INSTITUTE OF ENGINEERING & MANAGEMENT

DEPARTMENT OF ELECTRICAL ENGINEERING

SEMESTER WISE CURRICULAM

3rd YEAR- 5th SEMESTER

Syllabus for B. Tech Admission Batch 2022

University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Syllabus for B.Tech Admission Batch 2022

Index

Syllabus Structure:

Sl No	Type of Course	Course Code	Course Name	L	T	P	Total Contact Hours	Credit Points
1	Professional Core Courses	PCCEE501	Electrical Machines-II	3	0	0	3	3
2	Professional Core Courses	PCCEE502	Power system-I	3	0	0	3	3
3	Professional Core Courses	PCCEE503	Control System	3	0	0	3	3
4	Humanities and social sciences including Management	HSMCEE501	Engineering Economics	3	0	0	3	3
5	Professional Elective Courses	PECEE501	A. Electromagnetic Waves B. Industrial Electrical System	3	0	0	3	3
6	Open Elective Courses	OECEE501	A. Database Management System B. Analog and Digital Communication C. Industrial Automation- I	2	0	0	2	2
7	Humanities and social sciences including Management	ESPEE501	Essential Studies for Professionals V	2	0	0	2	0.5
8	Professional Core Courses	PCCEE591	Electrical Machines Laboratory - II	0	0	2	2	1
9	Professional Core Courses	PCCEE592	Power System Laboratory - I	0	0	2	2	1
10	Professional Core Courses	PCCEE593	Control System Lab	0	0	2	2	1
11	Humanities and social sciences including Management	SDP581	Skill Development for Professionals V			2	2	0.5
12	Project. Seminar and Industrial Training	PWEE581	Mini Project III			0	1	1
13	Massive Open Online Courses (MOOCs)	MOOCs	Massive Open Online Courses (MOOCs)					
14	Industry and Foreign Certification (IFC)	IFC	Industry and Foreign Certification (IFC)					
15	Mandatory Additional Requirements (MAR)	MAR581	Mandatory Additional Requirements (MAR)					
Total Credit Points of Semester				**19**	**0**	**8**	**28**	**22**

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Syllabus for B.Tech Admission Batch 2022

Subject Name: Electrical Machines-II **Credit: 3** **Lecture Hours: 40**

Subject Code: PCCEE501

Pre-requisite: Electrical Machines-I

Relevant Links:

StudyMaterial Coursera NPTEL LinkedIn

Course Objectives:

The purpose of learning this course is

1. To understand the arrangement of windings of AC machines
2. To understand the principle of production of pulsating and revolving magnetic fields
3. To understand the principle of operation and characteristics of three phase Induction machines
4. To understand the principle of operation and characteristics of single phase Induction machines
5. To understand the principle of operation and characteristics of synchronous machine
6. To understand the principle of operation and characteristics of special electromechanical devices
7. To solve problems of Induction machines, synchronous machines and special electro-mechanical devices

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Describe the arrangement of winding of AC machines.
CO2. Explain the principle of operation and0 solve numerical problems of Induction machines, Synchronous machines and special machines.
CO3. Estimate the parameters, characteristics and efficiency of Induction machines and Synchronous machines.
CO4. Select appropriate methods for starting, braking and speed control of Induction machines

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Fundamentals of AC machine windings:**	Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil -active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding-concentrated and distributed, Sinusoidal distributed winding, winding distribution factor	***International Academia:*** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/pages/syllabus/ ***AICTE-prescribedsyllabus:***https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf ***Industry Mapping:*** IS 13107:1991 Guide for measurement of winding resistance of an ac machine during operation at alternating voltage. **Simulation Software:** MATLAB.	5	1. Demonstration of Cut Section models of different electrical machines. 2. To make connection diagram to full pitch & fractional slot winding of 18 slot squirrel cage Induction motor for 6 poles & 4 pole operation.

2	**Pulsating and revolving magnetic fields:**	Constant magnetic field, pulsating magnetic field -alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.	***International Academia***: https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/pages/syllabus/ ***AICTEprescribedsyllabus:*** https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf ***Industry Mapping:*** IS/ IEC Specification No. 60034-1: 2004 for Rotating Electrical Machines. **Simulation Software:** MATLAB.	5	MATLAB experiment on analysis of different field systems
3	**Induction Machines:**	Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.	***International Academia***: https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/pages/syllabus/ ***AICTEprescribedsyllabus:*** https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf ***Industry Mapping:*** IS Specification No. 325: 1996 regarding Specification for three-phase induction motors. IS Specification No. 4029: 1967 regarding Guide for	10	1. Different methods of starting of a 3 phase Cage Induction Motor & their comparison [DOL, Auto transformer & Star-Delta] 2. Speed control of 3 phase squirrel cage induction motor by different methods & their comparison [voltage control & frequency control]. 3. Speed control of 3 phase slip ring Induction motor by rotor resistance control. 4. Load test on wound rotor Induction motor to obtain the performance characteristics. 5. To study the performance of Induction generator

			testing three phase induction motors. **Simulation Software:** MATLAB.		
4	**Single-phase induction motors:**	Constructional features double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications	***International Academia:*** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/pages/syllabus/ ***AICTEprescribedsyllabus:*** https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf ***Industry Mapping:*** IS Specification No. 7572: 1974 regarding Guide for Testing Single-phase AC and Universal Motors. **Simulation Software:** MATLAB.	5	1. Load test on single phase Induction motor to obtain the performance characteristics. 2. Determination of equivalent circuit parameters of a single-phase Induction motor.

5	**Synchronous machines:**	Constructional features, cylindrical rotor synchronous machine -generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine –two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators – synchronization and load division.	***International Academia:*** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/pages/syllabus/ ***AICTEprescribedsyllabus:*** https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf ***Industry Mapping:*** IS Specification No. 7132: 1973 regarding Guide for testing of synchronous machines. **Simulation Software:** MATLAB.	10	1. Determination of regulation of Synchronous machine by Synchronous Impedance method. 2. To determine the direct axis resistance [Xd] & quadrature reactance [Xq] of a 3 phase synchronous machine by slip test. 3. Parallel operation of 3 phase Synchronous generators.
6	**Special Electromechanical devices:**	Principle and construction of switched Reluctance motor, Permanent magnet machines, Brushless DC machines, Hysteresis motor, Stepper motor, Tacho generators.	***International Academia:*** ***AICTEprescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE/EE/EEE/ME/BSC104/mOD4/pg211.pdf ***Industry Mapping:*** IEEE 1812: 2023regarding IEEE Guide for Testing Permanent Magnet Machines. **Simulation Software:** MATLAB.	5	Mini Projects to be given.

Suggested Learning Resources:

Text Books:

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Electrical Machines	Prithwiraj Purkait & Indrayudh Bandopadhyay	1st	Oxford University Press	2	Module 1 - Fundamentals of AC machine windings
				8,9,10	Module 2- Pulsating and revolving magnetic fields
				8,9,10	Module 3- Induction Machines
				14	Module 4- Single-phase Induction motors
				15	Module 6- Special Electromechanical devices
Electric Machines	DP Kothari & IJ Nagrath	4th	McGraw Hill	8	Module 5- Synchronous Machines

Reference Books:

1. Electrical Machines, Theory & Applications, M.N. Bandyopadhyay, PHI
2. Electric Machinery & Transformer, Bhag S. Guru and H.R. Hiziroglu, 3rd Edition, Oxford University press.
3. Electric Machinery & Transformes, Irving L. Kosow, PHI
4. Electric Machinery, A.E.Fitzgerald, Charles Kingsley,Jr. & Stephen D. Umans, 6th Edition, Tata McGraw Hill Edition.
5. Electrical Machines, R.K. Srivastava, Cengage Learning
6. Theory of Alternating Current Machinery, Alexander S Langsdorf, Tata Mc Graw Hill Edition
7. Electric Machines, Charles A. Gross, CRC press.
8. Problems in Electrical Engineering, Parker smith, 9th Edition, CBS publishers & distributors.

Syllabus for B.Tech Admission Batch 2022

Subject Name: Power System-I **Credit:3** **Lecture Hours: 42**

Subject Code: PCCEE502

Pre-requisite: Basic Electrical Engineering; Electric Circuit Theory; Electromagnetic field theory.

Relevant Links: Study Material Coursera1234 NPTEL

Course Objectives:

The purpose of learning this course is

1. To understand the basic concept of power system with grid interconnections, restructuring and Micro-grids.
2. To model the performance and characteristics of various power system components
3. To study and evaluate the effect of faults in power system and the basic protection schemes with circuit breakers and relay systems. .
4. To understand the concepts of HVDC transmission and application of renewable energy in power generation.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the basic concept of power system with grid interconnections, restructuring and Micro-grids.
CO2. Realize the concepts of various power system components with their performance and characteristics.
CO3. Evaluate fault currents for different types of faults and the basic protection schemes with circuit breakers and relay systems.
CO4. Appreciate the concepts of DC power transmission and renewable energy generation

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Basic Concepts**	Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems).Synchronous Grids and Asynchronous (DC) interconnections. Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.	**Academia Mapping:** a) https://ocw.mit.edu/courses/6-061-introduction-to-electric-power-systems-spring-2011/ b) **https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf** **Industry Mapping:** MATLAB, PSIM, ETAP	4	1. Mini project has to be given on power system model preparation.
2	**Power System Components**	Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Travelling-wave Equations. Sinusoidal Steady-state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines. Transformers: Three-phase connections and Phase-shifts. Three-winding transformers, auto-transformers, Neutral Grounding transformers. Tap-Changing in transformers. Transformer Parameters. Single phase equivalent of three-phase transformers. Synchronous Machines: Steady-state performance	**Academia Mapping:** a) https://ocw.mit.edu/courses/6-061-introduction-to-electric-power-systems-spring-2011/ b) https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf **Industry Mapping:** MATLAB, PSIM, ETAP	15	1. Determination of the generalized constants A.B, C, D of long transmission line and regulation of a 3-Φ transmission line model. 2. Study of distribution system by network analyzer. 3. Measurement of earth resistance by earth tester. 4. Determination of dielectric strength of insulating oil. 5. Determination of breakdown strength of solid insulating material.

		characteristics .Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short-circuit conditions–steady-state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.			6. Determination of parameter of 3-Φ transmission line model by power circle diagram. 7. Study of different types of insulator. 8. Study of active and reactive power control of alternator. 9. Study and analysis of an electrical transmission line circuit with the help of software. 10. Determination of dielectric constant, tan delta, resistivity of transformer oil.
3	**Fault Analysis and Protection Systems**	Method of Symmetrical Components (positive, negative and zero sequences).Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents. Neutral Grounding. Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection) and their application. Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination. Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams.	**Academia Mapping:** a) https://ocw.mit.edu/courses/6-061-introduction-to-electric-power-systems-spring-2011/ b) **https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf** **Industry Mapping:** MATLAB, PSIM, ETAP	14	1. Calculation of different faults using MATLAB and ETAP

4	**Introduction to DC Transmission & Renewable Energy Systems**	DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC).LCC and VSC based dc link, Real Power Flow control in a dc link. Comparison of a cand dc transmission. Solar PV systems: I-V and P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines. Permanent Magnetic Synchronous Generators and Induction Generators. Power Electronics interfaces of wind generators to the grid.	**Academia Mapping:** a) https://ocw.mit.edu/courses/6-061-introduction-to-electric-power-systems-spring-2011/ b) https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf **Industry Mapping:** MATLAB, PSIM, ETAP	9	1. Mini project has to be given on converter based model.

Suggested Learning Resources:

Text Books

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Power System Engineering,	D P Kothari, I J. Nagrath	3rd	McGraw Hill	1,22,24,28	Module1- Basic Concepts
				2,3,4,5,17,19,20	Module2- Power System Components
				10,11,12,15,16	Module3- Fault Analysis and Protection Systems
				21,28	Module4-Introduction to DC Transmission & Renewable Energy Systems

Reference Books

1. J.Grainger and W.D.Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
2. O.I.Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education, 1995.
3. B.M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G.Strbac, “Electric Power Systems”, Wiley, 2012.

Syllabus for B.Tech Admission Batch 2022

Subject Name: Control System **Credit:3** **Lecture Hours: 45**

Subject Code: PCCEE503

Pre-requisite: Basic Electrical Engineering; Electric Circuit Theory; Electric Machine-I

Relevant Links: StudyMaterial Coursera NPTEL

Course Objectives:

The purpose of learning this course is to-

1. To find mathematical representation of LTI systems
2. To find time response of LTI systems of different orders
3. To find the frequency response of LTI systems of different orders
4. To understand stability of different LTI systems
5. To analyze LTI systems with state variables
6. To solve problems of mathematical modelling and stability of LTI systems

Course Outcomes:

CO1. Develop mathematical model of mechanical, electrical, thermal, fluid system and different control system components like servomotors, synchros, potentiometer, tacho-generators etc.

CO2. Analyze stability of LTI system using routh-hurtwitz (RH) criteria, root locus techniques in time domain and bode plot and Nyquist technique in frequency domain.

CO3. Design different control law or algorithms like proportional control, proportional plus derivative(PD) control, proportional plus integration(PI) control, and proportional plus integration plus derivative (PID) control and compensators like lag, lead, lag-lead for LTI systems.

CO4. Apply state variable techniques for analysis of linear, nonlinear and discrete-time systems.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Introduction to control problem**	Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.	***AICTE-prescribed syllabus:*** https://www.aicte-india.orgisites/default/files/Model Curriculum/UG-1/ug-voll.pdf ***International Academia:*** https://ocw.mit.edu/courses/2-04a-systems-and-controls-spring-2013/pages/calendar/ ***Industry Mapping:*** MATLAB	4	Find transfer function for open loop and closed loop blocks using Matlab.
2	**Time Response Analysis**	Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.	***AICTE-prescribed syllabus:*** https://www.aicte-india.orgisites/default/files/Model Curriculum/UG-1/ug-voll.pdf ***International Academia:*** https://ocw.mit.edu/courses/2-04a-systems-and-controls-spring-2013/pages/calendar/ ***Industry Mapping:*** MATLAB, ANSYS	10	Evaluate time response using Matlab for 2nd order system Analyse Stability of LTI system using root-loci technique by Matlab

3	**Frequency-response analysis**	Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion–gain and phase margin. Closed-loop frequency response.	***AICTE-prescribed syllabus:*** https://www.aicte-india.orgisites/default/files/Model Curriculum/UG-1/ug-voll.pdf ***International Academia:*** ***https://ocw.mit.edu/courses/2-14-analysis-and-design-of-feedback-control-systems-spring-2014/pages/calendar/*** ***Industry Mapping:*** MATLAB	6	Analyse stability of LTI system by Bode, Nyquist plot using Matlab
4	**Introduction to Controller Design**	Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.	***AICTE-prescribed syllabus:*** https://www.aicte-india.orgisites/default/files/Model Curriculum/UG-1/ug-voll.pdf ***International Academia:*** ***https://ocw.mit.edu/courses/2-14-analysis-and-design-of-feedback-control-systems-spring-2014/pages/calendar/*** ***Industry Mapping:*** MATLAB	10	Analyse stability of LTI system by Root-locus method using Matlab Design PID controller for LTI System using Matlab
5	**State variable Analysis**	Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete time systems.	***AICTE-prescribed syllabus:*** https://www.aicte-india.orgisites/default/files/Model Curriculum/UG-1/ug-voll.pdf ***International Academia:*** ***https://ocw.mit.edu/courses/2-14-analysis-and-design-of-feedback-control-systems-spring-2014/pages/calendar/*** ***Industry Mapping:*** MATLAB	6	Represent LTI system by State Space method using Matlab Analyse stability of LTI system in State Space domain using Matlab Design state feedback controller for LTI system using MATLAB

6	**Introduction to Optimal Control and Nonlinear Control**	Performance Indices. Regulator problem, Tracking Problem. Non-linear system– Basic concepts and analysis.	***AICTE-prescribed syllabus:*** https://www.aicte-india.orgisites/default/files/Model Curriculum/UG-1/ug-voll.pdf ***International Academia:*** ***https://ocw.mit.edu/courses/2-14-analysis-and-design-of-feedback-control-systems-spring-2014/pages/calendar/*** ***Industry Mapping:*** MATLAB	5	Represent nonlinear system in state space domain using Matlab.

Suggested Learning Resources:

Text books:

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Linear Control Systems with MATLAB Applications	B. S. Manke	12th Edition	Khanna Publishers	1,2,3,4,5	Module 1: Introduction to control problem
				6	Module 2: Time Response Analysis
				7	Module 3: Frequency-response analysis
				8	Module 4: Introduction to Controller Design
				9	Module 5: State variable Analysis
				10	Module 6: Introduction to Optimal Control and Nonlinear Control

Reference books:

1. Modern Control Engineering, K. Ogata, 4th Edition, Pearson Education
2. Control System Engineering, I. J. Nagrath & M. Gopal. New Age International Publication.
3. Control System Engineering, D. Roy Choudhury, PHI
4. Control System Design, C. Goodwin Graham, F. Graebe F. Stefan, Salgado. E. Mario, PHI

Syllabus for B.Tech Admission Batch 2022

Subject Name: Engineering Economics **Credit:3** **Lecture Hours: 26**

Subject Code: HSMCEE501

Pre-requisite: High school mathematics

Relevant Links: StudyMaterial NPTEL

Course Objectives:

The purpose of learning this course is-

1. An ability to account for the time value of money in economic analyse and ability to make economic decisions using present worth, annual worth, future worth, and capitalized cost;
2. An ability to calculate rates of return on investments and ability to calculate benefit-cost ratios of public works projects.
3. An ability to make economic decisions involving mortgages, car loans, bonds, stocks, and rent-to-own purchases.
4. An ability to calculate annual depreciation amounts for tangible assets using straight-line, declining balance, and MACRS depreciation.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Apply knowledge of mathematics, economics, and engineering principles to solve engineering problems.
CO2. Understand the major capabilities and limitations of cash flow analysis for evaluating proposed capital investments.
CO3. Account for time value of money using engineering economy factors and formulas,
CO4. Understand the implications and importance of considering taxes, depreciation, and inflation.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Economic Decisions Making –**	Overview, Problems, Role, Decision making process.	***International Academia:*** https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/ ***AICTE-prescribed syllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: N/A***	2	No corresponding lab
2	**Engineering Costs & Estimation** –	Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	**International Standards**: https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/ ***AICTE prescribed syllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: N/A***	4	No corresponding lab

3	**Cash Flow, Interest and Equivalence :**	Cash Flow – Diagrams, Categories & Computation, Time Value Of Money, Debt repayment, Nominal & Effective Interest.	***International Standards***: https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/ ***AICTE prescribed syllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: N/A***	2	No corresponding lab
4	**Present Worth Analysis**:	End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.	***International Standards:*** https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/ ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: NA***	2	No corresponding lab

5	**Cash Flow & Rate Of Return Analysis** –	Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate Of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.	***International Standards:*** ***https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/*** ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: NA***	4	No corresponding lab
6	**Uncertainty In Future Events -**	Estimates And Their Use In Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.	***International Standards:*** ***https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/*** ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: NA***	2	No corresponding lab
7	**Depreciation -**	Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.	***International Standards:*** ***https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/*** ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf)	4	No corresponding lab

			Industry Mapping: NA		
8	**Replacement Analysis -**	Replacement Analysis Decision Map, Minimum Cost Life Of A New Asset, Marginal Cost, Minimum Cost Life Problems.	***International Standards:*** ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: NA***	2	No corresponding lab
9	**Inflation And Price Change** –	Definition, Effects, Causes, Price Change With Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.	***International Standards:*** ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: NA***	2	No corresponding lab
10	**Accounting** –	Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	***International Standards: https://ocw.mit.edu/courses/esd-70j-engineering-economy-module-fall-2009/*** ***AICTE prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping: NA***	2	No corresponding lab

Suggested Learning Resources:

Text Books

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Economics for Engineers	H L Bhatia, S N Maheswari	Third Edition	Vikas Publishing House	1,2	Module 1: Introduction to Engineering Economy, Time value of money, Cash flow diagrams, Interest and Interest rate, Discrete compounding and payment.
				3	Module 2: Interest formulae for discrete compounding and discrete payments-Gradient series factors, Nominal & Effective interest.
				4,5	Module 3: Economic equivalence, Methods of comparison of alternatives.
				5	Module 4: Replacement analysis, Economic life of the asset.
				6	Module 5: Depreciation and Depletion.
				3	Module 6: Elements of cost, Break even analysis, Economic order quantity.
				3,7	Module 7: Cost estimation, Decision under risk and uncertainty.
				12	Module 8: Effect of taxation on economic studies, Income tax analysis.

Reference Books

1. Engineering Economy, Sullivan and Wicks: Pearson
2. Engineering Economics, R.PaneerSeelvan: PHI
3. Engineering Economics Analysis, Michael R Lindeburg: Professional Pub.

Syllabus for B.Tech Admission Batch 2022

Subject Name: Electromagnetic Waves **Credit:3** **Lecture Hours: 43**

Subject Code: PECEE501A

Pre-requisite: Electromagnetic Fields

Relevant Links: Study Material Coursera NPTEL LinkedIn Learning

Course Objectives:

The purpose of learning this course is to-

1. Understand transmission lines operation.
2. Understand the concept of plane wave problems for various boundary conditions.
3. Understand the wave propagation in lossy and low loss dielectric media.
4. Understand the field distributions in a rectangular wave-guide
5. Understand the radiation by antennas

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Analyse transmission lines and estimate voltage and current at any point on transmission line for different load conditions.

CO2. Analyse the field equations for the wave propagation in special cases such as lossy and low loss dielectric media.

CO3. Visualize TE and TM mode patterns of field distributions in a rectangular wave-guide.

CO4. Understand and analyse radiation by antennas.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Transmission Lines**	Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines,Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	6	No corresponding lab
2	**Maxwell's Equations**	Basic quantities of Electromagnetics, Basic laws of Electromagnetics: Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Maxwell's equations, Surface charge and surface current, Boundary conditions at media interface.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	6	No corresponding lab

3	**Uniform Plane Wave**	Homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	7	No corresponding lab
4	**Plane Waves at Media Interface**	Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection. Wave polarization at media interface, Brewster angle, Fields and power flow at media interface, lossy media interface, Reflection from conducting boundary.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	7	No corresponding lab
5	**Waveguides**	Parallel plane wave guide: Transverse Electric (TE)mode, transverse Magnetic(TM)mode, Cut-off frequency, Phase velocity and dispersion. Transverse Electromagnetic(TEM)mode, Analysis of wave guide-general approach, Rectangular wave guides.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	7	No corresponding lab

6	**Antennas**	Radiation parameters of antenna, Potential functions, Solution for potential functions, Radiations from Hertz-dipole, Near-field, Far-field, Total power radiated by a dipole, Radiation resistance and radiation pattern of Hertz dipole, Hertz dipole in receiving mode.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	7	No corresponding lab

Suggested Learning Resources:

Text Books

1. R.K.Shevgaonkar,"ElectromagneticWaves",TataMcGrawHill,2005.
2. M.N.O. Sadiku,"ElementsofElectromagnetics",OxfordUniversityPress,2007.

Reference Books

1. D.K.Cheng,"FieldandWaveElectromagnetics",Addison-Wesley,1989.
2. C.A.Balanis,"AdvancedEngineeringElectromagnetics",JohnWiley&Sons,2012.
3. C.A. Balanis, " Antenna Theory: Analysis and Design", John Wiley &Sons,2005.

Syllabus for B.Tech Admission Batch 2022

Subject Name: Industrial Electrical System **Credit:3** **Lecture Hours: 40**

Subject Code: PECEE501B

Pre-requisite: Basic Electrical Engineering, Circuit Theory, Digital Electronics

Relevant Links: Study Material NPTEL

Course Objectives:

At the end of this course, students will demonstrate the ability to

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. To have an overview of relevant Electricity Acts and appreciate the applications of various components of industrial electrical systems.
CO2. To be able to design the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings and SLD.
CO3. Analyze and select the proper size of various electrical system components
CO4. To conceive methods of Industrial Automation and Illumination Systems

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Electrical System Components**	Overview of The Electricity Act 2003, Indian Electricity Rule, 1956, The Energy Conservation Act, 2003, National Electrical code, 2011.LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components-Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram(SLD)of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** PLC SCADA DCS	8	No corresponding lab
2	**Residential and Commercial Electrical Systems**	Typesofresidentialandcommercialwiringsystems,generalrulesandguidelinesforinstallation,loadcalculationandsizingofwire,ratingofmainswitch,distributionboardandprotectiondevices,earthingsystemcalculations,requirementsofcommercialinstallation,decidinglightingschemeandnumberoflamps, earthingofcommercialinstallation,selectionandsizingofcomponents.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** PLC SCADA DCS	8	No corresponding lab

3	**Illumination Systems**	Understanding various terms regarding light, lumen, intensity, candlepower, lamp efficiency, specific consumption,glare,spacetoheightratio,wastelightfactor,depreciationfactor,various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, floodlighting current, short circuit current, circle diagram, operating characteristics.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** PLC SCADA DCS	6	No corresponding lab
4	**Industrial Electrical Systems I**	HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction–kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** PLC SCADA DCS	8	No corresponding lab

5	**Industrial Electrical Systems II**	DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG,UPS and Battery Banks, Selection of UPS and Battery Banks.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** PLC SCADA DCS	6	No corresponding lab
6	**Industrial Electrical System Automation**	Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** PLC SCADA DCS	6	No corresponding lab

Suggested Learning Resources:

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Basic Electrical Estimating	Jagadish Pal	1st	Aryan Publishing House	12	Module 1: Electrical System Components
Electrical Design Estimating and Costing	Raina and Bhattacharya	Reprint 2005	New Age Publisher	1,2	Module 2: Residential and Commercial Electrical Systems
Power System Engineering	M.Soni, U.S. Bhatnagar	9th	Dhanpat Rai	4	Module 3: Illumination
Electrical Design Estimating and Costing	Raina and Bhattacharya	Reprint 2005	New Age Publisher	1,2,7	Module 4: Industrial Electrical Systems I

Syllabus for B.Tech Admission Batch 2022

Subject Name: Introduction to database systems **Credit:3** **Lecture Hours: 36**
Subject Code: OECEE501A

Pre-requisite: Fundamental concepts of set theory and designing.
Relevant Links: Study material Coursera NPTEL Linkedin Learning InfosysSpringboard

Course Objectives:

1. To introduce database systems, data models, database languages and the diagrammatic approach to design database systems.
2. To introduce the logical and mathematical formulation concept on database systems and further extend these concept towards learning database implementation languages.
3. To develop understanding on relational database design.
4. To understand the internal operations on a database systems and the storage architecture of data concepts.

Course Outcomes:

CO1: Students will have a proper understanding on database system and design.
CO2: Students will learn the concepts of database designing using logical and mathematical concepts like relational algebra and calculus which further will be extended to learning of SQL.
CO3: Students will gather the understanding of relation database design through the concept of normalization.
CO4: Students will learn the internals of DBMS through proper understanding of transaction and further the storage architecture of data for a database system.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Introduction to database systems and Entity-Relationship Model**	Concept & Overview of DBMS, Data Models Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS E-R modelling - Basic concepts, Design Issues, Mapping Constraints Keys, Entity-Relationship Diagram Weak Entity Sets, Extended E-R features	***International Academia:*** 1. https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/ 2. https://ocw.mit.edu/courses/6-5830-database-systems-fall-2023/ ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf*** ***Industry Mapping:*** ***Star UML Downloading link*** https://staruml.io/download/ Diagram design online using Draw.io https://app.diagrams.net/	10L	Designing of E-R modelling using Star UML or any other standard designing software.

2	**Introduction to Relational Model and SQL & Integrity Constraints**	Structure of relational Databases, Relational Algebra operations, examples and exercise Relational Calculus - operations, examples and exercise Extended Relational Algebra Operations, Views, Modifications Of the Database Concept of database languages - DDL, DML, DCL Basic Structure, Set operations, Aggregate Functions, Null Values Domain Constraints, Referential Integrity Constraints, assertions, views Joins Nested Sub-queries Stored procedures and triggers, Overview of Query Optimization	***International Academia:*** 1. https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/ 2. https://ocw.mit.edu/courses/6-5830-database-systems-fall-2023/ ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf*** ***Industry Mapping:*** ORACLE10g https://www.oracle.com/in/database/technologies/xe-downloads.html	14L	Queries on the following – 1. Tablecreation. 2. Data insertion, deletion, updation in table. 3. Aggregation functions on data. 4. Concepts of keys in table. 5. Concept of Joins. 6. Sub-quries & Nested subqueries. 7. PL SQL programming. 8. Stored procedures and triggers – concept. Some of the sample queries- https://docs.google.com/document/d/1Pbg5YkwTHC11qqjjMvbNcDHxR-2TMIb1/edit?usp=drive_link&ouid=107146940537629597388&rtpof=true&sd=true

3	**Relational Database Design**	Functional Dependency, Different anomalies in designing a Database Armstrong axioms, closure of attribute set Equivalence of functional dependency Canonical Cover Keys, types of keys, finding no. of candidate keys Normalization using functional dependencies –1NF,2NF,3NF,BCNF,multivalued dependencies - concept of4NF, 5NF Decomposition using normal forms Lossless or Lossy decomposition	***International Academia:*** 1. https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/ 2. https://ocw.mit.edu/courses/6-5830-database-systems-fall-2023/ ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf*** ***Industry Mapping:*** ORACLE10g https://www.oracle.com/in/database/technologies/xe-downloads.html	10L	

4	**Internals of RDBMS And File Organization & Index Structures**	Concept of transactions and schedules, ACID properties Transaction processing, Concurrency control – conflict and view serializability Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes Dynamic Multilevel Indexes using B tree and B+ tree	***International Academia:*** 1. https://ocw.mit.edu/courses/6-830-database-systems-fall-2010/ 2. https://ocw.mit.edu/courses/6-5830-database-systems-fall-2023/ ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf*** ***Industry Mapping:*** ORACLE10g https://www.oracle.com/in/database/technologies/xe-downloads.html	12L	

Text Books:

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Database System Concepts	Silberschatz, Korth and Sudarshan	6th and 7th	McGraw-Hill	1, 2, 3, 4, 6, 7, 8, 11, 14, 15, 16	Module 1- Introduction to database systems and Entity-Relationship Model
Fundamentals of Database Systems	Elmasri and Navathe	6th	Pearson	1, 2, 3, 5, 6, 7, 8, 14, 15, 16, 17, 20, 21	Module 2 - Introduction to Relational Model and SQL & Integrity Constraints
Database Management System (DBMS): A Practical Approach	Chopra Rajiv,	3rd and 5th	S. Chand Publishing.	1, 4, 5, 6, 7, 8	Module 3 - Relational Database Design
					Module 4 - Internals of RDBMS And File Organization & Index Structures

Syllabus for B.Tech Admission Batch2022

Subject Name: Analog and Digital Communication **Credit:2** **Lecture Hours: 40**

Subject Code: OECEE501B

Pre-requisite: Analog and Digital Electronics.

Relevant Links: Study Material NPTEL LinkedIn Learning

Course Objectives:

The purpose of learning this course is to-

1. Need for modulation and calculate the antenna size for different carrier frequencies
2. Compare between the different demodulation methods,
3. Identify the type of modulation, calculate the side-band frequencies
4. Calculate the Noise temperature & SNR for different systems
5. Sound knowledge on various digital communication systems.

Course Outcomes:

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

CO1. Develop the generation and detection technique of analog communication system and analyze the different multiplexing techniques.
CO2. Examine the signal-to-noise ratio (SNR) performance of analog communications systems
CO3. Demonstrate the theory of probability and identify various complex program of communication system.
CO4. Execute the operation of different error control coding schemes for the reliable transmission of digital representation of signals and

information over the channel.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Review of signals and systems**	Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.	***International Academia:*** https://ocw.mit.edu/courses/6-011-introduction-to-communication-control-and-signal-processing-spring-2010/ ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** MATLAB	10	No corresponding lab
2	**Review of probability and random process.**	Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.	***International Academia:*** https://ocw.mit.edu/courses/6-011-introduction-to-communication-control-and-signal-processing-spring-2010/ ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** MATLAB	8	No corresponding lab

3	**Pulse modulation.**	Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers	***International Academia:*** https://ocw.mit.edu/courses/6-011-introduction-to-communication-control-and-signal-processing-spring-2010/ ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** MATLAB	8	No corresponding lab
4	**Elements of Detection Theory**	Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.	***International Academia:*** https://ocw.mit.edu/courses/6-011-introduction-to-communication-control-and-signal-processing-spring-2010/ ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** MATLAB	10	No corresponding lab
5	**Digital Modulation tradeoffs**	Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.	***International Academia:*** https://ocw.mit.edu/courses/6-011-introduction-to-communication-control-and-signal-processing-spring-2010/ ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** MATLAB	4	No corresponding lab

Suggested Learning Resources:

Text Books

Name of the Text Book	Author Name	Edition	Publisher Name	Chapter No.	Module No. and Name of the proposed Syllabus
Fundamentals of communication system	Proakis J. G. and Salehi M	Year 2005	Pearson Education	Chapter 3 & 4	Module 1: Review of signals and systems
				Chapter 5	Module 2: Review of probability and random process
				Chapter 7	Module 3: Pulse modulation
				Chapter 10	Module 4: Elements of Detection Theory
Modern digital and analog communication systems	B.P Lathi and Zhi Ding	4th Edition	Oxford Publication	Chapter 9	Module 5: Digital Modulation tradeoffs

Reference Books

1. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
2. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering", John Wiley, 1965.
3. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.

Syllabus for B.Tech Admission Batch 2022

Subject Name: Industrial Automation- I **Credit:2** **Lecture Hours: 30**

Subject Code: OECEE501C

Pre-requisite: Basic Electrical Engineering, Mathematics

Course Objectives:

1. To provide students with a comprehensive understanding of industrial automation systems, including their architecture, levels, and applications across various industries.
2. To familiarize students with the principles and operation of digital electronics, enabling them to design and troubleshoot basic automation circuits.
3. To introduce students to the components of industrial automation systems, such as programmable controllers, sensors, actuators, and SCADA/HMI systems, and their integration into automation solutions.
4. To equip students with the skills necessary to interpret engineering diagrams, including process and instrument diagrams (P&ID) and process flow diagrams (PFD), essential for system design and implementation.
5. To enable students to develop proficiency in level-I automation programming, including the concept of structured programming and exposure to simple programming languages like ladder logic (LAD) and function block diagram (FBD), facilitating the implementation of automation solutions.

Course Outcomes:

1. Understand the fundamentals of industrial automation, including the levels and architecture of automation systems, and their requirements and uses in various industries.
2. Gain proficiency in digital electronics, including numbering systems, logic gates, flip-flops, timers, counters, and data types conversion, essential for automation system design and operation.
3. Acquire knowledge of the components of industrial automation systems, such as programmable controllers, sensors, actuators, IO devices, computer hardware, networking components, and SCADA/HMI systems.
4. Develop skills in gathering inputs for automation systems, including interpreting engineering diagrams (P&ID, PFD), creating equipment and instrument lists, and understanding functional descriptions, crucial for system design and implementation.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Introduction**	Introduction & Ice Breaking What is Automation? Levels of Automation System Architecture of Industrial Automation System Requirements & uses of Automation Systems	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***IndustryMapping:***	1	
2	**Basics of digital electronics**	Numbering System Gates Flip-flops (Mainly SR Flip-Flops) Timers & Counters Data Types & Conversion	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	2	
3	**Component of Industrial Automation system**	Programmable Controllers & Power Supply Sensors, Actuators, IO Devices (RIO, VVVF Drives etc.) Computer Hardware (Programming Unit, HMI etc.) & System Software Networking Components SCADA/HMI Basics of Electrical Equipment (Motors, MCC, Contactors, Relays etc.)	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	7	

4	**Inputs for an Automation system**	Introduction to Engineering Process & Instrument Diagram (P&ID) Process Flow Diagram (PFD) Motor & Component List Instrument List Signal List/IO List Local Control Desk/Local Control Station Functional Description	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	5	
5	**Basics of level-I Automation programming**	Significance of Programming Concept of Structured Programming Programming Languages Exposure to Simple Programming (Binary and digital operations) in LAD Exposure to Simple Programming (Binary and digital operations) in FBD	***International Academia:*** ***AICTE-prescribedsyllabus:***(https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:***	15	

Syllabus for B.Tech Admission Batch 2022

Subject Name: Electrical Machines Laboratory-II **Credit:1** **Lecture Hours: 24**

Subject Code: PCCEE591

Pre-requisite: Electrical Machine -I Laboratory

Course Objective(s):

The purpose of learning this course is to-

1. To understand the arrangement of windings of AC machines.
2. To understand the principle of production of pulsating and revolving magnetic fields.
3. To understand the principle of operation and characteristics of three phase Induction machines.
4. To understand the principle of operation and characteristics of single phase Induction machines.
5. To understand the principle of operation and characteristics of synchronous machine.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Identify appropriate equipment and instruments for the experiment.
CO2. Test the instrument for application to the experiment.
CO3. Construct circuits with appropriate instruments and safety precautions.
CO4. Validate different characteristics of three phases Induction Motor, Single Phase Induction Motor, Alternator and Synchronous Motors.

LaboratoryExperiments

Module No	Description	Lecture Hours
1	Different methods of starting of a 3 phase Cage Induction Motor & their comparison [DOL, Auto transformer & Star-Delta].	**2**
2	To make connection diagram to full pitch & fractional slot winding of 18 slot squirrel cage Induction motor for 6 poles & 4 pole operation.	**2**
3	Speed control of 3 phase squirrel cage induction motor by different methods & their comparison [voltage control & frequency control].	**2**
4	Load test on single phase Induction motor to obtain the performance characteristics.	**2**
5	Determination of equivalent circuit parameters of a single phase Induction motor.	**2**
6	Speed control of 3 phase slip ring Induction motor by rotor resistance control.	**2**
7	Load test on wound rotor Induction motor to obtain the performance characteristics.	**2**
8	To determine the direct axis resistance [Xd] & Quadrature reactance [Xq] of a 3 phase synchronous machine by slip test.	**2**
9	To study the performance of Induction generator.	**2**
10	Determination of regulation of Synchronous machine by a. Synchronous Impedance method. b. Potier reactance method.	**2**
11	Parallel operation of 3 phase Synchronous generators.	**2**
12	V-curve of Synchronous motor.	**2**
Total		**24**

Syllabus for B.Tech Admission Batch 2022

Subject Name: Power System Laboratory - I **Credit:1** **Lecture Hours:24**

Subject Code: PCCEE592

Pre-requisite: Basic Electrical and Electronics Engineering Laboratory, Electric Circuit Theory Laboratory.

Course Objective(s):

The purpose of learning this course is-

1. To analyse two port circuit behavior.
2. Understand the behaviour of a synchronous machine and to determine its parameters.
3. Analyse the transmission line circuit
4. Calculate the breakdown strength of solid and liquid insulating materials.

Course Outcomes:

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

CO1. Analyze experimental results obtained from simulation of different lines and their corresponding effects.
CO2. Understand the behaviour of a synchronous machine and to determine its parameters.
CO3. Evaluate the breakdown strength of solid and liquid insulating materials.
CO4. Understand the planning of load dispatch economically and optimally.

Laboratory Experiments

Module No	Description	Lecture Hours
1	Determination of the generalized constants A.B, C, D of long transmission line	**2**
2	Study on Economic load dispatch.	**2**
3	Measurement of earth resistance by earth tester.	**2**
4	Dielectric strength test of insulating oil	**2**
5	Determination of breakdown strength of solid insulating material.	**2**
6	Different parameter calculation by power circle diagram	**2**
7	Study of different types of insulator.	**2**
8	Active and reactive power control of an alternator	**2**
9	Study and analysis of an electrical transmission line circuit with PSPICE.	**2**
10	Verification of Ferranti effect in a long transmission line.	**2**
11	Modeling and performance analysis of DC distribution system using matlab.	**2**
12	Modeling and performance analysis of transmission lines using matlab.	**2**
TOTAL		**24**

Syllabus for B.Tech Admission Batch 2022

Subject Name: Control System Lab **Credit:1** **Lecture Hours: 30**

Subject Code: PCCEE593

Course Objective(s):

The purpose of learning this course is to-

1. Mathematically model various systems and study their responses.
2. Successfully use modern IT tools to study the characteristics of different systems.
3. Study stability of various control systems.
4. To work effectively in a team

Course Outcomes:

At the end of this course, students will be able to demonstrate

CO1. Mathematically model electrical and mechanical systems and derive their transfer functions and use relevant IT tools such as MAT-Lab control system tool box, MAT-Lab- Simulink tool box & PSPICE for simulation and finding out solution of a problem. Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.

CO2. Evaluate the stability of different control systems and design various controllers (P, I, PID etc) for a given application.

CO3. Validate step response & impulse response for type-0, type-1 & Type-2 system with unity feedback using MATLAB & PSPICE.

CO4. To build leadership quality working in a team to construct the experiment, identify the variables and finding out the solution of a given problem using appropriate IT tools and interpret the experimental data to generate a proper report.

Laboratory Experiments

Experiment No.	Description	Hrs.
1	Design and simulation of linearized models using MATLAB	**3**
2	Time response and frequency response analysis using MATLAB	**3**
3	Design and simulation of LTI models of Feedback Control System using MATLAB.	**4**
4	Simulation and analysis of state space models for continuous time and discrete time systems using MATLAB.	**4**
5	PID control of a Thermal and / or Liquid Level System.	**4**
6	Study of D.C. Servo System for position control and speed control.	**4**
7	Position control of DC Servo System with Lead/Lag Compensator in the loop.	**4**
8	PID tuning on process Control Simulator	**4**
Total		**30**