New

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

Dealing Officials

Officer	Clerk
ARP	34

Dy. Registrar (Academic)

Guru Nanak Dev Engineering College, Ludhiana. Receipt No. 599 Date 20-7-26

No. EE/592 Dated 20/7/2026

Dean (Academics)

Please find below the Study Scheme for further approval from Academic Council:

Program	B.Tech.(Electrical Engineering)	Semester	5
Scheme Code	2024	AICTE/UGC	AICTE
Subject Group		Lateral Entry Status	N
Six Month Training	N	Compulsory Theory Count	5
Compulsory Practical Count	2	Elective Theory Count	4
Elective Practical Count	0	Total Course Count	11

List of Courses

S.No.	Course Category	Module Name	Course Code	Course Title	Theory/ Practical (T/P)	Course Type	Contact hours Per Week			Integrated Course	Credits	Marks Distribution		Min. % of Problems(#)
							L	T	P			CA Marks	ESE Marks	
1	Professional Core Courses	Control and Instrumentation	CEE110	PLC and Industrial Drives	T	Compulsory	3	1	2	Y	5	90	60	30
2	Professional Core Courses	Control and Instrumentation	CEE111	Control Systems	T	Compulsory	3	1	2	Y	5	90	60	60
3	Professional Core Courses	Electrical Machines	CEE112	Synchronous Machines	T	Compulsory	3	1	2	Y	5	90	60	40
4	Professional Elective Courses	Power and Energy Systems	EEE101	Electric Generation and Economics	T	Elective-I	3	1	0	N	4	40	60	40
5	Professional Elective Courses	Power and Energy Systems	EEE102	Energy Auditing and Management	T	Elective-I	3	1	0	N	4	40	60	30
6	Professional Elective Courses	Electrical Machines	EEE103	Electric Drives and Utilization	T	Elective-I	3	1	0	N	4	40	60	20
7	Professional Elective Courses	Computational Tools and Techniques	EEE104	Fuzzy Expert Systems	T	Elective-I	3	1	0	N	4	40	60	30

Uploaded by(Sign. with date)	Verified by(Sign. with date)	Recommended by(Sign. with date)
Department Clerk(hkcgne)	BoS Convener	HoD cum Chairperson (BoS)

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8	Engineering Science Courses	Entrepreneurship Fundamentals	ESC106	Entrepreneurship and Startups	T	Compulsory	3	0	0	N	3	40	60	0
9	Engineering Science Courses	Ideation and Creativity	ESEE101	Design Thinking	P	Compulsory	0	0	2	N	1	50	0	0
10	Mandatory Courses (Non-Credit)	Emergency Preparedness Essentials	MC103	Disaster Management and Preparedness	T	Compulsory	2	0	0	N	0	50	0	0
11	Project Work, Seminar and Internship	Experiential Learning	TREE102	Training-II	P	Compulsory	0	0	120	N	1	60	40	0
Total							26	7	128		36			

Department Remarks: Approved by BoS - Approved in 17th BOS Meeting held on 20-03-2026. For MC103 (Non-Credit Course), the minimum criteria for passing is to secure at least 40% of maximum marks assigned to Continuous Assessment (CA) and attain satisfactory level (S). Training-II (TREE102) evaluates Industrial/Institutional Training undertaken by students at the end of 4th semester with duration of minimum 120 hours and of 3-4 weeks.

ESE- End Semester Examination, **CA**- Continuous Assessment

#-Minimum percentage of Numerical/Design/Programming Problems in ESE (for Theory).

TREE102

Uploaded by(Sign. with date) Department Clerk(hkcgne)	Verified by(Sign. with date) BoS Convener	Recommended by(Sign. with date) HoD cum Chairperson (BoS)
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B.Tech 3rd Year (Electrical Engineering)

Subject Code: CEE110
Subject Name: PLC and Industrial Drives

Programme: B.Tech (EE)	**L:** 3 **T:** 1 **P:** 2	**Credits:** 5
Semester: 5	**Theory/Practical:** Integrated	**Teaching Hours:** 45(L)+15(T)+30(P) = 90 hrs
Total Max. Marks: 150	**Continuous Assessment (CA) Marks:** 90	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 30%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Core Course		

Prerequisites: CEE105, CEE107

Additional Material allowed in ESE: Non-Programmable Scientific Calculator

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Illustrate the architecture, working principles, and components of PLC systems and electric drives.
2	Apply PLC programming techniques using ladder logic and basic structured text for industrial control problems.
3	Examine industrial communication methods and the interfacing of PLC with HMI, sensors, and field devices.
4.	Analyze the performance characteristics of electric drives and induction motor control methods under different load conditions.
5.	Evaluate the selection and operation of power electronic converters and drive systems for efficient speed control and energy conservation.
6.	Design basic automation systems using PLC, HMI, and SCADA for industrial applications.

Contents

Part-A

Unit-I Introduction to PLC **08(L) hrs**

Introduction, Advantages of PLC control panel, Architecture of PLC, Functions of various blocks that make PLC, Working principle of PLC, Memory types, Different types of input/output circuits, Concept of digital I/O & analog I/O, Concept of PLC scan cycle. Industrial PLC brands overview (Siemens, ABB, Delta and Schneider). Introduction to IEC 61131-3 standard.

Unit-II PLC Programming **07(L) hrs**

Concept of sink and source I/O cards, Different programming methods (ladder, function block diagram, sequential text), programming devices, programming with PLC, Boolean gates, Timer/Counter instructions, Memory instructions, compare instructions, move instructions, Math instructions, Concept of latching/holding Interlocking, Memory Mapping.

Unit-III Introduction to Human Machine Interface **08(L) hrs**

Introduction to HMI, Components of HMI Systems, HMI Design and Development, HMI–PLC Communication, Alarms, Trends, and Data Logging, Applications of HMI in Industry, Communication protocols of PLC, Modbus (RTU/TCP), Profibus / Profinet, Ethernet/IP (basic idea), PLC networking basics.

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Part-B

Unit-IV Introduction to Electrical Drives **07(L) hrs**

Introduction to electric drives, block diagram of electric drive, classification of drives: According to supply system, load, protections and applications. Types of loads, fundamental torque equations, equivalent values of drive parameters, nature and classification of load torque, Difference between AC drives and DC drives.

Unit-V Solid State Controlled Drives **08(L) hrs**

Control of AC drives fed through single-phase and three-phase semi-converter and full-converter phase-controlled configurations, their analysis, Regeneration and braking through power converters, control of three phase induction motors by stator voltage and frequency control for speeds, V/f and Vector control, Energy efficient drives, losses in electrical drive system, Energy conservation in electric drives. Basics of Servo drives v/s VFD

Unit-VI Concept of SCADA **07(L) hrs**

Introduction to SCADA, Definition of SCADA, Need of SCADA in modern industries, Evolution of SCADA systems, SCADA System Architecture, Components of SCADA System, SCADA Applications, Advantages and Limitations of SCADA, SCADA vs HMI

Tutorial hours will be used for practice sessions for design/numerical problems/programming/case-studies, etc. (as the case may be).

Software & Hardware: - choose anyone from these

CODESYS software (ABB), MICROWIN SMART (SIMATIC S7-200), SX-programmer (FUJI PLC), WPLSoft2.5.1 DELTA, MICROLOGIX (ALLEN BRADLEY), LEGO Siemens, TIA PORTAL (SIMATIC S7-1200).

Laboratory Work:

Experiment No.	Experiment Title
1	Basic logic instructions of PLC and logic gates.
2	Hard wire logic for DOL starter followed by a PLC ladder program to perform the operation of D.O.L. starter.
3	Write a PLC ladder program to perform the operation of forward/reverse of motor along with interlocking.
4	Hard wire logic of relay (latching and holding concept)
5	Hard wire logic for timers
6	Hard wire logic for star delta starter followed by a PLC ladder program to perform the operation of automatic star-delta starter
7	PLC logic for S1 ON Then Op1 ON, S2 ON Then Op2 ON and Op1 OFF, S3 ON Op2 OFF Op1 ON
8	Use of arithmetic operations and move blocks
9	PLC logic for S1 ON then Op1 Op2 Op3 ON, S2 ON then Op1 Op2 ON, S3 ON then Op1 Op3 ON, S4 ON then Op2 Op3 ON
10	PLC logic for Pb1 ON then Op1 ON, Pb2 ON then Op2 ON, Op1 OFF, Pb3 ON then Op3 ON, Op1 Op2 OFF
11	PLC logic for Pb1 press 1st time then Op1 ON, Pb1 release 1st Time then Op2 ON, Pb1 Press 2nd time then Op3 Op4 ON ,Pb1 release 2nd time then all Op OFF

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12	PLC logic for S1 ON then Op1 ON after 10 sec- Op2 ON after 5 Sec - Op3 ON after 3 sec, S2 OFF then Op3 OFF after 10 sec- Op2 OFF after 5 Sec - Op1 OFF after 3 Sec
13	Write a PLC ladder program to perform the operation of blinker circuit. S1 ON then-Op1 ON after 0.1 sec, Op1 OFF after 0.1 sec, repeat 1. and 2. for ever
14	Introduction to Human Machine Interface and connections.
15	Write a PLC ladder program along with HMI to perform the operation of blinking of object in HMI
16	Write a PLC ladder program to perform the operation of controlling physical outputs through HMI.
17	Write a PLC ladder program to perform the operation of traffic light system.
18	PLC-based PID control (temperature or level simulation)
19	Introduction to types of Sensors and their interfacing with PLC's.
20	Introduction to Switchgear and different types of relays.
21	Basic parameterization of drive. (acceleration, deceleration, speed control)

Reference Material: Manual Available in lab

Mini Project: Students shall develop software/simulation/ hardware project based on above experiments list.

Text Books:

1. D.H. Hanssen, "Programmable Logic Controllers" Wiley, 1st Edition, 2015
2. M. Barnes, "Practical Variable Speed Drives and Power Electronics", Elsvier 1st edition, 2003
3. G. K. Dubey, "Power Semiconductor Controlled Drives", Prentice Hall, 1989.
4. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Prentice Hall, 2001.
5. G. K. Dubey, "Fundamentals of Electrical Drives", CRC Press, 2002.
6. W. Leonhard, "Control of Electric Drives", Springer Science & Business Media, 2001.
7. B.K. Bose, "Modern Power Electronics and AC Drives",PHI, 2002.

Reference Books:

1. W. Bolton, *"Programmable Logic Controllers"*, Newnes (Elsevier), 6th Edition, 2015.
2. F. D. Petruzella, *"Programmable Logic Controllers"*, McGraw-Hill Education, 5th Edition, 2016.
3. K. Kamel and E. Kamel, *"Programmable Logic Controllers: Industrial Control"*, McGraw-Hill Professional, 1st Edition, 2013.
4. M. Mitra and S. Sengupta, *"Programmable Logic Controllers and Industrial Automation: An Introduction"*, McGraw-Hill Education, 2nd Edition, 2017.
5. V. Subrahmanyam, *"Electric Drives: Concepts and Applications"*, McGraw-Hill Education, 2nd Edition, 2011.
6. S. K. Sul, *"Control of Electric Machine Drive Systems"*, Wiley-IEEE Press, 1st Edition, 2011.

Online Learning Materials:

1. https://www.marian.ac.in/public/images/uploads/pdf/online-class/eee/MODULE%206iia.pdf
   Accessed on March 15, 2026
2. https://inductiveautomation.com/resources/article/what-is-a-PLC
   Accessed on March 15, 2026

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Supplementary SWAYAM Course:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Industrial Automation and Control	Prof. S. Mukhopadhyay, Prof. S. Sen	IIT Kharagpur	https://nptel.ac.in/courses/108105063
2	Industrial Automation and Drives	Prof. Sanjay Agrawal and Mr Rahul Baghel	Chhattisgarh Swami Vivekanand Technical University (CSVTU) Bhilai	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_ee02

Experiments to be performed through Virtual Labs:

Sr. No.	Experiment Name	Experiment Link(s)
1	Introduction to PLC and Introduction to digital I/O interface to PLC	https://ied-nitk.vlabs.ac.in/exp/exp-interface-to-plc-nitk/index.html
2	To implement basic logic gate function using PLC.	https://ied-nitk.vlabs.ac.in/exp/exp-ladder-logic-nitk/index.html
3	To understand the working of on-delay timer instruction in a programmable logic controller.	https://ied-nitk.vlabs.ac.in/exp/exp-plc-on-delay-nitk/index.html
4	To understand the working of Off-Delay Timer instruction in a Programmable Logic Controller.	https://ied-nitk.vlabs.ac.in/exp/exp-plc-off-delay-nitk/index.html
5	To understand the working of retentive timer on instruction in a PLC.	https://ied-nitk.vlabs.ac.in/exp/exp-plc-retentive-timer-nitk/index.html
6	To understand the working of a count up instruction in a Programmable Logic Controller.	https://ied-nitk.vlabs.ac.in/exp/exp-plc-count-up-nitk/index.html
7	To understand the working of a count-down instruction in a programmable logic controller.	https://ied-nitk.vlabs.ac.in/exp/exp-plc-count-down-nitk-nitk/index.html
8	To achieve motor forward and reverse direction control using a PLC.	https://ied-nitk.vlabs.ac.in/exp/exp-motor-forward-reverse-direction-control-nitk/index.html

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: CEE111
Course Title: Control Systems

Programme: B.Tech(EE)	**L:** 3 **T:** 1 **P:** 2	**Credits:** 5
Semester: 5	**Theory/Practical:** Integrated	**Teaching Hours:** 45(L)+15(T)+30(P) = 90 hrs
Total Max. Marks: 150	**Continuous Assessment (CA) Marks:** 90	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 60%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Core Course		

Prerequisites (if any): CEE101, CEE108
Additional Material Allowed in ESE: Non-Programmable Scientific Calculator
On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Understand the modeling of linear-time-invariant systems using transfer function and state space representations
2	Design specifications for second order systems based on time response
3	Interpret the concept of stability and its assessment for linear-time invariant systems using various methods
4	Determine the stability of a system in the time domain and the frequency domain.
5	Design controllers in time and frequency domain
6	Evaluate controllability and observability using state space analysis

Contents

Part-A

Unit I: Introduction to Control Problem **07 (L) hrs**

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 reduction techniques, Industrial Control examples.

Unit II: Time Response Analysis **12 (L) hrs**

Standard test signals, Time response of first and second order systems for standard test inputs, study of poles and zeros, s-plane, 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.

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Unit III: Frequency-Response Analysis **08 (L) hrs**

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.

Part-B

Unit IV: Introduction to Controller Design **10 (L) hrs**

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems, zero order hold, Root-loci method of feedback controller design, Design specifications and methods in frequency-domain, Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.

Unit V: State Variable Analysis **08 (L) hrs**

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

Tutorial hours will be used for practice sessions for design/numerical problems/programming/case- studies etc. (as the case may be).

Laboratory Work:

Experiment No.	Experiment Title
1.	To verify the control action of P, PI and PID controllers and their applications.
2.	Measurement of displacement using LVDT.
3.	To study the input-output characteristics of a potentiometers and to use potentiometer as an error detector.
4.	To design a Lag compensator and test its performance characteristics.
5.	To design a Lead-compensator and test its performance characteristics.
6.	To obtain the characteristics of thermistor.
7.	To obtain the characteristics of Photocell sensor and light measurement.
8.	To obtain the Characteristics of LDR Sensor.
9.	To make the connections and find the ratio error of Current Transformer.
10.	To find the ratio error of Potential Transformer.
11.	To obtain the characteristics of RTD.
12.	Measurement of three -phase wave form using Digital Storage Oscilloscope (DSO).
13.	To observe phase sequence of 3- phase circuit by using rotating phase sequence indicator.
14.	To find the Speed control of DC motor using Pulse width modulation.
15.	To measure power & power factor in 3-phase circuit by 2-wattmeter method.
16.	To verify the characteristics of synchro transmitter-receiver set and to use it as an error detector.

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Reference Material: Manual Available in lab

Mini Project: Students shall develop software/simulation/ hardware project based on above experiments list.

Text Books:

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 2012.
2. B. C. Kuo, "Automatic Control Systems", Prentice Hall of India, 1995.
3. K.Ogata, "Modern Control Engineering", Prentice Hall, 2002.
4. I.J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers, 2007.
5. S. K. Bhattacharya, "Control Systems Theory and Applications", Pearson Education, 2010.

Reference Books:

1. R.C. Dorf and R.H. Bishop, "Modern Control Systems", Pearson Education, 2011.
2. G.F. Franklin, J. D. Powell and A.E. Naeini, "Feedback Control of Dynamic Systems", Pearson Education, 2015.
3. N.S. Nise, "Control Systems Engineering", Wiley India Pvt. Ltd., 2015.
4. J. J. D'Azzo and C.H. Houpis, "Linear Control System Analysis and Design", McGraw-Hill International, 1995.
5. J.J. DiStefano, A.R. Stubberud and I.J. Williams, "Schaum's Outline of Feedback and Control Systems", McGraw-Hill Education, 2007.

E-booksandonlinelearningmaterial:

1. https://mrcet.com/downloads/digital_notes/ECE/II%20Year/Control%20Systems.pdf
   Accessed on March 08,2026
2. https://vardhaman.org/wp-content/uploads/2021/03/Control-Systems.pdf.
   Accessed on March 08,2026

Supplementary SWAYAM Courses:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Control System	Prof. C. S. Shankar Ram	IIT Madras	https://onlinecourses.nptel.ac.in/noc21_de08/preview
2	Control Engineering	Prof. Ramkrishna Pasumarthy, Dr. Mousumi	IIT Madras, IIEST, Shibpur	https://nptel.ac.in/courses/108106098

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		Mukherjee		

Experiments to be performed through Virtual Labs:

Sr. No.	Experiment Name	Experiment Link(s)
1	Analyze the transfer function and pole-zero plot of a control system.	https://ce-dei.vlabs.ac.in/exp/pole-zero-plot/
2	First order unity feedback system	https://ce-dei.vlabs.ac.in/exp/first-order-unity-feedback/
3	Determination of step and impulse response for a second order unity feedback system	https://ce-dei.vlabs.ac.in/exp/second-order-unity-feedback-system/
4	Determine the impulse and step response for type '0', type '1' and type '2' systems	https://ce-dei.vlabs.ac.in/exp/type-zero-one-two-system/
5	To obtain root locus for a given transfer function of the system	https://ce-dei.vlabs.ac.in/exp/to-obtain-root-locus-for-a-given-transfer-function-of-the-system/
6	To obtain bode plot for a given transfer function of the system	https://ce-dei.vlabs.ac.in/exp/to-obtain-bode-plot-for-a-given-transfer-function-of-the-system/
7	Determine the nyquist plot of the given transfer function	https://ce-dei.vlabs.ac.in/exp/nyquist-plot-of-a-second-order-system/
8	Study the effect of PI, PD and PID controller on system performance.	https://ce-dei.vlabs.ac.in/exp/to-study-the-effect-of-pi-pd-and-pid-controller-on-a-control-system/

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: CEE112
Course Title: Synchronous Machines

Programme: B.Tech (EE)	**L:** 3 **T:** 1 **P:** 2	**Credits:** 5
Semester: 5	**Theory/Practical:** Integrated	**Teaching Hours:** 45(L)+15(T)+30(P) = 90 hrs
Total Max. Marks: 150	**Continuous Assessment (CA) Marks:** 90	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 40%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Core Course		

Prerequisites (if any): ESC101, CEE103, CEE106
Additional Material Allowed in ESE: Non-Programmable Scientific Calculator

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Understand the construction and principle of operation of synchronous machine.
2	Interpret phasor diagram, characteristics of alternator.
3	Apply various methods to evaluate voltage regulation of alternator.
4	Understand parallel operation of alternators.
5	Apprehend transients in synchronous machines.
6	Comprehend characteristics, starting methods of synchronous motors.

Contents

Part-A

Unit-I Introduction **8 (L) hrs**

Construction, Cylindrical and Salient Pole Rotors, Working Principle of Synchronous Machines, Excitation Systems, Production of Sinusoidal Electromotive Force (EMF), Flux and Magneto Motive Force (MMF) Phasors in Synchronous Machines, Classification of Windings, Pitch Factor, Distribution Factor, Electromagnetic Force Equation.

Unit-II Alternators **13 (L) hrs**

Phasor Diagram of Cylindrical Rotor Alternator, Ratings, Nature of Armature Reaction, Determination of Synchronous Reactance, Open-Circuit Characteristics, Short-Circuit Characteristics, Short-Circuit Ratio, Short-Circuit Loss, Effect of Variation of Power Factor on Voltage. Determination of Voltage Regulation: EMF Method, MMF Method, Z.P.F Method. Alternator on Infinite Bus Bar, Operation at Constant Load and Variable Excitation, Power Flow through Inductive Impedance, Power-Angle Characteristics of Synchronous Machines - Cylindrical and Salient Pole, Two Reaction Theory of Salient Pole Machines.

Part-B

Unit-III Parallel Operation of Alternators **05 (L) hrs**

Conditions for Parallel Operation of Single Phase and Three Phase Alternators, Synchronizing Power, Current and Torque, Effect of Increasing Excitation of one of the Alternators, Effect of Change of Speed of one of the Alternators, Effect of unequal Voltages, Load Sharing.

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Unit-IV Transients **09 (L) hrs**

Transient Reactance and Time Constants from Equivalent Circuits, Synchronous Machine Reactance's and their Determination, Short Circuit Oscillogram, Synchronization with the Grid System.

Unit-V Synchronous Motors **10 (L) hrs**

Operating Characteristics, Power-Angle Characteristics, Conditions for Maximum Power Developed, V-Curves and Inverted V-Curves, Methods of Starting, Synchronous Motors Applications, Synchronous Condensers, Hunting and Damper Windings, Single Phase Synchronous Motors: Reluctance and Hysteresis Motors.

Tutorial hours will be used for practice sessions for design/numerical problems/programming/case-studies, etc. (as the case may be).

Laboratory Work

Experiment No.	Experiment Title
1	To perform no-load and blocked–rotor test on three-phase induction motor and to obtain equivalent circuit parameters.
2	To perform load-test on three-phase induction motor and to plot torque versus speed characteristics.
3	To perform no-load and blocked–rotor test on single-phase induction motor and to obtain equivalent circuit parameters.
4	To start the three-phase induction motor using star- delta and DOL starters.
5	To perform Open circuit test and short circuit test on three-phase alternator and to draw open circuit & short circuit characteristics.
6	To analyze the effect of variation of field current on the stator current and power factor with synchronous motor running at no load and to draw V-curves & inverted Vcurves.
7	To perform parallel operation of three phase alternators using dark lamp method, two-bright and one dark lamp method.
8	To measure negative sequence, positive sequence and zero sequence reactance of Synchronous Machines.
9	To perform the speed control of three-phase induction motor by Kramer's method
10	To perform the speed control of three-phase induction motor by Cascading method.
11	To perform speed control of three-phase Slip Ring Induction Motor by rotor resistance control.
12	To obtain regulation of a three-phase alternator by MMF method.
13	To obtain regulation of a three-phase alternator by synchronous impedance method (EMF method).
14	To obtain voltage regulation of three phase alternator by ZPF method.

Reference Material: Manual Available in lab

Mini Project: Students shall develop software/simulation/ hardware project based on above experiments list.

Text Books:

1 P.S. Bimbhra, *"Electrical Machinery"*, Khanna Publishers, 2011.
2 I.J. Nagrath and D.P. Kothari, *"Electric Machines"*, McGraw HillEducation,2010.
3 A.E. Fitzgerald and C. Kingsley, *"Electric Machinery"*, New York, McGraw Hill Education.

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2013.

4 M.G. Say, *"Performance and design o f AC machines"*, CBS Publishers, 2002.

Reference Books:

1 A. E. Clayton and N. N. Hancock, *"Performance and design of DC machines"*, CBS Publishers, 2004.

2 S. Ghosh, "*Electrical Machines*", Pearson, 2005.

Online Learning Materials:

1) https://www.electrical4u.com/derivation-of-various-power-conditions-in-alternators-and-synchronous-motors Accessed on January23, 2026

2) https://electrical-engineering-portal.com/basics-synchronous-machines Accessed on January23, 2026

Supplementary SWAYAM Courses:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Electrical Machines II	Prof Tapas Kumar	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc23_ee55/preview
2	Induction, Synchronous and Special Electrical Machines	Dr. A. Venkadesan	NIT, Puducherry	https://onlinecourses.swayam2.ac.in/ntr25_ed135/preview

Experiments to be performed through Virtual Labs:

Sr. No.	Experiment Name	Experiment Link(s)
1	To Study No Load Test on Three Phase Induction Motor	https://em-coep.vlabs.ac.in/exp/no-load-test-induction-motor/
2	Study blocked rotor test on induction motor	https://em-coep.vlabs.ac.in/exp/blocked-rotor-test-induction-motor/
3	Study Open Circuit Test on Three Phase Alternator	https://em-coep.vlabs.ac.in/exp/open-circuit-phase-alternator/
4	To Study Short Circuit Test on Three Phase Alternator	https://em-coep.vlabs.ac.in/exp/short-circuit-phase-alternator/
5	To Study Load Test on Three Phase Alternator	https://em-coep.vlabs.ac.in/exp/load-test-phase-alternator/
6	V Curves and Inverted V curves of Three Phase Synchronous Motor	https://em-coep.vlabs.ac.in/exp/synchronous-motor/

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE101
Course Title: Electric Generation and Economics

Programme: B.Tech. (EE)	**L:** 3 **T:** 1 **P:** 0	**Credits:** 4
Semester: 5	**Theory/Practical:** Theory	**Teaching Hours:** 45(L) + 15(T) = 60 hrs
Total Max. Marks: 100	**Continuous Assessment (CA) Marks:** 40	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 40%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective		

Prerequisites (if any): ESC101
Additional Material Allowed in ESE: Non-Programmable Scientific Calculator

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Evaluate and compare the performance of conventional and non-conventional energy sources.
2	Understand the concept of cogeneration plants.
3	Analyze the load curves and related factors for determining power generation needs.
4	Carry out economic analysis of different electric energy generation techniques
5	Plan optimal method of loading turbo generator.
6	Justify the need of hydro thermal coordination

Contents

Part-A

Unit-I Conventional and Non-Conventional Resources of Electric Energy **09 (L) hrs**

Thermal, Nuclear, Hydro, Gas, and Diesel power plants; their layout and components. Selection of power plants, site, number, and capacity of units, conventional and non- conventional energy resources, Drawbacks of conventional energy resources, need and growth of non-conventional energy resources, Solar Power Plant, Wind energy System, MHD Generation, Base and Peak load plants, Environmental aspect of electric energy generation.

Unit-II Cogeneration **05 (L) hrs**

Definition and scope, Topping and Bottoming Cycles, Benefits, Cogeneration technologies.

Unit-III Loads and Load Curves **09 (L) hrs**

Types of loads, connected load, maximum demand, demand factor, group and peak diversity factors, chronological load curve, load duration curve, mass curve, load factor, capacity factor, utilization factor, load forecasting.

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Part-B

Unit-IV Economics of Electric Energy Generation **09 (L) hrs**

Capital cost of power plants, annual fixed and operating costs, unit cost of electrical energy, and effect of load factor on unit cost, depreciation, objectives and types of electricity tariff, determination of most economic power factor.

Unit-V Thermal & Hydro Power Generation Scheduling **13 (L) hrs**

Methods of loading turbo-generators, Input- output curve, Heat rate curve, Incremental cost curves, Method of Lagrangian multiplier, Effect of transmission losses, Co-ordination equations, Iterative procedure to solve co-ordination equations, Advantages of combined operation of plants, Optimal scheduling of hydro-thermal system.

Tutorial hours will be used for practice sessions for design/numerical problems/programming/case-studies etc. (as the case may be).

Text Books:

1. M.V. Deshpande, "Power plant engineering", Tata McGraw Hill, 2004.
2. B.R. Gupta, "Generation of electric energy", S. Chand, 2010.
3. I.J. Nagrath, and D.P. Kothari, "Power system engineering", Tata McGraw-Hill Education, 2008.
4. D. Rai, "Non-conventional energy sources", Khanna Publishers, 2004.

References Books:

1. A. J. Wood, and B. F. Woolenberg, "Power Generation Operation & Control", Wiley India, 2012.
2. P.K Nag, "Power plant engineering", Tata McGraw-Hill Education, 2014.
3. G. Boyle, "Renewable energy-power for a sustainable future", Oxford University Press, 2012.

Online Learning Material:

1. https://www.bharathuniv.ac.in/page_images/pdf/courseware_eee/Notes/NE1/BEE045%20POWER%20PLANT.pdf

   Accessed on February 10,2026.
2. https://mrcet.com/downloads/digital_notes/eee/epgtd.pdf

   Accessed on February 10,2026.

Supplementary SWAYAM Courses:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Economic Operations and Control of Power Systems	Prof. Gururaj Mirle Vishwanath, Prof .Narayana Prasad Padhy	IIT Kanpur, MNIT Jaipur	https://onlinecourses.nptel.ac.in/noc23_ee128/preview
2	Energy Economics and Policy	Prof. Shyamasree Dasgupta	IIT Mandi	https://onlinecourses.nptel.ac.in/noc20_hs68/preview

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3	Energy Resources, Economics, and Sustainability	Prof. Pratham Arora	IIT Roorkee	https://onlinecourses.nptel.ac.in/noc24_hs77/preview
4	Energy Resources, Economics and Environment By	Prof. Rangan Banerjee	IIT Delhi	https://onlinecourses.nptel.ac.in/noc26_hs21/preview

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE102
Course Title: Energy Auditing and Management

Programme: B.Tech.	**L:** 3 **T:** 1 **P:** 0	**Credits:** 4
Semester: 5	**Theory/Practical:** Theory	**Teaching Hours:** 45(L)+15(T) = 60 hrs
Total Max. Marks: 100	**Continuous Assessment (CA) Marks:** 40	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 30%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective		

Prerequisites (if any): ESC101
Additional Material Allowed in ESE: Non-Programmable Scientific Calculator

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Understand the importance of energy conservation and energy management in industrial and commercial sectors.
2	Analyze various energy sources, energy consumption patterns, and energy flow in systems.
3	Apply energy auditing methodologies to identify energy conservation opportunities.
4	Evaluate energy efficiency of electrical equipment, systems, and utilities.
5	Assess economic feasibility of energy conservation measures using financial analysis.
6	Develop strategies for effective energy management and sustainable energy utilization.

Contents

Part-A

Unit-I Energy Scenario and Energy Resources **07 (L) hrs**

Energy scenario: global, national, and regional perspectives, Energy demand and supply situation in India, Conventional and non-conventional energy resources, Energy consumption patterns in industry, commercial, residential, and agricultural sectors, Energy forecasting and energy planning and Role of energy conservation in sustainable development.

Unit-II Energy Management Concepts **08 (L) hrs**

Energy management: objectives and principles, Energy policy and energy management standards, Energy accounting and energy monitoring systems, Energy balance and energy flow diagrams, Role of Bureau of Energy Efficiency (BEE), Energy manager and energy auditor: roles and responsibilities, Energy management in electrical, thermal, and utility systems.

Unit-III: Energy Auditing **08 (L) hrs**

Energy audit: definition, need, and types (preliminary and detailed), Steps involved in energy auditing, Data collection and measurement techniques, Instrumentation for energy audit, Energy audit methodology for electrical and thermal systems and Preparation of energy audit reports.

Part-B

Unit-IV Energy Efficiency in Electrical Systems **08 (L) hrs**

Energy efficient motors and drives, Losses in transformers and methods of loss reduction, Energy efficiency in lighting systems (LED, CFL, electronic ballasts), Power factor improvement techniques, Energy conservation in distribution systems and Harmonics and their impact on energy efficiency.

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Unit-V Energy Efficiency in Industrial and Thermal Systems **07 (L)hrs**

Energy efficiency in boilers, furnaces, and compressors, Steam systems and condensate recovery, Energy conservation in pumps, fans, and blowers, Waste heat recovery techniques, Cogeneration and combined heat and power (CHP) systems.

Unit-V Economic Analysis and Energy Management Case Studies **07 (L)hrs**

Economic analysis of energy conservation projects, Payback period, net present value (NPV), internal rate of return (IRR), Life cycle cost analysis, Carbon credits and environmental impact assessment, Case studies on industrial, commercial and institutional energy audits.

Tutorial hours will be used for practice sessions for design/numerical problems/programming/case-studies etc. (as the case may be).

Text Books:

1. C.L. Wadhwa, Electrical Power Systems, New Age International Publishers, 2005.
2. Guide Book for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Government of India, 2005
3. W.C. Turner, Energy Management Handbook, CRC Press, 2007.

Reference Books:

1. C. W. Turner, W. Kennedy, Guide to Energy Management, Fairmont Press, 2007
2. S. Rao & B.B. Parulekar, Energy Technology, Khanna Publishers, 2005
3. A.Thumann, Plant Engineers and Managers Guide to Energy Conservation, Fairmont Press, 2008.
4. BEE Training Manuals, Bureau of Energy Efficiency, India, 2005.

Online Learning Material:

1. https://beeindia.gov.in/content/energy-auditors Accessed on March 08,2026.
2. https://www.peda.gov.in Accessed on March 08,2026.

Supplementary SWAYAM Course:

Sr. No.	*Course Name*	*Instructor*	*Host Institute*	*URL*
1	Building Energy Systems and Auditing	Prof. Shankha Pratim Bhattacharya	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc25_ar10/preview
2	Basic Principles of Energy Management & Energy Audit	Dr. R. N. Patel & Mr. Akhilesh Kumar Tiwari	Chhattisgarh Swami Vivekanand Technical University (CSVTU)	https://onlinecourses.swayam2.ac.in/nou23_es05/preview

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE103
Course Title: Electric Drives and Utilization

Programme: B.Tech. (EE)	**L:** 3 **T:** 1 **P:** 0	**Credits:** 4
Semester: 5	**Theory/Practical:** Theory	**Teaching Hours:** 45(L)+15(T) = 60 hrs
Total Max. Marks: 100	**Continuous Assessment (CA) Marks:** 40	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 20%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective		

Prerequisites (if any): ESC101
Additional Material Allowed in ESE: Non-Programmable Scientific Calculator

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Understand the principles, advantages and components of electric drives and Electric Traction system.
2	Analyze mechanical load characteristics and select appropriate electric motors and drive systems for various industrial applications.
3	Apply the principles of illumination and laws of lighting to design efficient indoor and outdoor lighting systems.
4	Explain and compare different electrical heating methods including resistance, induction, and arc heating for practical applications.
5	Understand the principles and applications of electric welding techniques such as resistance welding and arc welding.
6	Identify electrical circuits used in refrigeration, air-conditioning, and water coolers, and examine electrolytic and electrometallurgical processes.

Contents

Part-A

Unit-I Electric Drives and Traction System **10 (L) hrs**

Advantages of electric drives, Characteristics of different mechanical loads, Parts of electric drives, close loop of electric drive system, Types of motors used in electric drive pulley drives, Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift etc. Introduction to Electric traction system, types of electric traction system, components of system.

Unit-II Electric Heating and Welding **14(L) hrs**

Advantages of electrical heating, Heating methods: Resistance heating – direct and indirect resistance heating, properties of resistance heating elements, Induction heating; principle of core type and coreless induction furnace, Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace. Advantages of electric welding, Welding methods, Principles of resistance welding, Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications.

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Part-B

Unit-III Illumination **10(L) hrs**

Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux, Laws of illumination, Different type of lamps, construction and working. Main requirements of proper lighting; absence of glare, contrast and shadow, General ideas about street lighting, flood lighting, monument lighting and decorative lighting, light characteristics etc

Unit-IV Refrigeration and Air Conditioning System **06 (L) hrs**

Electrical Circuits used in Refrigeration and Air Conditioning and Water Coolers, Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly and Refrigerants.

Unit-V Electrolysis **05(L) hrs**

Electrolytic Processes, Laws of electrolysis, process of electro-deposition clearing, operation, deposition of metals, polishing, Applications of electrolysis.

Tutorial hours will be used for practice sessions for design/numerical problems/programming/case-studies etc. (as the case may be).

Text Books:

1. H. Partab, Art and Science of Utilization of Electrical Energy, 2nd Edition, Dhanpat Rai & Co, 2004.
2. J. B. Gupta, Utilization of Electric Power and Electric Traction, 9th Edition, S. K. Kataria & Sons, 2013.
3. S. K. Pillai, A First Course on Electrical Drives, 3rd Edition, New Age International Publishers, 2003.
4. M. G. Say, Alternating Current Machines, 5th Edition, CBS Publishers & Distributors, 2002
5. V. Subrahmanyam, Electrical Drives: Concepts and Applications, 2nd Edition, Tata McGraw-Hill Education, 2011.

Reference Books:

1. G. C. Sen, Electric Motor Drives and Control, 1st Edition, Wiley India, 2014.
2. E. O. Taylor, Utilization of Electrical Energy, 2nd Edition, Longman Scientific & Technical, 1994.

Online Learning Materials:

1. https://mrcet.com/downloads/digital_notes/EEE/31082020/Electrical%20Drives.pdf Accessed on February 10, 2026.
2. https://vardhaman.org/wp-content/uploads/2021/03/Utilization-of-Electrical-Energy.pdf Accessed on February 10, 2026.

Supplementary SWAYAM Course:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Fundamentals of Electric Drives	Prof. Shyama Prasad	IIT Kanpur	https://onlinecourses.nptel.ac.in/noc19_ee65/preview

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2	Illumination Engineering.	N.K. Kishore	IIT Kharagpur	https://onlinecourses.swayam2.ac.in/nou23_es05/preview

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B.Tech. 3rd Year (Electrical Engineering)

Subject Code: EEE104
Subject Name: Fuzzy Expert Systems

Programme: B.Tech (EE)	**L:** 3 **T:** 1 **P:**0	**Credits:** 4
Semester: 5	**Theory/Practical:** Theory	**Teaching Hours:** 45(L)+15(T)= 60 hrs
Total Max. Marks: 100	**Continuous Assessment (CA) Marks:** 40	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 30%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective		

Prerequisites (if any): BSEE101
Additional Material Allowed in ESE: Non-programmable Scientific Calculator

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Represent the various forms of fuzzy system.
2	Perform fuzzification and defuzzification of a given situation/ process.
3	Develop fuzzy rules for a fuzzy system.
4	Understand basic steps involved to design a Fuzzy-Logic controller.
5	Apply software tool for designing fuzzy logic-based controllers.
6	Apply fuzzy logics for solving classification problems.

Contents

Part-A

Unit I: Introduction **08 (L) hrs**
Crisp and Fuzzy Sets-Definition, Representation, Operations and Properties, Classical Relations and Fuzzy Relations-Cardinality, Operations and Properties, Fuzzy Cartesian Product and Composition.

Unit II: Fuzzification and Defuzzification **10 (L) hrs**
Fuzzy Membership Function-Features and Forms, Fuzzification-Definition, Need and Method, Fuzzy Linguistic Variables and Defuzzification-Definition, Need and Methods, Lambda Cut for Fuzzy Sets and Relations.

Unit III: Fuzzy Rule Based System **05 (L) hrs**
Formation of Fuzzy Rules, Approximate Reasoning, Canonical Rule Forms, Decomposition of Compound Rules, Aggregation and Properties of Fuzzy Rules, Fuzzy Inference System, Graphical Techniques of Inference

Part-B

Unit IV: Fuzzy Classification **10 (L) hrs**
Overview of pattern recognition and decision making, Classification by Crisp and Fuzzy Equivalence Relations, Cluster Analysis, Cluster Validity, c −Means Clustering, Hard c −Means (HCM), Fuzzy c −Means (FCM), Classification Metric, Hardening the Fuzzy c −Partition.

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Unit-V Applications of Fuzzy Expert Systems in Control System **12 (L) hrs**

Review of Conventional Control Systems, Fuzzy Logic Control-Need and Basic structure of a fuzzy controller, Control System Design Problem-introduction and assumptions, concept of Control Surface in fuzzy controllers, Basic structure and design steps of Simple Fuzzy Logic Controllers, Applications of Fuzzy Control Systems in Real-Life, use of software tools.

Text Books:

1. J.T. Ross, Fuzzy logic with Engineering Applications, McGraw Hill,1995
2. G.K. Lir., B.B. Yuan., Fuzzy sets and Fuzzy Logic, Prentice Hallof IndiaPrivateLimited,1997.
3. Fuzzy Set Theory and Its Applications by H. Zimmermann, Fourth Edition, Springer Publication, 2001.

References Books:

1. J.Yen, L Reza, Fuzzy Logic: Intelligence, Control, and Information, PHI,1998
2. N.P Padhy., Artificial Intelligence and Intelligent Systems, Oxford University Press,2005
3. G. Bojadziev and M. Bojadziev, Advances in Fuzzy Systems—Applications and Theory: Volume 5 (Fuzzy Sets, Fuzzy Logic, Applications), world scientific, 1996

Online learning material:

1. https://web.cs.wpi.edu/~rich/courses/imgd4100-c16/lectures/K-Fuzzy.pdf%20Accessed%20on%20march%202,2026 Accessed on March 08,2026.

Supplementary SWAYAM Course:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Fuzzy Sets, Logic and Systems & Applications	Prof. Nishchal Kumar Verma	Indian Institute of Technology Kanpur	https://onlinecourses.nptel.ac.in/noc25_ee40
2	Fuzzy Logic and Neural Networks	Prof. Dilip Kumar Pratihar	Indian Institute of Technology Kharagpur	https://onlinecourses.nptel.ac.in/noc25_ge15
3	Introduction to Soft Computing	Prof. S. N. Sivanandam	Indian Institute of Technology Madras	https://onlinecourses.nptel.ac.in

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Course Code: ESC106
Course Title: Entrepreneurship and Startups

Programme: B.Tech.	**L:** 3 **T:** 0 **P:** 0	**Credits:** 3
Semester: 5/6	**Theory/Practical:** Theory	**Teaching Hours:** 45(L) hrs
Total Max. Marks: 100	**Continuous Assessment (CA) Marks:** 40	**End Semester Examination (ESE) Marks:** 60
Minimum Percentage of Numerical / Design / Programming Problems in ESE: Nil		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Core Course		

Prerequisites (if any): NIL
Additional Material Allowed in ESE: NIL

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Comprehend concept and theories of entrepreneurship and its role in economic development.
2	Develop business plan and identify the reasons of failure of business plans.
3	Illustrate the steps in starting MSME.
4	Comprehend government policies and regulatory framework available in India to facilitate the process of entrepreneurial development.
5	Understand the contemporary issues of sustainable development, Identify different sources of finance for new enterprises and assess the role of financial institutions and various government schemes in entrepreneurial development
6	Assess the role of financial institutions and various government schemes in entrepreneurial development

Contents

Part A

Unit-1 Basics of Entrepreneurship **8(L) hrs**

Concept of Entrepreneurship, Theories of Entrepreneurship, Myths about Entrepreneurship, Entrepreneurial Traits and Motivation, Role of Entrepreneurship in economic development, Types of Entrepreneurs, Barriers in the way of Entrepreneurship, Entrepreneurship Development (ED) Cycle, Entrepreneurship development programmes (EDP).

Unit-2 Identification of Investment Opportunities **10(L) hrs**

Creativity and Business Ideas, Blocks to creativity, Business Plans and reasons of failure of business plans, Micro-Small-Medium Enterprise (MSME) & its role in developing countries, Steps and problems for starting, Government policies for industry and regulatory framework, foreign collaboration and investment, Scouting for project ideas, preliminary screening & pilot run /prototype modeling.

Unit-3 Market and Demand Analysis **7(L) hrs**

Information required for market and demand analysis, market survey, demand forecasting, uncertainties in demand forecasting.

Part B

Unit-4 EDP in India, South Asia and World programs **9(L) hrs**

Phases of Entrepreneurial – Government Policies & Initiatives, Administrative Frame work, Policy instruments, Statutory Boards, Industrial Estates, Industrial clusters, Incentives and subsidies, Promotional agencies, Business Incubators & Start-ups.

Unit-5 Financial Management **11(L) hrs**

Cost estimation, Types of capital, Budget Management, Bridge capital, Seed capital assistance, Margin money scheme, Industrial Sickness, Causes Remedies- An overview on the roles of institutions/schemes in entrepreneurial development- SIDBI, Commercial Banks. Other financing options- venture capital, lease funding, Angel Investors. Revival, Exit and End to a venture.

Text Books

1. A. Kumar, "Entrepreneurship", Pearson, New Delhi, 2018.
2. V. B. Nanda Gopal, "Entrepreneurial Development", Vikas Publishing, New Delhi, 2015.
3. V. Desai, "Dynamics of Entrepreneurial Development & Management", Himalaya Publishing House.

Reference Books

1. S.S.Khanka, "Entrepreneurial Development", S.Chand & Co., New Delhi.
2. Patricia G. Greene and Mark P. Rice, "Entrepreneurship education", Edward Elgar Publishing, 2007.

Online Learning Materials

1. https://www.efindglobal.org/wp-content/uploads/The-Entrepreneurs-Guide-to-Building-a-Successful-Business-2017.pdf Accessed on 02 May, 2025

Supplementary SWAYAM Course

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Entrepreneurship	Prof. C Bhaktavatsala Rao	IIT Madras	https://onlinecourses.nptel.ac.in/noc25_mg81/preview

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: ESEE101
Course Title: Design Thinking

Programme: B.Tech. (EE)	**L: 0 T: 0 P:** 2	**Credits:** 1
Semester: 5	**Theory/Practical:**	**Teaching Hours:** 30(P) = 30 hrs
Total Max. Marks: 50	**Continuous Assessment (CA) Marks:** 50	**End Semester Examination (ESE) Marks:** 0
Minimum Percentage of Numerical / Design / Programming Problems in ESE: 90%		
Duration of End Semester Examination (ESE): NA		
Course Type: Engineering Science		

Prerequisites (if any): NIL
Additional Material Allowed in ESE: NIL

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Carry out the layout of wiring circuits of electrical installations and those of motor control circuits.
2	Estimate the various costs involved in these electrical installations
3	Analyze the impact of Indian electricity act 2003.
4	Prepare the quotation and tender for the purchase of electrical equipment and materials.
5	Develop proposals/single line diagrams for electrical installations in specified premises.
6	Perform energy audit of a small utility.

Laboratory Work : Perform the following experiments incorporating design thinking principles to foster creativity, innovation, and user-centric problem-solving.

Experiment No.	Experiment Title
1	To study Indian electricity act 2003.
2	To carry out wiring diagram of residential building/educational institute/industry.
3	To study design parameters of electrical panel boards.
4	To estimate the cost of a domestic installation (Residential building/laboratory/drawing hall) with concept of illumination design.
5	To estimate the cost of industrial installation
6	To estimate the cost of overhead service connection.
7	To estimate the cost of underground service connection.
8	To estimate the load and cost of any five electrical appliances.
9	Prepare a proposal (Layout, design and estimation) for installing street lights in the college premises with required diagrams, estimates etc. as per the BIS regulations.

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10	Make use of various electricity standard codes and (BIS& IEC) to Prepare a list of standards and codes for the following. a. Code of practice for wiring. b. Earthing. c. Installation of Medium Voltage motors. d. Installation of Medium Voltage generator. e. Installation of Power and distribution Transformers. f. Fire and safety g. Energy conservation. h. Selection of motors for AC drives. i. Installation of lightning arresters.
11	Develop/ Prepare a quotation for purchasing different materials required for the electrification of a residential building having a connected load below 5kW.
12	Draw a detailed wiring diagram for the electrification of a house building with at least 3 light circuits and 2 power circuits.
13	Draw the single line diagram for the power distribution scheme in the college premises.
14	To study various types of light sources and lighting schemes.
15	To carryout electrical energy audit of laboratory/office/workshop.
16	To visit the concerned industries in collaboration with BIS for the analysis of issues regarding implementation of Indian standards.

Text Books

1. S. Singh, 'Electrical Estimating and Costing', Dhanpat Rai & Co., Reprint 2013.
2. D. Tanmoy, 'Installation, Testing, Commissioning and Maintenance of Electrical Apparatus', Dhanpat Rai & Co., Reprint 2013.
3. K.B. Raina, Dr. S. K. Bhattacharya, 'Electrical Design Estimating and Costing' New Age International.
4. Bureau of Indian Standard. SP-30:2011, National Electrical Code.
5. Bureau of Indian Standard. IS: 732-1989, Code of Practice for Electrical Wiring Installation.

Online Learning Materials

1. http://www.cpwd.gov.in/Publication/Internal2013.pdf Accessed on March 17, 2026
2. https://mrcet.com/downloads/digital_notes/EEE/23092022/Electrical%20Estimating%20and%20Costing%20digital%20notes.pdf Accessed on March 17, 2026
3. https://www.gpgajapati.in/pdf/El&E%20notes%206th%20sem%20by%20sushanta%20kumar%20malik,%20sr%20Lect..pdf Accessed on March 17, 2026

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Experiments to be performed through Virtual Labs:

Sr. No.	Experiment Name	Experiment Link(s)
1	Prepare the cost estimation sheet for the project under consideration	https://psem1-coep.vlabs.ac.in/exp/cost-estimation-sheet/index.html

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Guru Nanak Dev Engineering College, Ludhiana
An Autonomous College under UGC Act 1956
B.Tech. Civil Engineering

Course Code: MC103/BCEXXX/BCAXXX
Course Title: Disaster Management and Preparedness

Programme: B.Tech.	**L:** 2 **T:** 0 **P:** 0	**Credits:** 0
Semester: 5th / 6th	**Theory/Practical:** Theory	**Teaching Hours:** 30(L)+0(T)+0(P) = 30hrs
Total Max. Marks: 50	**Continuous Assessment (CA) Marks:** 50	**End Semester Examination (ESE) Marks:** Nil
Minimum Percentage of Numerical / Design / Programming Problems in ESE: Nil		
Duration of End Semester Examination (ESE): Nil		
Course Type: Mandatory Course (Non-Credit)		

Prerequisites (if any): NIL

Additional Material Allowed in ESE: NIL

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Explain the fundamental concepts of disaster management, including hazards, vulnerabilities, risks, capacities, impacts, prevention, and mitigation strategies.
2	Classify the various natural and human-induced disasters for preparing the hazard and vulnerability profile of India.
3	Assess the environmental, social, economic, health, and demographic impacts of disasters to perform basic vulnerability and risk assessment for disaster-prone areas.
4	Apply the principles of the disaster management cycle for effective disaster risk reduction.
5	Describe the role of modern technologies in disaster prediction, monitoring, and management.
6	Demonstrate awareness of disaster management practices for various stakeholders in building resilient and sustainable communities.

Contents

Part-A

Unit I: Introduction to Disaster Management **(2 Hours)**

Concepts and definitions of disaster, hazard, vulnerability, emergency and risk; severity, frequency and exposure of hazards; capacity, resilience and impacts of disasters; principles of prevention, preparedness and mitigation for reducing disaster risks.

Unit-II: Classification of Disasters **(6 Hours)**

Classification of disasters: natural disasters including floods, droughts, cyclones, earthquakes, tsunamis, landslides, volcanic eruptions, coastal erosion, soil erosion and forest fires; human-induced disasters such as industrial accidents, chemical spills, nuclear and radiological emergencies, transportation accidents, urban flooding and terrorist activities; hazard and vulnerability profile of India with special emphasis on mountain regions, coastal areas and ecologically fragile zones.

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Unit-III: Disaster Impacts and Risk Assessment **(8 Hours)**

Environmental, physical, social, ecological, economic and political impacts of disasters; health and psychosocial consequences; demographic considerations including gender, age and special-needs groups; global and national disaster trends; climate change and urban disasters; concepts of vulnerability analysis, risk assessment and risk mapping; stages of disaster recovery and associated challenges.

Part-B

Unit-IV: Disaster Risk Reduction and Management **(7 Hours)**

Disaster management cycle and its phases including prevention, mitigation, preparedness, response, relief, recovery and rehabilitation; structural and non-structural mitigation measures; risk analysis, vulnerability and capacity assessment; early warning systems; post-disaster environmental response including water supply, sanitation, food safety, waste management, disease control, communication and security; emergency medical and public health services; reconstruction and rehabilitation; capacity building and gender-sensitive approaches; roles and responsibilities of government agencies, local institutions, communities, NGOs, media and insurance sector; disaster management policies, legislation and program in India with reference to the National Disaster Management Authority.

Unit-V: Application of Science and Technology in Disaster Management **(4 Hours)**

Role of Geographic Information System (GIS), Remote Sensing, Global Positioning System (GPS), Internet of Things (IoT), Artificial Intelligence (AI), drones and mobile applications in disaster prediction, monitoring and management; disaster communication systems and dissemination of early warning information; knowledge-based expert systems and risk-time charts; influence of developmental projects, land-use changes and urbanization on vulnerability; Sustainable Development Goals (SDGs), disaster resilience, reconstruction and resilient development strategies.

Unit-VI: Accessibility and Inclusive Disaster Management **(3 Hours)**

Accessibility in disaster preparedness, mitigation, response and reconstruction; inclusive emergency planning and evacuation measures; emergency services and communication systems for persons with disabilities and vulnerable populations; universal accessibility and resilient community development for achieving inclusive and sustainable disaster management.

Text Books/ Reference:

1. S.C. Sharma, Disaster Management, Khanna Publishing House, 2022.
2. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
3. http://www.ndmindia.nic.in (National Disaster Management in India, Ministry of Home Affairs).
4. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
5. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
6. Singh Jagbir, Disaster Management – Future Challenges & Opportunities, I.K. International Publishing House.
7. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.
8. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
9. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

Scheme Code: 2024

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Guru Nanak Dev Engineering College, Ludhiana

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B.Tech 3rd Year (Electrical Engineering)

Course Code: TREE102
Course Title: Training-II

Programme: B.Tech (EE)	**L:** 0 **T:** 0 **P:** 120	**Credits:** 1
Semester: 5	**Theory/Practical:** Practical	**Teaching Hours:** 120(P) = 120 hrs
Total Max. Marks: 100	**Continuous Assessment (CA) Marks:** 60	**End Semester Examination (ESE) Marks:** 40
Minimum Percentage of Numerical / Design / Programming Problems in ESE: NA		
Duration of End Semester Examination (ESE): NA		
Course Type: Project work, Seminar and Internship		

A six-week Institutional/Industrial Training shall be conducted during the summer vacation following the completion of the fourth semester. An external Viva-Voce examination shall be held immediately after the completion of the training. The evaluation and award of marks/credits shall be given in the 5th semester itself.

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