CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INSTITUTE VISION AND MISSION:

Vision:

To be centre of excellence in technical education and research

Mission:
To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision:

To achieve Academic and Professional Excellence in Teaching and Research in the frontier areas of Electrical and Electronics Engineering Vis-a -Vis serve as a Valuable Resource for Industry and Society.

Mission:

Empowering the Faculty and Student Rendezvous to Nurture Interest for Conceptual Keystone, Applied Multidisciplinary Research, Inspiring Leadership and Efficacious Entrepreneurship culture , Impeccable Innovation in frontier areas to be synergetic with Environmental, Societal and Technological Developments of the National and International community for Universal Intimacy.

M1: Emphasis on providing Strong Theoretical Foundation & Engineering Leadership Eminence, infusion of Creativity and Management skill while maintaining Ethics and Moral for Sustainable Development. **(Individual development**)

M2: Enable the Faculty and Student Interactions to trigger interest for Applied Multidisciplinary Research and Entrepreneurship Culture resulting in Significant Advancement of the field of Specialization with Involvement of Industries and Collaborative Educational Networks. **(Sense of Ownership, Networking and Eco system Development)**

M3: Extend the Conducive Neighborhoods for Innovation in frontier areas to keep pace with Environmental, Societal and Technological Developments of the National and International Community to Serve Humanity. **(Service to Society, Atmanirbhar Bharat)**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS):

- **PEO 1-** Graduates will Ennoble in offering Design solutions for Complex Engineering Problems using appropriate modern Software tools, with the specified need of the Industry and Protagonist in transforming the Society into a Knowledge Society.

- **PEO 2-** Graduates will Elevate Engineering Leadership and will be recognized as Experts working in Government, Consulting firms, International organizations with their Creativity in Design of Experiments, Analysis and Interpretation of Data and Synthesis of Information.

- **PEO 3-** Graduates will Exalt in their Professional career by Persistence in Team work, Ethical behavior, Proactive involvement, and Effective Communication.

- **PEO 4-** Graduate will Excel by becoming Researches, Professors and Entrepreneurs who will create and Disseminate new knowledge in the frontier areas of Engineering, Technology and Management

PROGRAM OUTCOMES (POs):

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOS):

PSO 1: Evaluate complex Engineering Problems to meet the distinct need of Industry & Society, by utilizing knowledge of Mathematics, Science, Emerging Technologies such as AI, Block chain & IT tools.

PSO 2: Exhibit Latent talent in understanding the Engineering and Administration standards at work place as a team leader to manage Projects in the Multi-Disciplinary Environments.

PSO 3: Establish Engineering Expertise in Power system, Machines and Drives Systems and also Pursue Research in the Frontier areas such as Embedded systems, Renewable Energy, E-Mobility and Smart grid.

With effect from the Academic Year 2024-25

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VII Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2023-24

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER-VII

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20EE Exx	PE-4	3	0	0	3	40	60	3
2		OE-2	3	0	0	3	40	60	3
3		OE-3	3	0	0	3	40	60	3
4	20 EG O02	Gender Sensitization	2	0	0	-	----	-	NC
5	20MB C01	EE & A	3	0	0	3	40	60	3
PRACTICALS									
6	20 EE C31	Project –Part-1	0	0	4	--	50	--	2
7	20 EE I03	Internship-III	4-6 weeks/ upto135 Hours						3
			14	**0**	**4**	**-**	**210**	**240**	**17**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

Program Elective-4	
Course Code	**Name of the subject**
20 EE E41	Power system Dynamics & Control
20 EE E42	HVDC Transmission Systems
20 EE E43	Artificial Intelligence for Electrical Engineering
20 EE E44	Digital Control Systems
20 EE E45	Machine Modelling and Analysis
20EE E46	Advanced microprocessors and controllers

+

With effect from the Academic Year 2024-25

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VIII Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2023-24

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER-VIII

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20 EE Exx	**PE-5**	3	0	0	3	40	60	3
2		OE-4	3	0	0	3	40	60	3
3	20 EE C33	**Technical Seminar**	0	0	3	-	50	-	1
4	20 EE C34	**Project Part-2**	0	0	12*	-	100	100	4
Total			6	0	15	-	**230**	**220**	11

*180 hrs for the students working on the paid internship during VIII SEM

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

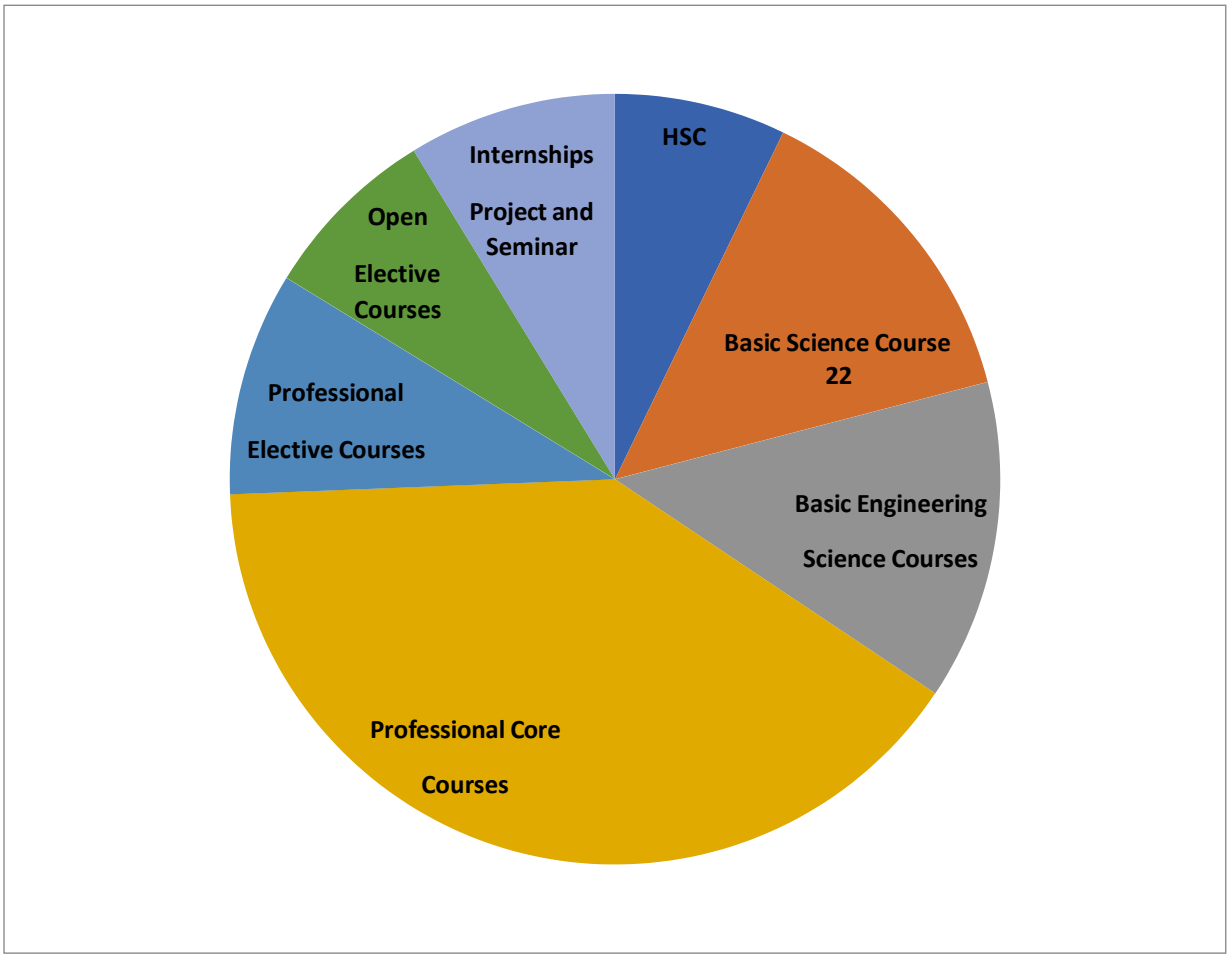
Program Elective-5	
Course Code	**Name of the subject**
20 EE E51	Smart Grid Technologies
20 EE E52	FACTS
20 EE E53	Electrical Estimation and Costing
20 EE E54	Advanced Control Systems
20 EE E55	Electric Hybrid Vehicles
20EE E56	Embedded System Design

DISTRIBUTION OF CREDITS FROM I TO VIII SEMESTERS

ITEM		CREDITS ALLOTED	% OF CREDITS OUT OF TOTAL CREDITS
S E M E S T E R	I	21	13.13
	II	20	12.5
	III	24	15
	IV	21	13.13
	V	27	16.88
	VI	19	11.88
	VII	17	10.63
	VIII	11	6.88
Total		**160**	**100**
HSC		11.5	7.19
BSC		22	13.75
BESC		21.5	10
PCC		64	40
PEC		15	9.38
OEC		12	7.5
I+P+S		14	9.38

Credit Distribution for the B.E. Electrical & Electronics Engineering Curriculum

	Credits
HSC	11.5
Basic Science Course	22
Basic Engineering Science Courses	21.5
Professional Core Courses	64
Professional Elective Courses	15
Open Elective Courses	12
Internships Project and Seminar	14
Total	**160**



VII-SEMESTER

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE Model Curriculum with effect from AY 2023-24

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER – VII

S.no	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20EE Exx	**PE-4**	3	-	-	3	40	60	3
2	20 xx Oxx	**OE-2**	3	-	-	3	40	60	3
3	20 xx Oxx	**OE-3**	3	-	-	3	40	60	3
4	20 EG M04	Gender Sensitization	2	-	-	-	-	50	NC
5	20MB C01	Engineering Economics & Accountancy	2	-	-	3	40	60	3
PRACTICALS									
6	20 EE C31	Project –Part-1	-	-	4	-	50	-	2
7	20 EE I03	Internship-III	5-6 Weeks/135 Hours				50	-	3
Total			**14**	**-**	**4**	**-**	**260**	**240**	**17**
Clock Hours Per Week: 21									

L: Lecture **T: Tutorial** **P: Practical/Project Seminar/Dissertation**

CIE: Continuous Internal Evaluation **SEE: Semester End Examination**

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
AICTE Model Curriculum with effect from AY 2023-24

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER – VII

List of Courses in Program Elective-IV	
Course code	**Title of the Course**
20 EE E41	Real Time Control of Power Systems
20 EE E42	HVDC Transmission Systems
20 EE E43	AI Techniques in Electrical Engineering
20 EE E44	Digital Control Systems
20 EE E45	Machine Modelling and Analysis
20 EE E46	Advanced Microprocessors and Controllers

20EE E41

Real-Time Control of Power System

(Semester-VII-Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Power Systems, Power system operation and control

Course Objectives:

1. To understand the power system State Estimation and Security
2. To acquire knowledge about SCADA and its functionalities
3. To explore about Energy Management System and Wide-area Monitoring system

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

1. Estimate the state of Power System
2. Asses the securityof the power system under abnormalities.
3. Illustrate the fundamental of SCADA system
4. Demonstrate the role of EMS in control centers
5. Explain the significance of WAMS in improving the power system operation

UNIT-I

State Estimation in Power System: Power System State Estimation, Weighted Least Square State Estimation: maximum likelihood concepts, matrix formulation, State Estimation of an AC Network, State Estimation by Orthogonal Decomposition, detection and identification of bad measurements, Network Observability and pseudo-measurements

UNIT-II

Power System Security: Introduction, Factors Affecting Power System Security, Contingency Analysis: Detection of Network Problems, An overview of Security Analysis, Linear Sensitivity Factors, AC Power Flow Methods, Contingency Selection, Concentric Relaxation, Bounding

UNIT-III

SCADA: Introduction, Building Blocks of SCADA system, Remote Terminal Unit (RTU), Evolution of RTUs, Components of RTU, Advanced RTU functionalities, Intelligent Electronic Devices (IEDs), Evolution of IEDs, IED functional block diagram, IED advanced functionalities.

UNIT-IV

Energy Management Systems (EMS): Introduction, Energy control centers, Energy management systems (EMS): Why and what and challenges, Energy management systems evolution, EMS framework, EMS time frames, EMS software applications and data flow, Generation operation and management, Transmission operations and management: Real time

UNIT-V

Wide-Area Monitoring: Phasor measurement unit, Phasor quantity and time synchronization, Wide-area measurement system, PMU-PDC system architecture, Optimal Placement of PMUs, Applications of PMUs, wide-area monitoring system (WAMS), EMS with WAMS, Future trends in EMS with WAMS.

Text Books

1. Allen J. Wood, Bruce.F. Woolenberg, Power Generation, Operation & Control, Wiley Publishers, 2006
2. Power System SCADA and Smart Grids, Mini S. Thomas and John D. McDonald, CRC Press, 2015, 1st Edition

Suggested Reading:

1. Power System Analysis, John J. Grainger and William D Stevenson Jr.: McGraw Hill, 2017, ISE
2. Power System control – Technology, TorstenCegrell, Prentice –Hall International series in Systems and control Engineering,Prentice Hall International Ltd., 1986
3. Real – Time Computer Control, S. Bennett and D.A. Linkens (Editors): IEE Control Engineering series (24), Peter PeregrinusLtd., 1984

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	2	3	1	-
CO2	3	2	1	1	-	-	-	-	-	-	-	2	3	2	-
CO3	3	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO4	3	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO5	3	1	-	-	-	-	-	-	-	-	-	2	-	1	-

"If you do not steal time,
time will loot you!."

-OWN

20EE E42

HVDC TRANSMISSION SYSTEMS

(Semester-VII - Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of Power Electronics and Power Systems

Course Objectives:

1. To study the basics of HVDC and comparison between HVDC and HVAC and multi-terminal DC systems and their controlmethods.
2. To comprehend different converter circuits used in HVDC.
3. To familiarize with the control methods and protection methods of HVDC and its filter design techniques.

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

1. Understand the basics of HVDC and compare between HVDC and HVAC.
2. Analyse the converter circuits used in HVDC.
3. Understand the HVDC control methods and be able to drawthe control characteristics.
4. Understand the HVDC filter design technique and protection methods.
5. List out different MTDC links and their control.

UNIT-I

Basic Concepts Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C. Transmission.

UNIT-II

Analysis of HVDC Converters: Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode – their performance. HVDC-voltage Source converters: Principle and operation.

Converter Circuits: Properties of Converter circuits, Different kinds of arrangements, Analysis of Bridge converters with grid control, with and without overlap angle, Equivalent circuit of rectifier. Inversion: Operation as Inverter, Equivalent circuit of Inverter.

UNIT-III

Control: Basic means of control, Limitations of manual control, Desired features of control, Combined characteristics of rectifier and inverter, Power reversal, constant minimum angle, Ignition angle control, Constant current control, Constant Extinction angle control. Starting and stopping of DC link.

UNIT-IV

Converter Faults and Protection: Short circuit current, Arc-back, Commutation failure, Bypass valves, DC reactors, DC circuitbreakers, Protection against over voltages,

Harmonics: Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non Characteristics harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics. Minimum cost tuned AC filters.

UNIT-V Multi-terminal DC Systems: Application of MTDC systems, Types of MTDC systems, Comparison of series and parallel MTDC systems, Control of MTDC system (Basics).

Text Books:

1. Padiyar KR., "HVDC Power Transmission Systems", New age, 2017
2. S.Kamakshaiah and V.Kamaraju., "HVDC transmission", McGraw Hill 2017.

Suggested Reading:

1. Kimbark E.W., "Direct Current Transmission" Vol-I, JohnWtley, 1971. 1990.
2. Arrillaga J., "High Voltage Direct Current Transmission", Peter Peregrinus Ltd., London, Pergamon Press, 1983.
3. "S. Rao", EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3rd Edition 1999.
4. "E. Uhlmann", Power Transmission by Direct Current, B. S. Publications, 2009

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	-	-	-	-	-	-	2	3	3	1
CO2	2	2	1	1	-	-	-	-	-	-	-	1	3	3	1
CO3	2	1	2	-	-	-	-	-	-	-	-	1	3	3	1
CO4	2	2	2	1	-	-	-	-	-	-	-	2	3	3	1
CO5	2	2	2	-	-	-	-	-	-	-	-	2	3	3	1

20EE E43

AI TECHNIQUES IN ELECTRICAL ENGINEERING

(Semester-VII -Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have prior knowledge on Strong knowledge of Mathematics, Good Analytical Skills, Ability to understand complex algorithms, Basic knowledge of Statistics and modeling, Good command over programming languages

Course Objectives:

1. To locate soft computing methodologies, such as artificial neural networks, Fuzzy logic and machine learningalgorithms.
2. Toexposestudentstothebasicideas,challenges,techniquesandlearningalgorithmsinANN,fuzzy logic and machinelearning techniques.
3. To know the applications of AI Techniques in electrical engineering and to analyze the machine learningwith real-world problems.

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

1. Understand the concepts of ANNs, Fuzzylogic and machine learning Techniques
2. Remember the difference between knowledge based systems and algorithmic based systems.
3. Understand the basics of machine learning concepts.
4. Apply fuzzy logic controller and machine learning algorithms for real-world problems.
5. Analyze critically the techniques presented and apply them to electrical Engineering problems.

UNIT– I

Artificial Neural Networks: Introduction, Models of Neural Network, Architectures, Knowledge representation, Artificial Intelligence and Neural networks, Learning process, Characteristics of ANN, supervised learning, unsupervised learning, reinforcement learning, Errorcorrection learning, Hebbian learning, Boltzman learning , Back Propagation Algorithm, Radial Basis Function Network, learningtasks.

UNIT-II

Fuzzy Logic: Introduction, Fuzzy versus crisp, Fuzzy sets, Membership function, Basic Fuzzy set operations, Properties of Fuzzy sets, Fuzzy Cartesian Product, Operations on Fuzzy relations, Fuzzy Quantifiers, Fuzzy Inference, Fuzzy Rule based system, De-fuzzification methods

UNIT-III

Introduction to Machine learning: characterization of Learning Problems, Basics of Multivariate Data Analytics, Forms of Regression: linear regression, Ridge regression, least absolute shrinkage, and selection operator (Lasso or LASSO).

UNIT-IV

Supervised Learning: Classification-KNN, Decision Tree, Naive Bayes, Logistic Regression, Perceptron, Support-VectorMachines, Unsupervised Learning - Classification; Topics: K-means Clustering, Principal Component Analysis (PCA)

UNIT-V

Applications of AI Techniques: Load Flow studies, Economic load dispatch, control system-tuning of controllers, speedcontrol of DC and AC Motors.

Text Books:

1. S. Rajasekaran &G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms"- PHI, New Delhi,2010
2. Mathematics for Machine Learning by Deisenroth, Faisal and Ong.
3. Deep Learning- Ian Good fellow, Yoshua Benjio, Aaron Courville, The MIT Press
4. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley& Sons Inc.

Suggested Reading:

1. P.D.Wasserman, Van Nostr and Reinhold," Neural Computing Theory & Practice"-NewYork,1989.
2. BartKosko,"Neural Network & Fuzzy System" PrenticeHall,1992.
3. YagnaNarayana,"ArtificialNueralNetworks"-PHI,NewDelhi,2012.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	2	-	-	-	2	-	2	3	1	3	2
CO2	3	2	1	1	2	-	-	-	2	-	2	3	1	2	2
CO3	3	2	1	1	3	2	-	-	2	-	2	3	1	3	3
CO4	3	3	3	3	3	2	2	-	3	-	3	3	3	3	3
CO5	3	3	3	3	3	2	2	-	3	-	3	3	3	3	3

20EE E44

DIGITAL CONTROL SYSTEMS

(Semester-VII - Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have a prior knowledge of Linear Control Systems and Z-Transforms

Course Objectives: The objective of the course is to

1. To represent a continuous time system in its discrete form and perform mathematical modelling.
2. To analyse a discrete time system using Z-transform tool and also to design discrete controllers and compensators.
3. To study the Classical approach Theory of Discrete-time systems and to analyse non-linear system using Lyapunov stabilityconcept

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

1. Develop the discrete representation for the given continuous time Systems
2. Analyse the stability of discrete-time systems.
3. Build state space models for discrete time systems.
4. Design digital controllers.
5. Construct Lyapunov function and design feedback controller

UNIT-I

Discrete Representation of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit, Sampling and Quantization, Choice of sampling frequency. ZOH equivalent.

UNIT-II

Discrete Time System Analysis and its Stability: Z-Transform and Inverse Z Transform for analysing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system. Stability analysis of Discrete Time System by Jury test and using bilinear transformation. Design of digital control system with dead beat response.

UNIT-III

State Space Approach for discrete time systems: State space models of discrete systems, State space analysis.Controllability and observability analysis. Effect of pole - zero cancellation on the controllability & observability. Pole placement by state feedback.

UNIT-IV

Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete Compensator.

UNIT-V

Lyapunov's Stability Analysis: Introduction, Lyapunov's stability criterion, Direct method of Lyapunov andthe linear system, Methods of constructing Lyapunov function for nonlinear systems- Krasovskii's method, Variable gradient method.

Text Books:

1. Ogata.K,"DiscreteTimecontrolSystems",PHIPublications,2nd Edition 1 January 2005.
2. M. Gopal, "Digital Control Engineering" New Age International Private Limited; Second edition (1 January 2014).

Suggested Readings:

1. B.C. Kuo, "Digital Control System", Oxford HED, Second edition 2012.
2. G.F.Franklin, J.D.Powell& M. L. Workman, "Digital Control of Dynamic Systems", Addison-Wesley; 3rd edition(December 29, 1997).

CO-PO&PSO Correlation Articulation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	2	--	--	--	--	--	--	--	--	--	1	2	--
CO-2	3	3	--	--	--	--	--	--	--	--	--	--	--	2	--
CO-3	3	3	2	--	--	--	--	--	--	--	--	--	1	2	1
CO-4	3	3	2	1	--	--	--	--	--	--	--	--	1	2	1
CO-5	3	3	2	--	--	--	--	--	--	--	--		1	2	1

"It is an immutable law in business that words are words, explanations are explanations, promises are promises- but only performance is reality."

-Harold S.Geneen

20EE E45

MACHINE MODELLING AND ANALYSIS

(Semester-VII - Program Elective-IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge of Electrical Engineering and AC-DC Machines

Course Objectives:

1. To address the varying requirements of electric machine applications2.To design a machine and its control equipment
3.To analyze larger systems

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

1.Derive voltage equations on electrical side: driving equipment on mechanical side.
2.Understand principles of two-pole machine
3.Obtain typical eigen values of the state matrix for electrical machines.
4.Apply the techniques to transform variables from one frame to another.
5.Analyze any electrical machine by mathematical modelling.

UNIT-I

Basics of rotating Electromagnetic machines: Elementary two -pole machine –Basics of electromechanical Energy conversion – Machine winding inductances – Illustration of efficiency of transformation – Transformation as an eigen value problem – The qd0 transformation, transformation between stationary circuit variable to arbitrary reference frame.

UNIT-II

Modelling and analysis of DC machine: Introduction – Expression of Induces EMF in a practical machine – Equivalent circuit of DC motor – State variable representation of the DC motor equations methods of excitation of DC motors

UNIT-III

Modelling and Analysis of conventional synchronous machines: Introduction – 3-phase synchronous machine physical description – Mathematical model of the electrical part – Analysis of synchronous machine dynamics.

UNIT-IV

Modelling and analysis of symmetrical Induction machines: Introduction – Idealized Induction machine – flux leakage and voltage equations in actual machine variables – referred to stator side expansion of torque in terms of a,b,c variables – Analysis of balanced steady state operation of Induction motor

UNIT-V

Modelling and analysis of AC single phase motors: Introduction – Approach to modelling single phase Induction motor – AC series motor – Repulsion motor

Text Books:

1.R. Ramanujan : Modelling and Analysis of Electrical machines, IK industrial publishing 2018.

Suggested Readings:

1.P.S. Bimbra, Generalized theoryof electrical machines, Khanna publishers 1987.
2.N.N. Hencock: Matrix analysis of electrical machines, second edition, Pergamon press, oxford, UK 1974.

CO-PO & PSO Correlation Articulation Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	-	-	-	-	-	-	1	1	2	3
CO2	2	2	1	1	1	-	-	-	-	-	-	1	1	1	2
CO3	3	3	3	3	3	-	-	-	-	-	-	1	2	3	3
CO4	3	3	2	2	3	-	-	-	-	-	1	2	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	1	2	2	3	3

"Our definition of a weakness is anything that gets in the way of excellent performance."

-Donald Clifton

20EE E46

ADVANCED MICROPROCESSORS AND CONTROLLERS

(Semester-VII - Program Elective - IV)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Students should have basic knowledge of Microcontrollers

Course Objectives:

1. To expose the students to the fundamentals of microprocessor architecture.
2. To introduce the advanced features in microprocessors and microcontrollers.
3. To enable the students to understand various microcontroller architectures.

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

1. Understand the advanced microprocessor architectures
2. Analyze the programming components of processor systems.
3. Design of system using Pentium processors.
4. Evaluate the performance of ARM microcontrollers MOTOROLA 68HC11.
5. Apply embedded design approach for interfacing devices with advanced processors.

UNIT I

HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM: CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

UNIT II

HIGH PERFORMANCE RISC ARCHITECTURE – ARM: Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set - Instruction cycle timings - The ARM Programmer's model – ARM Development tools – ARM Assembly Language Programming - C programming – Optimizing ARM Assembly Code – Optimized Primitives.

UNIT III

ARM APPLICATION DEVELOPMENT: Introduction to DSP on ARM –FIR filter – IIR filter – Discrete Fourier transform – Exception handling – Interrupts – Interrupt handling schemes- Firmware and bootloader – Embedded Operating systems – Integrated Development Environment- STDIO Libraries – Peripheral Interface – Application of ARM Processor - Caches – Memoryprotection Units – Memory Management units – Future ARM Technologies.

UNIT IV

MOTOROLA 68HC11 MICROCONTROLLERS: Instruction set addressing modes – operating modes- Interrupt system- RTC-Serial Communication Interface – A/D Converter PWM and UART.

UNIT V

PIC MICROCONTROLLER: CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART- A/D Converter –PWM and introduction to C-Compilers.

Text Books:

1. Andrew N.Sloss, Dominic Symes and Chris Wright " ARM System Developers Guide : Designing and Optimizing System Software" , First edition, Morgan Kaufmann Publishers, 2004.

Suggested Readings:

1. Steve Furber , "ARM System –On –Chip architecture", Addition Wesley, 2000.
2. Daniel Tabak , "Advanced Microprocessors", Mc Graw Hill. Inc., 1995
3. James L. Antonakos , "The Pentium Microprocessor", Pearson Education, 1997.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	1	1	1	1	-
CO2	2	3	3	2	1	-	-	-	-	-	1	1	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	2	2	1	3	1
CO4	2	2	2	2	1	-	-	-	-	-	2	2	1	1	1
CO5	1	2	2	1	1	-	-	-	-	-	2	2	1	1	2

"For it is better, with closed eyes, to follow God as our guide, than, by relying on our own prudence, to wander through those circuitous paths which He devises for us."

-John Calvin

GENDER SENSITIZATION
(Semester-VII)

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: This course will introduce the students to:

1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

Course Outcomes: After successful completion of the course the students will be able to:

1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to societyhistorically, culturally and politically.
4. Analyze the contemporarysystem of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

UNIT – I
Understanding Gender:

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II
Gender And Biology:

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

UNIT – III
Gender and Labour:

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV
Issues Of Violence

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:"*Chupulu".*
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V
Gender: Co - Existence

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Additional Reading: Rosa Parks-The Brave Heart.

Text book:

1. A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote,Vasudha Nagaraj, AsmaRasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **"Towards a World of Equals: A Bilingual Textbook on Gender"** published by Telugu Akademi, Hyderabad, Telangana State, **2015**.

Suggested Readings:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. **"I Fought For My Life…and Won."**Available online at:
http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-

20MB C01

ENGINEERING ECONOMICS AND ACCOUNTANCY

(Semester-VII)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The Objectives of the Course are:

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

Course Outcomes: After Completion of the Course, Student will be able to:

1. Apply fundamental knowledge of Managerial Economics concepts and tools.
2. Analyze various aspects of Demand Analysis, Supplyand Demand Forecasting.
3. Understand Production and Cost relationships to make best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on anytechnique.

Unit-I

Introduction to Managerial Economics: Introduction to Economics and itsevolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

Unit-II

Demand and Supply Analysis: Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

Unit-III

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts – Types of Costs, Cost-Output Relationship – Short Run and Long Run; Market structures – Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

Unit-IV

Accountancy: Book-keeping, Principles and Significance of Double Entry BookKeeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

Unit-V

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional andDiscounted Cash Flow Methods - Numerical problems.

Text Books:

1. Mehta P.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013.

Suggested Readings:

1. Panday I.M. "Financial Management", 11th edition, VikasPublishing House, 2015.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of India Pvt Ltd, 2007.
4. A. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2013.

CO-PO-PSO Correlation articulation Matrix

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	1	1	1	1	1	-	-			
CO2	2	2	2	2	-	1	1	1	-	1	-	1			
CO3	1	2	1	2	2	-	2	1	-	1	-	-			
CO4	2	2	1	2	2	1	1	3	-	1	-	-			
CO5	1	3	1	2	1	1	2	-	-	1	2	1			

20EE C31

PROJECT: PART-1

(Semester-VII)

Instruction	4P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	2

Prerequisite: Knowledge of preparing slides by using power point presentations, Capable of searching for suitable literature and Presentation skills.

Course Objectives: This course aims to:

1. The student takes up investigative study in the broad field of Engineering / Technology, either fully theoretical / practical or involving both theoretical and practical.
2. The work to be assigned by the Department on an individual basis or two / three students in a group, under theguidance of a supervisor.
3. This is expected to provide a good initiation for the student(s) towards R&D.

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

1. List the various approaches to the selected problem.
2. Interpret the advantages and disadvantages of various approaches.
3. Apply the selected approach for simulating / modeling /designing the problem.
4. Analyse and write a report on the results of the simulation / modeling of the problem selected.
5. Justify and present the results of the simulation / modeling / design before the departmental committee.

The objective of Project Part-1is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical / practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two / three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a basic approach to the Problem relating to the assigned topic;
3. Conducting a preliminary Analysis / Modelling / Simulation / Experiment / Design / Feasibility;
4. Preparing a Written Report on the Studyconducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before the departmental Committee.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	2	2	3	3	2	2	2
CO2	2	2	2	2	2	1	1	2	1	1	1	2
CO3	3	2	2	2	3	1	1	2	2	2	2	2
CO4	3	3	3	2	2	2	2	2	2	2	2	2
CO5	3	3	2	3	3	2	1	2	2	3	2	3

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Departmental Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

"A man must be big enough to admit his mistakes, smart enough to profit from them, and strong enough to correct them."

-John C.Maxwell

20EE I03

INTERNSHIP

(Semester-VII)

Instruction	5-6 Weeks/135 Hours
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	3

Prerequisite: Knowledge of Basic Sciences and Engineering Sciences

Course Objectives: This course aims to:

1. Exposing the students to the industrial environment
2. Create awareness with the current industrial technological developments relevant to program domain
3. Provide opportunity to understand the social, economic and administrative considerations in organizations

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

1. Understand Engineer's responsibilities and ethics
2. Use various materials, processes, products and quality control
3. Provide innovative solutions to solve real world problems
4. Acquire knowledge in technical reports writing and presentation
5. Apply technical knowledge to real world industrial situations

For implementation procedures and letter formats, annexure I and III of Internship document may be referred.

Evaluation of Internship: The industrial training/internship of the students will be evaluated in three stages:

a) Evaluation bythe Industry (in the scale of 1 to 10 where 1-Unsatisfactory; 10-Excellent)
b) Evaluation by faculty Mentor on the basis of site visit(s) or periodic communication (15 marks)
c) Evaluation through seminar presentation/Viva-Voce at the Institute bythe constituted committee (25 marks)

Evaluation through Seminar presentation/Viva-Voce at the institute: Students shall give a seminar before an E*xpert Committee* constituted by college (Director, HoD/Senior faculty, mentor and faculty expert from the same department) based on his/her training/internship carried out

. The evaluation will be based on the following criteria:

- Quality of content presented
- Proper planning for presentation
- Effectiveness of presentation
- Depth of knowledge and skills
- Attendance record, dailydiary, departmental reports shall be analyzed along with the internship Report

Monitoring/ Surprise Visits: During the internship program, the faculty mentor makes a surprise visit to the internship site, to check the student's presence physically. If the student is found to be absent without prior intimation to the concerned industry, entire training/internship may be canceled. Students should inform through email to the faculty mentor as well as the industry supervisor at least one day prior to avail leave.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	3	-	3	-	3	3
CO2	1	1	1	3	3	-	2	1	-	-	-	-
CO3	2	3	3	3	3	2	3	1	1	-	-	-
CO4	-	-	-	-	-	3	-	1	3	3	-	1
CO5	1	3	3	3	3	2	3	-	1	-	-	1

"A parent's job isn't to prevent their children from failing, but to pick them up when they do."

-Aaron DeCa

VII- SEMESTER

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE Model Curriculum with effect from AY 2023-24

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER – VIII

S.no	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
THEORY									
1	20 EE Exx	**PE-5**	3	-	-	3	40	60	3
2	20 xx Oxx	**OE-4**	3	-	-	3	40	60	3
PRACTICALS									
2	20 EE C32	Technical Seminar	-	-	3	-	50	-	1
3	20 EE C33	Project: Part-2	-	-	12*	Viva-Voce	100	100	4
Total			**06**	**-**	**15**	**-**	**230**	**220**	**11**
Clock Hours Per Week: 21									

*180 hrs for the students working on the paid internship during VIII SEM

L: Lecture **P: Practical/Project Seminar/Dissertation** **CIE: Continuous Internal Evaluation**

T: Tutorial **SEE: Semester End Examination**

List of Courses in Program Elective-V	
Course code	**Title of the Course**
20 EE E51	Smart Grid Technologies
20 EE E52	Flexible AC Transmission System
20 EE E53	Electrical Estimation and Costing
20 EE E54	Advanced Control Systems
20 EE E55	Electric Hybrid Vehicles
20EE E56	Embedded System Design

20 EE E51

SMART GRID TECHNOLOGIES

(Semester-VIII- Elective - V)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: The objective of this course is:

1. To studythe importance of smart grid and components of smart grid
2. To understand the communication technologies, infrastructure required for smart metering
3. To know various functions of distribution automation and operation of micro grid

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

1. Discuss the components and operation of Smart Grid at transmission and distribution level
2. Select the communication technologyrequired for smart grid applications
3. Illustrate components and operation of smart metering and implementation of demand side integration
4. Analyze the different types of micro grid, storage systems and communication infrastructure
5. Explain the equipment used in distribution automation and implement the distribution management system functions

UNIT-I

Introduction to Smart Grid: Conventional grid versus Smart Grid, drivers of smart grid, functionalities and key components of smart grid for transmission system and distribution systems, smart grid vision and road map to India, policies, standards, regulations, national smart grid mission framework.

UNIT-II

Communication Technologies: Dedicated and shared communication channels, switching techniques, communication channels: wired communication, twisted pair, optical fiber, radio communication, Ethernet, wireless LAN, Bluetooth, WiMAX, standards for information exchange.

UNIT-III

Smart Metering Infrastructure: Evolution of electricity metering, benefits of smart metering, components of smart metering, hardware requirements, communication infrastructure and protocols for smart metering: Home area network, neighborhood area network, data concentrator, meter data management system, Demand side integration (DSI): services, implementation of DSI, hardware support

UNIT-IV

Micro Grids: Introduction, mini/micro grids, architecture of micro grid, types of micro grid, DC micro grid, AC micro grid, AC-DC micro grid, Protocols and standards, communication to monitor real time network status, energy storage in micro grids, benefits of distributed generation and energystorage in micro grid systems.

UNIT-V:

Distribution Automation: Substation automation equipment: current transformers, voltage transformers, relay IED, faults in distribution system: components for fault isolation and restoration, voltage regulation, Distribution Management systems: Data sources and associated external systems, modelling and analysis tools, Applications: Network reconfiguration, volt/var control.

Text Books:

1. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Smart Grid, Wiley Publications, 2012
2. Stuart Borlas'e, "Smart Grid: Infrastructure, Technologyand solutions" CRC Press

Suggested Reading:

1. James Momoh, "Smart Grid Fundamentals of Design and Analysis" IEEE Press, Wiley Publications, 2012
2. Smart grid Hand Book for Regulators and policymakers, Nov 2017 published by India Smart Grid Forum
3. Bharat Modi, Anuprakash, Yogesh Kumar, "Fundamentals of Smart grid Technology", Katson publishers, 2015

CO-PO-PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	--	--	--	--	1	--	1	2	3	1
CO2	2	2	3	2	3	--	--	--	--	3	--	1	2	2	1
CO3	2	2	3	2	3	--	--	--	--	1	--	1	2	3	1
CO4	2	3	3	2	3	--	--	--	--	2	--	1	2	3	2
CO5	3	3	3	3	3	--	--	--	--	1	--	1	3	3	2

"Temporary solutions often become permanent problems."

-Craig Bruce

20 EE E52

FLEXIBLE AC TRANSMISSION SYSTEMS

(Semester-VIII- Elective - V)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites: Power Electronics, Power Systems

Course Objectives:

1. To understand concepts of various FACTS devices and controllers
2. To studythe various converter topologies used in FACTS
3. To studythe principles of operation and control of shunt series and combined FACTS controllers

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

1. Choose the appropriate FACTS device/controller based on the needs of inter connected power transmission systems.
2. Analyze various Power Electronic Converters used in FACTS.
3. Illustrate the operation of shunt compensators (i.e. SVC, STATCOM) for the end of line voltage support and transient stability problems
4. Analyze the operation and control of GCSC, TCSC and SSSC.
5. Explain the principles, operation and control aspects of UPFC for P and Q control

UNIT-I

General System Considerations and FACTS: Transmission Interconnections, Flow of Power in an AC System, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, principles of series and shunt compensation, Basic Types of FACTS Controllers, Benefits from FACTS, Application of FACTS.

UNIT-II

Voltage-Source Converters: Basic concept of Voltage-Sourced Converters, single-Phase Full-wave Bridge converter operation, single phase-leg operation, Square-Wave Voltage Harmonics for a single-phase bridge, Three-phase full-wave bride converter, sequence of valve conduction process in each phase-leg, three-level voltage-sourced converter, Pulse-Width Modulation (PWM) converter, Generalized Technique of Harmonic Elimination and voltage control.

UNIT-III

Shunt Compensators: Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, improvement of Transient Stability, Power Oscillation Damping, Static Var Compensators, SVC and STATCOM, The Regulation Slope, Transfer Function and dynamic Performance, Transient Stability Enhancement and Power Oscillation Damping

UNIT-IV

Series Compensators: Objectives of Series Compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, GTO thyristor controlled series capacitor, Thyristor controlled series capacitor, SSSC.

UNIT-V

Combined Compensators: Introduction, Unified Power Flow Controller (UPFC), basic operating principles, independent real andreactive power flow control, control structure, basic control system for P and Q control.

Text Books:

1. Narain G. Hingorani, Laszlo Gyugyi, 'Understanding FACTS', IEEE press, 1999.
2. Y.H.Song, A.T.Johns, 'Flexible A.C.Transmission System', IEE, London, 1999

Suggested Reading:

1. KR Padiyar, 'Facts Controllers In Power Transmission and Distribution', 2nd edition, New Age Publications,2016.
2. R. Mohan Mathur, Rajiv K. Varma, 'Thyristor-Based FACTS Controllers for Electrical Transmission Systems', Wiley Publications IEEE Press, 2002
3. Timothy J.E. Miller, 'Reactive Power Control in Electric Systems', 1982.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	3	-	1	1	1	-	-	-	1	-	2	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	-	2	2
CO3	2	2	-	3	-	1	1	1	-	-	-	1	-	2	2
CO4	2	2	-	3	-	1	1	1	-	-	-	1	-	2	2
CO5	1	1	-	1	-	-	-	-	-	-	-	-	-	2	2

"They say the world has become too complex for simple answers. They are wrong."

-Ronald Reagan

20 EE E53

ELECTRICAL ESTIMATION AND COSTING

(Semester-VIII- Elective - V)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Students should have prior knowledge on basic electrical engineering, switchgear and protection

Course Objectives:

1. To emphasize the estimation and costing aspects of all electrical equipment, installation, and designs on the cost viability.
2. To estimate Bill of Quantity for Residential and Commercial Installations
3. To design overhead transmission and distribution lines, substations, and illumination schemes

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

1. Understand the concepts related to electrical Wiring and costing
2. Estimate electrical installation and costing for Residential buildings.
3. Estimate electrical installation estimation and costing for commercial and small industries.
4. Understand the components and Estimate the materials required to Design Electrical Installation of Substation, Transmission and Distribution lines.
5. Identifyand design the various types of light sources for different applications.

UNIT-I

Electrical Wiring: Different types of wires, wiring system and wiring methods, Comparison of different types of wirings. Specifications of Different types of wiring materials and Accessories Domestic and industrial panel wiring. Different types of wiring circuits. I.E., rules for wiring (General safety, supplyand use of energy)

Principles of costing: purpose of estimating and costing, Recording of estimates, Determination of cost material and labour, overhead charges and purchase orders

UNIT-II

Residential Building Electrification: General guidelines for conducting Estimates, Sequence to be followed in carrying out the estimate, positioning of equipment**,** Selection of Wires, Sub circuits, Method of drawing single line diagram. Load calculations and Selection of rating of main switch Distribution board, preparing an estimate for Residential wiring, working of protective switchgear ELCB and MCB.

UNIT-III

Electrification of Commercial Installation: Concept of commercial installation, Differentiate between electrification of residential and commercial installation, Fundamental considerations for planning of an electrical installation system for commercial building, Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards and main switch. Methods of Earthing for commercial electrical installation,

UNIT-IV

Estimation Of Overhead Transmission & Distribution Lines: Introduction, Typical AC electrical power system, Main components of overhead lines, Line supports. Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductor's configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials, Types of insulators, Lightning Arresters, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers. Muffs, Points to be considered at the time of erection of overhead lines, Erection of supports, setting of stays, fixing of cross arms, and insulators, Conductor erection, Repairing and jointing, Dead end clamps, Positioning of conductors and attachment to insulators Jumpers, Tee-offs, Earthing of transmission lines. Guarding of overhead lines, Clearances of conductor from ground Spacing between conductors. Testing and commissioning of overhead distribution lines, some important specifications.

UNIT-V

Estimation of Substations: Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substations – Floor mounted type. Equipment for Substations and Switchgear Installations. Preparing an estimate for substation Material

Design of Illumination Schemes: Introduction, Terminology in illumination, laws of illumination, various types of light sources, estimation and costing of lighting schemes.

Text Books:

1. "K. B. Raina, S. K. Bhattacharya", "Electrical Design Estimating and Costing", New Age International Publisher, 2018
2. Er. V. K. Jain, Er. Amitabh Bajaj", "Design of Electrical Installations", University Science Press.
3. Gupta J. B., Katson, Ludhiana", "Electrical Installation, estimating and costing", S. K. Kataria and sons,2013.
4. "Surjit Singh", "Electrical Estimation and Costing". Dhanpatrai & Co. second edition, 2001.

Suggested Readings:

1. Code of practice for Electrical wiring installations (System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1		-	2	-	2	-	-	-	1	0	3	2
CO2	2	2	2	1	-	1	1		-	-	-		2	3	2
CO3	3	2	2	1	-	1	1	1	-	-	-	1	2	3	2
CO4	3	2	2	1	-	1	1		-	-	-	1	1	3	2
CO5	3	2	2	1	-	1	-	-	-	-	-	2	-	3	2

20 EE E54

ADVANCED CONTROL SYSTEMS

(Semester-VIII- Elective - V)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisite: Students should have a prior knowledge of Linear Control Systems and Z-Transforms

Course Objectives: The objective of the course is to:

1. Understand the mathematicalrepresentation of sampled data control systems, its stabilityanalysis and theconcepts of controllability and observability.
2. Study the concepts of state feed-back controller & observer and to construct phase plane trajectories for a given non-linear systems to judge its stability.
3. Study the concepts of Lyapunov's stability method applicable for a linear and non-linear system and to Know the concept of formulating an optimal control problem

Course Outcomes: After the completion of the course the students will be able to:

1. Develop discrete time system models and to perform stability tests on it.
2. Develop state space representation of discrete time systems and apply the concepts of controllability and observability- tests for discrete- time systems.
3. Design of state feed-back controller and observer for discrete- time systems.
4. Analyze Stability of non-linear control systems.
5. Justifythe stabilitystudythrough Lyapunov's criteria and to apply optimal control techniques to extremize a cost function

UNIT-I

Sampled Data Control Systems: Introduction to difference equations, Z-transform, Pulse transfer function, Inverse Z transform, Analysis of sampled data control systems, Z and S domain relationships, Stability Analysis-Jury's stability test, bilinear transformation.

UNIT-II

Nonlinear Systems: Introduction to common physical nonlinearities, phase plane- method, Singular points, stability of nonlinear system, Construction of phase trajectories- Isocline's method, ä-method, The Describing Function-basic concepts, Derivation of describing functions- dead zone and saturation.

UNIT-III

State-space Analysis and Design: State space representation of discrete time systems, phase variable and canonical form of state model, solution of discrete time state equation using z-transform, concept of Controllability and Observability, Controllable and Observable phase variable form of state model.

UNIT - IV

State Feedback Controllers and Observers: Design of state feedback controller through pole placement, Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

UNIT-V

Lyapunov Stability Analysis: Introduction, Lyapunov stability criterion, direct method of Lyapunov and the linear system, Methods of constructing Lyapunov function for nonlinear systems- Krasovskii's method, Variable gradient method.

Optimal control: Formulation of optimal control problem.

Text Books:

1. I. J Nagrath, M. Gopal, "Control Systems Engineering", New Age International (P) Limited,2017.
2. Ogata.K,"DiscreteTimecontrolSystems",PHIPublications,2nd Edition-1 January 2005.

Suggested Reading:

1. M. Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill, 2/e,2003.
2. K. Ogata,"ModernControlEngineering",PearsonPublications,5th Edition, 2015.
3. D. Subbaram Naidu, Optimal Control Systems. CRC Press, ISBN: 0849308925

CO-PO&PSO Correlation Articulation Matrix-

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	--	--	--	--	--	--	--	--	--	--	--	2	--
CO2	3	3	--	--	--	--	--	--	--	--	--	--	1	2	--
CO3	3	3	--	--	--	--	--	--	--	--	--	--	--	2	1
CO4	3	3	--	--	--	--	--	--	--	--	--	--	--	2	--
CO5	3	3	--	--	--	--	--	--	--	--	--	--	1	2	1

20 EE E55

ELECTRIC AND HYBRID VEHICLES

(Semester-VIII- Elective - V)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite:

1. Basic knowledge of Electrical & Mechanical Engineering, Engines, Machines, Batteries and Circuit analysis.

Course objectives:

1. To understand the concept Electric and Hybrid vehicles, and their advantages and disadvantages
2. To Understand the Performance Characteristics of various types of hybrid electric vehicles, Knowledge of various energystorage system of EV and EHV and energy management
3. To Develop and Optimise the design of propulsion motors for EV applications and knowledge of charging technologies.

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

1. Be familiar to the models of describing Electric and hybrid vehicles and their performance.
2. Calculation of tractive effort required for EHV and EV with different vehicle parameters and optimisation of power train.
3. Design optimisation of Electric power train and implementation of charging technology.
4. Analyze the different possible ways of energy storage and battery selection.
5. Illustrate the principle of Hybrid Electric Vehicle, Battery Electric Vehicle and Plug-in EHV and able to prepare. a business plans.

UNIT-I

Introduction: Conventional Vehicles: Basics of vehicle performance, Four Stroke and 2 Stroke IC Engine and their construction and operating principle, measures to improve IC Engine performance, vehicle power source characterization, , transmission characteristics using clutch and gear box, gear ratio, Transmission Efficiency, Air pollution, global warming and climate change, EV Advantages, Introduction to Battery Electric Vehicle (BEV), Components and systems of Electric Vehicle, Performance of EVs , Govt. Policies and guidelines for implementation of electric mobility, Trends and challenges of implementation of electric mobilityand start up opportunities.

UNIT-II

Hybrid Electric Vehicles: Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, Vehicle Mechanics, impact of modern drive-trains on energy supplies and Vehicle to grid (V2G) fundamentals. Electric Vehicle Modelling– Consideration of Rolling Resistance – Consideration of Vehicle Mass – Tractive Effort – Vehicle Acceleration –Selection and Sizing of the propulsion motor , Modelling Electric Vehicle Range, Plug-in electric vehicles, Hybrid electric drive for ship propulsion and military application,

UNIT-III

Electric and Hybrid Power Trains: Basic concept of hybrid traction, introduction to various hybrid drive train topologies, concept of Series Hybrid , Parallel Hybrid and Series-Parallel Hybrid Vehicle model, different modes of operation and Energy management strategies used in EHV . Power flow control in hybrid drive-train topologies, fuel efficiency analysis, Basic concept of electric traction, Components and systems of HEV, Regenerative braking fundamentals, drive system efficiency. Vehicle le to Grid(V2G) fundamentals,

UNIT-IV

Energy Storage and Charging Technology: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage**,** basics of construction and chemical reactions in Lead-acid battery , Nickel-Cadmium, Nickel-Metal Hydride, Lithium based batteries, basics of Metal Air batteries, battery sizing, Fuel Cell based energy storage system, Super Capacitor based energy storage , Hybridization of energy storage batteries with Capacitor based energy storage devices, Different types of EV charging stations for batterycharging, Wireless charging technology,

UNIT-V

Design, Analysis, Testing & Qualification of Propulsion Motor: PM Materials (Nd FeB, SmCo, Ferrite and Alnico) . Properties of NdFEB, SmCo and Ferrite material w.r.t EV/EHV Requirements), Basic concepts of Design, Construction and analysis of water cooled/Air-cooled PM Motor for EV and HEV, Outer rotor PM Motor drive, Permanent Magnet assisted Hybrid Reluctance Motor of EV, Basics of Axial Flux PM Motor Basic Design and construction Aspects of Induction Motors for EV and HEV, Qualification Testing methods and standards, basics of EMI & EMC applicable to EHV, Use of electromagnetic Software for design optimisation of PM and Induction motor for EV/EHV.

Text Books:

1. C. Mi, M. A. Masrur, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley& Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.

Suggested Reading:

1. James Larminie, "Electric Vehicle Technology Explained", John Wiley& Sons, 2003
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016
3. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
4. Vehicle Power Management: Modeling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.
5. National Electric Mobility Mission Plan 2020 Released by DHI, Govt. of India
6. Zero Emission Vehicles (ZEV) Towards a Policy Framework, NITI Aayog
7. IEC and different IS and Eclectic Mobility Standards.

CO-PO&PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	3	1	1	1	2	2	-	-	1
CO2	2	1	1	1	1	2	-	-	-	-	2	-	3	-	2
CO3	2	2	1	1	2	-	2	1	2	2	3	2	3	3	2
CO4	2	1	1	1	3	2	3	1	-	-	1	1	2	3	2
CO5	3	-	1	1	-	2	3	1	2	2	-	2	2	3	2

20 EE E56

EMBEDDED SYSTEM DESIGN

(Semester-VIII- Elective - V)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Students shouldhave basic knowledge of Microprocessors and Microcontrollers.

Course Objectives: This course aims to:

1. Learn about fundamentals of the embedded systems
2. Understand the hardware and software details of the embedded systems.
3. Acquire knowledge on the serial, parallel and network communication protocols.

Course Outcomes: Upon completion of this course, students will be able to:

1. Understand the fundamentals of the embedded systems
2. Analyze thehardware and software components of the embedded systems.
3. Design interfacing of the systems with other processing systems.
4. Evaluate the performance of an embedded system using debugging tools.
5. Applyembedded design approach for various applications.

UNIT – I

Introduction to Embedded Systems: Embedded systems versus General Computing Systems, History of embedded systems, classifications, applications areas, characteristics and quality attributes of embedded systems, Design metrics and challenges in embedded system design.

UNIT – II

Embedded Hardware and Software: Processor embedded into a system, Processor selection for embedded system, embedded hardware units and devices in a system, embedded software in a system and an overview of programming languages, challenges and issues related to embedded software development.

UNIT – III

Communication Protocols: I^2C, CAN, Firewire-IEEE 1394 Bus standard, advanced serial high-speed buses. Parallel Bus device protocols: ISA, PCI, PCI-X, Internet Enabled Systems-Network protocols: Ethernet.

UNIT – IV

Embedded Software Development Process: Embedded System design and co-design issues in system development process, Design cycle in the development phase for an Embedded Systems. Embedded software development tools: Host and Target Machines, Linker/Locators for embedded software, Embedded Software into the Target system. Issues in hardware and software design and co-design

UNIT – V

Testing, Debugging Techniques and Applications: Integration and testing of embedded hardware, testing methods, debugging techniques, Laboratory tools and target hardware debugging: Logic Analyzer, simulator, emulator and In-circuit emulator, IDE

Case Study: Embedded Systems design for automatic vending machines and digital camera.

Text Books:

1. Raj Kamal, "Embedded Systems-Architecture, Programming and Design",3/e, McGraw Hill Education,2015.
2. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	-	-	1	1	-
CO2	2	3	3	2	1	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	-	-	1	3	1
CO4	2	2	2	2	1	-	-	-	-	-	-	-	1	1	1
CO5	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2

"High achievers spot rich opportunities swiftly, make big decisions quickly and move into action immediately. Follow these principles and you can make your dreams come true."

-**Robert H. Schuller**

20EE C32 **With effect from the Academic Year 2023-24**

TECHNICAL SEMINAR

(Semester-VIII)

Instruction	3 P Hours per Week
Duration of SEE	--
SEE	--
CIE	50 Marks
Credits	1

Prerequisite: Student must have completed Project:Part-1

Course Objectives:

1. To introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/her specialization.
2. Seminar topics maybe chosen bythe students with advice from the faculty members and the student shall read further relevant articles in the domain.
3. Documenting the seminar report in a prescribed format.

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

1. Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.
2. Exhibit effective communication skills, stage courage and confidence.
3. Demonstrate intra-personal skills.
4. Explain new innovations / inventions in therelevant field.
5. Prepare and experience in writing the Seminar Report in a prescribed format.

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state-of-the-art topics in a broad area of his/ her specialization. Seminar topics may be chosen by the students with advice from the facultymembers and the student shall read further relevant articles in the domain.

This seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one-page synopsis of the seminar talk for display on thenotice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested bythe department.

Seminars are to be scheduled from 3rdweek to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks, the students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall be preferably from anypeer reviewed recent Journal publications.

Guidelines for awarding marks(CIE): Max.Marks:50		
S.No	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2	1	1	3	2	3	1	2
CO2	3	3	1	2	2	2	1	1	3	2	3	2
CO3	2	2	1	2	2	2	1	2	3	3	2	2
CO4	3	2	3	3	2	2	2	2	2	2	2	2
CO5	3	2	2	2	2	2	3	3	2	3	2	2

20EE C33

PROJECT:PART-2

(Semester-VIII)

Instruction	12 P Hours per Week
Duration of SEE	Viva Voce
SEE	100 Marks
CIE	100 Marks
Credits	4

Prerequisite: Student must have earned the credit of 'Project: Part - 1'.

Course Objectives:

1. The object of Project:Part2 is to enable the student extend further the investigative study, either fullytheoretical / practical or involving both theoretical and practical work.
2. The work shall be carried out under the guidance of a Supervisor from the Departmental one or jointlywith a Supervisor drawn from R&D laboratory/Industry.
3. Preparing an Action Plan for conducting the investigation, including team work;

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

1. Recall the details of the approach for the selected problem.
2. Interpret the approach to the problem relating to the assigned topic.
3. Determine the action plan to conduct investigation.
4. Analyze and present the model/simulation / design as needed.
5. Evaluate, present and report the results of the analysis and justify the same.

The objective of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical / practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment tonormallyinclude:

1. In depth studyof the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis / Modelling / Simulation / Design / Problem Solving / Experiment as needed;
5. Final development of product / process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation / Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated bythe Department.
8. Final Seminar presentation before the Departmental Committee.

Guide lines for awarding marks in CIE: (**Max.Marks:100**)

Evaluation by	Max. Marks	Evaluation Criteria/Parameter
Department Review Committee	10	Review1
	15	Review2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which maylead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in **SEE**: (**Max.Marks:100**)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

CO-PO & PSO Correlation Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	2	1	2	3	3	2	2
CO2	3	3	3	3	3	2	2	3	3	3	2	2
CO3	2	3	3	3	3	2	2	2	2	3	3	2
CO4	3	3	3	2	2	2	2	2	2	2	2	2
CO5	3	3	3	2	2	1	2	3	3	3	3	2