Scheme of Instruction & Examination
B.E. THIRD YEAR, VI SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
Semester - VI

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			Hours per week				Maximum Marks		
			L	T	P/D	Duration in Hrs	CIE	SEE	
Theory Courses									
1	4PC612EE	Switch Gear and Protection	3	0	0	4	40	60	3
2	4PC613EE	Power Electronic Control of Electrical Drives	3	0	0	3	40	60	3
3	4PC614EE	Microprocessors & Micro Controllers	3	0	0	3	40	60	3
4	4ES606EC	Signals & Systems	3	0	0	3	40	60	3
5	4PE6–EE	Professional Elective-II	3	0	0	3	40	60	3
6	4OE6–	Open Elective –II	3	0	0	3	40	60	3
Laboratories									
7	4PC656EE	Electrical Machines-II Lab	0	0	3	3	40	60	1.5
8	4PC657EE	Power Electronics and Drives Lab	0	0	3	3	40	60	1.5
9	4PW601EE	Mini Project Seminar	0	0	2	2	40	60	1
10	4HS654HS	Soft Skills Lab	0	0	2	2	40	60	1
11	4PW701EE	Summer Internship*	4 weeks during summer						
Total			**18**	**0**	**10**	**28**	**440**	**660**	**23**

Professional Elective - II		
1	4PE604EE	Energy Storage Systems
2	4PE605EE	Electric Vehicles
3	4PE606EE	Self-Study Course

Open Elective - II		
1	1OE602AD	Deep Learning(Not For CSE , AIDS & AIML)
2	2OE602CE	Green Building Technologies (Not For CE)
3	3OE602CS	Software Engineering (Not For CSE , AIDS & AIML)
4	4OE602EE	Electric Vehicle Technology (Not For EEE)
5	5OE602EC	Fundamentals of IOT (Not For ECE)
6	6OE602ME	3-D Printing (Not For ME)

HS: Humanities and Social Sciences BS: BasicScience ES: Engineering Science

MC: MandatoryCourse PC:ProfessionalCore PE: Professional

OE: Open Elective PW: Project Work L: Lecture

T: Tutorial P: Practical D: Drawing

CIE: ContinuousInternal Evaluation

SEE: Semester End Evaluation (Univ.Exam) EE : Electrical Engg.

Note:

1. Each contact hour is a clock hour.
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student the complete the experiment.

* Students have to undergo summer internship of 4-6 weeks at the end of semester VI and credits will be awarded after evaluation in.

Course Code	Course Title	Core/Elective					
4PC612EE	SWITCHGEAR AND PROTECTION	Core					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES:

The objective of this course is to make the student

1. To be able to understand the need of protection in power system and protection with conventional and staticrelays.
2. To understand the protection of transformers, generators andneed of circuit breakers.

COURSE OUTCOMES :

At the end of the course students will be able to

1. Acquire the knowledge of construction, working principles and testing of different electromagnetic relays, static relays, distance relays, differential relays and circuit, breakers used to protect generators, Transformers, Transmission lines anddistribution feeders.
2. Analyze the characteristics of over current, over voltage, distance and differential relays.
3. Select the ratings of relays and circuit breakers for different applications
4. Explain the construction details, advantages and disadvantages of Gas insulated substations.
5. Explain the protection methods used against over voltages.

UNIT - I

Introduction to Protective Relays: Need for protection - primary protection - backup protection Zones of protection - Definitions of relay pick up and reset values - Classification of relays - Operating principles and construction of Electromagnetic and Induction type relays. Over current relay - Over voltage – Directional relay - Universal relay torque equation. Over current protection for radial feeder and ring mains - Protection of parallel lines - Relay settings for over current relays Earth fault and phase fault protection.

UNIT - II

Static Phase and Amplitude Comparators: Characteristics of dual input comparators. Static Relays -Instantaneous over current relay - Definite time over current relay - Inverse time over current relay – Directional over current relay (Block diagram

approach only) Distance protection - Characteristics of 2- input distance relays on the RX diagram - Input characteristics for various types of distance relays - 3-step distance relays Microprocessor based / numerical over current, over voltage, under voltage relay (block diagram).

UNIT - III

Transformer and Generator Protection: Differential relays - Percentage differential relays protection of generator and transformer using percentage differential relays, Split phase protection, Overheating, Loss of excitation - Protection of transformers against magnetizing inrush - Buchholz relay - Protection of earthing transformers.

UNIT - IV

Circuit Breakers : Need for circuit breakers, Parts of circuit breaker trip coil circuit-Arc properties -Principles of arc quenching - Theories, Recovery and restriking voltages - Rating of circuit breakers – Rated symmetrical and asymmetrical breaking current - Rated making current - Rated capacity, Voltage and frequency of circuit breakers, Auto re-closure-duty cycle, Current chopping - Resistance switching - Derivations of RRRV - Maximum RRRV, Recovery voltage, Problems - Types of circuit breakers - Oil, Minimum oil, Air, Air blast, SF, Vacuum and miniature circuit breakers, Testing of circuit breakers.

UNIT - V

Gas Insulated Substations and Over Voltage Protection: Constructional details (components), Merits and demerits, Protection of lines against direct lightning strokes – ground wires - Protection angle Protection zone - Tower footing resistance and its effects - Equipment protection assuming rod gaps, arcing horns - Different types of lightning arresters - their construction Surge absorbers - Peterson coil – Insulation Coordination.

TEXTBOOKS:

1. Wadhwa C.L, Electrical Power System, Wiley Eastern Ltd., 2022.
2. Badriram, Viswakarma, Power System Protection and Switchgear, Tata McGraw Hill, 2003.
3. Sunil S. Rao, Switchgear and Protection, Khanna Publications, 2000.

REFERENCES/SUGGESTEDREADING:

1. M.S. Naidu, Gas Insulated Substations, I.K. int. Publishing House Pvt. Ltd. - 2008
2. Fundamentals of Power Sytem Protection, Y.G.Paithankar, S.R.Bhide PHI Learning Private Limited - 2009.
3. Principles of power systems by VK.Metha , Rohit Mehta, S.Chand & Company Ltd, 8th Edition
4. A course in Power Systems by J.B.Gupta, S.K.Kataria& sons 11th Edition 2016.

Course Code	Course Title	Core/Elective					
4PC613EE	POWER ELECTRONIC CONTROL OF ELECTRICAL DRIVES	Core					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES:

The objective of this course is to make the student

1. Apply the concepts of power electronic circuits to various motors.
2. Understand the operation of various drives.
3. Control DC motors and AC motors fed by various power electronic circuits.

COURSE OUTCOMES :

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

1. Apply the concepts of rectifiers to analyze DCMotor.
2. Control DC motors with Dual converters.
3. Apply chopper concepts to analyze DC motors.
4. Apply AC voltage regulator concepts to analyze Induction motors.
5. Explain the synchronous motor operation fed by inverters.

UNIT – I :

Control of DC Motors through Phase Controlled Rectifiers: Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics.

Three phase semi and fully controlled converters connected to DC separately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

UNIT – II:

Four Quadrant Operation of DC Drives through Dual Converters: Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of DC motors by dual converters – Closed loop operation of DC motor.

UNIT-III:

Control of DC Motors by Choppers: Single quadrant, Two –quadrant and four quadrant chopper fed DC separately excited and series excited motors – Continuous current operation – Output voltage and current wave forms – Speed torque expressions – speed torque characteristics – Closed Loop operation ,Problems, BLDC Motor construction and control methods.

UNIT –IV:

Control of Induction Motors : Control of Induction Motor by AC Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency characteristics: Variable frequency control of induction motor by Voltage source and current source inverter, cyclo-converters PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – Closed loop operation of induction motor drives Static, problems. Rotor resistance control: Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages applications – problems.

UNIT – V:

Control of Synchronous Motors: Separate control &self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI and CSI cyclo converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cyclo converter, PWM, VFI, CSI.

TEXTBOOKS:

1. Fundamentals of Electrical Drives , G.K Dubey, Narosa Publications
2. Power Electronics: Circuits, Devices, and Applications' by M. H. Rashid, Pearson Education India, 2014.
3. Power Electronics byDr. P.S Bimbhra, Khanna Publishers, 2013.

REFERENCES/SUGGESTEDREADING:

1. Power Electronics: Converters, Applications and Design by N. Mohan and T.M. Undeland, John Wiley& Sons, 2007.
2. Fundamentals of Power Electronics by R.W. Erickson and D. Maksimovic, Springer Science & Business Media, 2007.
3. Power Electronics: Essentials and Applications byL. Umanand, WileyIndia, 2009.

Course Code	Course Title	Core/Elective					
4PC614EE	MICROPROCESSOR AND MICRO CONTROLLERS	Core					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To be able to understand in details about 8086 microprocessor architecture, programming and interfacing.
2. To be able to understand about 8051 microcontroller architecture, an programming.

COURSE OUTCOMES :

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

1. Explain the architecture of 8086.
2. Analyze the applications by writing the assembly language programs.
3. Explain the interfacing of Microprocessor.
4. Explain types of microcontrollers and their applications.
5. Knowledge on ARM Architecture.

UNIT-I

Microprocessor: Architecture of 8086 – Segmented memory, Addressing modes, Instruction set, Minimum and maximum mode operations.

UNIT-II

Introduction to Programming: Assembly language programming, Assembler directives, Simple programs using assembler, Strings, Procedures, Macros timing.

UNIT-III

Interfacing to Microprocessor: Memory and I/O interfacing, A/D and D/A interfacing, 8255(PPI), Programmable Internal Timer (8253), Keyboard and display interlace, Interrupts of 8086.

UNIT - IV

Micro Controller Architecture: Types of Micro Controllers, 8051 MC – Architecture input/output pins, Port and circuits, Internal and external memories, counters and timers, serial data input/output, Interrupts & timers.

UNIT - V

Introduction to Programming: Basic Assembly language programming, instruction cycle, Addressing modes,8051 instruction set, Classification of instructions, Simple programs.

Introduction to ARM Controller: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012.

REFERENCES/SUGGESTEDREADING:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.
2. Introduction to Embedded Systems, Shibu K.V, MHE, 2009.
3. The 8051 Microcontrollers, Architecture and Programming and Applications - K.Uma Rao, AndhePallavi, Pearson, 2009.

Course Code	Course Title	Core/Elective					
4ES606EC	SIGNALS & SYSTEMS	Core					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. Analyze basic concepts related to continuous time signals and systems, mathematical representation of periodic signals.
2. Familiarize with basic operations on signals and mathematical representation of a periodic signals using Fourier and Laplace transform.
3. Analyze basic concepts related to discrete time signals and systems, mathematical representation discrete time signals.
4. Describe the concept of Z- Transform and its properties and illustrate their applications to analyze systems.
5. Define convolution operations on continuous and discrete time signals.

COURSE OUTCOMES :

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

1. Define and differentiate types of signals and systems in continuous and discrete time
2. Apply the properties of Fourier transform for continuous time signals
3. Relate Laplace transforms to solve differential equations and to determine the response of the Continuous Time Linear Time Invariant Systems to known inputs
4. Apply Z-transforms for discrete time signals to solve Difference equations
5. Analyze Linear and circular Convolution on of discrete time signals with graphical representation.

UNIT - I

Introduction to continuous time signals: Elementary basic time signals, Basic operations on continuous-time signals. Classification of continuous time signals.

Introduction to discrete-time signals: Sampling and Sampling Theorem, Classification of discrete time signals.

UNIT - II

Behavior of continuous and discrete-time LTI systems: System properties: linearity: additive and homogeneity, shift- invariance, causality and stability. Linear and circular convolution, properties of convolution. System representation through differential equations and difference equations.

UNIT - III

Frequency domain representation of continuous time signals: Fourier series– Existence of Fourier series, Trigonometric and Exponential Fourier series.

Fourier Transform: The direct and inverse FT, existence of FT, Properties of FT, FT of standard signals, properties of FT.

UNIT - IV

Laplace transforms: The direct LT, Region of convergence, existence of LT, properties of LT. The inverse LT, Solution of differential equations, system transfer function.

UNIT - V

Z-Transforms: The direct Z transforms, Region of convergence, Z-plane and S-plane correspondence, Properties of Z- transforms. Inverse Z transforms System transfer function. Solution to linear difference equations.

TEXTBOOKS :

1. A. NagoorKani, Signals and Systems, Tata McGraw Hill, 2011.
2. P. Ramesh babu, R Ananada Natarajan, “Signals and Systems”, SCITECH, 3rd edition, 2009.

REFERENCES/SUGGESTED READING :

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, Signals and systems, Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, anApplications, Pearson, 2006.
3. H. P. Hsu, Signals and systems, Schaum‘s series, McGraw Hill Education, 2010.

Course Code	Course Title	Core/Elective					
4PE604EE	ENERGY STORAGE SYSTEMS (PROFESSIONAL ELECTIVE – II)	Elective					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

1. Outline energy storage technologies
2. Discuss types of energy storage systems.
3. Compare the energy storagesystems.

COURSE OUTCOMES:

After completing this course, the student will be able to

1. Understand the need of EnergyStorage Systems.
2. Know the principles of energy managementtechnologies.
3. Analyze the features of energy storagesystems.
4. Compare the different Electrical Energy storage systems.
5. Applications of energy storagesystems.
6. Understand technologies of energy management systems.

UNIT - I

Need for Electrical Energy Storage : Need for continuous and flexible supply, Emerging needs for EES in More renewable energy, with Less fossil fuel, advantage with usage of Smart grid, EES need in Long distance between generation and consumption, EES for Decongestion of power grids for peak loads, EES need for Transmission by cable.

UNIT - II

Roles of Electrical Energy Storage Technologies: Characteristics of electrical energy storage system (EES) and the roles of EES, High generation cost during peak-demand periods, The roles of electrical energy storage technologies , EES roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT - III

Features of energy storage systems : Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage

(CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT - IV

Types of Electrical Energy storage systems: Ultra capacitors, Super conducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies. Electrical output characteristics (output voltage Vs output load current) of ESS. Battery charging methods.

UNIT - V

Applications : Present status of applications in Utility use (Conventional power generation, Grid operation & Service), Consumer use (Uninterruptable power supply for large consumers), Renewable energy generation, Smart grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems. power electronics based battery chargers.

TEXTBOOKS:

1. A.G.Ter-Gazarian, "Energy Storage for Power Systems", Second Edition, The Institution of Engineering and Technology (IET) Publication, UK, (ISBN - 978-1- 84919-219-4),2011.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt," Energy Storage in Power Systems" Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016.

REFERENCES / SUGGESTED READING:

1. Electric Power Research Institute (USA), "Electricity Energy Storage Technology Options: A White Paper Primer on Applications, Costs, and Benefits" (1020676), December 2010.
2. Paul Denholm, Erik Ela, Brendan Kirby and Michael Milligan, "The Role of Energy Storage with Renewable Electricity Generation", National Renewable Energy Laboratory (NREL) -a National Laboratory of the U.S. Department of Energy.
3. P. Nezamabadi and G. B. Gharehpetian, "Electrical energy management of virtual power plants in distribution networks with renewable energy resources and energy storage systems", IEEE Power Distribution Conference, 2011.

Course Code	Course Title	Core/Elective					
4PE605EE	ELECTRIC VEHICLES	Elective					
	(PROFESSIONAL	L	T	P/D	Credits	CIE	SEE
	ELECTIVE – II)	3	0	0	3	40	60

COURSE OBJECTIVES:

The objective of this course is to make the student

1 Know the history of electric hybrid electric vehicles (EV & HEV) and emphasize the need andimportance of EV-HEV for sustainable future.

2 Introduce the fundamental concepts and principles of electric and hybrid electric vehicles drivetrain topologies.

3 Develop a thorough understanding of the key elements of EV/HEV: Electric Machines forPropulsion Applications and Energy Sources.

COURSE OUTCOMES:

At the end of the course students will be able to

1. To identify and describe the history and evolvement of electric & hybrid electric vehicles toemphasize on the need and importance of EV/HEV for sustainable future.
2. To identify and describe the principles of various EV/HEVs drive train topologies along with their power flow control and fuel efficiency estimation.
3. To design and select electric propulsion system components for EV/HEV drives suitability for the desirable performance and control.
4. To compare and evaluate various energy sources and energy storage components for EV and HEV applications.
5. Select various types of propulsion units and their control depending upon the application.

UNIT - I

Introduction : Basics of vehicles mechanisms, history of electric vehicles (EV) and hybrid electric vehicles (HEV), need and importance of EV and HEV, Power/Energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics. Vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

UNIT - II

Drive-Train Topologies: Review of electric traction, configuration of HEV: Series, Parallel, Series -Parallel and Complex configurations, basics of hybrid traction system, various hybrid drive-train topologies, power flow control in drive-train topologies, fuel efficiency analysis.

UNIT - III

Electrical Machines and Power Converters for Hybrid and Electric Vehicles: Electric system components for EV/HEV, suitability of DC and AC machines for EV/HEV applications, AC and DC Motor drives. Permanent magnet and switch reluctance machines, configuration and control of drives. Power Converters- Converters for EV and HEV applications.

UNIT - IV

Energy Sources for EV/HEV: Requirements of energy supplies and storage in EV/HEV, Review of batteries, fuel cells, flywheels and ultra-capacitors as energy sources for EV/HEV, characteristics and comparison of energy sources for EV/HEV, hybridization of different energy sources.

UNIT - V

Electric Vehicles Charging Station: Type of Charging station, Selection and Sizing of charging station, Components of charging Station and Single line diagram of charging station. Contactless inductive charging- Stationary Inductive charging, resonant and compensation circuit topologies.

TEXTBOOKS:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiely, USA, 2012.
2. Iqbal Hussain, Electric & Hybrid Vehicles – Design Fundamentals, 2nd Edition, CRC Press, 2011.

REFERENCES/SUGGESTEDREADING:

1. Chris Mi, M. Abdul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspective, Wiely, 2011.
2. SimoraOnori, Hybrid Electric Vehicles Energy Management Strategies, Springer.

Course Code	Course Title	Core/Elective					
4PE606EE	SELF-STUDY COURSE	Elective					
	(PROFESSIONAL	L	T	P/D	Credits	CIE	SEE
	ELECTIVE – II)	3	0	0	3		

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To foster self-directed learning environments to expand students' autonomy, encourage them to completetheir weekly assignments, and provide opportunities for students with limited computer and language skills.
2. To facilitate large-scale interactive participation and open access via theweb.
3. To ensure that all students with different personal and academic characteristics are able to follow the course information.
4. To use peer and self-assessment for formative evaluation in conjunction with rubrics or other form of guidance to improve both students' learning and the accuracy of their assessments.

COURSE OUTCOMES :

After completing this course, the student will be able to

1. Enables the student anywhere to study free in higher education.
2. To help build a communityfor the students, professors, and teaching assistants (TAs).
3. Increases students' commitment and participation.
4. Provide clear and structured assessments, and design the assessments by taking into account the students' profile.
5. Provide opportunities for students to manage their own time in order to develop their intrinsic motivation and commitment to the course.

Professional Elective:

- IoTs
- Smart Electric Grid
- Extra High Voltage AC and DC Transmission
- Sensor and Transducers Technology
- Certification through Massive Open Online Courses (MOOCs) (Min. 8 weeks)

Massive Open Online Courses (MOOCs) are online courses available for anyone to enroll. MOOCs provide an affordable and flexible way to learn new skills, advance your career and deliver quality educational experiences at scale.

Suggested MOOCS Certification Platforms (but not limited to):

- Swayam NPTEL Course
- edX (formerly MITX, created by the Massachusetts Institute of Technology (MIT) in 2001)
- Open2Study
- Coursera
- FutureLearn
- Udacity
- Udemy
- Khan Academy
- Canvas
- Open Education Europa
- The Open University

Guidelines for Registration of Self-Study Course:

1. Approval should have been obtained from Departmental HOD and Course Coordinator to enrolfor the self study* in the previous semester.
2. The syllabus and evaluation methodology of the self study course shall be specified by the Departmental Committee and approved byHOD.
3. No formal lectures will be delivered for such course.
4. One credit can be earned through self-study course, subject to the approval of HOD.
5. Registration for self-study course has to be done in the current semester along with other courses.
6. The student undergoing self study course can be evaluated through Continuous Assessments and End Semester Examination or MOOCS Certification, as approved by HOD.
7. A faculty member identified by the HOD will be responsible for the evaluation of thecourse.

Course Code	Course Title	Core/Elective					
1OE602EE	DEEP LEARNING (OPEN ELECTIVE – II)	Elective					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. Develop and Train Deep Neural Networks.
2. Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and recognition
3. Build and train RNNs, work with NLP and Word Embeddings
4. The internal structure of LSTM and GRU and the differences between them

COURSE OUTCOMES:

At the end of the course students will be able to

1. Feature Extraction from Image and Video Data
2. Implement Image Segmentation and Instance Segmentation in Images
3. Implement image recognition and image classification using a pre trained network (Transfer Learning)
4. Traffic Information analysis using Twitter Data
5. Auto encoder for Classification & Feature Extraction

UNIT - I

Fundamentals about Deep Learning. Perception Learning Algorithms. Probabilistic modeling. Early Neural Networks. How Deep Learning different from Machine Learning. Scalars. Vectors. Matrixes, Higher Dimensional Tensors. Manipulating Tensors. Vector Data. Time Series Data. Image Data. Video Data.

UNIT - II

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre- processing for neural networks, Feature Engineering. Over fitting and Under fitting. Hyper parameters.

UNIT - III

About CNN. Linear Time Invariant. Image Processing Filtering. Building a convolutional neural network. Input Layers, Convolution Layers. Pooling Layers.

Dense Layers. Back propagation Through the Convolutional Layer. Filters and Feature Maps. Back propagation Through the Pooling Layers. Dropout Layers and Regularization. Batch Normalization. Various Activation Functions. Various Optimizers. LeNet, Alex Net, VGG16, ResNet. Transfer Learning with Image Data. Transfer Learning using Inception Oxford VGG Model, Google Inception Model, and Microsoft ResNet Model. RCNN, Fast R-CNN, Faster R- CNN, Mask-RCNN, YOLO.

UNIT - IV

About NLP & its Toolkits. Language Modeling. Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip- Gram Model for Word Embedding. Part of Speech (PoS) Global Co occurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation Glove. Back propagation Through Time. Bidirectional RNNs (BRNN) . Long Short Term Memory (LSTM). Bi-directional LSTM. Sequence-to- Sequence Models (Seq2Seq). Gated recurrent unit GRU.

UNIT - V

About Deep Reinforcement Learning. Q-Learning. Deep Q-Network (DQN). Policy GradientMethods. Actor-Critic Algorithm. About Auto encoding. Convolutional Auto Encoding. Variational.

TEXTBOOKS:

1. Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media, Inc.2017
2. Learn Keras for Deep Neural Networks, JojoMoolayil, Apress,2018
3. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020.

REFERENCES/SUGGESTEDREADING:

1. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND, 2017
2. Pro Deep Learning with Tensor Flow, Santanu Pattanayak, Apress, 2017.

Course Code	Course Title	Core/Elective					
2OE602CE	GREEN BUILDING TECHNOLOGIES (OPEN ELECTIVE-II)	Elective					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To impart knowledge of the principles behind the green building technologies
2. To know the importance of sustainable use of natural resources and energy.
3. To understand the principles of effective energy and resources management in buildings.
4. To bring awareness of the basic criteria in the green building rating systems.
5. To understand the methodologies to reduce, recycle and reuse towards sustainability.

COURSE OUTCOMES :

At the end of the course students will be able to

1. Define a green building, along with its features, benefits and rating systems.
2. Describe the criteria used for site selection and water efficiency methods.
3. Explain the energy efficiency terms and methods used in green building practices.
4. Select materials for sustainable built environment & adopt waste management methods.
5. Describe the methods used to maintain indoor environmental quality.

UNIT - I

Introduction to Green Buildings: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc.

Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT III

Energy Efficiency: Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy.

Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT - IV

Building materials: Methods to reduce embodied energy in building materials: (a)Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolona cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials

Waste Management: Handling of construction waste materials, separation of household waste, on-site and off- site organic waste management.

UNIT - V

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Day lighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics.

Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

TEXTBOOKS:

1. Michael Bauer, Peter Mösle and Michael Schwarz "Green Building – Guidebook for Sustainable Architecture" Springer, 2010.
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.

REFERENCES/SUGGESTEDREADING:

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.

Course Code	Course Title	Core/Elective					
3OE602CS	SOFTWARE ENGINEERING (OPEN ELECTIVE-II)	Elective					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. Describe and compare various software development methods and understand the context in which each approach might be applicable
2. To impart knowledge on various phases, methodologies and practices of software development
3. To apply the project management and analysis principles to software project development
4. To understand the importance of testing in software development, study various testing strategies along with its relationship with software quality and metric
5. To apply the design & testing principles to software project development.

COURSE OUTCOMES :

At the end of the course students will be able to

1. Acquired working knowledge of alternative approaches and techniques for each phase of SDLC.
2. Judge an appropriate process model(s) for software project attributes and analyze requirements for project development.
3. Acquire skills necessary as an independent or as part of a team for architecting a complete software project by identifying solutions for recurring problems exerting.
4. Concede product quality through testing techniques employing appropriate metrics by understanding the practical challenges associated with the development of a significant software system.
5. Apply the software engineering principles in real time project development.

UNIT-I

Introduction to Software : What is software? Types of software, Characteristics of Software Attributes of good software. **Software Engineering:** What is software

engineering, Software engineering costs? What are the key challenges facing software engineering, Systems engineering & software Engineering, SDLC.

Software Development Process Models: prescriptive Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Models, Personal and Team Process Models, Process Technology, Product and Process.

UNIT - II

Software Engineering Principles: SE Principles, Communication Principles, Planning Principles, Modelling Principles, Construction Principles, Deployment.

Software Requirement Analysis and Specification: System and software requirements, Types of software requirements, Elicitation and analysis of requirements, Requirement validation, Requirements specification, Feasibility.

UNIT - III

Building the Analysis Model: Data Modelling Concepts, Object-Oriented Analysis, Scenario-based Modelling, Flo oriented Modelling, Class-based Modelling.

Design Engineering: Design Process and Quality, Design Concepts, the Design Model.

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT - IV

Creating an Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design.

Coding: Programming languages and development tools, Selecting languages and tools Good programming practices, Coding Standards

UNIT - V

Software Testing and Quality Assurance: Verification and validation Techniques of testing Black-box and White- box testing Inspections Levels of testing Unit testing, Integration Testing, Interface testing, System testing, Alpha and beta testing, Regression testing Design of test cases, Quality management activities: Product and process quality Standards, ISO900, Capability Maturity Model (CMM), Risk management.

Debugging: Debugging Techniques, The Art of Debugging.

Current trends in Software Engineering Software Engineering for projects and products.

TEXTBOOKS:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, VII Edition, McGraw Hill, 2009.
2. Software Engineering by Ian Sommerville, VII edition, Addison-Wesley.
3. Fundamentals of Software Engineering by Rajib Mall.

REFERENCES/SUGGESTEDREADING:

1. Ali Behforooz and Frederick J. Hudson, Software Engineering Fundamentals, Oxford University Press, 1996.
2. Pankaj Jalote, An Integrated Approach to Software Engineering, III Edition, Narosa Publishing House, 2000.

Course Code	Course Title	Core/Elective					
4OE602EE	ELECTRIC VEHICLES TECHNOLOGY (OPEN ELECTIVE – II)	Elective					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1 Know the history of electric hybrid electric vehicles (EV & HEV) and emphasize the need and importance of EV-HEV for sustainable future.

2 Introduce the fundamental concepts and principles of electric and hybrid electric vehicles drive train topologies

3 Develop a thorough understanding of the key elements of EV/HEV: Electric Machines for Propulsion Applications and Energy Sources.

COURSE OUTCOMES :

At the end of the course students will be able to

1. To identify and describe the history and evolvement of electric & hybrid electric vehicles to emphasize on the need and importance of EV/HEV for sustainable future.
2. To identify and describe the principles of various EV/HEVs drive train topologies along with their power flow control and fuel efficiency estimation.
3. To design and select electric propulsion system components for EV/HEV drives suitability for the desirable performance and control.
4. To compare and evaluate various energy sources and energy storage components for EV and HEV applications.
5. Select various types of propulsion units and their control depending upon the application.

UNIT - I

Introduction : History of electric vehicles (EV) and hybrid electric vehicles (HEV), need and importance of EV and HEV, Power/Energy supplies requirements for EV/ HEV applications, vehicle power source characterization, and transmission characteristics. Vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion.

UNIT - II

Drive-Train Topologies: Series, Parallel, Series -Parallel and Complex configurations of HEV, basics of hybrid traction system, various hybrid drive-train topologies, power flow control in drive-train topologies, fuel efficiency analysis.

UNIT - III

Electrical Machines and Power Converters for Hybrid and Electric Vehicles : Electric system components for EV/HEV, suitability of DC and AC machines for EV/HEV applications, AC and DC Motor drives. Permanent magnet and switch reluctance machines, configuration and control of drives. Power Converters- Converters for EV and HEV applications.

UNIT - IV

Energy Sources for EV/HEV: Requirements of energy supplies and storage in EV/HEV, Review of batteries, fuel cells, flywheels and ultra-capacitors as energy sources for EV/HEV, characteristics and comparison of energy sources for EV/HEV, hybridization of different energy sources.

UNIT - V

Electric Vehicles Charging Station: Type of Charging station, Selection and Sizing of charging station, Components of charging Station and Single line diagram of charging station. Contactless inductive charging- Stationary Inductive charging, resonant and compensation circuit topologies.

TEXTBOOKS :

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiely, USA, 2012.
2. Iqbal Hussain, Electric & Hybrid Vehicles – Design Fundamentals, 2nd Edition, CRC Press, 2011.

REFERENCES/SUGGESTEDREADING :

1. Chris Mi, M. Abdul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspective, Wiely, 2011
2. Simora Onori, Hybrid Electric Vehicles Energy Management Strategies, Springer.

Course Code	Course Title	Core/Elective					
5OE602EC	FUNDAMENTALS OF IOT (OPEN ELECTIVE –II)	Elective					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To introduce the fundamentals, applications and requisite infrastructure of IoT.
2. To describe Internet principles and communication technologies relevant to IoT.
3. To discuss hardware and software aspects of designing an IoT system.
4. To explain the concepts of cloud computing and data analytics.
5. To illustrate the business models and manufacturing strategies of IoT products.

COURSE OUTCOMES :

At the end of the course students will be able to

1. Understand the various applications of IoT and other enabling technologies.
2. Comprehend various protocols and communication technologies used in IoT.
3. Construct simple IoT systems with requisite hardware and p ythonprogramming.
4. Understand the relevance of cloud computing and data analytics to IoT.
5. Apply the business model of IoT from developing a prototype to launching aproduct.

UNIT-I

Introduction to Internet of Things: Introduction to Internet of Things: Physical Design of IoT: Things in IoT, IoT protocols, Logical Design of IoT: IoT functional Blocks, Communication Models, APIs, IoT enabling technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, IoT Applications: Smart Home, Smart Cities, Smart Environment, Smart Energy, Smart Retail and logistics, Smart Agriculture and Industry, Smart Industry and smart Health

UNIT - II

Internet Principles and communication technology: Internet Communications: An Overview –IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addresses TCP and UDP Ports, Application Layer Protocols – HTTP, HTTPS,

UNIT - III

Prototyping and Programming: Cost Vs Ease of Production, Prototypes and Production, Open-Source Vs Closed Source. Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling.

Introduction to Python, Data Types and Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/Time Operations., Classes, Python packages for IoT, IoT Physical Devices and Endpoints: Raspberry Pi, Interfaces of Pi, Programming pi with Python - Controlling LED and LDR using Pi with python programming.

UNIT - IV

Cloud computing and Data analytics: Introduction to Cloud storage models -SAAS, PAAS, IAAS. Communication APIs, Amazon web services for IoT, Skynet IoT Messaging Platform. Introduction to Data Analytics for IoT - Apache Hadoop- Map reduce job execution workflow.

UNIT V

IoT Case Studies: Case studies illustrating IoT Design – Smart Lighting, Weather Monitoring, Smart Irrigation, Business model for IoT product manufacturing, IoT Startups, Mass manufacturing, Ethical issues in IoT.

TEXTBOOKS:

1. Internet of Things - Converging Technologies for smart environments and integrated ecosystems, River Publishers.
2. Adrian McEwen (Author), Hakim Cassimally, “Designing the Internet of Things”, Wiley India Publishers

REFERENCES/SUGGESTEDREADING:

1. Fundamentals of Python, Kenneth A Lambert and B.L. Juneja, Cenage Learning.
2. Internet of Things (A Hands-on-Approach), Vijay Madisetti, Arshdeep Bahga, VPT Publisher, 1st Ed., 2014.

Course Code	Course Title	Core/Elective					
6OE602ME	3D PRINTING	Elective					
	TECHNOLOGIES	L	T	P/D	Credits	CIE	SEE
	(OPEN ELECTIVE –II)	3	0	0	3	40	60

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To understand the fundamental concepts of 3D Printing, its advantages & limitations.
2. To know the various types of STL file errors and other data formats used in additive manufacturing Technology.
3. To know the working principle, advantages, disadvantages & applications of liquid, solid and powder based 3D Printing technologies.
4. To know the diversified applications of 3D Printing technologies and explore them in different industrial sectors.

COURSE OUTCOMES :

At the end of the course students will be able to

1. Describe the fundamentals of 3D printing, classify and explain advantages and disadvantages of 3D Printing technologies.
2. Select the suitable CAD data formats and software used in 3D Printing technology.
3. Describe the operating principles, capabilities and limitations of liquid, solid & powder based 3D Printing Technologies.
4. Compare different 3D printing technologies based on their process capabilities and applications.
5. Apply the capabilities and knowledge of 3D printing in different industrialsectors.

UNIT - I

Prototyping Fundamentals: Historical Development, Fundamentals of 3D Printing, Advantages and Limitations of 3D Printing, commonly used terms, 3D Printing Process Chain, 3D Modeling, Data conversion and transmission, Checking & Preparing, Building, Post processing, Classification of 3D Printing processes,

Fundamental Automated Processes, Distinction between 3D Printing and Conventional Machining Processes.

Data Formats & Software: Data formats; conversion and transmission, STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs, Newly Proposed Formats. Software's Features: Magics, Mimics, Solid View, Cura, ITK Snap.

UNIT - II

Liquid based Systems: Stereo Lithography Apparatus (SLA) Models and Specifications, Process, working principle, photopolymers, photo polymerization, Layering Technology laser and laser scanning, Applications, Advantages and Disadvantages Poly jet: Models and Specifications, Process, working principle, Applications, Advantages and Disadvantages Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages.

UNIT - III

Solid-based Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages. Multi Jet Modeling (MJM): Models and specifications, Process, Working principle, Applications, Advantages and Disadvantages.

UNIT - IV

Powder Based Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages. **Three Dimensional Printing (3DP):** Models and Specifications, Process, working principle, Applications, Advantages and Disadvantages. **Laser Engineered Net Shaping (LENS):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages.

UNIT - V

Applications of 3D Printing : Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Electronic Industry, Jewellery Industry, Coin Industry, GIS application, Construction field, Arts and Architecture, Pattern for investment and vacuum casting, Medical Models

and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production. Medical Devices, Forensic Science and Anthropology and Web Based Rapid Prototyping Systems.

TEXTBOOKS:

1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" Fifth edition, World scientific
2. 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing" Springer, Second Edition.

REFERENCES/SUGGESTEDREADING:

1. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies:
2. Frank W. Liou, "Rapid Prototyping & Engineering Applications"- CRC Press, Taylor & Francis Group.
3. Rafiq Noorani, "Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley & Sons.

Course Code	Course Title	Core/Elective					
4PC656EE	ELECTRICAL MACHINES - II LAB	core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60

COURSE OBJECTIVES:

The objectives of this course is to impart knowledge of

1 To learn operation and performance characteristics of induction machines by conducting variousexperiments and tests practically.
2 To understand the operation and performance characteristics of synchronous machines by conducting various experiments and tests.

COURSE OUTCOMES :

After completing this course, the student will be able to

1. Understand Performance characteristics of single-phase induction motor.
2. Analyze the performance of Three-phase induction motor by conducting No load, blocked rotor and Brake test.
3. Understand the speed control methods of 3-Phase Induction Motor and BLDC motor.
4. Understand the importance of Voltage regulation of an alternator.
5. Explain different methods used to measure the voltage regulation of an alternator.

LIST OF EXPERIMENTS :

1. Brake test on a 3 phase Induction Motor
2. No load & blocked rotor tests on a 3 phase Induction Motor.
3. Equivalent circuit of a single phase Induction Motor.
4. Regulation of a three phase alternator by Synchronous Impedance & MMF methods
5. Regulation of 3 phase alternator by ZPF method
6. V & inverted V curves of a three phase synchronous motor.
7. Determination of Xd&Xq of a salient pole synchronous machine.
8. Speed control of 3-phase induction motor by rotor resistance control method
9. Power factor improvement of 3-phase induction motor using capacitors
10. Power angle characteristics of synchronous machine
11. Speed control of BLDC motor

Note: At least 10 experiments should be conducted.

SUGGESTEDREADING:

1. P. S. Bimbhra, Electrical Machinery, 7th Edition, Khanna Publishers,2011.
2. J.B. Gupta. Theory & Performance of Electrical Machines Publishedby S.K. Kataria& Sons, 2015 Edition.
3. I. J. Nagrath and D. P. Kothari, Electric Machines, 5th Edition, McGrawHill Education, 2017.

Course Code	Course Title	Core/Elective					
4PC657EE	POWER ELECTRONICS AND DRIVES LAB	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60

COURSE OBJECTIVES :

The objectives of this course is to make student

1. Study various power electronic devices and its characteristics
2. Study firing and commutation circuits of SCR.
3. Study various power electronic circuits and its applications.

COURSE OUTCOMES:

After completion of this course student should be able to:

1. Analyze the characteristics of SCR.
2. Analyze firing and commutation circuits of SCR.
3. Analyze various power electronic circuits.
4. Analyze the operation of various motors fed by power electronic circuits
5. Simulate various power electronic circuits fed motors using MATLAB/ SIMULINK software.

LIST OF EXPERIMENTS

1. Static Characteristics of SCR.
2. R, RC, UJT Firing circuits for SCR.
3. Commutation circuits of SCR.
4. Single-phase half-controlled and fully-controlled rectifiers with R and RL loads.
5. Single-phase AC voltage regulators with R and RL loads.
6. Single-phase cyclo-converters with R and RL loads.
7. MOSFET based Chopper.
8. V/f control of induction motor.
9. Simulation of AC Chopper.
10. Simulation of DC motor control using rectifiers.
11. Simulation of DC motors control using choppers.
12. Simulation of three-phase inverter for 120 and 180 degree mode of operation

Note: At least 10 experiments should be conducted.

SUGGESTEDREADING:

1. Fundamentals of Electrical Drives , G.K Dubey, Narosa Publications
2. Power Electronics: Circuits, Devices, and Applications' by M. H. Rashid, Pearson Education India, 2014. 3.Power Electronics byDr. P.S Bimbhra, Khanna Publishers, 2013.

Course Code	Course Title	Core/Elective					
4PC657EE	SOFT SKILLS LAB	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60

COURSE OBJECTIVES :

The objectives of this course is to impart knowledge of

1. To enable the students to listen to different speakers in different contexts for various purposes and learn target language expressions.
2. To enable the students to develop confidence and interactive skills to speak professionally in different situations.
3. To enable students to learn and develop various reading skills and strategies.
4. To enable the students to develop written expression of thought and provide opportunities to explore ideas by utilizing various techniques.
5. To equip the students to develop needed confidence and interactive skills to speak professionally and acquire skills to face any Interview.

COURSE OUTCOMES :

After completing this course, the student will be able to

1. Listen to a variety of speakers and texts and will be able to comprehend and perform the required tasks.
2. Interact in a group professionally and communicate confidently in terms of both the spoken and written communication.
3. Develop the skills and strategies of reading and writing.
4. Face any Interview confidently by managing time, making decisions by speaking appropriately according to the context.
5. Demonstrate right attitude and right skills to cope with team and communicate professionally.

LIST OF EXPERIMENTS

I. Listening Skills

- Listening to different situations by Native Speakers.
- Listening to Conversations.
- Listening to Motivational Speeches.

II. Speaking Skills

- Describing a person or a place or a thing using relevant adjectives.
- Picture Perception
- Oral Presentations.
- Etiquette in different situations.

III. Reading Skills

- Reading different Texts
- Reading Comprehension Passages.
- Skimming and Scanning
- Paraphrasing.

IV. Writing Skills

- Writing Slogans related to the image.
- Communicating on Social Media.

V. Interview Skills

- Skills required to attend an Interview
- Soft Skills to be demonstrated in a Job Interview.
- Debates and Group discussions.

SUGGESTEDREADING :

1. Andrea J. Rutherford. Basic Communication Skills for Technology. Pearson Education. Inc. New Delhi.
2. Antony Jay and Ros Jay. Effective Presentation. How to be a Top Class Presenter. Universities Press.(India) Limited.1999.
3. Robert M Sherfield and etal. "Developing Soft Skills" 4th edition, New Delhi: Pearson Education, 2009.
4. M.Ashraf Rizvi Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited. New Delhi.

Course Code	Course Title	Core/Elective					
4PW651EE	MINI PROJECT SEMINAR	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60

COURSE OBJECTIVES:

The objectives of this course is to impart knowledge of

1. The student(s) shall explore the technological needs of society.
2. The student(s) shall understand the technological problems of society.

COURSE OUTCOMES :

After completion of this course student should be able to:

1. The student(s) is able to provide a solutions the technological problems of society.
2. The student(s) is able suggest technological changes which suits current needs of society.
3. The student(s) is able to explain new technologies available for problems of the society.

Preamble :

There is lot of scientific and technological changes in the nation during last few decades in almost all the sectors. The state and central governments are introducing many schemes to all classes of people of the nation to increase the productivity in various sectors. India is a rural centric nation and the fruits of the scientific inventions and new technology shall be shared among all remote corners of the nation. With this aim, a socially relevant project is newly introduced in the curriculum with an objective of taking up the projects relevant to the societal needs.

General guidelines :

- A socially relevant project (Mini Project) shall be a community service based project and it shall be innovative.
- A student has to pursue the socially relevant project to solve real life and pressing problems of society.
- The pursued socially relevant projects shall contribute to national development goals and priorities.

- Socially relevant project can be carried out by an individual student or by a team of maximum five (05) of the department.
- The student(s) shall visit the society (Villages/Hospitals/Social Service Organizations etc.) to identify the problem, conduct literature survey, and provide a feasible solution through fabricated models.
- The socially relevant project selected shall be in the broad area of concerned discipline of course. Preference shall be given to rural societal problems.
- Each team shall work under the supervision of a faculty member of the concerned department.
- The duration of the project is about 15 to 20 hrs in total and students may split total duration into 2hrs per week based on convenience. The attendance shall be maintained by the respective supervisor.
- The developed solutions will be assessed by the Department and shall be evaluated for 40 Marks.
- Additional 10 Marks will be awarded for the outcome based (Patents, Journal Publications, Conference Proceedings, Technical Seminar Presentations, Design Registrations, etc.) Projects.

Sample Projects (but not limited to):

- A solar-powered cell phone charger, while learning about batteries, solar cells, power, and efficiency.
- A programmable “useless box”, which is a silly toy to play with on your desk. While building thisproject, you will use switches, motors, transistors, digital logic, and learn to control physical thingswith software.
- An LED display, which uses the idea of multiplexing to control more lights than your microcontrollerhas outputs.
- An electrocardiogram (ECG) to measure your heartbeat. You will learn how to build an amplifiercapable of magnifying the tiny electrical signal from your heart into something your microcontrollercan measure.

Course Code	Course Title	Core/Elective					
4PW701EE	SUMMER INTERNSHIP	Core					
		L	T	P/D	Credits	CIE	SEE
		4-6 weeks duration					

COURSE OBJECTIVES :

The objectives of this course is to impart knowledge of

1. Produce an accurate record of work performed during the Internship/Co-op
2. Apply engineering knowledge to a problem in industry.
3. Produce a technical report.
4. Discuss work in a team environment, if relevant to the project.
5. Conduct herself/himself responsibly, safely, and ethically in a professional environment.

COURSE OUTCOMES:

After completion of this course student should be able to:

1. Get Practical experience of software design and development, and coding practices within Industrial/R&D Environments.
2. Gain working practices within Industrial/R&D Environments.
3. Prepare reports and other relevant documentation.

Summer Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Government or Private Organizations/Computer Industry/Software Companies/R&D Organization for a period of 4-6 weeks. This will be during the summer vacation following the completion of the III-year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry coordinate (person from industry).

The course schedule will depend on the specific internship/training experience. The typical time per topic will vary depending on the internship:

- Overview of company/project
- Safety training
- Discussions with project teams

- Background research, review of documents, white papers, and scientific papers
- Planning, designing, and reviewing the planned work
- Executing the plans
- Documenting progress, experiments, and other technical documentation
- Further team discussions to discuss results
- Final report writing and presentation

After the completion of the project, each student will be required to:

1. `Submit a brief technical report on the project executed and
2. Present the work through a seminar talk (to be organized by the Department).

Award of sessional marks are to be based on the performance of the students at the workplace and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will co-ordinate the overall activity of Industry Attachment Program.

Note : Students have to undergo summer internship of 4-6 weeks at the end of semester VI and credits will be awarded after evaluation in VII semester.