Department of Electronics and Communication Engineering
Bhagat Phool Singh Mahila Vishwavidyalaya,
Khanpur Kalan (Sonepat), Haryana-131305
(A state university established by govt. of Haryana vides Act no. 31 of 2006)
www.bpswomenuniversity.ac.in

Course Structure for B. Tech Eighth Semester (Fourth Year)									
S. No.	**Code**	**Course Title**	**Hours/Week**			**Total Credits**	**Internal Marks**	**External Marks**	**Total Marks**
			L	**T**	**P**				
Subjects									
1.	*	Program Elective-6	3	0	0	3	20	80	100
2.	**	Program Elective-7	3	0	0	3	20	80	100
3.	***	Open Elective-4	3	0	0	3	20	80	100
4.	****	Open Elective-5	3	0	0	3	20	80	100
Labs									
5.	ECP-480	Major Project	0	0	16	8	40	160	200
6.	ISS-480	Independent Study Seminar	0	3	0	1	100	0	100
7.	GPP-482	General Proficiency	0	0	0	0	0	50	50
Total			**12**	**3**	**16**	**21**	**220**	**530**	**750**

***Program Elective-6**		**Program Elective-7	
Subject Code	**Subject**	**Subject Code**	**Subject**
ECEL-480-A	High Speed Electronics	ECEL-482-A	CAD for VLSI Design
ECEL-480-B	Transform Technique	ECEL-482-B	**Bio Electronics**
ECEL-480-C	Virtual and Augmented Reality	ECEL- 482-C	Automotive Technologies
ECEL-480-D	Power Electronics	ECEL-482-D	Nano Electronics
********	MOOC/NPTEL Course	ECEL-482-E	Artificial Neural Networks
***Open Elective-4		**** Open Elective-5**	
Subject Code	**Subject**	**Subject Code**	**Subject**
OEL-480-A	Cloud Computing & Big Data	OEL-482-A	Robotics and Automation
OEL-480-B	Information Security	OEL-482-B	Web Designing
OEL-480-C	Intellectual Property Rights & Patents	OEL-482-C	Entrepreneurial Development
OEL-480-D	Self Awareness & Integral Development	OEL-482-D	Operational Research
********	MOOC/NPTEL Course	OEL-482-E	Introduction to Smart Grid

Note: 1. Minimum passing marks for any subject (paper) shall be 40% in the external examination and 40% in the aggregate of internal and external examination of the subject.

2. General Fitness for Profession: A comprehensive viva-voce of the students will be taken by external examiner and Chairperson of the department (internal examiner) and Class Coordinator at the end of the semester. The evaluation of the student for

General Fitness for the Profession will be carried out through viva-voce taken by the committee of examiners.

1. Students may opt Elective course / Additional course as decided by Departmental Committee from NPTEL/MOOCs/ Swayam or any other online platform. The course code for the same will be decided by Departmental Committee.
2. The students may opt individual Industrial Project/R&D Project/Start-Up Project in collaboration with industry, R&D institutions etc.
3. Students may opt Programme Elective/Open Elective/Generic elective course from CBCS offered by other department.

High Speed Electronics

ECEL-480-A **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objectives: The objective of this course is:

- To develop a fundamental understanding in the concepts of Non clocked and Clocked Logic Styles.
- To know the essentials of Latching Strategies.
- To impart the knowledge in Asynchronous Clocking Techniques.

Pre-requisite: VLSI Design and Digital Electronics

Course Outcome: After studying this course students will be able to:

- Summarize the characteristics of Non-Clocked Logic Styles.
- Illustrate the characteristics of Clocked Logic Styles.
- Generalize the circuit design margin.
- Categorize the latching strategies.
- Outline the Interface techniques in high-speed VLSI Design.
- Design and develop high speed CMOS VLSI design circuits.

Contents

UNIT-I	**12 Hours**
Non-Clocked Logic Style: Static CMOS Structure – DCVS Logic – Non-Clocked Pass-Gate Families – TG Logic-DCVSPGCPL-SRPL-EEPL-PPL-LEAP-DPL	
UNIT-II	**12 Hours**
Circuit Design Margin: Circuit Design Margin- Design Variability- Process Induced Variation – Design Induced Variation – Application Induced variation – Noise.	
UNIT-III	**12 Hours**
Latching Strategies: Basic Latch Design – Latching Single-Ended Logic – Latching Differential Logic – Race Free Latches for Precharged Logic – Asynchronous Latch Techniques	
UNIT-IV	**12 Hours**
Interface Techniques: Signaling Standards – Chip-to-chip Communication Networks – ESD Protection – Driver Design Techniques – Receiver Design Techniques.	
Suggested Text Books	
1.	Kerry Bernstein & et.al, "High Speed CMOS Design Styles", Kluwer Academic Publishers, 2012.
2.	Evan Sutherland, Bob Stroll, David Harris, "Logical Efforts, Designing Fast CMOS Circuits", Kluwer Academic Publishers, 1999.
3.	Philip.E. Allen and Douglas.R. Holberg, CMOS Analog Circuit Design, Oxford University Press, Indian 3rd Edition, 2012.
4.	Paul.R. Gray, Paul.J. Hurst, S.H. Lewis and R. G. Meyer, Analysis and Design of Analog Integrated Circuits, Wiley India, Fifth Edition, 2010

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus

Transform Technique

ECEL-480-B **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course objective: The objective of this course is:

- To learn Time to Frequency domains in 1-D &2-D.
- To learn different transform techniques like DCT, Hadamard.
- To learn STFT.
- To learn filter banks, DWT.
- To learn about fractional Fourier transforms.

Pre-requisites: Digital Signals Processing

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

- Observe spectral analysis of signals based for different time domain signals.
- Understand types of 1D and 2D transforms and their applications.
- Understand the importance of the wavelet transform and its applications
- Understand the concept on DWT technique.

Contents

Unit - I	**08 Hours**
Fourier Analysis: Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT. **Transforms:** Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT,– definition, properties and applications.	
Unit - II	**12 Hours**
Continuous Wavelet Transform (CWT): Short comings of STFT, Need for wavelets, Wavelet Basis Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies	
Unit - III	**10 Hours**
Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.	
Unit - IV	**08 Hours**
Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis- BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets.	
Suggested Text Books	
1.	Raghuveer M.Rao and Ajit S. Bopardikar, "Wavelet Transforms-Introduction theory and applications" Pearson Edu, Asia, New Delhi, 2003.
2.	S.Jayaraman, S.Esakkirajan, T.Veera Kumar, "Digital Image Processing" , TMH, 2009
3.	C. Sydney Burrus, "Introduction to Wavelets and Wavelet Transforms", PHI, 1st Edition, 1997l.

4.	Soman. K. P, Ramachandran. K.I, "Insight into Wavelets from Theory to Practice" Printice Hall India, 1st Edition, 2004

NOTE: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each unit.

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Virtual and Augmented Reality

ECEL-480-C **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The students will be able to

- Understand the rapidly evolving and commercially viable field of Computer Science.
- Understand the fundaments and features of VR and AR.
- Familiarize with the applications of VR and AR in different sectors like education, industries, entertainment, business etc.
- Understand computer graphics, geometric modeling and Virtual environment.

Pre-requisite: NA

Course Outcomes: After completion of this course, student will be able to

- Understand fundamentals of computer vision, computer graphics and human-computer interaction techniques related to VR/AR.
- Understand geometric modeling and Virtual environment.
- Relate and differentiate VR/AR technology.
- Use various types of hardware and software in virtual reality systems.
- Implement Virtual/Augmented Reality applications.

Contents

UNIT- I	**8 Hours**
Virtual Reality and Virtual Environment: Introduction, computer graphics, real time computer graphics, flight Simulation, virtual environment requirement, benefits of virtual reality, historical development of VR. **Virtual Environment:** Input: Tracker, sensor, digital gloves, movement capture, video-based Input, 3D menus and 3D scanner, Output: Visual /Auditory / Haptic Devices.	
UNIT- II	**11 Hours**
Computer Graphics and Geometric Modelling: Introduction, the virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, color theory, conversion from 2D to 3D, 3D space curves, 3D boundary representation, simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms. **Geometrical Transformations:** Introduction, frames of reference, modelling transformations, instances, picking, flying, scaling the VE, collision detection	
UNIT- III	**11 Hours**
Generic VR system: Introduction, virtual environment, computer environment, VR technology, model of interaction, VR Systems. **Animating the Virtual Environment:** Introduction, the dynamics of numbers, linear and nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system. **Physical Simulation:** Introduction, objects falling in a gravitational field, rotating wheels, elastic collisions, projectiles, simple pendulum, springs, flight dynamics of an aircraft.	
UNIT- IV	**10 Hours**

Augmented Reality: Taxonomy, technology and features of augmented reality, difference between AR and VR, challenges with AR, AR systems and functionality, augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems. **AR / VR Applications:** Introduction, Engineering, Entertainment, Science, Training.	
Suggested Text Books	
1.	Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley 2016.
2.	Alan B. Craig, "Understanding Augmented Reality, Concepts and Applications", Morgan Kaufmann, 2013.
3.	Alan Craig, William Sherman and Jeffrey Will, "Developing Virtual Reality Applications, Foundations of Effective Design", Morgan Kaufmann, 2009.
4.	John Vince, "Virtual Reality Systems ", Pearson Education, Asia, 2007.
5.	Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Power Electronics

ECEL-480-D **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is:

- To learn and skill about build and test circuits using power devices such as SCR.
- To understand and proficient about design controlled rectifier, DC to DC converters, DC to AC inverters.
- To understand & learn how to analyze these inverters and some basic applications.
- To learn and skill about Design SMPS.

Pre- requisites: knowledge about semiconductor devices nd subject Physics.

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

- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices.
- Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits
- Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.

Contents

Unit – I	**12 Hours**
Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBT- Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based).Concept of fast recovery and schottky diodes as freewheeling and feedback diode.	
Unit - II	**13 Hours**
Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor. Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper	
Unit - III	**12 Hours**
Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter	
Unit - IV	**12 Hours**
Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant	

converter - series loaded half bridge DC-DC converter. Applications: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.	
Suggested Text Books	
1.	Muhammad H. Rashid, "Power electronics" Prentice Hall of India.
2.	Ned Mohan, Robbins, "Power electronics", edition III, John Wiley and sons.
3.	P.C. Sen., "Modern Power Electronics", edition II, Chand& Co.
4.	V.R.Moorthi, "Power Electronics", Oxford University Press.
5.	Cyril W., Lander," Power Electronics", edition III, McGraw Hill

NOTE: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each unit.

CAD for VLSI Design

ECEL-482-A **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objectives: The objective of this course is:

- To design the circuit using Floor planning, Placement and Routing concepts.
- To design and implement various algorithms onto FPGA.
- To verify Simulation and Synthesis process in the circuit design.

Pre-requisite: VLSI Design and Digital Electronics

Course Outcome: After studying this course students will be able to:

- Use the basic VLSI design Automation Tools.
- Solve the Tractable and Intractable problems.
- Verify the VLSI design process through Simulation and Synthesis.
- Explore the concepts of Partitioning and Floor planning.
- Explain various techniques related to Placement , Routing, circuit extraction and DRC
- Implement the various algorithms in FPGA

Contents

UNIT-I	**12 Hours**
Introduction: Introduction to VLSI Methodologies – Types of ASICs – Design flow -VLSI Physical Design Automation – Fabrication process and its impact on Physical Design, A quick tour of VLSI Design Automation Tools – Data structures and Basic Algorithms -	
UNIT-II	**12 Hours**
Simulation And Synthesis: Simulation – Logic synthesis – Combinational Logic Synthesis - Binary Decision Diagrams – Two Level Logic Synthesis- Verification – High level synthesis – Compaction.Simulation - Gate-level modeling and simulation - Switch-level modeling and simulation	
UNIT-III	**12 Hours**
FLOOR PLANNING: Floor planning concepts - shape functions and floorplan sizing - Types of local routing problems - Area routing - channel routing - global routing - algorithms for global routing, Simulation - Gate-level modeling and simulation - Switch-level modeling and simulation - Combinational Logic Synthesis - Binary Decision Diagrams - Two Level Logic Synthesis.	
UNIT-IV	**12 Hours**
CAD Implementations in FPGA: Physical Design Automation of FPGAs – MCMS – Implementation of various Algorithms using VHDL & Verilog onto FPGA's.	

Suggested Text Books

1.	N.A. Sherwari, "Algorithms for VLSI Physical Design Automation", John Wiley, 2003.
2.	Sabih H. Gerez," Algorithms for VLSI design automation", John Wiley, 2004.
3.	M.J.S.Smith, "Application – Specific Integrated Circuits", Addison, Wesly Longman Inc.,1997

NOTE: There will be nine questions in total from all four units. First question is compulsory and set from all four units. Students will have to attempt any five questions in all selecting at least one question from each unit.

Bio-Electronics

ECEL-482-B **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The basic objective of this course is:

- To understand the biomedical signals.
- To provide an overview about behavior of cells on semiconductor materials.
- To make students familiarized with various bioelectronics device and sensors.

Pre-requisite: None

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

- To analyze the necessity of bio electronics, scope and their application.
  To detect, measure and analyze the biomedical signals.
- To get an exposure of several fabrication methods used in Bioelectronics**.**

Contents

UNIT- I	**10 Hours**
Introduction : Nature of Biomedical signals; Bio Electronic potentials; Necessity of Bio Electronics; Components; Scope and Application; Basics of cell biology; Structure of the cell, the nervous system and the neuron; function of enzymes; nucleus and role of DNA and RNA, adhesion of cell to surfaces.	
UNIT- II	**10 Hours**
Electrical Circuit treatment of biological environments: Behaviour of cells on semiconductor materials; Ionic conduction, the metal-electrolyte double layer, models of the cell membrane; Cell culture and biocompatibility testing; Mathematical modeling of the nervous system. Use of model neurons for associative computer memory; Bio-inspired systems.	
UNIT- III	**09 Hours**
Electrical signal detection in biological systems: Silicon, glass and metal electrodes, amplifier design; Fundamentals of electron transfer and its application in bio electronic systems.	
UNIT- IV	**10 Hours**
Bioelectronics device and sensors: Microelectronic fabrication methods as adapted to Bioelectronics, hard and soft lithography, bio-compatibility of materials, Importance, working, types; Miniaturization and Microsystems including sensing using optical techniques, field effect transistors, ion-selective and enzymatic sensitive electrodes, as well as impedance monitoring, case study: Examples of industrial biosensors, e.g. for glucose monitoring and for DNA Analysis and some others	
Suggested Text Books	
1.	Biosensors. Elizabeth A. H. Hall, Open University Press, Buckingham, 1990.
2.	**Ions, electrodes and membranes.** By **John Wiley** & Sons, New York, 2nd ed., 1992
3.	**Bioelectronics. Bone Stephen and Zaba Bogumil.** Published by John Wiley & Sons Ltd, Chichester and New York, 1992.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Automotive Technologies

ECEL-482-C **Total Credits:3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is to:

- Pursue a successful career in automotive and Ancillary industries that meet the needs of Indian and multinational companies. .
- Synthesize the data and apply the technical concepts in the automotive applications.
- Formulate, solve and analyze engineering problems using mathematical, scientific and engineering principles.

Pre- requisites: This module aims to introduce students to use quantitative methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

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

- Demonstrate a degree of mastery over the area as per the Specialization of the program.
- Apply their knowledge of mathematics, science and automotive technology to the solution of complex problems in Automotive engineering.
- Design the complex automotive system, components, processes that meet the specified needs, with appropriate consideration for public health and safety along with social, cultural and environment considerations.

Contents

Unit - I	**10 Hours**
Introduction to Automotive Components and Materials: Automotive Components categories, Different materials used for automotive components, Functionality considerations of automotive parts, Factors influencing selection of materials for components. Influence of material properties on functionality and forming of components, Strengthening mechanisms and their need in automotive environment.	
Unit - II	**12 Hours**
Advanced Manufacturing Process of Automotive Components: Conventional casting and forging processes. Forming technology for light weight materials. Powder metallurgy, Non-conventional machining technologies like Ultrasonic machining, Water jet cutting, Electrochemical processing, Laser cutting etc.	
Unit - III	**12 Hours**
Composites in Automotive Environment: Need for composites, Properties of engineering composites and their limitations, Significance of Polymer, Metal and Ceramic matrix composite systems, Property correlation with reinforcement shape and distribution, Processing and application of different composites for automotive components.	
Unit - IV	**10 Hours**
Selection of Materials and Manufacturing techniques: Correlation of functionality of the component with material properties. Factors influencing material selection. Derivation of performance index based on the functionality of the component. Ashby technique for material selection.	
Suggested Text Books	
1.	M. F. Ashby and H. Shercliff, D. Cubon, (2007) Materials Engineering Science,

	Processing and Design, Butterworth Publications.
2.	M. P. Groover. (2005)Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 2nd edition, John Wiley & Sons
3.	W. D. Callister. (2005) Materials Science and Engineering an Introduction, 6th edition, John Wiley & Sons.

NOTE: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each unit.

Nano Electronics

ECEL-482-D **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The students will be able to:

- Understand the functioning and behavior of Nano technology.
- Understand the fundamentals of quantum devices.
- Understand the basic ideas of molecular electronics.
- Learn the methods and fabrication techniques of nano components.

Pre-requisite: Basics of Electronic devices and circuits.

Course Outcomes: After completion of this course, student will be able to:

- Familiarize with Nano-technology.
- Study the properties and applications of nano components and molecular electronics.
- Analyze the fabrication process of nano components.
- Design projects based on nano-electronics.

Contents

UNIT- I	**10 Hours**
Introduction to Nanotechnology: Overview of current research in nano-scale electronics and devices, characteristic scale for quantum phenomena, nanoparticles, nano-clusters, nanotubes, nanowires and nanodots; Quantum well structures, quantum dots, quantum wires; Current and future nanotechnology applications in engineering and materials, electronics and computing, energy and medicine; Carbon Nanotube: Electronic structure, Transport, optical, thermal and mechanical properties of nano tubes and its Application.	
UNIT- II	**8 Hours**
Quantum Device: Length Scales/Transport, Ballistic Electron Transport, Coulomb Blockade, RTD, Electron-Wave Coupling Devices; Spintronic	
UNIT- III	**10 Hours**
Molecular Electronics: Organic semiconductors, Organic molecules as switches, motor-molecules and biomimetic components, conducting polymers, light emitting polymers, Molecular Semiconductors and Metals, Logic Gates.	
UNIT- IV	**12 Hours**
Processing and Nano-Fabrication: Synthesis of nanomaterials, Application of Nano Materials. Micro & Nano electromechanical systems, Fabrication techniques of Nano devices; Photolithography: E-beam lithography, Advanced Nano-lithography; Thin Film Technology: MBE, CVD, PECVD, LB and Self Assembly, Spu n-Coating. **Nano-Characterization:** Scanning Probe Microscopy, Electron Microscopy (TEM, SEM) Photon Spectroscopy, Electron Spectroscopy, Nanomanipulator.	
Suggested Text Books	
1.	Mohan Sunder Rajan, "Nano-the next revolution" NBTI.
2.	Charles P. Pode, "Introduction to Nano Technology", Springer.
3.	Nano Electronics and Information Technology: Rainer Waser ,Publisher Wiley-VCH
4.	Handbook of Nanotechnology: Bhushan, Springer.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Artificial Neural Networks

ECEL-482-E **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The students will be able to:

- Understand the fundamentals of Artificial Neural Networks.
- Familiarize with the architecture and working of various ANN models.
- Understand the role of feed forward networks and back propagation concept.
- Familiarize with applications of ANN in different domains.

Pre-requisite: Fundamental of electromagnetic theory.

Course Outcomes: After completion of this course, student will be able to

- Familiarize with basic concept and working of Artificial Neural Networks.
- Compare and demonstrate various ANN models.
- Demonstrate feed forward networks and back propagation network.
- Describe the applications of ANN in various fields.

Contents

UNIT- I	**10 Hours**
Introduction to Artificial Neural Networks: Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between Brain and the Computer, Comparison Between Artificial and Biological Neural Networks, Network Architecture, Setting the Weights, Activation Functions, Learning Methods.	
UNIT- II	**10 Hours**
Fundamental Models of Artificial Neural Networks: Introduction, McCulloch – Pitts Neuron Model, Architecture, Learning Rules, Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Leastmean Squre (LMS) rule, Competitive Learning Rule, Out Star Learning Rule, Boltzmann Learning, Memory Based Learning.	
UNIT- III	**12 Hours**
Feed Forward Networks: Introduction, Single Layer Perceptron Architecture, Algorithm, Application Procedure, Perception Algorithm for Several Output Classes, Perceptron Convergence Theorem, Brief Introduction to Multilayer Perceptron networks, Back Propagation Network (BPN), Generalized Delta Learning Rule, Back Propagation rule, Architecture, Training Algorithm, Selection of Parameters, Learning in Back Propagation, Application Algorithm, Local Minima and Global Minima, Merits and Demerits of Back Propagation Network, Applications, Radial Basis Function Network (RBFN), Architecture, Training Algorithm for an RBFN with Fixed Centers.	
UNIT- IV	**8 Hours**
Applications of Neural Networks: Implementation of A/D Converter using Hopfield Network, Solving Optimization Problems, Solving Simultaneous Linear Equation, Solving Traveling Salesman Problems using Hopfield Networks, Application in Pattern Recognition, Image Processing.	
Suggested Text Books	
1.	J.M.Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3rd Edition.

2.	S.N. Shivanandam, S. Sumati, "Introduction to Neural Networks Using MATLAB 6.0", TMH.
3.	Simon Haykin, "Artificial Neural Network", Pearson Education, 2nd Ed.
4.	Laurene Fausett, "Fundamental of Neural Networks", Pearson, 1st Ed.
5.	B. Yegnanarayana, "Artificial Neural Networks", PHI.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Cloud Computing and Big Data

OEL-480-A **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The students will be able to:

- Learn the concepts related to cloud computing.
- Understand the current challenges, methodologies and technologies in processing big data.
- Understand to analyze big data using professional packages and tools.

Pre-requisite: None.

Course Outcomes: At the end of this course students will demonstrate the ability to:

- Familiarize with concepts related to cloud computing.
- Learn deployment models and virtualization for clouds.
- Demonstrate cloud computing techniques for various applications.
- Analyze cloud computing services used at various levels.
- Describe the outcomes of big data analysis.

Contents

UNIT- I	**10 Hours**
Introduction: Distributed Computing, Cluster Computing, Grid Computing, Overview of Cloud Computing, History of Cloud Computing, Defining a Cloud, Benefits of Cloud Computing, Cloud Computing Architecture, Services Models (XaaS), Infrastructure as a Service, Platform as a Service, Software as a Service.	
UNIT- II	**10 Hours**
Deployment Models and Virtualization: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Dynamic Provisioning and Resource Management, Virtualization: Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Pros and Cons of Virtualization, Xen, VMware, Hyper-V.	
UNIT- III	**10 Hours**
Cloud Platform in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services, Additional Services, Google App Engine- Architecture and Core Concepts, Application Life Cycle, Cost Model, Microsoft Azure – Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.	
UNIT- IV	**10 Hours**
Big Data: Overviews of Big Data, State of the Practice in Analytics, The Data Scientist, Big Data Analytics in Industry Verticals, Data Analytics Lifecycle Challenges of Conventional Systems, Statistical Concepts: Sampling Distributions, Re-Sampling, Statistical Inference, Prediction Error, Regression Modelling, Multivariate Analysis, Bayesian Modelling.	
Suggested Text Books	
1.	Rajkumar Buyya, Christian Vecchiola and S ThamaraiSelvi, "Mastering Cloud Computing", Tata McGraw Hill Education Pvt. Ltd., 2013.
2.	Kai Hwang, Geofferyu C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2012.
3.	John W. Ritting and James F. Ransome, "Cloud Computing: Implementation Management and Security", CRC press, 2012.
4.	Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
5.	Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data

	Streams with Advanced Analytics", John Wiley & sons, 2012.
6.	Pete Warden, "Big Data Glossary", O'Reilly, 2011.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Information Security

OEL-480-B **Total Credits:3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is to:

- Make students Learn the fundamentals of cryptography and its application to network security.
- Make understand network security threats, security services, and counter measures.

Pre- requisites: This module aims to introduce students to use quantitative methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

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

- Understand and explain the risks faced by computer systems and networks.
- Identify and analyze security problems in computer systems and networks.
- Explain how standard security mechanisms work.
- Develop security mechanisms to protect computer systems and networks. .

Contents

Unit - I	**10 Hours**
Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms **Conventional Cryptographic Techniques:** Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher.	
Unit - II	**12 Hours**
Symmetric and Asymmetric Cryptographic Techniques : DES, AES, RSA algorithms **Authentication and Digital Signatures:** Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.	
Unit - III	**12 Hours**
Program Security: Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of use Errors, Viruses, Trapdoors, Salami attack, Man-in-themiddle attacks, and Covert channels.	
Unit - IV	**15 Hours**
Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls.	
Suggested Text Books	
1.	Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2.	Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
3.	Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4.	Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

NOTE: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each

unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each unit.

Intellectual Property Rights & Patents

OEL-480-C **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective:

- To give an idea about IPR, registration and its enforcement.
- This course is aimed at familiarizing students with the nuances of Intellectual Property Rights (IPR) so as to help them integrate the IPR process in their research activities.
- To make the students familiar with basics of IPR and their implications in Research, development and commercialization

Pre- requisites: Students are expected to have experience in presentation, group discussion etc.

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

- Ability to manage Intellectual Property portfolio to enhance the value of the firm
- Should be able to understand the concept of industrial applicability
- would be able to read and understand IPR literature

Contents

Unit – I	**10 Hours**
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad –Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR	
Unit - II	**10 Hours**
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.	
Unit - III	**10 Hours**
Concept and procedures of obtaining rights and ownership for creative works in India. Copyright in computer programs, engineering drawings, databases, films, media; performers; publishing industry etc. Licensing of copyright; Infringement of copyright. Role of copyright societies.	
Unit - IV	**12 Hours**
Trademarks: introduction, signs that may serve as trademarks, Madrid agreement, geographic indications. Industrial design: introduction, differentiate between industrial design, trademark and patent. Procedure for protection of Industrial design. Patents: purpose, need of patent, required condition for patentability. Limitation and advantages of patenting. Unfair competition..	
Suggested Text Books	
1.	Ganguli Prabuddha “Intellectual Property Rights--Unleashing the Knowledge Economy”, Tata McGrawHill (2001)
2.	Ganguli Prabuddha Gearing up for Patents…..The Indian Scenario”, Universities Press (1998)
3.	Ganguli Prabuddha “Geographical Indications--its evolving contours” accessible in http://iips.nmims.edu/files/2012/05/main_book.pdf (2009)
4.	Intellectual Property (Licensing in trade marks) –Prof. Raman Mittal

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be

required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Self Awareness and Integral Development

OEL-480-D **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**

Course objective: The objective of this course is:
- Express personal values and integrity.
- Articulate and engage in areas of emotional literacy
- Increase effective communication skills to enhance relationships.

Pre-requisite: None

Course Outcomes: The student will be able to:
- Students will explore the dimensions of self by studying various systems and techniques for self-awareness
- They will become more conscious of: their attitudes, beliefs and ways of being; symptoms of stress and imbalance; healthy responses to stress and imbalance.

Contents

Unit – I	**12 Hours**
Personal Skills: •Knowing oneself, confidence building, personal values-time and stress management, Planning for career and exploring opportunities in the domain	
• **Unit – II**	**10 Hours**
Social Skills: Appropriate and contextual use of language-non-verbal communication-Interpersonal skills- problem solving.	
Unit – III	**10 Hours**
Personality Development: Personal grooming and business etiquettes, corporate etiquette, social etiquette and telephone etiquette, role play and body language.	
Unit – IV	**8 Hours**
Professional skills: Organizational skills- team work- business and technical correspondence-job oriented skills-professional etiquettes. **Presentation skills:** Group discussion, public speaking.	
Suggested Text Books	
1.	Butterworth, Eric. 1982. In the Flow of Life. Unity Village Publisher, Unity Books.
2.	Hendricks, Gay. 2000. Conscious Living: Finding Joy in the Real World. San Francisco
3.	Hay, Louise 1984. You Can Heal Your Life. Santa Monica: Hay House.
4.	Jan von Plato : Elements of Logical Reasoning
5.	Murphy Hidderandt: Thomas Effective Business Communication Mc Graw Hill.

Note: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each un

Robotics and Automation

OEL-482-A **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The students will be able to

- Understand the fundamentals and functioning of robots.
- Learn to visualize the motion and characteristics of robots.
- Learn about various motion planning techniques and the associated control architecture.
- Study and analyze the designing of robots for a given application.

Pre-requisite: Basics of Embedded Systems, knowledge of programming.

Course Outcomes: At the end of this course students will demonstrate the ability to

- Explain the concepts of motion, path control and vision of robots.
- Examine different sensors and actuators for different applications.
- Design a robot and an end-effector and solve the kinematics and dynamics of motion for robots.
- Describe the impact and progress of robotics in different domains.

Contents

UNIT- I	**10 Hours**
Introduction, History of robots, Classification of robots, Present status and future trends. Basic components of robotic system. Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Mechanisms and transmission, End effectors, Grippers-different methods of gripping, Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, Cam type gripper, Magnetic grippers, Vacuum grippers, Air operated grippers; Specifications of robot.	
UNIT- II	**10 Hours**
Drive systems and Sensors Drive system- hydraulic, pneumatic and electric systems Sensors in robot – Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.	
UNIT- III	**12 Hours**
Kinematics and Dynamics of Robots 2D, 3D Transformation, Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformations, Simple problems. Matrix representation, Forward and Reverse Kinematics of Three Degree of Freedom, Homogeneous Transformations, Inverse kinematics of Robot, Robot Arm dynamics,	
UNIT- IV	**10 Hours**
Introduction to Robotic Programming, On-line and off-line programming, programming examples.	
Suggested Text Books	
1.	Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
2.	Craig. J. J. “Introduction to Robotics- mechanics and control”, Addison- Wesley, 1999.
3.	S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2009.
4.	Richard D. Klafter, Thomas A, ChriElewski, Michael Negin, “Robotics Engineering an

	Integrated Approach", PHI Learning. 2009.
5.	Francis N. Nagy, Andras Siegler, "Engineering foundation of Robotics", Prentice Hall Inc., 1987.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Web Designing

OEL-482-B **Total Credits: 3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The students will be able to:

- Understand basic principles of web site design.
- Understand Java programming language for web designing.
- Learn about designing of website adhering to current web standards.

Pre-requisite: Basics of Java programming.

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

- Understand basic principles of web site design, considering the information architecture.
- Incorporate best practices in navigation, usability in website design.
- Design of website adhering to current web standards (HTML, XML, CSS).

Contents

UNIT- I	**8 Hours**
Introduction: Brief history of internet, introduction to world wide web, basic principles involved in developing a web site, rules of web designing, web standards, audience requirements, Design concept.	
UNIT- II	**10 Hours**
Web Essentials and Standards: Clients, servers, introduction to Markup languages, scripting languages, Introduction to elements of HTML, XHTML and CSS, Introduction to Document object model (DOM), working with text, list, tables, frames, hyperlinks, Images multimedia, forms and controls. CSS properties, Id and Class, Box Model, creating page Layout and Site Designs.	
UNIT- III	**10 Hours**
Javascript as Programming Language: Data types, values, variables, expressions and operators, JavaScript Statements, loops, arrays, strings, methods, defining and invoking functions and their closure, random functions and maths library, representing dates. Javascript in web browsers, difference between server side and client side javascript, embedding javascript in HTML and frameworks, Changing CSS style, hiding HTML elements, showing hidden HTML elements. DOM and event handling, error handling, mouse, text, drag, drop and keyboard events and node operations.	
UNIT- IV	**10 Hours**
Website Development Tools: Google Web Designer, Macaw, Sketch, Firefox, YSlow, Wordpress, open Element etc.	
Suggested Text Books	
1.	Thomas A Powell, HTML: The Complete Reference, Tata McGraw Hill Publications.
2.	2. Scott Guelich, Shishir Gundavaram, Gunther Birzniek; CGI Programming with Perl 2/e, O'Reilly
3.	3. Doug Tidwell, James Snell, Pavel Kulchenko; Programming Web Services with SOAP, O' Reilly
4.	4. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

Entrepreneurial Development

OEL-482-C **Total Credits:3**
L T P **Internal Marks: 20**
3 1 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is to:

- Impart importance of studying entrepreneurship development.
- Teach how their own business can be started.
- Familiarize how the government helps SSI for their growth and developments.

Pre- requisites: To enhance the urge for becoming Entrepreneur.

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

- Learn importance of studying entrepreneurship development.
- Lean how their own business can be started.
- Learn how the government helps SSI for their growth and developments.

Contents

Unit - I	**12 Hours**
Introduction: Concept of Entrepreneurship; Role of Entrepreneurship in Economic Development; Factors Impacting Emergence of Entrepreneurship; Types of Entrepreneurs. Characteristic Of Successful Entrepreneurs; Qualities Required for Entrepreneur, Entrepreneurship Process; Women Entrepreneurs; Social Entrepreneurship; Entrepreneurial Challenges.	
Unit - II	**12 Hours**
Entrepreneurship Development and Leadership: Entrepreneurial class Theories; Entrepreneurial training; Characteristics of entrepreneurial leadership, Components of Entrepreneurial Leadership; International Entrepreneurship- Opportunities and challenges; Entrepreneurial Challenges	
Unit - III	**10 Hours**
Entrepreneurship Project Development: Idea generation; Developing a Marketing plan,, steps in marketing research;, perspectives in business plan preparation, elements of a business plan; Business plan failures	
Unit - IV	**12 Hours**
Promotional agencies: Govt. support to new enterprise; Entrepreneurship Development Programmes and financing of new ventures; Role of various institutions in developing entrepreneurship in India. International entrepreneurship- opportunities and challenges; Intrapreneurship. Govt. support to new enterprise.	
Suggested Text Books	
1.	Lall, Madhurima and Shikha Sahai," Entrepreneurship", Excel Books, New Delhi.
2.	Charantimath, Poornima, "Entrepreneurship Development and Small Business Entrprises", Pearson Education, New Delhi.
3.	Dutta, B. (2009). Entrepreneurship Management (Text and Cases) (1 ed.). New Delhi: Excel Book
4.	Hisrich, Robert d; Michael Peters and Dean Shephered, "Entrepreneurship", Tata Mc

	Graw Hills.
5.	Barringer, Brace R; and Duane, R: Ireland, “Entrepreneurship”, prentice Hall, New Jersy.

NOTE: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each unit.

Operation Research

OEL-482-D **Total Credits:3**
L T P **Internal Marks: 20**
3 0 0 **External Marks: 80**
Total Marks: 100

Course Objective: The objective of this course is to:

- Enable the students to generate mathematical models of business scenarios.
- Develop the ability among student to analyse the business situations.

Pre- requisites: NA

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

- Formulate and obtain the optimal solution for Linear Programming problems.
- Determine the optimal solution for Transportation problems.
- Determine the optimal solution for Assignment problems.
- Determine the best strategy and value of the given game model.
- Plan, Schedule and Control the given project.
- Decide an optimal replacement period/policy for a given item/equipment/machine.

Contents

Unit - I	**15 Hours**
Formulation of LP Problem. Graphical method, Simplex method for maximization and minimization LP Problems. Duality in Simplex Problems, **Queuing Theory:** Introduction to probability concept for queuing problems. Basic structure, Terminology, Classification, Birth and Death Process. Queuing Models	
Unit - II	**12 Hours**
MODI method for optimality check, North West Corner Method, Least-cost Method and Vogel's Approximation Method (VAM) for solving balanced and unbalanced transportation problems. Problems of degeneracy and maximization. **Assignment Models:** Assignment model for maximization & minimization problems. Travelling Salesman Problems, Industrial Problems.	
Unit - III	**12 Hours**
Processing of n-jobs through m-machines with each job having same processing order. Processing of two jobs through m-machines with each job having different processing order. **Decision Theory:** Decision making under uncertainty and under risk, Multistage decision making, Multi criteria decision making.	
Unit - IV	**15 Hours**
Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. Activity time estimates. Critical path and project time duration. Probability of completing the project on or before specified time. Concept of Float and slack. **Game Theory:** Two-person zero-sum games. Minimax and Maximin principle. Arithmetic, Algebraic, Matrix Algebra method. Solution by Dominance, Sub game, Graphical method, Linear programming method	

Suggested Text Books

1.	S.Kalavathy, "Operations Research", Vikas Publication, 4th Edition, 2013.
2.	N.D. Vohra, "Operations Research", Tata McGraw Hill, 2004.
3.	H.A. Taha, "Operations Research", Prentice-Hall India, 6th Edition, 2004.

4.	Hira and Gupta, “Operation Research” S. Chand Publications.

NOTE: Nine questions will be set in all by the examiners taking two questions from each unit. Students will be required to attempt five questions in all selecting at least one question from each unit. Question No. 1 must compulsory and covers whole syllabus with short questions from each unit.

Major Project

ECP-480 **Total Credits: 8**
L T P **Internal Marks: 40**
0 0 16 **External Marks: 160**
Total Marks: 200

Course Objective: The aim of this course is to:
Pre-requisite: No
Course Outcomes: After the course is completed the student will have:

- Practical exposure of Industrial Projects Skill
- Learn various aspects of software and hardware handling of industrial work.
- Attitude more professionally inclined.
- Better understanding about time management.

A student will prepare a project on emerging areas of Engineering and Technology and will carry out the task under the supervision of assigned faculty by the Department. She will Prepare a report and be evaluated through a panel of examiners consisting of the following:

1. Head/ Chairperson of Department : Chairperson
2. Project coordinator : Member
3. External examiner : To be appointed by the University

The student will be required to submit two copies of her project report to the department for record (one copy each for the department and participating teacher). Project coordinator will be assigned the project load of, maximum of 2 hours per week including his own guiding load of one hour. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her. The format of the cover page and the organization of the body of the report for the major project will be finalized by the department and circulated by the Chairperson of the Department.

Independent Study Seminar

ISS-480 **Total Credits: 1**
L T P **Internal Marks: 100**
0 3 0 **External Marks: 00**
Total Marks: 100

Course Objective: The aim of this course is to

- To learn how to carry out literature search
- To learn the art of technical report writing
- To learn the art of verbal communication with the help of modern presentation techniques

Pre-requisite: No

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

- Understand of contemporary / emerging technology for various processes and systems.
- Share knowledge effectively in oral and written form and formulate documents.

A student will select a topic in emerging areas of Engineering and Technology and will carry out the task under the supervision of assigned faculty by the Department. She will prepare a report and give a seminar on the same before a committee constituted by the Chairperson of the Department. The committee should comprise of 2 or 3 faculty members from different specializations. Internal assessment will be effected by the following committee of two persons:
Independent Study Seminar Coordinator: Convener
One or two faculty from the department: Member
The teacher(s) associated in the committee will each be assigned one hours teaching load per week. However, each concerned faculty guiding/supervising the students for Independent Study/Seminar will be assigned a load of one hour per week. Students have to study the particular topic as per their interest/requirements or suggested by the faculty under supervision.

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General Proficiency

GPP-482 **Total Credits: 0**
L T P **Internal Marks: 00**
0 0 0 **External Marks: 50**
Total Marks: 50

Course Objective: The aim of this course is to

- Inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of her performance /achievements in different walks of life.

Pre-requisite: No

General Proficiency is a compulsory & qualifying course (Audit Pass) under which student will be evaluated for her performance in all types of activities like Academics, Cultural, Sports, NSS, organisation of camps, social activities etc., during her all 8 semesters, at the end of 8th semester. Regarding this course student will be motivated during the induction programme at the time of admission, so that she will be vigilant for motivation towards these activities. The evaluation of the student for her General Fitness for the Profession will be carried out by the committee of examiners constituted as under:-

1. Chairperson of the Department: Chairperson
2. Final Year Coordinator/ Internal Examiner of the Department: Member
3. External Examiner: Appointed by the University