2 Demonstrate the different wireless technologies such as cdma, gsm, gprs etc
- ITC604.3 3. appraise the importance of ad-hoc networks such as manet and vanet and wireless
- ITC604.4 4. describe and judge the emerging wireless technologies standards such as wll, wlan, wpan, wman.
- ITC604.5 5. explain the design considerations for deploying the wireless network infrastructure.
- ITC604.6 6. differentiate and support the security measures, standards. services and layer wise security considerations.

Course Name Advanved Internet Programming

**Course Outcomes : student should be able to:**

- ITDLO6021.1 1.Determine seo objectives and develop seo plan prior to site development.
- ITDLO6021.2 2. Explain search engine optimization techniques and develop keyword generation.
- ITDLO6021.3 3.. Describe different web services standards
- ITDLO6021.4 4. Describe different web services standards
- ITDLO6021.5 5. Apply multiple quantitative and qualitative methods for web analytics 2.0.
- ITDLO6021.6 5. Apply multiple quantitative and qualitative methods for web analytics 2.0.

Course Name Digital Forensics

**Course Outcomes : student should be able to:**

- ITDLO6023.1 1. Define the concept of ethical hacking and its associated applications in Information Communication Technology (ICT) world.
- ITDLO6023.2 2. Describe the need of digital forensic and role of digital evidences .
- ITDLO6023.3 3. Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection .
- ITDLO6023.4 4. Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications /devices like Windows/Unix system.
- ITDLO6023.5 5. Apply the knowledge of IDS to secure network and performing router and network analysis
- ITDLO6023.6 6. List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools .

Course Name Software design lab

**Course Outcomes : student should be able to:**

- ITL601.1 1.Sketch a modeling with uml
- ITL601.2 2.Design and deploy structural modeling
- ITL601.3 3.Design and deploy behavioral modeling
- ITL601.4 4.Deploy architectural modeling
- ITL601.5 5.Examine estimation about schedule and cost for project development.
- ITL601.6 6.Select project development tool.
- ITL601.7

Course Name Business Intelligence Lab

**Course Outcomes : student should be able to:**

ITL602.1

1. Identify sources of Data for mining and perform data exploration

ITL602.2

2. Organize and prepare the data needed for data mining algorithms in terms of attributes and class inputs, training, validating, and testing files.

ITL602.3

3. Implement the appropriate data mining methods like classification, clustering or association mining on large data sets using open source tools like WEKA

ITL602.4

4. Implement various data mining algorithms from scratch using languages like Python/ Java etc.

ITL602.5

5. Evaluate and compare performance of some available BI packages

ITL602.6

6. Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support.

Course Name Cloud Service Design Lab

**Course Outcomes : student should be able to:**

ITL603.1

1. Define & implement Virtualization using different types of Hypervisors

ITL603.2

2. Describe steps to perform on demand Application delivery using Ulteo .

ITL603.3

3. Examine the installation and configuration of Open stack cloud

ITL603.4

4. Analyze and understand the functioning of different components involved in Amazon web services cloud platform.

ITL603.5

5. Describe the functioning of Platform as a Service

ITL603.6

6. Design & Synthesize Storage as a service using own Cloud

Course Name Sensor Network Lab

**Course Outcomes : student should be able to:**

ITL604.1

1. Identify the requirements for the real world problems.

ITL604.2

2. Conduct a survey of several available literatures in the preferred field of study.

ITL604.3

3. Study and enhance software/ hardware skills.

ITL604.4

4. Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.

ITL604.5

5. To report and present the findings of the study conducted in the preferred domain

ITL604.6

6. Demonstrate an ability to work in teams and manage the conduct of the research study.

Course Name Mini project

**Course Outcomes : student should be able to:**

ITM605.1

Discover potential research areas in the field of IT

ITM605.2

Conduct a survey of several available literature in the preferred field of study

ITM605.3

Compare and contrast the several existing solutions for research challenge

ITM605.4

Demonstrate an ability to work in teams and manage the conduct of the research study.

ITM605.5

Formulate and propose a plan for creating a solution for the research plan identified

ITM605.6

To report and present the findings of the study conducted in the preferred domain

SEM VII

Course Name Enterprise Network Design

**Course Outcomes : student should be able to:**

- ITC701
1. Analyzing the customer requirements and apply a methodology to network design
  2. Student will be able to create structure and modularize the network.
  3. Student will be design basic campus and data center network.
  4. Student will be able to design remote connectivity for enterprise network.
  5. Student will be able to design ip addressing and select suitable routing protocols for
  6. Student will be able to compare openflow controllers and switches with other enter

Course Name Infrastructure Security

**Course Outcomes : student should be able to:**

- ITC702.1
- ITC702.2
- ITC702.3
- ITC702.4
- ITC702.5
- ITC702.6
1. Understand the concept of vulnerabilities, attacks and protection mechanisms
  2. Analyze and evaluate software vulnerabilities and attacks on databases and operatir
  3. Explain the need for security protocols in the context of wireless communication
  4. Understand and explain various security solutions for web and cloud infrastructure
  5. Understand, and evaluate different attacks on open web applications and web servi
  6. Design appropriate security policies to protect infrastructure components

Course Name MOBILE APPLICATION DEVELOPMENT

**Course Outcomes : student should be able to:**

- ITDLO7032 .1
- ITDLO7032 .2
- ITDLO7032 .3
- ITDLO7032 .4
- ITDLO7032 .5
- ITDLO7032 .6
1. Describe android platform, architecture and features.
  2. Design user interface and develop activity for android app.
  3. Use intent , broadcast receivers and internet services in android app.
  4. Design and implement database application and content providers.
  5. Use multimedia, camera and location based services in android app.
  6. Discuss various security issues in android platform.

Course Name Software Testing and Quality Assurance

**Course Outcomes : student should be able to:**

- ITDLO7034.1
- ITDLO7034.2
- ITDLO7034.3
- ITDLO7034.4
- ITDLO7034.5
- ITDLO7034.6
1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs
  2. Implement various test processes for quality improvement
  3. Design test planning
  4. Manage the test process
  5. Apply the software testing techniques in commercial environment
  6. Use practical knowledge of a variety of ways to test software and an understanding of some of the trade-offs between testing techniques.

Course Name Artificial Intelligence

**Course Outcomes : student should be able to:**

- BEITC703.1
1. Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents

- BEITC703.2 2. Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
- BEITC703.3 3. Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing
- BEITC703.4 4. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning
- BEITC703.5 5. Formulate and solve problems with uncertain information using Bayesian approaches.
- BEITC703.6 6. Apply concept Natural Language processing to problems leading to understanding of cognitive computing.

Course Name Network Design Lab

**Course Outcomes : student should be able to:**

- ITL701.1 To be familiarized with the requirements of an enterprise and address its major design areas
- ITL701.2 To recognize the hierarchical network model for the enterprise
- ITL701.3 Identify the networking devices and their configurations required for the design and also prepare a bill of materials
- ITL701.4 Propose a design for the Server Farm of an enterprise network and discuss up gradations if needed.
- ITL701.5 Provide suitable IP addressing plan and best possible routing protocol for an enterprise network.
- ITL701.6 Construct a suitable design for an enterprise network and test it using a tool.

Course Name Advance Security Lab

**Course Outcomes : student should be able to:**

- ITL702.1 Implement and analyze program and database vulnerabilities buffer overflow and sql i
- ITL702.2 Explore and analyze different security tools to secure mobile devices, web browser, wi
- ITL702.3 Explore reconnaissance, attack and forensics tools in kali linux
- ITL702.4 Learn security of system using personal firewall installation
- ITL702.5 Understand aaa using raduis
- ITL702.6 Understand aaa using tacacs
- ITL702.7

Course Name Intelligent system Lab

**Course Outcomes : student should be able to:**

- BEITL703.1 Design the building blocks of an Intelligent Agent using PEAS representation
- BEITL703.2 Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
- BEITL703.3 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing
- BEITL703.4 Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
- BEITL703.5 Formulate and solve problems with uncertain information using Bayesian approaches

BEITL703.6 Apply concept Natural Language processing and cognitive computing for creation of domain specific ChatBots

Course Name ANDROID APPS DEVELOPMENT LAB

**Course Outcomes : student should be able to:**

- ITL704.1 Install and configure an integrated development environment for android application
- ITL704.2 Design and implement user interfaces and layouts of android app.
- ITL704.3 Use intents for activity and broadcasting data in android app.
- ITL704.4 Design and implement database application and content providers.
- ITL704.5 Experiment with camera and location based service.
- ITL704.6 Develop android app with security features.

Course Name PROJECT-I

**Course Outcomes : student should be able to:**

- ITM705.1 Discover potential research areas in the field of IT
- ITM705.2 Conduct a survey of several available literature in the preferred field of study
- ITM705.3 Compare and contrast the several existing solutions for research challenge
- ITM705.4 Demonstrate an ability to work in teams and manage the conduct of the research study.
- ITM705.5 Formulate and propose a plan for creating a solution for the research plan identified
- ITM705.6 To report and present the findings of the study conducted in the preferred domain

Course Name Product Lifecycle Management

**Course Outcomes : student should be able to:**

- ILO7011.1 1.Explain the phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
- ILO7011.2 2. Illustrate various approaches and techniques for designing and developing products.
- ILO7011.3 3. Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
- ILO7011.4 4.Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
- ILO7011.5 5. Illustrate various environmental aspects in product design
- ILO7011.6 6. Demonstrate the relevance between Understand product lifecycle assessment and life cycle cost analysis.

Course Name Management Information System

**Course Outcomes : student should be able to:**

- ILO7013.1 1.Explain the impact of Information Systems on Organisations and Society at large.
- ILO7013.2 2. Discuss the implementaion of data and information management in an organisation and the challenges associated with it.
- ILO7013.3 3. Describe ethical issues, potential threats to privacy and the methods to protect Information resources.
- ILO7013.4 4. Analyse the effect of Social Computing and the ways in which modern organizations use this technology.

- ILO7013.5 5. Explain how businesses can use different types of computer networks along with latest technologies.
- ILO7013.6 6. Learn the various information systems that modern organizations utilize.

Course Name Operation Research

**Course Outcomes : student should be able to:**

- ILO7015.1 1. Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.
- ILO7015.2 2. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change.
- ILO7015.3 3. Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems.
- ILO7015.4 4. Understand the applications of integer programming and a queuing model and compute important performance measures

Course Name Cyber Security and Laws

**Course Outcomes : student should be able to:**

- ILO7016.1 1. Understand the concept of cybercrime and its effect on outside world
- ILO7016.2 2. Understand different cyber offences and cyber crime on different environment
- ILO7016.3 3. Analyse various tools used in performing cybercrime
- ILO7016.4 4. Understand the legal requirement of cyberspace
- ILO7016.5 5. Distinguish different aspects of cyber law
- ILO7016.6 6. Identify the need for different Information Security Standards compliance during software design and development

SEM VIII

Course Name Big Data Analytics

**Course Outcomes : student should be able to:**

- ITL801.1 Student will be able to explain the motivation for big data systems and identify the main sources of Big Data in the real world.
- ITL801.2 Student will be able to demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
- ITL801.3 Student will be able to implement several Data Intensive tasks using the Map Reduce Paradigm.
- ITL801.4 Student will be able to apply several newer algorithms for Clustering Classifying and finding associations in Big Data.
- ITL801.5 Student will be able to design algorithms to analyze Big data like streams, Web Graphs and Social Media data.
- ITL801.6 Student will be able to design and implement successful Recommendation engines for enterprises.

Course Name Internet of Everything

**Course Outcomes : student should be able to:**

- ITC802.1 1. Apply the concepts of IOT
- ITC802.2 2 Identify the different technology
- ITC802.3 3. Apply IOT to different applications
- ITC802.4 4. Analysis and evaluate protocols used in IOT.
- ITC802.5 5 Design and develop smart city in IOT.
- ITC802.6 6. Analysis and evaluate the data received through sensors in IOT

Course Name User Interaction Design

**Course Outcomes : student should be able to:**

- ITDLO8041.1 Students will be able to identify and criticize bad features of interface designs.
- ITDLO8041.2 Students will be able to predict good features of interface designs
- ITDLO8041.3 Students will be able to illustrate and analyze user needs and formulate user design specifications
- ITDLO8041.4 Students will be able to interpret and evaluate the data collected during the process
- ITDLO8041.5 Students will be able to evaluate designs based on theoretical frameworks and methodological approaches.
- ITDLO8041.6 Students will be able to produce/show better techniques to improve the user interaction design interfaces.

Course Name R-PROGRAMMING LAB

**Course Outcomes : student should be able to:**

- ITL804.1 Install and use R for simple programming tasks.
- ITL804.2 Extend the functionality of R by using add-on packages
- ITL804.3 Extract data from files and other sources and perform various data manipulation tasks
- ITL804.4 Code statistical functions in R. 5. Use R Graphics and Tables to visualize results of variou
- ITL804.5 Use R Graphics and Tables to visualize results of various statistical operations on data .
- ITL804.6 Apply the knowledge of R gained to data Analytics for real life applications.

Course Name Big Data Lab

**Course Outcomes : student should be able to:**

- ITL 801.1 Demonstrate capability to use Big Data Frameworks like Hadoop
- ITL 801.2 Program applications using tools like Hive, pig, , NO SQL and MongoDB for Big data Applications
- ITL 801.3 Construct scalable algorithms for large Datasets using Map Reduce techniques
- ITL 801.4 Implement algorithms for Clustering, Classifying and finding associations in Big Data
- ITL 801.5 Design and implement algorithms to analyze Big data like streams, Web Graphs and Social Media data and construct recommendation systems.
- ITL 801.6 Apply the knowledge of Big Data gained to fully develop a BDA applications for real life

Course Name Internet of Everything Lab

**Course Outcomes : student should be able to:**

- ITL802.1 1. Identify the requirements for the real world problems.
- ITL802.2 2. Conduct a survey of several available literatures in the preferred field of study.
- ITL802.3 3. Study and enhance software/ hardware skills.
- ITL802.4 4. Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.
- ITL802.5 5. To report and present the findings of the study conducted in the preferred domain
- ITL802.6 6. Demonstrate an ability to work in teams and manage the conduct of the research study.

Course Name DevOps Lab

**Course Outcomes : student should be able to:**

- ITL803.1 Summarize the importance of DevOps tools used in software development life cycle
- ITL803.2 Summarize the importance of Jenkins to Build, Deploy and Test Software Applications
- ITL803.3 Examine the different Version Control strategies
- ITL803.4 Analyze & Illustrate the Containerization of OS images and deployment of applications over Docker
- ITL803.5 Summarize the importance of Software Configuration Management in DevOps
- ITL803.6 Synthesize the provisioning using Chef/Puppet/Ansible or Saltstack

Course Name PROJECT-II

**Course Outcomes : student should be able to:**

- ITM805.1 Discover potential research areas in the field of IT
- ITM805.2 Conduct a survey of several available literature in the preferred field of study
- ITM805.3 Compare and contrast the several existing solutions for research challenge
- ITM805.4 Demonstrate an ability to work in teams and manage the conduct of the research study.
- ITM805.5 Formulate and propose a plan for creating a solution for the research plan identified
- ITM805.6 To report and present the findings of the study conducted in the preferred domain

Course Name Enterprise Resource Planning



**Course Outcomes : student should be able to:**

- ITDLO8045.1 1. Explain the basic concepts of Enterprise Resource Planning.
- ITDLO8045.2 2. Identify different technologies used in Enterprise Resource Planning.
- ITDLO8045.3 3. Analyse the concepts of ERP Manufacturing Perspective and ERP Modules.
- ITDLO8045.4 4. Discuss the benefits of Enterprise Resource Planning.
- ITDLO8045.5 5. Review different activities carried out in the Enterprise Resource Planning life cycle.
- ITDLO8045.6 6. Examine the role of E-Commerce & E-Business in Enterprise Resource Planning.

Course Name Project Management

**Course Outcomes : student should be able to:**

- ILO 8021.1 Gain project management foundation and various organizational structures knowledge
- ILO 8021.2 Apply selection criteria and select an appropriate project from different options
- ILO 8021.3 Write work break down structure for a project and develop a schedule based on it.
- ILO 8021.4 Identify opportunities and threats to the project and decide an approach to deal with them strategically
- ILO 8021.5 Use Earned value technique and determine & predict status of the project
- ILO 8021.6 Capture lessons learned during project phases and document them for future reference

Course Name Digital Business Management

**Course Outcomes : student should be able to:**

- ILO 8028.1 Summarize drivers of digital business.
- ILO 8028.2 Illustrate various approaches and techniques for E-business and management
- ILO 8028.3 Explain different digital business support services and technologies in E infrastructure
- ILO 8028.4 Explain various ethics and societal impacts of ecommerce
- ILO 8028.5 Identify the need of security and summarize various security techniques.
- ILO 8028.6 Develop E-business plan

Course Name Finance Management

**Course Outcomes : student should be able to:**

- ILO 8022.1 Explain the importance and components of the Indian Financial System
- ILO 8022.2 Estimate the risk & returns and present / future value of various investments
- ILO 8022.3 Describe corporate finance and significance of financial statements & ratio analysis
- ILO 8022.4 Calculate capital budgeting using various investment appraisal criterias & also the working capital requirements
- ILO 8022.5 Explain the various sources of finance and capital structure theories & approaches
- ILO 8022.6 Describe the dividend policy theories & approaches

Course Name Environmental Management

**Course Outcomes : student should be able to:**

- ILO8029.1 1. Identify environmental Issues relevant to India and Global concerns.
- ILO8029.2 2. Understand and apply the concept of Environment Management and Sustainable de
- ILO8029.3 3. Relate to the scope of Environment Management and identify career opportunities.
- ILO8029.4 4. Understand the concept of ecology, Ecosystem, its interdependence and food chain.
- ILO8029.5 5. Demonstrate awareness of environment related legislations.
- ILO8029.6 6. Develop awareness of EMS and ISO-14000.

**SIES Graduate School of Technology, Nerul  
Department of Printing and Packaging Technology**

**Program Specific Objectives (PSO)**

1. To apply the knowledge of printing & Packaging technology in innovative, dynamic and challenging environment for design and development of new products.
2. To improve the ability of collaborative learning to find out cost-effective, optimal solutions for existing and new problems in the printing & packaging field.

**Course Outcomes R-2016 UoM Syllabus (Choice Based Credit Grading System)**

**Second Year Sem-III**

**Subject: Applied Mathematics – III**

- PPC301.1 Obtain and invert Laplace Transform using standard results and shifting theorem.
- PPC301.2 Determine eigen values & eigen vectors of a matrix and power or exponential of a matrix using them.
- PPC301.3 Formulate and analyze mathematical problems followed by drawing clear and reasonable conclusions.
- PPC301.4 Infer about a particular sample with high degree of reliability.
- PPC301.5 Formulate and analyze statistical problems followed by drawing clear and reasonable conclusions.
- PPC301.6 Apply fourier transform in engineering learning

**Subject: Packaging Introduction & Concepts**

- PPC302.1 Effectively observe and compare the different package forms  
Describe the importance of compatibility studies and their associated parameters
- PPC302.2
- PPC302.3 Analyze the various hazards & environmental issues related to Packaging
- PPC302.4 Analyze the aesthetics of a package and the differentiating factors
- PPC302.5 Elaborate the importance of quality in packaging
- PPC302.6 Explain significance of packaging in terms of today's market

**Subject: Introduction to Printing Technology**

- PPC303.1 Distinguish various printing principles like planography, intaglio & relief.
- PPC303.2 Compare the process of image generation on the basis of typography, reprography & layout making.

- PPC303.3 Analyze the various Press configurations of Offset, Gravure, Flexography&Letterpress.
- PPC303.4 Classify Inks and Substrates used in various Printing technologies.

- PPC303.5 Recognize various materials used in printing operations and distinguish Print finishing operations
- PPC303.6 Choose an appropriate Printing process for any given Printing job.

**Subject: Glass, Metal and Textile Based Packaging Materials**

- PPC305.1 Describe & interpret the various manufacturing process for glass bottles, metal cans & tubes and textile based bags .
- PPC305.2 Explain various design aspects for various types of package forms made up of glass.
- PPC305.3 Explain various design aspects for various types of package forms made up of metal.
- PPC305.4 Summarize the aerosol technology and its wide application in packaging.
- PPC305.5 Discuss various quality control and testing procedures for these package forms.
- PPC305.6 Describe the basics of fabric & textile technology to produce bags of various materials like jute, hemp etc.

**Subject: Applied Mathematics III Tutorial**

- PPT301.1 Obtain and invert Laplace Transform using standard results and shifting theorem.
- PPT301.2 Determine eigen values & eigen vectors of a matrix and power or exponential of a matrix using them.
- PPT301.3 Formulate and analyze mathematical problems followed by drawing clear and reasonable conclusions.
- PPT301.4 Infer about a particular sample with high degree of reliability.
- PPT301.5 Formulate and analyze statistical problems followed by drawing clear and reasonable conclusions.
- PPT301.6 Apply fourier transform in engineering learning

**Subject: Principles of Graphic Arts and Design**

- PPL301.1 Create a design based on specific requirement.
- PPL301.2 Analyze the usage of particular colour & text in Package design.
- PPL301.3 Generate various design layouts with proper visual impacts.
- PPL301.4 Create a design for folding carton with appropriate software.
- PPL301.5 Edit an image and use it in a Package design.
- PPL301.6 Generate Logos for a given concept or product.

### **Subject: Screen Printing Laboratory**

- PPL302.1 Prepare screen printing image carrier by direct, indirect photographic methods.
- PPL302.2 Demonstrate the use of different photographic films for mesh preparation according to image.
- PPL302.3 Produce different printed samples for various substrates like fabric, glass, acrylic, wood by selecting suitable inks & coatings for that material.
- PPL302.4 Produce & analyze a halftone dot image generated for four color printing and registration of color.
- PPL302.5 Analyze the common faults in Screen Printing Process
- PPL302.6 Printing of two color job in textile and paper materials

### **Subject: Paper Based Material Testing**

- PPL303.1 Check grammage and thickness of paper & paperboard.
- PPL303.2 Find out burst factor of paper.
- PPL303.3 Perform stiffness test.
- PPL303.4 Perform Puncture resistance of CFB.
- PPL303.5 Identify flute types in CFB
- PPL303.6 Make paper carry bags as per the standard.

### **Subject: Glass, Metal and Textile Based Packaging Materials Tutorials**

- PPL304.1 Use various testing standards
- PPL304.2 Calculate capacity & dimensions for containers
- PPL304.3 Analyze Thermal shock & chemical resistance for glass bottles
- PPL304.4 Perform & Analyze coating related tests for metals used for cans
- PPL304.5 Analyze corrosion tests for metals
- PPL304.6 Conduct tests for textile based materials

## **SEM-IV**

### **Subject: Plastics in Packaging**

- PPC401.1 Describe the various polymerization mechanisms and techniques.
- PPC401.2 Differentiate between thermoplastics & thermosets.
- PPC401.3 Effectively communicate the relation between effects of temperature and crystallinity of polymers.
- PPC401.4 Identify and categorize various plastics by chemical and instrumentation methods.

- PPC401.5 Choose a plastic material for a specific application based on their physical and chemical properties.
- PPC401.6 Describe the properties that are important from the point of view of plastic processing.

**Subject: Ancillary Packaging Materials**

- PPC402.1 Analyze various cushioning materials and describe their properties.
- PPC402.2 Analyze the types of adhesives and apply the concept of adhesion in the packaging.
- PPC402.3 Elaborate the functions of various closures and choose a closure for a specific application.
- PPC402.4 Choose the right label for a specific packaging application.
- PPC402.5 Analyze the types of straps & tapes and describe their application in different packages.
- PPC402.6 Describe the significance of codings and coatings in packaging.

**Subject: Colour Reproduction**

- PPC403.1 Summarize the Colour Vision theory and its concept.
- PPC403.2 Discuss & summarize the conventional and digital method of colour separation.
- PPC403.3 Examine images and modify them with colour correction.
- PPC403.4 Measure the densitometric terms and analyze graphically.
- PPC403.5 Summarize the spectrophotometric terms and perform relative measurements of various printed samples.
- PPC403.6 Recognize the input & output devices being used.

**Subject: Offset Printing**

- PPC404.1 Describe the various terminologies in offset printing process.
- PPC404.2 Operate offset machines and evaluate single colour sheet feed press.
- PPC404.3 Identify and rectify suitable solutions for errors associated with platemaking and pressroom.
- PPC404.4 Analyze troubles related with quality and can produce possible remedies to minimize print problems.
- PPC404.5 Identify the conversion technology of offset printed jobs
- PPC404.6 Plan & Layout the imposition of commercial jobs.

**Subject: Digital Electronics & Microcontrollers**

- PPC405.1 Describe any logical expression using basic gates.
- PPC405.2 To examine the structure of various number systems and its application in digital design
- PPC405.3 Discuss the combinational & sequential circuits like encoder, decode, flip-flop, registers & counters.
- PPC405.4 Identify features of various Microcontroller.
- PPC405.5 Write and execute assembly language programs.
- PPC405.6 Summarize the need and functioning

**Subject: Principles of Graphic Arts and Design-II**

- PPL401.1 Create a Package design based on specific requirement.
- PPL401.2 Create Ups using the editing software for given substrate dimension.
- PPL401.3 Generate various design layouts with proper visual impacts.
- PPL401.4 Create a design for folding carton with appropriate software.
- PPL401.5 Edit an image and use it in a Package design
- PPL401.6 CO6. Design a Website and Upload in Internet.

**Subject: Plastic Material Testing**

- PPL402.1 Identify plastic material by chemical and instrumentation method.
- PPL402.2 Perform simple tensile test on UTM.
- PPL402.3 Determine ESCR of a plastic sample.
- PPL402.4 Perform impact test using dart impact method.
- PPL402.5 Determine coefficient of friction of plastic films.
- PPL402.6 Analyzethermogram from a DSC.

**Subject: Colour Reproduction Laboratory**

- PPL403.1 Match any two given colours under prescribed light source
- PPL403.2 Measure density and compare with the standards.
- PPL403.3 Analyse the colour difference between any two given printed samples
- PPL403.4 Measure various vitals of Print quality such as Dot gain, Print contrast, Hue error & Grayness and Trapping
- PPL403.5 Comment on Print quality based on measured values
- PPL403.6 Suggest Corrections required to achieve better print quality

**Subject: Offset Printing\***

- PPL404.1 Analyse the problem of printed sample & troubleshoot it



- PPL404.2 Perform printing on single color offset printing machine
- PPL404.3 Evaluate the number of sheets required for printing a particular job.
- PPL404.4 Evaluate the inking & dampening system condition through testing.
- PPL404.5 Plan & provide a dummy pack for a particular product.
- PPL404.6 Evaluate the conversion technologies used for a commercial pack.

**Subject: Digital Electronics & Microcontrollers Laboratory**

- PPL 405.1 To demonstrate the knowledge of operation of logic gates.
- PPL 405.2 To apply Boolean theorems, DeMorgan's theorems and Karnaugh maps reduction method to simplify logic problems.
- PPL 405.3 Create the appropriate truth table from a description of a combinational logic functions.
- PPL 405.4 Demonstrate the knowledge of operation of basic types of flip-flops.
- PPL 405.5 To analyze and design digital combinational circuits including arithmetic circuits (half adder, full adder, half subtractor and full subtractor).
- PPL 405.6 Develop skill in simple program writing for 8051.

**Subject: Ancillary Packaging Material Testing**

- PPL406.1 Determine peel / bond strength of an adhesive.
- PPL406.2 Perform shear resistance test on tape/label.
- PPL406.3 Determine the grammage of all components in a label.
- PPL406.4 Determine tack of a self-adhesive tape or a label by Rolling Ball Tack Tester.
- PPL406.5 Determine opening and closing torque for closures.
- PPL406.6 Effectively perform strapping and taping of a CFB Box.

**SEM – V**

**Subject: Plastic Processing and Conversion Technologies**

- PPC501.1 Describe the fundamental concepts in plastic processing and conversion technology.
- PPC501.2 Analyse the various plastic materials and its application
- PPC501.3 Understand and use suitable conversion technique as per the end product
- PPC501.4 Produce plastic products by using various conversion techniques
- PPC501.5 Perform different testing methods for plastic product
- PPC501.6 Study different processing parameters required in industry

**Subject: Gravure Printing**

- PPC502.1 Describe the various components of gravure printing machine and its functions.
- PPC502.2 Explain various design aspects gravure cylinder and the process of engraving it.
- PPC502.3 Summarize the various operations performed while printing on Gravure machine
- PPC502.4 Discuss various inks and substrates used for gravure process with quality control measures
- PPC502.5 Describe various web handling and registration control for gravure printing
- PPC502.6 Calculate the different anatomy of gravure cylinder

**Subject: Theory of Machines and Design**

- PPC503.1 Analyse the stresses and strains in mechanical components, and understand, identify and quantify failure modes for mechanical parts.
- PPC503.2 Describe the basic machine elements used in machine design.
- PPC503.3 Design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
- PPC503.4 Develop the approach to design the component under realistic conditions.
- PPC503.5 Design Machine element against static loading
- PPC503.6 Develop the ability to design the component under realistic conditions

**Subject: Instrumentation and Process Control**

- PPC 504.1 Knowledge of measuring devices and signal conditioning will help students to select the correct transducer as per the requirement.
- PPC 504.2 Students will be able to confidently design a PID controller using opamps or through MATLAB program.
- PPC 504.3 The understanding of applications of PLC's in latest printing machines and also packaging machines will be develop.
- PPC 504.4 Understand applications of PLC's in industries and printing and packaging machines.
- PPC 504.5 Explain PLC and SCADA systems and their use in process control.
- PPC 504.6 To Understand and formulate various applications like DAS and data logger

### **Subject: Industrial Products Packaging**

- PPC 505.1 Effectively choose packaging materials based on characteristics of industrial products.
- PPC 505.2 Describe the various properties & defects of wood packaging material
- PPC 505.3 Analyse the various hazards & environmental issues related to Packaging and select a specific protection method for the product.
- PPC 505.4 Choose various bulk carriers for industrial packaging based on the type of product.
- PPC 505.5 Analyse various types of internal fitments for product protection and retainment.
- PPC 505.6 Explain the characteristics and applications of various wooden package forms.

### **Subject: Plastic Processing and Conversion Technologies Laboratory**

- PPL 501.1 Describe the fundamental concepts in plastic processing and conversion technology.
- PPL 501.2 Analyse the various plastic materials and its application.
- PPL 501.3 Understand and use suitable conversion technique as per the end product.
- PPL 501.4 Produce plastic products by using various conversion techniques.
- PPL 501.5 Perform different testing methods for plastic product.
- PPL 501.6 Study different processing parameters required in industry.

### **Subject: Package Design and Graphics – I**

- PPL502.1 Define basic design terminology,
- PPL502.2 Visualize and prepare detail drawing of a given object
- PPL502.3 Create a design based on specific requirement.
- PPL502.4 Design Plastic/Glass/Metal Containers.
- PPL502.5 Analyse various package designs.
- PPL502.6 Design & draw detail and assembly of different packages

### **Subject: Theory of Machines and Design Laboratory**

- PPL503.1 Analyse the stresses and strains in mechanical components, and understand, identify and quantify failure modes for mechanical parts.
- PPL503.2 Describe the basic machine elements used in machine design.
- PPL503.3 Design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
- PPL503.4 Develop the approach to design the component under realistic conditions.
- PPL503.5 Design Machine element against static loading

PPL503.6 Develop the ability to design the component under realistic conditions

**Subject: Instrumentation and Process Control Laboratory**

- PPL504.1 Knowledge of measuring devices and signal conditioning will help students to select the correct transducer as per the requirement.
- PPL504.2 Students will be able to confidently design a PID controller using opamps or through MATLAB program.
- PPL504.3 The understanding of applications of PLC's in latest printing machines and also packaging machines will be developed.
- PPL504.4 Understand applications of PLC's in industries and printing and packaging machines.
- PPL504.5 Explain PLC and SCADA systems and their use in process control.
- PPL504.6 To Understand and formulate various applications like DAS and data logger

**Subject: Business & Corporate Ethics**

- PPL505.1 Communicate effectively in both oral and written form and equip to demonstrate knowledge of professional and ethical responsibilities
- PPL505.2 Design a technical document using precise language, suitable vocabulary and apt style
- PPL505.3 Develop the life skills/ interpersonal skills to progress professionally by building stronger relationships
- PPL505.4 Demonstrate awareness of contemporary issues knowledge of professional and ethical Responsibilities
- PPL505.5 Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP
- PPL505.6 Deliver formal presentations effectively implementing the verbal and non-verbal skills

**SEM – VI**

**Subject: Packaging Machineries and Systems**

- PPC601.1 Suggest the packaging material use and its conversion as per the product geometry.
- PPC601.2 Suggest the filling machine required for the line operations.
- PPC601.3 Choose the ancillary machineries required in the line operations based on the product to be packed.
- PPC601.4 Analyse the different conveying system used for various line operations.

- PPC601.5 Select different online and offline testing methods that are required during the converting operations or on the packaging lines.
- PPC601.6 Suggest Methods and Machine used for case packing.

**Subject: Food and Pharmaceutical Packaging**

- PPC602.1 Analyse and choose a barrier material for a specific food product based on barrier properties studied.
- PPC602.2 Analyse and choose a preservation method for a specific food product-based product sensitivity and shelf life required.
- PPC602.3 Describe the various characteristics of pharmaceutical drugs and their sensitivities.
- PPC602.4 Select the right type of package form for a pharma product, based on the product nature, form & size.
- PPC602.5 Determine the shelf life of given food and develop the technique to improve the same.
- PPC602.6 Develop a pharmaceutical package to increase the stability of the medicine during its storage.

**Subject: Flexographic Printing**

- PPC603.1 Develop ability to operate flexography machine.
- PPC603.2 Acquire skills to handle trouble shoot on flexography presses.
- PPC603.3 Identify press type & configuration.
- PPC603.4 Discuss the merits & demerits of press types & structural variants.
- PPC603.5 Analyse the ink & Substrate for any print job.
- PPC603.6 Describe the Quality control, Environmental & safety tools & regulations available.

**Subject: Colour Management**

- PPC604.1 Summarize importance of Colour management.
- PPC604.2 Select test charts for various devices to create profile based on the need.
- PPC604.3 Apply various rendering intents on images using image editing software.
- PPC604.4 Measure the quality of profile generated by software.
- PPC604.5 Summarize various colour management workflows.
- PPC604.6 Understand the current trends in Colour management industry.

**Subject: (Department Elective –I) Packaging Distribution Dynamics**

- PPDE6011.1 Analyse the hazards encountered in distribution and determine protection requirement

- PPDE6011.2 On the basis of principles of distribution dynamics estimate the vibration, shock encountered by a product in distribution
- PPDE6011.3 Calculate cushioning requirement for a product in distribution.
- PPDE6011.4 Perform tests to gauge package performance in distribution.
- PPDE6011.5 Analyse ways to reduce the effect of vibration, shock and handling of product during distribution.
- PPDE6011.6 Explain the method for developing the cushion curve and damage boundary curve.

**Subject: (Department Elective –I) Inks and Coatings**

- PPDE6012.1 Explain the formulation for different types of inks
- PPDE6012.2 Explain the ink components for different printing processes and materials
- PPDE6012.3 Test and analyse the properties of inks and coatings.
- PPDE6012.4 Suggest ink for a given process
- PPDE6012.5 Troubleshoot problems related to ink synthesis
- PPDE6012.6 Suggest suitable varnish for a given application.

**Subject: (Department Elective –I) Digital and security Printing**

- PPDE6013.1 Analyse & describe the Digital image anatomy for Pre-press environment.
- PPDE6013.2 Analyse & describe the concepts in digital printing with its Merits & De-merits.
- PPDE6013.3 Summarise the process involved in Digital work-flow & data handling.
- PPDE6013.4 Elaborate the importance of security printing with respect to use in everyday life.
- PPDE6013.5 Describe first line inspection of different documents & Creation of various security devices.
- PPDE6013.6 Discuss the significance of Brand protections and tools available.

**Subject (Department Elective –I) Print Finishing and Converting**

- PPDE6014.1 Analyse the print finished product.
- PPDE6014.2 Examine the Product for the entire process involved in manufacturing and finishing.
- PPDE6014.3 Discuss the print finishing requirements for verity of different segment jobs.
- PPDE6014.4 Analyse the layout and imposition of the job
- PPDE6014.5 Identify and rectify post finishing process problems
- PPDE6014.6 Discuss the various post finishing terminology

### **Subject: Packaging Machineries & Systems Tutorials**

- PPT601.1 Suggest the packaging material use and its conversion as per the product geometry.
- PPT601.2 Suggest the filling machine required for the line operations.
- PPT601.3 Choose the ancillary machineries required in the line operations based on the product to be packed.
- PPT601.4 Analyse the different conveying system used for various line operations.
- PPT601.5 Select different online and offline testing methods that are required during the converting operations or on the packaging lines.
- PPT601.6 Suggest Methods and Machine used for case packing.

### **Subject: Package Design & Graphics-II**

- PPL601.1 Understand the need and importance of CAD file in Packaging Design
- PPL601.2 Impact CAD of and Layout on costing and production
- PPL601.3 Using 3D as a QA tool to evaluate packaging design
- PPL601.4 Make a print ready graphic file (trapping, white/ varnish layers/barcodes / preflighting etc.,)
- PPL601.5 Understand the concepts of Digital sample making.
- PPL601.6 Understand various print and finishing processes and their effects on graphics.

### **Subject: Flexographic Printing Laboratory**

- PPL602.1 Develop ability to operate flexography machine.
- PPL602.2 Acquire skills to handle trouble-shooting on flexography presses.
- PPL602.3 Identify press type & configuration
- PPL602.4 Discuss the merits & demerits of press types & structural variants.
- PPL602.5 Analyse the ink & substrate for any print job.
- PPL602.6 Describe the quality control, environmental & safety tools & regulations available.

### **Subject: Colour Management Laboratory**

- PPL603.1 Summarize importance of Colour management.
- PPL603.2 Select test charts for various devices to create profile based on the need.
- PPL603.3 Apply various rendering intents on images using image editing software.
- PPL603.4 Measure the quality of profile generated by software.
- PPL603.5 Summarize various colour management workflows.
- PPL603.6 Understand the current trends in Colour management industry.

### **Subject: (Department Elective –I Tutorial) Packaging Distribution Dynamics Tutorial**

- PPDET6011.1 Analyse the hazards encountered in distribution and determine protection requirement
- PPDET6011.2 On the basis of principles of distribution dynamics estimate the vibration, shock encountered by a product in distribution
- PPDET6011.3 Calculate cushioning requirement for a product in distribution.
- PPDET6011.4 Perform tests to gauge package performance in distribution.
- PPDET6011.5 Analyse ways to reduce the effect of vibration, shock and handling of product during distribution.
- PPDET6011.6 Explain the method for developing the cushion curve and damage boundary curve.

### **Subject (Department Elective –I Tutorial) Inks and Coatings Tutorial**

- PPDET6012.1 Explain the formulation for different types of inks
- PPDET6012.2 Explain the ink components for different printing processes and materials
- PPDET6012.3 Test and analyse the properties of inks and coatings.
- PPDET6012.4 Suggest ink for a given process
- PPDET6012.5 Troubleshoot problems related to ink synthesis
- PPDET6012.6 Suggest suitable varnish for a given application.

### **Subject: (Department Elective –I Tutorial) Digital and security Printing Tutorial**

- PPDET6013.1 Analyse & describe the Digital image anatomy for Pre-press environment.
- PPDET6013.2 Analyse & describe the concepts in digital printing with its Merits & De-merits.
- PPDET6013.3 Summarise the process involved in Digital work-flow & data handling.
- PPDET6013.4 Elaborate the importance of security printing with respect to use in everyday life.
- PPDET6013.5 Describe first line inspection of different documents & Creation of various security devices.
- PPDET6013.6 Discuss the significance of Brand protections and tools available.



### **Subject: (Department Elective –I Tutorial) Print Finishing and Converting Tutorial**

- PPDET6013.1 Analyse the print finished product.
- PPDET6013.2 Examine the Product for the entire process involved in manufacturing and finishing.
- PPDET6013.3 Discuss the print finishing requirements for variety of different segment jobs.
- PPDET6013.4 Analyse the layout and imposition of the job
- PPDET6013.5 Identify and rectify post finishing process problems
- PPDET6013.6 Discuss the various post finishing terminology

### **Subject: Industrial Visits**

- PPS601.1 Analyse the print, packaged, converted & finished product
- PPS601.2 Examine the Product for the entire process involved in manufacturing, converting and finishing.
- PPS601.3 Understand operational workflows for various Industries.
- PPS601.4 Analyse Plant Layout, Inventory & Logistics provisions.
- PPS601.5 Understand the Organisational structure and Manpower requirements.
- PPS601.6 Discuss the Safety-Health-Environmental practices, Laws, Regulations & Certifications found in the Industry.

## **SEM – VII**

### **Subject: Laws, Regulations & Sustainability in Packaging**

- PPC701.1 Summarize the rules and regulations with respect to packaging in India and their impact in the domestic market
- PPC701.2 Identify and compare the international laws with relation to packaging
- PPC701.3 Describe the need & scope of sustainability in a process, product/package or equipment
- PPC701.4 Describe & analyze the metrics & LCA for packaging sustainability
- PPC701.5 State and explains the various waste management systems
- PPC701.6 Describe the need of biopolymers & biobased polymers in sustainable economy

### **Subject: Packaging Distribution & Logistics**

- PPC702.1 Justify the necessity of ULD for variety of Logistics environment
- PPC702.2 Analyse the requirement and suggest an appropriate Unit Load Devices.
- PPC702.3 Summarise the activities in Logistics and SCM.
- PPC702.4 Analyse the requirement and suggest suitable Material handling and Inventory systems.
- PPC702.5 Analyse the requirement and suggest suitable Transportation & Warehousing methods

PPC702.6 Describe the role of retailing in packaging industry.

**Subject: Financial & Marketing Management**

- PPC703.1 Explain the Indian finance system and its components.
- PPC703.2 Describe the concept of Time Value of Money, Corporate Finance and Sources of Funds
- PPC703.3 Elaborate on Financial Statements, Ratios, Capital Budgeting & Working Capital Management.
- PPC703.4 Perform investment appraisal using a capital budgeting technique
- PPC703.5 Explain the basics concepts of marketing management
- PPC703.6 Describe various types of marketing strategies with examples.

**Subject: Total Quality Management**

- PPC704.1 Enlist various principles of TQM
- PPC704.2 Implement various philosophies of TQM
- PPC704.3 Use statistical approach for quality control
- PPC704.4 List and explain various TQM Tools
- PPC704.5 Explain importance of ISO and quality systems
- PPC704.6 Implement quality tools for continuous improvement

**Subject: Project Management & Entrepreneurship**

- PPC705.1 Describe the fundamental concepts in Project management
- PPC705.2 Analyze the various scheduling and planning techniques
- PPC705.3 Understand and apply suitable strategy for any specific project
- PPC705.4 Apply project management principles in business situations to optimize resource utilization and time.
- PPC705.5 Analyze and manage risks involved in Project.
- PPC705.6 Demonstrate skills needed to run a successful business

**Subject: Department Elective – II Advanced Food Packaging**

- PPDE7011.1 Choose a packaging material with suitable permeability value as required
- PPDE7011.2 Describe & perform the migration analysis for packaging materials
- PPDE7011.3 Evaluate the shelf life of packaged food product
- PPDE7011.4 Describe the filling system & suggest a suitable one on the basis of product need
- PPDE7011.5 Apply concepts of microbial inactivation for retort & aseptic packaging
- PPDE7011.6 Develop an active and intelligent package for perishable food

**Subject: Department Elective – II Advanced Industrial Products Packaging**

- PPDE7012.1 Describe characteristics of industrial packaging materials & explain the corrosion prevention techniques
- PPDE7012.2 Estimate desiccant requirements for an industrial package.
- PPDE7012.3 Describe the various wooden packaging forms & reinforcement methods.
- PPDE7012.4 Compute the cube utilization for a given industrial packaging system.
- PPDE7012.5 Choose various bulk carriers for industrial packaging based on the type of product.
- PPDE7012.6 Explain the packaging considerations for various industrial products with examples.

**Subject: Department Elective – II Labelling Technology**

- PPDE7013.1 Explain and compare the different types of labels, their features and manufacturing process.
- PPDE7013.2 Explain the process of printing, finishing of labels
- PPDE7013.3 Select the types of labels and materials used on the different packages.
- PPDE7013.4 Explain the process of label application on the package
- PPDE7013.5 Design the labels of all types along with the compensations
- PPDE7013.6 Describe the new trends in the labelling industry.

**Subject: Packaging Distribution & Logistics Laboratory**

- PPL701.1 Identify the Pallet structure and its utility aspects
- PPL701.2 Explain the requisites of testing procedures, machinery and safety aspects
- PPL701.3 Perform the destructive testing of pallet infer the findings
- PPL701.4 Perform the destructive testing of empty CFB boxes and infer the findings
- PPL701.5 Perform the destructive tests on Product-Package system and infer the findings.
- PPL701.6 Understand the significance of Package testing for its transport and handling worthiness

**Subject: Department Elective – II Laboratory Advanced Food Packaging Laboratory**

- PPDEL7011.1 Choose a packaging material with suitable permeability value as required
- PPDEL7011.2 Describe & perform the migration analysis for packaging materials
- PPDEL7011.3 Evaluate the shelf life of packaged food product
- PPDEL7011.4 Describe the filling system & suggest a suitable one on the basis of product need
- PPDEL7011.5 Apply concepts of microbial inactivation for retort & aseptic packaging
- PPDEL7011.6 Develop an active and intelligent package for perishable food

**Subject: Department Elective – II Laboratory Advanced Industrial Products Packaging Laboratory**

- PPDEL7012.1 Estimate cushioning requirements
- PPDEL7012.2 Compute package design based on the type of industrial product
- PPDEL7012.3 Design wooden packages based on specifications & Indian standard
- PPDEL7012.4 Design internal fitments for industrial products

- PPDEL7012.5 Design CFB / folding cartons for industrial products
- PPDEL7012.6 Estimate cube utilization for industrial packages.

**Subject: Department Elective – II Laboratory Labelling Technology Laboratory**

- PPDEL7013.1 Explain different types of labels, their features and manufacturing process.
- PPDEL7013.2 Describe the process of printing, finishing and applying labels on the packs.
- PPDEL7013.3 Explain the types of labels and materials used on the different packages
- PPDEL7013.4 Select a suitable label for different type of packages
- PPDEL7013.5 Design the labels of all types along with the compensations.
- PPDEL7013.6 Find the new trends in the labelling industry

**Subject: Printing & Packaging Costing Tutorial**

- PPT701.1 Explain the concepts of Direct vs Indirect & Fixed vs Variable costs
- PPT701.2 Describe the elements of costing in printing & packaging jobs with examples
- PPT701.3 Estimate costing for a corrugated fibre board box / folding carton.
- PPT701.4 Estimate costing for a printing job.
- PPT701.5 Estimate costing for a multilayer plastic laminate material.
- PPT701.6 Estimate costing for a wooden package.

**Subject: Mini-Project**

- PPP701.1 Perform literature survey and identify the problem.
- PPP701.2 Apply basic engineering fundamental in the domain of practical applications.
- PPP701.3 Cultivate the habit of working in a team
- PPP701.4 Attempt a problem solution in a right approach.
- PPP701.5 Prepare report as per the standard guidelines.
- PPP701.6 Demonstrate knowledge and understand engineering & management principles

**Subject: Product Life Cycle Management**

- ILO7011.1 Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation
- ILO7011.2 Illustrate various approaches and techniques for designing and developing products.
- ILO7011.3 Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc
- ILO7011.4 Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
- ILO7011.5 Apply environmental aspects in product design
- ILO7011.6 Illustrate various approaches and techniques in Life Cycle cost Assessment and Analysis.

**Subject: Reliability Engineering**

- ILO7012.1 Understand and apply the concept of Probability to engineering problems
- ILO7012.2 Apply various reliability concepts to calculate different reliability parameters
- ILO7012.3 Estimate the system reliability of simple and complex systems
- ILO7012.4 Carry out a Failure Mode Effect and Criticality Analysis

**Subject: Management Information System**

- ILO7013.1 The course is blend of Management and Technical field.
- ILO7013.2 Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built
- ILO7013.3 Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage
- ILO7013.4 Identify the basic steps in systems development

**Subject: Design of Experiments**

- ILO7014.1 To understand the issues and principles of Design of Experiments (DOE)
- ILO7014.2 To list the guidelines for designing experiments
- ILO7014.3 To become familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization

**Subject: Operations Research**

- ILO7015.1 Apply the techniques used in operations research to formulate a real-world problem and solve it using various problem solving approaches.
- ILO7015.2 Develop an integrated framework for strategic thinking and problem solving.
- ILO7015.3 Identify the situations and appropriate equations and mathematical tools needed to solve optimization problems.
- ILO7015.4 Identify the characteristics of different situations and apply the appropriate decision making tools to be used in each type.
- ILO7015.5 Gain the ability to recognize situations in a manufacturing environment that suggests the use of certain quantitative methods to assist in optimizing the solution.
- ILO7015.6 Plan of national importance structures based upon the previous history.

**Subject: Cyber Security and Laws**

- ILO7016.1 Understand the concept of cybercrime and its effect on outside world.
- ILO7016.2 Understand different cyber offences and cyber-crime on different environment.
- ILO7016.3 Analyze various tools used in performing cybercrime.
- ILO7016.4 Understand the legal requirement of cyberspace.
- ILO7016.5 Distinguish different aspects of cyber law.
- ILO7016.6 Identify the need for different Information Security Standards compliance during software design and development.

**Subject: Disaster Management and Mitigation Measures**

- ILO7017.1 To understand physics and various types of disaster occurring around the world
- ILO7017.2 To identify extent and damaging capacity of a disaster
- ILO7017.3 To study and understand the means of losses and methods to overcome /minimize it.
- ILO7017.4 To understand role of individual and various organization during and after disaster
- ILO7017.5 To understand application of GIS in the field of disaster management
- ILO7017.6 To understand the emergency government response structures before, during and after disaster

**Subject: Energy Audit and Management**

- ILO7018.1 To understand the importance energy security for sustainable development and the fundamentals of energy conservation.
- ILO7018.2 To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
- ILO7018.3 To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

**Subject: Development Engineering**

- ILO7019.1 To familiarise the characteristics of rural Society and the Scope, Nature and Constraints of rural Development
- ILO7019.2 To provide an exposure to implications of 73rdCAA on Planning, Development and Governance of Rural Areas
- ILO7019.3 An exploration of human values, which go into making a 'good' human being, a 'good' professional, a 'good' society and a 'good life' in the context of work life and the personal life of modern Indian professionals
- ILO7019.4 To familiarise the Nature and Type of Human Values relevant to Planning Institutions

## **SEM - VIII**

### **Subject: Industrial Training & Project**

- PPC801.1 Exhibit the corporate culture/ethics in their work-space/career.
- PPC801.2 Identify the size and scale of operations in Industry.
- PPC801.3 Accomplish allotted tasks within deadlines.
- PPC801.4 Demonstrate an understanding of various constraints in industry.
  
- PPC801.5 Learn problem solving techniques and also work as a team.
- PPC801.6 Apply the knowledge learnt in their own career.

**SIES Graduate School of Technology, Nerul**  
**Department of Mechanical Engineering**

**Program Specific Objectives (PSO)**

1. An ability to identify, formulate, solve, analyse and draw appropriate conclusions of mechanical engineering problems in the field of thermal, designing and manufacturing.
2. An ability to use the techniques, skills and modern engineering tools such as CAD-CAM, analysis and automation tools necessary for engineering practice

**Course Outcomes R-2016 UoM Syllabus (Choice Based Credit Grading System)**

**Second Year: Sem-III**

**Subject: Applied Mathematics-III**

- MEC301.1 Find Laplace Transform and Inverse Laplace Transform of functions using the properties and properties
- MEC301.2 Find Inverse Laplace Transform using Convolution Theorem and apply Laplace Transform to find solution of Ordinary Differential Equation
- MEC301.3 Expand periodic functions using Fourier series and Complex form of Fourier series and understand the concept of Half range sine and cosine series, orthogonal and orthonormal functions
- MEC301.4 Understand the concept of complex variable, analytic functions, harmonic functions, Residues and conformal mapping. Expand complex function using Taylors and Laurent series
- MEC301.5 Solve partial differential equation using Fourier series and find numerical solution of partial differential equation
- MEC301.6 Apply the concept of Correlation and Regression to find correlation coefficient, Rank correlation and Regression lines

**Subject: Thermodynamics**

- MEC302.1 Demonstrate application of the laws of thermodynamics to wide range of systems.
- MEC302.2 Derive steady flow energy equation for various flow and non-flow thermodynamic systems
- MEC302.3 Compute heat and work interactions in thermodynamics systems
- MEC302.4 Demonstrate the interrelations between thermodynamic functions to solve practical problems.
- MEC302.5 Use steam table and mollier chart to compute thermodynamics interactions
- MEC302.6 Compute efficiencies of heat engines and power cycles

**Subject: Strength of Materials**

- MEC303.1 Demonstrate fundamental knowledge about various types of loading and stresses..
- MEC303.2 Analyze the SFD & BMD for different types of loads and support conditions.
- MEC303.3 Analyze the stresses induced in basic mechanical components.
- MEC303.4 Estimate the strain energy in beams.
- MEC303.5 Analyze the deflection in beams.



MEC303.6 Analyze buckling and bending phenomena in column, struts and beams

<b>Subject:</b>	<b>Production Process-I</b>
MEC304.1	Demonstrate understanding of casting and special casting processes.
MEC304.2	Demonstrate understanding of various types of joining processes and their applications.
MEC304.3	Illustrate various forming processes and their principles.
MEC304.4	Illustrate the concept of producing polymer components and ceramic components.
MEC304.5	Differentiate machine tools, and understand their selection and applications.
MEC304.6	Distinguish between the conventional and modern machine tools.

<b>Subject:</b>	<b>Material Technology</b>
MEC305.1	Identify various crystal imperfections, deformation mechanisms, and strengthening mechanisms.
MEC305.2	Demonstrate various failure mechanisms of materials.
MEC305.3	Interpret iron-iron carbide phase diagram, and different phases in microstructures of materials at different conditions.
MEC305.4	Recommend specific heat treatment process for different applications.
MEC305.5	Identify effect of alloying elements on properties of steels.
MEC305.6	Illustrate basics of composite materials, nano- materials and smart materials.

<b>Subject:</b>	<b>Computer Aided Machine Drawing</b>
MEL301.1	Visualize and prepare detail drawing of a given object.
MEL301.2	Read and interpret the drawing
MEL301.3	Draw details and assembly of different mechanical systems.
MEL301.4	Convert detailed drawing into assembly drawing using modelling software
MEL301.5	Convert assembly drawing into detailed drawing using modelling software
MEL301.6	Prepare detailed drawing of any given physical object/machine element with actual measurements

<b>Subject:</b>	<b>Strength of Material</b>
MEL302.1	Analyse the stress - strain behaviour of materials
MEL302.2	Measure ultimate tensile/compression strength of material
MEL302.3	Measure torsional strength of material
MEL302.4	Perform impact test using Izod and Charpy method
MEL302.5	Measure the hardness of materials.
MEL302.6	Perform flexural test with central and three-point loading conditions

<b>Subject:</b>	<b>Material Technology</b>
MEL303.1	Demonstrate the understanding of the procedure to prepare samples for studying microstructure using microscope (metallography)
MEL303.2	Interpret different phases present in different plain carbon steels and cast irons.
MEL303.3	Perform different heat treatment processes for a steel and observe microstructures in these conditions

- MEL303.4 Identify effects of Annealing, Normalizing and Hardening on microstructure of medium carbon steel
- MEL303.5 Determine hardenability of steel using Jominy end Quench test
- MEL303.6 Determine S-N curve by Fatigue Test

**Subject: Machine Shop Practice-I**

- MEL304.1 Operate various machines like lathe, shaper etc.
- MEL304.2 Perform plain turning, taper turning, and screw cutting etc. on lathe machine.
- MEL304.3 Perform machining operations on shaper
- MEL304.4 Demonstrate metal joining process like compressive welding
- MEL304.5 Perform forging operations
- MEL304.6 Perform shaping operations

## Second Year: Sem-IV

**Subject: Applied Mathematics-IV**

- MEC401.1 Find Eigen values and eigenvectors of a matrix to diagonalize the Square matrix.
- MEC401.2 Evaluate surface/ volume integral using Stokes and Gauss Divergence theorem.
- MEC401.3 Use Binomial, Poisson and Normal distribution to solve statistical probability
- MEC401.4 To analyze the problem by using Large and Small Sampling theory
- MEC401.5 Find the regression lines using method of least squares and correlation coefficients.
- MEC401.6 Optimize the solution of NLPP

**Subject: Fluid Mechanics**

- MEC402.1 Classificify and evaluate various properties of fluids
- MEC402.2 Explain of fluid motion and types of flow lines
- MEC402.3 Apply Bernoulli's equation to non compressible fluid systems
- MEC402.4 Calculate resistance to flow of incompressible fluids through closed conduits and over surfaces
- MEC402.5 Evaluate the boundary layer flows and flow separation
- MEC402.6 Apply fundamentals of compressible fluid flows to relevant systems

**Subject: Industrial Electronics**

- MEC403.1 Illustrate construction, working principles and applications of power electronic switches
- MEC403.2 Identify rectifiers and inverters for dc and ac motor speed control
- MEC403.3 Develop circuits using OPAMP and timer IC555
- MEC403.4 Identify digital circuits for industrial applications
- MEC403.5 Illustrate the knowledge of basic functioning of microcontroller
- MEC403.6 Analyse speed-torque characteristics of electrical machines for speed control

**Subject: Production Process-II**

- MEC404.1 Demonstrate understanding of metal cutting principles and mechanism.
- MEC404.2 Identify cutting tool geometry of single point and multipoint cutting tool.
- MEC404.3 Demonstrate various concepts of sheet metal forming operations.
- MEC404.4 Demonstrate concepts and use of jigs and fixtures.
- MEC404.5 Illustrate various non-traditional machining techniques.
- MEC404.6 Illustrate concepts and applications of additive manufacturing.

**Subject: Kinematics of Machinery**

- MEC405.1 Describe various types of mechanisms
- MEC405.2 Develop mechanisms to provide specific motions
- MEC405.3 Draw Velocity and acceleration diagram for mechanism upto 6 link
- MEC405.4 Draw cam profile for specific motion of followers
- MEC405.5 Identify varoius types of gears and gear trains

MEC405.6 Select appropriate power transmission for specific applications

**Subject: Data Base and Information Retrieval**

MEL401.1 Identify data models and schemes in DBMS

MEL401.2 Demonstrate the features of database management systems and Relational database

MEL401.3 Use SQL- the standard language of relational databases

MEL401.4 Demonstrate understanding of functional dependencies and design of the database

MEL401.5 Design graphical user Interface for specific application

MEL401.6 Create visual software entities

**Subject: Fluid Mechanics**

MEL402.1 Verify the Archimedes Principle

MEL402.2 Verify the Bernoulli's Principle

MEL402.3 Calibrate Venturimeter, Orificemeter and Pitot tube

MEL402.4 Determine minor losses and Darcy's friction factor for flow through pipes (pipe fittings)

MEL402.5 Determine Reynolds number for different types of flow.

MEL402.6 Calibration of Pressure Gauges

**Subject: Industrial Electronics**

MEL403.1 Demonstrate characteristics of various electrical and electronics components

MEL403.2 Develop simple applications built around these components

MEL403.3 Identify use of different basic gates

MEL403.4 Identify and use digital circuits for industrial applications

MEL403.5 Built and demonstrate basic parameter measurement using microcontroller

MEL403.6 Test and Analyse speed-torque characteristics of electrical machines for speed control.

**Subject: Kinematics of Machinery**

MEL404.1 Draw velocity diagram by instantaneous center method

MEL404.2 Draw velocity and acceleration diagrams for four bar mechanism by relative method.

MEL404.3 Draw velocity and acceleration diagrams for Slider crank mechanism by relative method

MEL404.4 Draw Cam profile for the specific follower motion

MEL404.5 Plot displacement-time, velocity-time, acceleration-time cam profiles

MEL404.6 Develop and build mechanisms to provide specific motion

<b>Subject:</b>	<b>Machine Shop Practice-II</b>
MEL405.1	Operate lathe machine,
MEL405.2	Perform shaping operations
MEL405.3	Perform finishing operations on grinding machine
MEL405.4	Perform milling operations.
MEL405.5	Perform precision turning
MEL405.6	Perform drilling and threading operations.

### Third Year: Sem-V

**Subject: Internal Combustion Engines**

- MEC501.1 Describe types, basic parts, their material and working cycles and classification of internal combustion engine and difference between air standard and fuel cycle and actual cycles.
- MEC501.2 Explain the working of different systems and processes of SI engines.
- MEC501.3 Explain working of different systems and processes of C.I. engines
- MEC501.4 Describe the working of lubrication, cooling and supercharging systems and evaluate parameters of supercharged or turbocharged engine.
- MEC501.5 Analyse engine performance and illustrate emission norms and emission control
- MEC501.6 Explain the different technological advances such as electronic control in engines and alternate fuels

**Subject: Mechanical Measurements and Control**

- MEC502.1 Comprehend architecture of the measurement system
- MEC502.2 Describe working principle of mechanical measurement system
- MEC502.3 Analyse mathematical modelling of the control system
- MEC502.4 Analyse the transient and steady state of first and second order system
- MEC502.5 Solve problems in control system under different time domain
- MEC502.6 Analyse stability of the control system

**Subject: Heat Transfer**

- MEC503.1 Identify the modes of heat transfer conduction, convection and radiation
- MEC503.2 Develop mathematical model for each mode of heat transfer
- MEC503.3 Develop mathematical model for fin and transient heat transfer
- MEC503.4 Estimate convective heat transfer coefficient in forced and free convection
- MEC503.5 Analyse different heat exchangers and quantify their performance
- MEC503.6 Apply concept of radiation to solve real life problem

**Subject: Dynamics of Machinery**

- MEC504.1 Demonstrate working Principles of different types of governors and Gyroscopic effects on the mechanical systems
- MEC504.2 Calculate basic of static and dynamic forces in the mechanisms
- MEC504.3 Determine natural frequency of free undamped element/system
- MEC504.4 Determine vibration response of free damped mechanical elements / systems
- MEC504.5 Analyze the vibration isolation, transmissibility, measuring instrument system under forced single degree of freedom vibratory system
- MEC504.6 Calculate critical speed of shaft and analyze static and dynamic balancing of rotating and reciprocating masses.

**Subject: Press Tool Design**

- MEDLO5011.1 Demonstrate various press working operations for mass production of sheet metal parts
- MEDLO5011.2 Identify press tool requirements to build concepts pertaining to design of press tools
- MEDLO5011.3 Prepare working drawings and setup for economic production of sheet metal components
- MEDLO5011.4 Select suitable materials for different elements of press tools
- MEDLO5011.5 Illustrate the principles and blank development in bent & drawn components
- MEDLO5011.6 Elaborate failure mechanisms of pressed components, safety aspects and automation in press working

**Subject: Machining Sciences and Tool Design**

- MEDLO5012.1 Illustrate the theory of metal cutting and calculate the values of various forces involved in the machining operations.
- MEDLO5012.2 Analyse heat generation in machining operation and cutting fluids/coolant operations.
- MEDLO5012.3 Illustrate the properties of various cutting tool materials and hence select an appropriate tool material.
- MEDLO5012.4 Analyze tool life and economics of machining operations.
- MEDLO5012.5 Illustrate tool nomenclatures and design single point cutting tools.
- MEDLO5012.6 Design multipoint cutting tools.

**Subject: Internal Combustion Engines**

- MEL501.1 Dismantle engine assembly
- MEL501.2 Overhaul and assemble engine components
- MEL501.3 Perform load test/speed test on engine setup
- MEL501.4 Calculate performance of multi cylinder engine
- MEL501.5 Analyse engine performance and draw heat balance sheet
- MEL501.6 Perform exhaust gas analysis

**Subject: Mechanical Measurements and Control**

- MEL502.1 Describe the architecture of the measurement system
- MEL502.2 Describe the working principle of mechanical measurement system
- MEL502.3 Analyse mathematical modelling of the control system
- MEL502.4 Analysis of the Transient and steady state of first and second order system
- MEL502.5 Analysis of the control system under different time domain
- MEL502.6 Analysis of the stability of control system.

**Subject: Heat Transfer**

- MEL503.1 Estimate thermal conductivity of metals/non metals/liquids
- MEL503.2 Compute heat transfer coefficient in natural as well forced convection



- MEL503.3 Determine effect of area on heat transfer
- MEL503.4 Measure emissivity of grey body
- MEL503.5 Quantify fin effectiveness/efficiency
- MEL503.6 Analyse heat exchanger performance

**Subject: Dynamics of Machinery**

- MEL504.1 Plot and analyse governor characteristics
- MEL504.2 Analyse gyroscopic effect on laboratory model
- MEL504.3 Estimate natural frequency of mechanical systems
- MEL504.4 Analyse vibration response of mechanical systems
- MEL504.5 Determine damping coefficient of a system
- MEL504.6 Estimate critical speed of the shaft

**Subject: Manufacturing Sciences Lab**

- MEL505.1 Design and develop simple productive and cost effective jigs and fixtures.
- MEL505.2 Identify press tool requirements to build concepts pertaining to design of press tools.
- MEL505.3 Design multipoint cutting tool.
- MEL505.4 Select a proper force measurement method for the required machining operation.
- MEL505.5 Select a proper temperature measurement method for the required machining operation.
- MEL505.6 Analyze tool life and economics of machining.

**Subject: Business Communication and Ethics**

- MEL506.1 Design a technical document using precise language, suitable vocabulary and apt style.
- MEL506.2 Develop the life skills/ interpersonal skills to progress professionally by building stronger relationships.
- MEL506.3 Demonstrate awareness of contemporary issues knowledge of professional and ethical responsibilities.
- MEL506.4 Apply the traits of a suitable candidate for a job/higher education, upon being trained in the techniques of holding a group discussion, facing interviews and writing resume/SOP.
- MEL506.5 Deliver formal presentations effectively implementing the verbal and non-verbal skills
- MEL506.6 Demonstrate awareness on intellectual property rights and responsible use of social media.

### Third Year: Sem-VI

**Subject: Metrology and Quality Engineering**

- MEC601.1 Measure Linear and angular dimensions.
- MEC601.2 Measure surface roughness
- MEC601.3 Measure various parameters of gear tooth profile.
- MEC601.4 Use optical profile projector for measurement.
- MEC601.5 Use various instruments for measurement of screw threads.
- MEC601.6 Measure flatness by Interferometer method.

**Subject: Machine Design-I**

- MEC602.1 Demonstrate understanding of various design considerations
- MEC602.2 Apply basic principles of machine design
- MEC602.3 Design machine elements for static as well as dynamic loading
- MEC602.4 Design of components subjected to fluctuating loads
- MEC602.5 Design machine elements on the basis of strength/ rigidity concepts
- MEC602.6 Analyse and design mechanical spring

**Subject: Finite Element Analysis**

- MEC603.1 Analyze Approximation techniques using FEM approach
- MEC603.2 Analyze various problems using weak formulation techniques using RR Method
- MEC603.3 Analyze one dimensional domain problems using FEM approach
- MEC603.4 Analyze two dimensional domain problems using FEM approach
- MEC603.5 Analyze two dimensional vector problems using FEA.
- MEC603.6 Apply numerical techniques for dynamics problems and validate same using FEA approach

**Subject: Refrigeration and Air Conditioning**

- MEC604.1 Demonstrate fundamental principles of refrigeration and air conditioning
- MEC604.2 Identify and locate various important components of the refrigeration and air conditioning system
- MEC604.3 Illustrate various refrigeration and air conditioning processes using psychometric chart
- MEC604.4 Design Air Conditioning system using cooling load calculations.
- MEC604.5 Estimate air conditioning system parameters
- MEC604.6 Demonstrate understanding of duct design concepts

**Subject: Mechatronics**

- MEDLO6021.1 Identify the suitable sensor and actuator for a mechatronics system
- MEDLO6021.2 Select suitable logic controls
- MEDLO6021.3 Analyse continuous control logics for standard input conditions
- MEDLO6021.4 Develop ladder logic programming

- MEDLO6021.5 Design hydraulic/pneumatic circuits  
 MEDLO6021.6 Design a mechatronic system such as simple mechanical applications

**Subject: Robotics**

- MEDLO6022.1 Demonstrate the basic functioning and components of robot  
 MEDLO6022.2 Carryout direct, inverse kinematic analysis of fixed robot mobile robot  
 MEDLO6022.3 Carryout workspace analysis and trajectory planning of various robot  
 MEDLO6022.4 Identify and select suitable sensors and actuators  
 MEDLO6022.5 Identify and select suitable robot for inspection and material handling  
 MEDLO6022.6 Explain various aspects/features of robot as humanoids with applications and case studies

**Subject: Metrology and Quality Engineering**

- MEL601.1 Measure linear and angular dimensions  
 MEL601.2 Measure surface roughness  
 MEL601.3 Measure various parameters of gear tooth profile  
 MEL601.4 Use optical profile projector for measurement  
 MEL601.5 Use various instruments for measurement of screw threads  
 MEL601.6 Measure flatness by Autocollimator / Interferometry method

**Subject: Machine Design-I**

- MEL602.1 Apply basic knowledge of failure to design simple elements  
 MEL602.2 Design joints subjected to static loading.  
 MEL602.3 Use design data book/standard codes to standardise the designed dimensions  
 MEL602.4 Design of components subjected to fluctuating loads  
 MEL602.5 Design machine elements on the basis of strength/ rigidity concepts  
 MEL602.6 Design dimensions into working/manufacturing drawing

**Subject: Finite Element Analysis**

- MEL603.1 Select appropriate element for given problem to solve 1D problem  
 MEL603.2 Select suitable meshing and perform convergence test to validate problem using analytical method  
 MEL603.3 Select appropriate solver for given problem to validate results using analytical method  
 MEL603.4 Interpret the result and conclude the accuracy of the solution  
 MEL603.5 Apply basic aspects of FEA to solve engineering problems  
 MEL603.6 Analyze CFD technique to solve numerical on flow through pipe.

**Subject: Refrigeration and Air Conditioning**

- MEL604.1 Demonstrate fundamental principles of refrigeration and air conditioning  
 MEL604.2 Identify and locate various important components of the refrigeration and air

- conditioning system
- MEL604.3 Represent various refrigeration and air conditioning processes using psychometric chart
- MEL604.4 Operate and maintain refrigeration system
- MEL604.5 Operate and maintain air conditioning system
- MEL604.6 Simulate VCERS

**Subject: Mechatronics Lab**

- MEL605.1 Demonstrate implementation of interfacing sensors and actuators using microcontrollers
- MEL605.2 Visualization of DH parameter of a mechanism
- MEL605.3 Demonstrate discrete control system using PLC microcontroller
- MEL605.4 Design and develop a control system for specific use
- MEL605.5 Implement program to PLC system and demonstrate its application
- MEL605.6 Develop pneumatic circuits for a specific system

## Final Year: Sem-VII

**Subject: Machine Design-II**

- MEC701.1 Design appropriate gears for power transmission on the basis of given load and speed
- MEC701.2 Design bearings for given application from the manufacturing catalogue
- MEC701.3 Design hydro dynamic bearings for given application from the manufacturing catalogue
- MEC701.4 Design Cam follower and clutches for the given application
- MEC701.5 Design belts for the given applications
- MEC701.6 Design clutches based on uniform pressure theory and uniform wear theory consideration

**Subject: CAD/CAM/CAE**

- MEC702.1 Identify proper computer graphics techniques for geometric modelling.
- MEC702.2 Apply Transformation, manipulation techniques to different objects
- MEC702.3 Prepare part programming applicable to CNC machines
- MEC702.4 Use rapid prototyping and tooling concepts in any real life applications
- MEC702.5 Identify the tools for Analysis of a complex engineering component
- MEC702.6 Recognise the need of CIM systems, Socio -techno- economic aspects of CIM

**Subject: Production Planning and Control**

- MEC703.1 Illustrate production planning functions and manage manufacturing functions in a better way
- MEC703.2 Develop competency in scheduling and sequencing of manufacturing operations
- MEC703.3 Forecast the demand of the product and prepare an aggregate plan
- MEC703.4 Develop the skills of Inventory Management and cost effectiveness
- MEC703.5 Create a logical approach to Line Balancing in various production systems
- MEC703.6 Implement techniques of manufacturing planning and control

**Subject: Automobile Engineering**

- MEDLO7032.1 Illustrate the types and working of clutch and transmission system.
- MEDLO7032.2 Demonstrate the working of different types of final drives, steering gears and braking systems
- MEDLO7032.3 Illustrate the constructional features of wheels, tyres and suspension systems
- MEDLO7032.4 Describe the understanding of types of storage, charging and starting systems
- MEDLO7032.5 Identify and explain the type of body and chassis of an automobile
- MEDLO7032.6 Comprehend the different technological advances in automobile

**Subject: Pumps, Compressore and Fans**

- MEDLO7033.1 Comprehend Construction and working different types of pumps
- MEDLO7033.2 Evaluate performance of centrifugal pumps and analyse characteristic curves of

pumps

- MEDLO7033.3 Evaluate the performance of reciprocating Pump
- MEDLO7033.4 Describe different types of compressors
- MEDLO7033.5 Evaluate the performance of Centrifugal Compressor and Axial Compressor
- MEDLO7033.6 Describe the types of Fans & blower and Analyse their performance

**Subject: Product Lifecycle Management**

- ILO7011.1 Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation
- ILO7011.2 Illustrate various approaches and techniques for designing and developing products.
- ILO7011.3 Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
- ILO7011.4 Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
- ILO7011.5 Apply environmental aspects in product design.
- ILO7011.6 Illustrate various approaches and techniques in Life Cycle cost Assessment and Analysis.

**Subject: Operation Research**

- ILO7015.1 Apply OR techniques to formulate and solve real-world problem.
- ILO7015.2 Develop an integrated framework for strategic thinking and problem solving
- ILO7015.3 Identify mathematical tools that are needed to solve optimisation problems
- ILO7015.4 Identify appropriate decision making approaches and apply tools to be used.
- ILO7015.5 Analyse situations in manufacturing environment and optimizing the solution
- ILO7015.6 Identify features of operations and production management and provide solution .

**Subject: Machine Design-II**

- MEL701.1 Design gears based on the given conditions
- MEL701.2 Design gearbox for a given application
- MEL701.3 Design cam & followers for a given condition
- MEL701.4 Design clutches for a given application
- MEL701.5 Design brakes for given condition
- MEL701.6 Select bearings for a given applications from the manufacturers catalogue

**Subject: CAD/CAM/CAE**

- MEL702.1 Identify proper computer graphics techniques for geometric modelling.
- MEL702.2 Transform, manipulate objects as well as store and manage data
- MEL702.3 Create CAM Toolpath and prepare NC- G code
- MEL702.4 Apply rapid prototyping and tooling concepts in any real life applications
- MEL702.5 Identify the tools for Analysis of a complex engineering component.
- MEL702.6 Develop 3D models by using CAD software

<b>Subject:</b>	<b>Production Planning and Control</b>
MEL703.1	Prepare a process sheet
MEL703.2	Prepare a Gantt Chart
MEL703.3	Forecast the demand of the product and prepare an aggregate plan
MEL703.4	Perform ABC analysis of a given problem
MEL703.5	Develop the skills of Inventory Management and cost effectiveness
MEL703.6	Create a logical approach to Line Balancing for various production systems

<b>Subject:</b>	<b>Project-I</b>
MEP701.1	Literature survey / industrial visit and identify the problem
MEP701.2	Apply basic engineering fundamental in the domain of practical applications
MEP701.3	Cultivate the habit of working in a team
MEP701.4	Attempt a problem solution in a right approach
MEP701.5	Correlate the theoretical and experimental/simulations results and draw the proper inferences
MEP701.6	Prepare report as per the standard guidelines.

## Final Year: Sem-VIII

### **Subject: Design of Mechanical Systems**

- MEC801.1 Apply the concept of system design.
- MEC801.2 Design material handling systems such as hoisting mechanism of EOT crane,
- MEC801.3 Design belt conveyor systems
- MEC801.4 Design engine components such as cylinder, piston, connecting rod and crankshaft
- MEC801.5 Design pumps for the given applications
- MEC801.6 Prepare layout of machine tool gear box and select number of teeth on each gear

### **Subject: Industrial Engineering and Management**

- MEC802.1 Identify the need for optimization of resources and its significance in manufacturing industries
- MEC802.2 Demonstrate the concept of value engineering and value analysis with its relevance.
- MEC802.3 Describe the different concepts involved in method study and understanding of work content in different situations.
- MEC802.4 Describe different aspects of work system design pertinent to manufacturing industries.
- MEC802.5 Recommend the possible ways of facility design for better utilization of available resources.
- MEC802.6 Comprehend concepts of Agile manufacturing, Lean manufacturing and Flexible manufacturing.

### **Subject: Power Engineering**

- MEC803.1 Compute heat interactions in combustion of reactive mixtures
- MEC803.2 Differentiate boilers, boiler mountings and accessories
- MEC803.3 Calculate boiler efficiency and assess boiler performance
- MEC803.4 Demonstrate working cycles of gas turbines
- MEC803.5 Draw velocity triangles of impulse/reaction turbines and calculate performance parameters/efficiency
- MEC803.6 Demonstrate basic working of pumps

### **Subject: Power Plant Engineering**

- MEDLO8041.1 Comprehend various equipment/systems utilized in power plants
- MEDLO8041.2 Demonstrate site selection methodology, construction and operation of Hydro Electric Power Plants
- MEDLO8041.3 Describe site selection and working of steam power plants
- MEDLO8041.4 Describe operation of Combined Cycle Power Plants
- MEDLO8041.5 Classify reactors and comprehend waste disposal issues in nuclear power plants
- MEDLO8041.6 Solve problems on power plant economics



**Subject: Renewable Energy Sources**

- MEDLO8043.1 Demonstrate need of different renewable energy sources and their importance.
- MEDLO8043.2 Calculate and analyse utilization of solar energy.
- MEDLO8043.3 Calculate and analyse utilization wind energy.
- MEDLO8043.4 Illustrate design of biogas plant.
- MEDLO8043.5 Illustrate concept of geothermal energy and energy from the ocean.
- MEDLO8043.6 Illustrate concepts of hydrogen energy.

**Subject: Design of Mechanical Systems**

- MEL801.1 Apply the concept of system design.
- MEL801.2 Design of hoisting mechanism of EOT crane,
- MEL801.3 Design belt conveyor systems
- MEL801.4 Design pumps for the given applications
- MEL801.5 Design engine components such as cylinder, piston, connecting rod and crankshaft
- MEL801.6 Design of machine tool gearbox

**Subject: Power Engineering**

- MEL802.1 Differentiate boilers
- MEL802.2 Differentiate boiler mountings and accessories
- MEL802.3 Conduct a trial on impulse turbine and analyse its performance
- MEL802.4 Conduct a trial on reaction turbine and analyse its performance
- MEL802.5 Conduct a trial on Centrifugal pump and analyse its performance
- MEL802.6 Conduct a trial on Reciprocating pump and analyse its performance

**Subject: Project Management**

- ILO8021.1 Gain project management foundation and various organizational structures knowledge.
- ILO8021.2 Apply selection criteria and select an appropriate project from different options.
- ILO8021.3 Write work break down structure for a project and develop schedule based on it.
- ILO8021.4 Identify opportunities and threats to the project and decide an approach to deal with them strategically.
- ILO8021.5 Use Earned value technique and determine & predict status of the project.
- ILO8021.6 Capture lessons learned during project phases and document them for future reference.

**Subject: Digital Business Management**

- ILO8028.1 Summarize drivers of digital business.
- ILO8028.2 Illustrate various approaches and techniques for E-business and management.
- ILO8028.3 Explain different digital business support services and technologies in E infrastructure.
- ILO8028.4 Explain various ethics and societal impacts of ecommerce.
- ILO8028.5 Identify the need of security and summarize various security techniques.

ILO8028.6 Develop E-business plan.

**Subject: Environmental Management**

ILO8029.1 Identify environmental Issues relevant to India and Global concerns.

ILO8029.2 Understand and apply the concept of Environment Management and Sustainable development.

ILO8029.3 Relate to the scope of Environment Management and identify career opportunities

ILO8029.4 Understand the concept of ecology, Ecosystem, its interdependence and food chain.

ILO8029.5 Demonstrate awareness of environment related legislations.

ILO8029.6 Develop awareness of EMS and ISO-14000.

**Subject: Project-II**

MEP801.1 Literature review, design and drawing for the selected problem.

MEP801.2 Cultivate the habit of working in a team .

MEP801.3 fabrication of the model.

MEP801.4 Experimentation and testing of the model.

MEP801.5 Analysis and inferences on the test result.

MEP801.6 Prepare report as per the standard guidelines.