

GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

No. EE/591
Dean (Academics)

Dated 20/7/2020

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

Program	B.Tech.(Electrical Engineering)	Semester	6
Scheme Code	2024	AICTE/UGC	AICTE
Subject Group		Lateral Entry Status	N
Six Month Training	N	Compulsory Theory Count	4
Compulsory Practical Count	2	Elective Theory Count	9
Elective Practical Count	0	Total Course Count	15

List of Courses

S.N	Course Category	Module Name	Course Code	Course Title	Theory/ Practical (T/P)	Course Type	Contact hours Per Week	Integrat ed Course	Credits	Marks Distribution	Min. % of Problems(%)
a.							L T P			CA Marks	ESE Marks
1	Professional Core Courses	Power and Energy Systems	CEE113	Power System Analysis and Stability	T	Compulsory	3 1 2	Y	5	90	60
2	Professional Core Courses	Circuits and Devices	CEE114	Embedded Systems	T	Compulsory	3 1 2	Y	5	90	60
3	Professional Elective Courses	Power and Energy Systems	EEE105	Power Generation Technologies	T	Elective-II	3 1 0	N	4	40	60
4	Professional Elective Courses	Computational Tools and Techniques	EEE106	Optimization Techniques	T	Elective-II	2 1 2	Y	4	90	60
5	Professional Elective Courses	Electrical Machines	EEE107	Computer-Aided Electrical Machine Design	T	Elective-II	2 1 2	Y	4	90	60
6	Professional Elective Courses	Control and Instrumentation	EEE108	Digital Control System	T	Elective-II	3 1 0	N	4	40	60
7	Professional Elective Courses	Power and Energy Systems	EEE109	Renewable Energy Sources and Grid Integration	T	Elective-III	3 1 0	N	4	40	60

@labat	Adhisingh	H.O.P. Ludhiana
Uploaded by (Sign, with date) Department Clerk (Signature)	Verified by (Sign, with date) BOS Convenor	Recommended by (Sign, with date) G.H.O. cum Chairperson (BOS)
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8	Professional Elective Courses	Power and Energy Systems	EEE110	Smart Grids	T	Elective-III	3	1	0	N	4	40	60	10
9	Professional Elective Courses	Power and Energy Systems	EEE111	High Voltage Engineering	T	Elective-III	3	1	0	N	4	40	60	10
10	Professional Elective Courses	Power and Energy Systems	EEE112	High Voltage Transmission Systems	T	Elective-III	3	1	0	N	4	40	60	20
11	Engineering Science Courses	Power and Energy Systems	ESEE102	E-Mobility	T	Compulsory	3	1	0	N	4	40	60	20
12	Project Work, Seminar and Internship	Career Preparation Skills	FSEE101	Corporate Readiness	T	Elective	2	0	0	N	2	40	60	0
13	Mandatory Courses (Non-Credit)	Indian Knowledge Foundations	MC102	Essence of Indian Knowledge Tradition	T	Compulsory	2	0	0	N	0	50	0	0
14	Mentoring and Professional Development	Life Skills	MPD103	Mentoring and Professional Development	P	Compulsory	0	0	1	N	1	100	0	0
15	Project Work, Seminar and Internship	Experiential Learning	PREE101	Minor Project	P	Compulsory	0	0	2	N	1	60	40	0
Total							35	11	11		50			

Department Remarks: Approved by BoS - Approved in 17th BOS Meeting dated 20-03-2026. For MC102 (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). For MPD103, there is one period per week in both semesters of 3rd year, final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

ESE- End Semester Examination, CA- Continuous Assessment

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

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B.Tech 3rd Year (Electrical Engineering)

Course Code: CEE113

Course Title: Power System Analysis and Stability

Programme: B.Tech (EE)	L: 3 T: 1 P: 2	Credits: 5
Semester: 6	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: Professional Core Course		

Prerequisites (if any): CEE109

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	Apply transmission line and network modelling techniques to evaluate power system performance under steady state.
2	Analyze balanced and unbalanced fault conditions using symmetrical components.
3	Evaluate power system stability under disturbances using the swing equation and Equal Area Criterion.
4	Understand frequency and voltage control mechanisms for ALFC and reactive power compensation.
5	Outline the power system security assessment using monitoring, contingency analysis, and control actions.
6	Demonstrate power system analysis and stability studies using software and simulation tools.

Contents

Part-A

Unit-I Load Flow Analysis

09(L) hrs

Review of the structure of an interconnected power system, per-unit system: definition, advantages, selection of base quantities, base conversion and reactance diagram of power system. Formation of bus admittance matrix, bus classification, real and reactive power balance equations, methods of load flow analysis: Gauss-Seidel, Newton-Raphson and Fast Decoupled. Load flow solution, comparison of load flow methods, computational issues in large-scale power systems.

Unit-II Fault Analysis

10(L) hrs

Need for fault analysis and short-circuit studies, formation of bus impedance matrix using the building algorithm method. Analysis of balanced three-phase faults using Thevenin theorem and Z-bus methods, fault level (short-circuit MVA), and circuit breaker rating. Symmetrical components and sequence quantities, modelling of power system elements and sequence impedances, formation of sequence networks for transformer connections, single line-to-ground (L-G), line-to-line (L-L), double line-to-ground (L-L-G) faults using symmetrical component analysis.

Guru Nanak Dev Engineering College, Ludhiana

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B.Tech 3rd Year (Electrical Engineering)

Part-B

Unit-III Power System Stability

09(L) hrs

Concept and classification, swing equation for synchronous machine connected to infinite bus (SMIB) system, power-angle curve and steady-state stability limit, transient stability and loss of synchronism due to faults. Equal Area Criterion, critical clearing angle and critical clearing time. Numerical solution of the swing equation using point-by-point and Euler's methods. Power system stability improvement methods.

Unit-IV Frequency and Voltage Control

09(L) hrs

Governor and turbine modelling, load-frequency dependence and droop characteristics. Block diagram of Automatic load frequency Control of single-area and two-area systems, Area Control Error. Reactive power control and voltage regulation, excitation system and Automatic Voltage Regulator (AVR), voltage control devices including tap-changing transformers, SVC and STATCOM.

Unit-V Power System Security

08(L) hrs

Energy Control Centre functions, monitoring and control, Phasor Measurement Units (PMU) and Wide-Area Measurement Systems (WAMS), state estimation, operating states (Normal, Alert, Emergency, Extremis), contingency analysis and N-1 criterion, preventive control actions, emergency control actions including load shedding and islanding, system restoration basics.

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	Introduction to mathematical, programming and software tools for power system studies such as MiPower, MATLAB/Simulink, ETAP, PowerWorld, PSCAD etc.
2	To develop single line diagram of a power system using a software tool.
3	Use of software tools for formation of Bus Admittance Matrix (Y-bus).
4	Use of software tools for formation of Bus Impedance Matrix (Z-bus) using the building algorithm method.
5	Use of software tools for load-flow analysis using the Gauss-Seidel method.
6	Use of software tools for load-flow analysis using the Newton-Raphson method.
7	Use of software tools for symmetrical (three-phase) fault analysis.
8	Use of software tools for unsymmetrical fault analysis (L-G, L-L and L-L-G faults).
9	Use of software tools for Automatic Load Frequency Control (ALFC) of a single-area system, with and without a PI controller.
10	Use of software tools for transient stability studies using the swing equation and the Equal Area Criterion.
11	Use of software tools for contingency analysis (N-1 security analysis).
12	Use of software tools for voltage profile improvement using reactive power compensation and tap-changing transformer.

Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech 3rd Year (Electrical Engineering)

13	Use of software tools for power system security assessment using monitoring and state estimation concepts.
14	Use of software tools for distributed generation placement and its impact on voltage profile and system losses.
15	Visit to load dispatch centre/ relevant industry.

Reference Material: Manual Available in lab

Mini Project: Students shall develop software/simulation based relevant project on standard IEEE Bus Systems.

Text Books:

1. J. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
2. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003.
3. H. Saadat, "Power System Analysis", McGraw Hill Education, 2010.
4. A.R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.

Reference Books:

1. O. I. Elgerd, "Electric Energy Systems Theory: An Introduction", McGraw Hill Education, 1995.
2. P. Kundur, "Power System Stability and Control", McGraw Hill Education, 1994.
3. P. M. Anderson and A. A. Fouad, "Power System Control and Stability", Wiley IEEE Press, 2003.
4. A.J. Wood and B. F. Wollenberg, "Power Generation, Operation and Control", Wiley India, 2013.

Online Learning Materials:

1. https://cemkolaghat.in/study_mat/PC-EE502_Power%20System%20Analysis.pdf
Accessed on Jan 27, 2026
2. [https://annamalaiuniversity.ac.in/studport/download/engg/ee/resources/05PC602_%20Power%20System%20Analysis%20VI%20Sem%20BE%20\(E&E\).pdf](https://annamalaiuniversity.ac.in/studport/download/engg/ee/resources/05PC602_%20Power%20System%20Analysis%20VI%20Sem%20BE%20(E&E).pdf)
Accessed on Jan 27, 2026
3. https://mrcet.com/downloads/digital_notes/EEE/POWER%20SYSTEM%20ANALYSIS%20NOTES.pdf
Accessed on Jan 27, 2026
4. <https://nptel.ac.in/courses/117105140>
Accessed on Jan 27, 2026
5. <https://www.youtube.com/watch?v=rEyE3NxK8vE>
Accessed on Jan 27, 2026
6. https://archive.nptel.ac.in/content/storage2/courses/108104051/chapter_4/4_15.html
Accessed on Jan 27, 2026
7. <https://www.youtube.com/watch?v=FT5KfLjhl9Q>
Accessed on Jan 27, 2026

Supplementary SWAYAM Course:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Power System Analysis	Prof. Debapriya Das	IIT Kharagpur	https://nptel.ac.in/courses/117105140

Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech 3rd Year (Electrical Engineering)

2	Power System Analysis	Prof. A.K.Sinha	IIT Kharagpur	https://nptel.ac.in/courses/108105067
3	Computer Aided Power System Analysis	Prof. Biswarup Das	IIT Roorkee	https://nptel.ac.in/courses/108107127
4	Power System Dynamics	Dr. M.L. Kothari	IIT Delhi	https://nptel.ac.in/courses/108102080
5	Power System Stability	Prof. Debapriya Das	IIT Kharagpur	https://www.youtube.com/watch?v=c26vrVEg4IM
6	MATLAB Programming for Numerical Computation	Dr. Niket Kaisare	IIT Madras	https://nptel.ac.in/courses/103106118

Experiments to be performed through Virtual Labs:

Sr. No.	Experiment Name	Experiment Link(s)
1	To form the Y-Bus matrix for power flow studies in power systems.	https://ps2-iitr.vlabs.ac.in/exp/ybus-matrix/
2	power flow analysis using gauss-seidel method	https://ps2-iitr.vlabs.ac.in/exp/gauss-seidel-powerflow/
3	Power Flow Analysis using Newton-Raphson Method	https://ps2-iitr.vlabs.ac.in/exp/newton-raphson-powerflow/
4	To perform the power flow analysis using the Fast Decoupled method	https://ps2-iitr.vlabs.ac.in/exp/fast-decoupled-powerflow/
5	Transient Stability Analysis for Single Machine Infinite Bus (SMIB) System	https://ps2-iitr.vlabs.ac.in/exp/smib-transient-stability/
6	Load Frequency Control: Droop Control and Power Sharing	https://ps2-iitr.vlabs.ac.in/exp/load-frequency-control/

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Guru Nanak Dev Engineering College, Ludhiana
An Autonomous College under UGC Act 1956
B.Tech. 3rd Year (Electrical Engineering Department)

Subject Code: CEE114
Subject Name: Embedded Systems

Programme: B.Tech (EE)	L: 3 T: 1 P: 2	Credits: 5
Semester: 6	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: Professional Core Course		

Prerequisites: CEE105, CEE102

Additional Material allowed in ESE: Non-Programmable Scientific Calculator

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

CO#	Course Outcomes (CO)
1.	Understand fundamentals of microprocessors and microcontrollers and compare 8085, 8051 and modern embedded platforms
2.	Explain architecture and working of 8051 microcontroller and modern microcontrollers (Arduino/ESP32)
3.	Develop programs in Assembly and C for 8051 and Embedded C for modern platforms
4.	Perform arithmetic, logical and data manipulation operations in embedded systems
5.	Interface peripherals and implement timers, interrupts and serial communication protocols
6.	Design and develop real-time embedded applications using sensors, actuators and communication interfaces

CONTENTS

PART-A

Unit-I Fundamentals of Microprocessors and Embedded Systems **08(L) hrs**

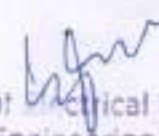
Digital computers, general architecture, important terminologies, internal working of computer. Microprocessor v/s microcontroller. Embedded systems overview and applications. Instruction sets and programming languages. Overview of 8-bit and 32-bit architectures.

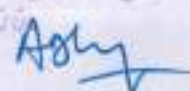
Unit-II The 8051 Microcontroller Architecture **07(L) hrs**

8051 hardware architecture, pin diagram, I/O ports and circuits. Memory organization (RAM/ROM), stack and stack pointer. Block diagram of 8051. Header circuit and crystal oscillator. Introduction to HEX file.

Unit-3 Programming Concepts and Instruction Set **07(L) hrs**

Assembly language programming, program counter, directives, PSW register and flags. Addressing modes. Arithmetic, logical and compare instructions. Jump, loop and call instructions. Data representation (BCD, ASCII). Data serialization and basic application programs.

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Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech. 3rd Year (Electrical Engineering Department)

PART-B

Unit-IV Embedded C Programming (8051 & Arduino)

09(L) hrs

Embedded C basics, data types, delay generation, I/O programming. Logic and data conversion programs. Introduction to Arduino programming environment, GPIO programming, digital and analog I/O.

Unit-V Timers, Communication and Interrupts

08(L) hrs

Timers and counters in 8051 and Arduino. Timer modes and delay generation. Serial communication basics (UART). Introduction to communication protocols: UART, I2C and SPI. Interrupt programming (timer and external interrupts). Basics of real-time systems.

Unit-VI Interfacing and Applications

06(L) hrs

Interfacing of LED, LCD, keyboard, ADC, DAC, sensors and motors. Stepper and DC motor control. Introduction to IoT systems using ESP32/Arduino (sensor data acquisition and transmission). Mini project development.

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	Familiarization with 8051 microcontroller training board and demonstration of writing and executing a program on KEIL software compiler.
2	Write a program to perform different arithmetic operations on two numbers lying at two memory locations and display the result on KEIL software IDE.
3	Write a program to demonstrate different addressing modes in microcontroller
4	Understanding and making the header circuit of 8051 microcontroller. Demonstration of converting program written in assembly, C to HEX file and burning the same on 8051 IC.
5	Write a program to demonstrate jump, loop and call instruction in microcontroller.
6	Write a program to convert Binary (hex) to ASCII conversion.
7	Write a program to interface LED(s) with 8051 microcontroller and make different patterns.
8	Write a program to interface relay with 8051 microcontrollers
9	Write a program to generate a square wave of different duty cycles (PWM technique).
10	Interfacing of 7-segment display with 8051 microcontroller and display numbers 0-9 wit
11	Write a program in C to demonstrate the concept of time-based frequency generation.
12	Interfacing of 16 x 2 LCD display with 8051 microcontrollers.
13	Interfacing of Matrix keyboard with 8051 microcontrollers.
14	Write a C program to demonstrate the concept of interrupts and serial communication.
15	Interfacing of 1k Ω pot with ADC and 8051 microcontroller and display proportionate voltage depending in the position of wiper on pot on 16 x 2 LCD display.
16	Interfacing of LM-35 temperature sensor with 8051 microcontroller and display the temperature on 16 x 2 LCD display.
17	Interfacing of Stepper and DC motor with 8051 microcontroller and perform different operations like a) Forward Motion b) Reverse Motion c) Speed and Position control.
18	To familiarize students with the Arduino development environment and basic GPIO programming by interfacing an LED and a push button, and to develop a program that controls

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B.Tech. 3rd Year (Electrical Engineering Department)

	the LED based on the state of the push button.
19	To understand and implement I2C communication protocol by interfacing a sensor or LCD module with a microcontroller, and to develop a program for transmitting and receiving data using I2C.
20	To study the SPI communication protocol by establishing communication between master and slave devices, and to develop a program for data exchange using SPI interface.
21	To explore wireless communication using ESP32 by connecting it to a Wi-Fi network and transmitting sensor or user data to a remote system or server.
22	To design a basic IoT system by acquiring data from a sensor using a microcontroller and displaying or transmitting the data to a cloud platform or serial interface for monitoring.

Reference Material: Manual Available in lab

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

Text Books:

1. K.J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, Penram International Publishing (India) Pvt. Ltd, 2007.
2. M.A. Mazidi, The 8051 Microcontroller and Embedded System, Pearson Education, 2008.
3. J. Uffenbeck, Microcomputers and Microprocessors (PHI, 3rd Edition).
4. R. Kamal, Embedded Systems: Architecture, Programming and Design, McGraw Hill Education, 2017.
5. S. Monk, Programming Arduino Getting Started with Sketches, 2nd Edition, Mc Graw Hill.

Reference Books:

1. M. Margolis, Arduino Cookbook: Recipes to Begin, Expand and Enhance your projects, 3rd Edition, 2020.
2. F. Vahid and T. Givargis, Embedded System Design: A Unified Hardware/Software Introduction, Wiley India, 2006.
3. D.E. Simon, An Embedded Software Primer, Pearson Education, 2000.

Online learning material:

1. https://books.google.co.in/books/about/Microprocessor_and_Microcontroller.html?id=WcfCwAAQBAJ&redir_esc=y Accessed on March 18, 2026
2. https://books.google.co.in/books/about/Microprocessors_and_Microcontroller.html?id=OVYGy4NhyMMC Accessed on March 18, 2026
3. <https://www.freebookcentre.net/Electronics/MicroProcessors-Books.html> Accessed on March 18, 2026
4. https://books.google.co.in/books/about/MICROPROCESSORS_AND_MICROCONTROLLERS.html?id=viEaDA_AAQBAJ&redir_esc=y Accessed on March 18, 2026

Supplementary SWAYAM Course:

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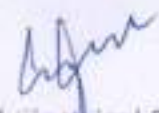
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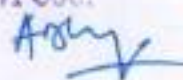
B.Tech. 3rd Year (Electrical Engineering Department)

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Microprocessors And Microcontrollers	Microprocessors And Microcontrollers	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc22_ee12/preview
2	Introduction to Embedded System Design	Prof. Dhananjay V. Gadre, Prof. Badri Subudhi	Netaji Subhas University of Technology, IIT Jammu	https://onlinecourses.nptel.ac.in/noc26_cs22/preview

Experiments to be performed through Virtual Labs:

Sr. No.	Experiment Name	Experiment Link(s)
1	To Program a binary Counter Using 8051 Microcontroller.	https://esd-iitr.vlabs.ac.in/exp/binary-counter-8051/
2	To Implement an Up/Down Counter Using Two General Purpose I/O Pins as Control Inputs.	https://esd-iitr.vlabs.ac.in/exp/up-down-counter-8051/
3	To Interface a DAC (Digital-to-Analog Converter) with 8051 Microcontroller and Generating a Ramp Waveform.	https://esd-iitr.vlabs.ac.in/exp/dac-interface-8051/
4	To Implement an Up/Down Counter Using One Interrupt Pin as a Control Pin.	https://esd-iitr.vlabs.ac.in/exp/up-down-counter-8051/
5	To Interface an ADC (Analog-to-Digital Converter) with the 8051 microcontroller and display the digital output on two 7-segment displays.	https://esd-iitr.vlabs.ac.in/exp/adc-interface-8051/
6	To Implement a 8-bit Pseudo Noise (PN) Sequence Generator based on 8051 microcontroller.	https://esd-iitr.vlabs.ac.in/exp/pn-sequence-generator-8051/

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Ludhiana-141 006.



Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE105

Course Title: Power Generation Technologies

Programme: B.Tech. (Electrical Engineering)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	Theory/Practical: Theory	Teaching Hours: 45(L) = 45 hrs + 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 Course		

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	Identify the components and operational features of steam generators, condensers, steam nozzles, and steam turbines used in thermal power plants.
2	Analyze the thermodynamic cycles of steam power plants including Rankine, regenerative, reheat-regenerative, and binary vapour cycles.
3	Classify hydroelectric power plants and select appropriate water turbines based on plant requirements.
4	Interpret the principles of nuclear energy generation and the functioning of nuclear reactors and associated safety systems.
5	Compare the performance and operational characteristics of gas turbine and diesel power plants.
6	Evaluate the combined operation of power plants and assess pollution control methods in power generation systems.

Contents

Part-A

Unit-I Steam Generators, Condensers and Turbines

09 (L) hrs

Classification of steam generators, selection, operation of locomotive, Babcock Wilcox, Cochran boilers, Types of condensers, effect of air in condensers, Dalton's law of partial pressure, cooling water calculations, steam nozzles, types of steam turbine efficiencies, compounding, governing and control.

Unit-II Steam power Plant

09 (L) hrs

Classification, Operation, Description of Rankin cycle, Regenerative cycle, Reheat-Regenerative Cycle, Binary Vapour Cycle, Selection of plant site and its layout, coal handling system, combustion system, Fluidised bed combustion, Ash handling, Feed pumps, Heat exchangers, Economizers, Super heaters, Reheaters, Air preheaters, Feed water heaters, Evaporators.

Unit-III Hydro-Electric Power Plant

05 (L) hrs

Classification of hydro plants, Selection of water turbines for hydro power plant, Automatic and remote control of hydro-station, layout of hydro power plant.

Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech. 3rd Year (Electrical Engineering)

Part-B

Unit-IV Nuclear Power Plants

07 (L) hrs

Nuclear physics, Binding energy, Radioactive decay. Fertile material, Mass defect, nuclear reactions type and application, Generation of nuclear energy by fission, nuclear reactors. Site selections, safety measures, plant layout, Fusion reaction, Future of nuclear power.

Unit -V Gas Turbine and Diesel Power Plants

09 (L) hrs

Elements of gas turbines, Open and closed cycles for gas turbines, Performance terms, Thermal refinement to gas turbines cycle, Plant layout, applications, gas turbines Cycle calculations.

Classifications of IC Engines and their performance, Four stroke and two stroke diesel engines, combustion phenomenon; Essential components, Cetane number, knocking, super charging, operation and layout of diesel power plant

Unit-6 Combined Operation of Different Power Plants and Pollution Control

06 (L) hrs

Advantages of combined operation of plants, load division between power stations, coordination of different types of Power Plants. Pollution from thermal & nuclear plants, Particulate emission and control, electrostatic precipitator, solid waste disposal.

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

Text Books:

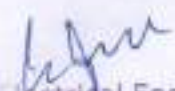
1. Chakrabarti A., M.L. Soni, P.V. Gupta and U.S. Bhatnagar, A Textbook on Power System Engineering, Dhanpat Rai & Co, 2011.
2. M.M. El-Wakil, Power Plant Engineering, McGraw Hill, USA, 1984.
3. R.K. Rajput, Power Plant Engineering, Luxmi Publications, 2015.
4. P.C. Sharma, Power Plant Engineering, Kataria & Sons, 2010.
5. B.G.A. Skrotzki and W.A. Vapot, Power Station Engineering and Economy, Tata McGraw-Hill, 2008.

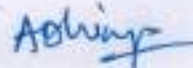
References Books:

1. P.K. Nag, Power Plant Engineering, Tata McGraw-Hill Education, 2014.
2. R.K. Hegde, Power Plant Engineering, Pearson Education India, 2015.
3. M.K. Gupta, Power Plant Engineering, PHI Learning Pvt. Ltd, 2012.
4. F. Zabihian, Power Plant Engineering, CRC Press / Routledge, 2013.
5. G.K. Vijayaraghavan and R. Rajappan, Power Plant Engineering, Lakshmi Publications, 2014.
6. T. Deb, Power Plant Engineering (Electrical Power Generation and Power Station Practice), Bhavya Books, 2015.

Online Learning Material:

1. <https://mrceet.com/downloads/B.tech%20Digital%20Lecture%20notes/B.Tech%20IV%20Year%20I%20Semester/Power%20Plant%20Engineering%20Digital%20Material.pdf>
Accessed on March 08, 2026.
2. https://vemu.org/uploads/lecture_notes/06_07_2021_1883044261.pdf
Accessed on March 08, 2026.

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Supplementary SWAYAM Courses:

Sr. No	Course Name	Instructor	Host Institute	URL
1	Power Plant Engineering	Prof. Ravi Kumar	IIT Roorkee	https://onlinecourses.nptel.ac.in/noc25_me113/preview
2	Power Plant System Engineering	Prof. Niranjana Sahoo	IIT Guwahati	https://onlinecourses.nptel.ac.in/noc25_me62/preview

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Aswini

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B.Tech. 3rd Year (Electrical Engineering Department)

Course Code: EEE106

Course Title: Optimization Techniques

Programme: B.Tech. (EE)	L: 2 T: 1 P: 2	Credits: 4
Semester: 6	Theory/Practical: Integrated	Teaching Hours: 30(L)+15(T) +30 (Lab) = 75 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: Professional Elective Course		

Prerequisites (if any): NIL

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	Comprehend the techniques and applications of Engineering optimization.
2	Apply basic concepts of mathematics to formulate an optimization problem.
3	Analyze characteristics of a general linear programming problem.
4	Examine various methods of solving the unconstrained minimization problem.
5	Formulate non-linear optimization problems and analyze their solutions using appropriate optimization techniques.
6	Acquire the skill of using optimization tools.

Contents

Part-A

Unit-1 Introduction to Optimization

06(L) hrs

Statement of an Optimization problem, Optimal Problem formulation, Classification of Optimization problem, Optimum design concepts, Definition of Global and Local optima, Optimality criteria, overview of applications of Optimization.

Unit-2 Linear programming

06(L) hrs

Standard form of linear programming, geometry of linear programming problems, solution of a system of linear simultaneous equations, pivotal production of general systems of equations, simplex algorithms, revised simplex methods, duality in linear programming.

Part-B

Unit-3 Non-Linear programming

12(L) hrs

Optimization algorithms for solving unconstrained optimization problems using Gradient based methods: Cauchy's steepest descent method, Newton's method, Conjugate gradient method.

Optimization algorithms for solving constrained optimization problems: direct methods, penalty function methods, steepest descent method, Engineering applications of unconstrained and constrained algorithms.

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Unit-4 Overview of modern and AI-based optimization methods

06(L) hrs

Genetic Algorithms, Simulated Annealing, Ant Colony Optimization, Tabu Search, Neural Network and Fuzzy-based Optimization

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	Familiarization with optimization tools: MATLAB, MATPOWER, AMPL, GAMS, and Python environments.
2	Installation, interface study, and execution of basic commands using optimization tools.
3	To write simple scripts/functions by using optimization tools and handling vectors, matrices, and I/O operations.
4	To Handle vectors, matrices and input-output operation by using optimization tools.
5	To formulate and solve LPP by using optimization tools.
6	To formulate and solve NLP by using optimization tools.
7	To formulate and solve Economic Dispatch (ED) without transmission losses.
8	To formulate and solve Economic Dispatch (ED) with transmission losses
9	To formulate and solve Unit Commitment (UC) problem.
10	To formulate and solve DC Optimal Power Flow (DCOPF)
11	To formulate and solve AC Optimal Power Flow (ACOPF).
12	Solution of unconstrained optimization problems using Newton's method.
13	Implementation and comparison of gradient-based optimization methods for convergence analysis.
14	To formulate and solve electricity scheduling problem.
15	To formulate and solve electricity Demand Response optimization problem.

Reference Material: Manual Available in lab

Mini Project: Students shall develop software/simulation based relevant project on standard IEEE Bus Systems.

Text Books

1. S.S. Rao, "Engineering Optimization: Theory and Practice", New Age International Pvt. Ltd., New Delhi, 2000.
2. G. Hadley, "Linear programming", Narosa Publishing House, New Delhi, 1990.
3. H.A. Taha, "Operations Research: An Introduction", 5th Edition, Macmillan, New York, 1992.
4. K. Deb, "Optimization for Engineering Design Algorithms and Examples", Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.

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B.Tech. 3rd Year (Electrical Engineering Department)

Reference Books

1. K. Srinivasa Raju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management", PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288, 2010.
2. J. Arora, "Introduction to Optimization Design", Elsevier Academic Press, New Delhi, 2004
3. R. Saravanan, "Manufacturing Optimization through Intelligent Techniques", Taylor & Francis (CRC Press) – 2006

Online Learning Materials:

- 1) https://www.iitg.ac.in/rkbc/CE602/ce602_2024.htm Accessed on February 10, 2026
- 2) <https://www.ieor.iitb.ac.in/files/optimization-notes.pdf> Accessed on February 10, 2026

Supplementary SWAYAM Courses

Sr. No.	Course Name	Instructor(s)	Host Institute	URL
1	Optimization	Dr. D. Chakraborty and Prof. A. Goswami	IIT Kharagpur	https://nptel.ac.in/courses/111105039
2	Optimization Theory and Algorithms	Prof. U. Khankhoje	IIT Madras	https://onlinecourses.nptel.ac.in/noc24_ee122/preview

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Ashwini

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE107

Course Title: Computer Aided Electrical Machine Design

Programme: B.Tech. (EE)	L: 2 T:1 P:2	Credits: 4
Semester: 6	Theory/Practical: Integrated	Teaching Hours: 30(L)+15(T) +30 (Lab) = 75 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: Professional Elective Course		

Prerequisite : CEE103, CEE106

Additional Material Allowed in ESE: Non-Programmable Scientific Calculator

On Completion of the Course, the students will have the ability to:

CO#	Course Outcomes (CO)
1.	Study the structure and operating characteristics of electrical machines.
2.	Analyze electrical, magnetic, and thermal loading effects in electrical machines
3.	Apply electrical machine design principles to develop a basic machine design.
4.	Design the dimensions and various parameters related to Transformer, Induction motor and Synchronous motor.
5.	Evaluate traditional design limitations and apply optimization techniques.
6.	Apply a software tool for computations required in electrical machine design.

Contents:

Part-A

Unit-I Introduction

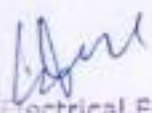
07 (L) hrs

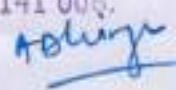
Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loading. Thermal considerations, heat flow, temperature rise and machine rating, Introduction to design software.

Unit-II Transformers

08 (L) hrs

Rating and size of a single- and three-phase transformers, Design overall dimensions, window space factor, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

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B.Tech. 3rd Year (Electrical Engineering)

Part-B

Unit-III Induction Motors

07 (L) hrs

Size and rating of three phase induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor. Magnetic leakage reactance, magnetizing current and short circuit current calculations.

Unit-IV Synchronous Machines

08 (L) hrs

Sizing of a synchronous machine, main dimensions, design of salient pole machines, Short Circuit Ratio (SCR), estimation of air gap length, design of rotor, design of damper winding, determination of full load field MMF, design of field winding, design of turbo alternators.

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	Introduction to mathematical programming and software tools for electrical machine design such as MATLAB/Simulink/ AUTOCAD.
2	Study of CAD-based design workflow for electrical machines using software tools.
3	Basic MATLAB programming for electrical machine design calculations.
4	Design of single-phase transformer using MATLAB/ AUTOCAD.
5	Calculation of transformer core dimensions and winding parameters using software tools.
6	Calculation of transformer losses (core loss and copper loss) using software tools.
7	Thermal analysis of transformer using simulation software.
8	Armature winding design and analysis of DC machine using software tools.
9	Design of three-phase induction motor using MATLAB/AUTOCAD.
10	Stator and rotor slot design of induction motor using software tools.
11	Calculation of torque-slip characteristics of induction motor using MATLAB.
12	Design of synchronous generator parameters using MATLAB/ AUTOCAD.
13	Field winding and armature design of synchronous machine using software tools.
14	Calculation of efficiency and losses of induction motor using software tools.
15	Introduction to finite element method (FEM) in electrical machine design using software tools.

Reference Material: Manual Available in lab

Mini Project: Students shall develop software/simulation based relevant project.

Textbooks:

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.

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2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London, 2002.
3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006

Reference Books:

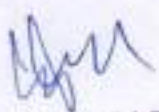
1. K. L. Narang, "A Textbook of Electrical Engineering Drawings", Satya Prakashan, 1969.
2. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
3. K. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.

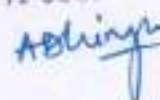
Online learning material:

1. https://www.worldcat.org/search?q=su%3AElectric+machinery+Design+and+construction.&qt=hot_subject
Accessed on March 08,2026.
2. <https://www.dsengg.ac.in/eee/14%20COMPUTER%20AIDED%20DESIGN%20ELECTRICAL%20APPARATUS.pdf>
Accessed on March 08,2026.

Supplementary SWAYAM Course:

<i>Sr. No.</i>	<i>Course Name</i>	<i>Instructor</i>	<i>Host Institute</i>	<i>URL</i>
1	Computer-Aided-Design of Electrical Machine	Prof. Bhim Singh	IIT Delhi	https://onlinecourses.nptel.ac.in/noc25_ee14/preview

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A. Bhingra

Guru Nanak Dev Engineering College, Ludhiana
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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE108
Course Name: Digital Control System

Programme: B. Tech (EE)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	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: 60%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective Course		

Prerequisites: CEE111

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 basics of sampling, quantization and hold circuits.
2	Understand the concept of z transform and its properties.
3	Determine the discrete representation of LTI systems.
4	Interpret the concept of stability in discrete time systems.
5	Apprehend state space approach for discrete systems.
6	Design digital controllers for discrete systems.

Contents

Part-A

Unit I: Discrete Representation of Continuous Systems

08(L) hrs

Basics of Digital Control Systems, Discrete representation of continuous systems, Sample and hold circuit, Mathematical Modeling of sample and hold circuit, Effects of Sampling and Quantization, Choice of sampling frequency, Zero Order Hold equivalent.

Unit II: Discrete System Analysis

10(L) hrs

Z-Transform and Inverse Z Transform for analyzing discrete time systems, Pulse Transfer function, and Pulse transfer function of closed loop systems, Mapping from s-plane to z plane, Solution of Discrete time systems, Time response of discrete time system.

Unit III: Stability of Discrete Time System

07(L)hrs

Stability analysis by Jury's test, Stability analysis using bilinear transformation, Design of digital control system with dead beat response, Practical issues with dead beat response design.

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B.Tech. 3rd Year (Electrical Engineering)

Part-B

Unit IV: State Space Approach for discrete time systems

10(L) hrs

State space models of discrete systems, State space analysis, solution of linear time invariant and linear time variant state equations, canonical forms Lyapunov Stability, Controllability, observability analysis. Effect of pole zero cancellation on the controllability & observability.

Unit V: Design of Digital Control System

10(L) hrs

Design of Discrete PID Controller, Design of discrete state feedback controller, Design of set point tracker, and Design of Discrete Observer for LTI System, Design of Discrete compensator, Modern control Systems in Electric Vehicles and Hybrid Electric Vehicles and its Electronic Control Unit.

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

Text Books:

1. K. Ogata, "Discrete Time Control Systems", Prentice Hall, Englewood Cliffs, 1995. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
2. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
3. B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.
4. C. L. Phillips and H. T. Nagle, "Digital Control System Analysis and Design", Prentice Hall, 4th Edition, 2007.
5. S. K. Singh, "Digital Control Systems: Analysis and Design", McGraw Hill Education, 2nd Edition, 2012.
6. L.J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers, 2007.

References Books:

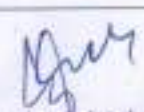
1. G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of Dynamic Systems" Addison-Wesley, 1998.
2. L. William Brogan, Modern Control Theory, Pearson Education India, 2011.

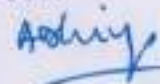
Online learning material:

1. <https://www.site.uottawa.ca/~rhabash/ELG4157DigitalControlSystems.pdf>
Accessed on February 16, 2026.
2. <http://www.intechopen.com/books/applications-of-nonlinear-control>
Accessed on February 16, 2026.

Supplementary SWAYAM Courses:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Digital control systems	Prof. C. S. Shankar Ram	IIT Guwahati	https://nptel.ac.in/courses/108103008

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE109

Course Title: Renewable Energy Sources and Grid Integration

Programme: B.Tech. (EE)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	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 Course		

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	Analyze the global and national energy scenario as regards to energy crisis.
2	Analyze the available solar energy potential and its utilization in India.
3	Explain the basic principles and physics of wind power generation systems.
4	Assess the applications of fuel cells in various energy and industrial sectors.
5	Examine the role and future potential of biomass energy systems in sustainable development.
6	Discuss energy generation from non-conventional sources such as biomass, wind, geothermal, tidal, and other renewable resources.

Contents

Part-A

Unit-I Introduction

06 (L) hrs

Global and National energy scenarios, Limitation of conventional energy sources, need and growth of alternative energy source, Energy-Environment interaction, basic scheme and application of direct energy, miscellaneous sources of alternate energy: geothermal, tidal, waste-to-energy.

Unit-II Solar Energy

09 (L) hrs

Solar energy in India, Solar radiation spectra, solar geometry, Earth Sun angles and observer Sun angles, solar day length, solar collectors, estimation of solar energy availability, Applications of solar energy, solar furnace, Diode equivalent circuit of PV cell, Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency.

Unit-III Wind Energy

10 (L) hrs

Wind systems in India, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions, Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics and Wind Energy Conversion systems.

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Guru Nanak Dev Engineering College, Ludhiana

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B.Tech. 3rd Year (Electrical Engineering)

Part-B

Unit-IV Fuel Cell

06 (L) hrs

Principle of Operation of Fuel Cell, Gibb's free energy, general description of fuel cells types, construction, operational characteristics and applications.

Unit-V Biomass Energy

07 (L)hrs

Availability of bio-mass and its Conversion Theory, Harvesting of biomass (coppieing, pollarding, lopping, pruning, thinning), Biomass conversion technologies (thermochemical, biochemical and agrochemical) technology, briquetting, biomass gasification technology.

Unit-VI Renewable Energy Integration Concepts

07 (L)hrs

Synchronization of RES with grid, Intermittency and variability challenges, Distributed generation & Microgrids and decentralized energy systems, Hybrid systems, Rural electrification, Energy policy and regulatory frameworks.

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

Text Books:

1. B. R. Gupta, Generation of Electrical Energy, S. Chand, 2017.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, 2005.
3. S. Rao and B.B. Parulekar, Energy Technology: Non-Conventional, Renewable and Conventional, Khanna Publishers, 2005.
4. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.

Reference Books:

1. W. T. Capehart, W. Turner and W. Kennedy, Guide to Energy Management, Fairmont Press, 2008.
2. A.Thumann, Plant Engineers and Managers Guide to Energy Conservation, Fairmont Press. BEE Training Manuals, Bureau of Energy Efficiency, India, 2008.
3. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.
4. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
5. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
6. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

Online Learning Material:

1. https://kp.kiit.ac.in/pdf_files/06/SM_6th-Sem_Elect_RENEWABLE-ENERGY-SYSTEM.pdf
Accessed on February 11, 2026.
2. https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
Accessed on February 11, 2026.

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An Autonomous College under UGC Act 1956

B.Tech. 3rd Year (Electrical Engineering)

Supplementary SWAYAM Course:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	Prof. Vaibhav Vasant Goud, Prof. R. Anandalakshmi	IIT Guwahati	https://nptel.ac.in/courses/103103206
2	Physics of Renewable Energy Systems	Prof. Amreesh Chandra	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc21_ph33/preview

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE110
Course Title: Smart Grids

Programme: B.Tech. (EE)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	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: 10%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective Course		

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 basic concepts, components, and architecture of smart grid.
2	Comprehend the various measurement technologies in smart grid.
3	Apprehend the importance of renewable energy in smart system.
4	Demonstrate knowledge about battery technology and energy storage in smart grids.
5	Elucidate integration of renewable energy sources with micro-grid.
6	Justify the use of modern communication techniques for smart grid challenges.

Contents

Part-A

Unit-I Introduction to Smart Grid

07(L) hrs

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Concept of Robust and Self-Healing Grid, Present development, Introduction to national and international scenario and policies.

Unit-II Sensors and Measurement

08 (L) hrs

Sensors for Smart Grid, Monitoring and Measurement Technologies, Digital relays for smart grid protection, Phasor Measurement Units, Smart meters, Smart Appliances, Multi Agent Systems Technology, Micro grid and Smart grid comparison, Wide Area Measurement

Unit-III Distributed Generation and Energy Storage

13 (L) hrs

Digi Technologies: Solar Energy, Photo-voltaic Systems, Wind turbine Systems, Biomass, Small and Micro Hydro Power, Geothermal heat pumps, Energy storage devices: Batteries, Flow Batteries, Fuel Cell and hydrogen electrolytes, Flywheel, Super conduction magnetic energy storage systems, super capacitors, Battery management system, Battery energy storage system.

Part-B

Unit-IV Micro-Grid

07 (L) hrs

Concept of micro-grid, need and applications of micro-grid, formation of micro-grid, Issues and remedies of interconnection, protection, operation and control of micro-grid.

Guru Nanak Dev Engineering College, Ludhiana

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B.Tech. 3rd Year (Electrical Engineering)

Unit-V Smart Communication

10 (L) hrs

Advanced Metering Infrastructure, Home Area Network, Neighborhood Area Network, Wide Area Network, Bluetooth, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network. Communication protocols for substation automation, EV charging and smart metering.

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

Text Books

1. A. Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011
2. C.W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press 2009
3. J. Ekanayake, N. Jenkins, K. Liyanage, "Smart Grid: Technology and Applications", Wiley 2012
4. S. Borlase, "Smart Grid: Infrastructure, Technology and solutions "CRC Press,2012.

References Books

1. A.G. Phadke, "Synchronized Phasor Measurement and their Applications", Springer,2012.
2. N. Hatziargyriou, "Microgrids architecture and control", Wiley IEEE,2014.
3. F.L.L. Hong YE, "Renewable Energy System", CRC Press,2013

Online Learning Material:

1. https://www.bharathuniv.ac.in/page_images/pdf/courseware_eee/Notes/NE1/BEE045%20POWER%20PLANT.pdf Accessed on February 12,2026.
2. https://mrcet.com/downloads/digital_notes/eee/epgtd.pdf Accessed on February 12,2026

Supplementary SWAYAM Courses

Sr. No	Course Name	Instructor	Host Institute	URL
1	Smart grid: Basics to Advanced Technologies	Prof. N.P. Padhy, Prof. Premalata Jena	IIT, Roorkee	https://onlinecourses.nptel.ac.in/noc23_ee128/preview

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Deptt. of Electrical Engineering
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 An Autonomous College under UGC Act 1956
B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE111
Course Title: High Voltage Engineering

Programme: B.Tech. (EE)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	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: 10%		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Professional Elective Course		

Prerequisites (if any): CEE107, CEE109

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	Analyse the breakdown mechanism of solids, liquids and gases.
2	Classify the insulating materials.
3	Conceptualize the idea of high voltage and safety measures involved.
4	Comprehend methods of generation of various high voltages.
5	Evaluate compensation requirement in EHVAC transmission line.
6	Understand the merits of high voltage DC transmission.

Contents

Part-A

Unit-I Dielectric Breakdown

12 (L) hrs

Gases: Ionization process, Townsend's current growth equations, 1st and 2nd ionization coefficients, Townsend's criterion for breakdown, Streamer theory of breakdown, Paschen's law of Gases, Gases used in practice, Partial Discharge measurements.

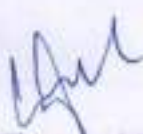
Liquids: Conduction and breakdown in pure and commercial liquids, Suspended particle theory, Cavitation and Bubble theory, Stressed oil volume theory, Liquids used in practice.

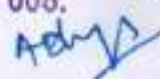
Solids: Intrinsic, Electromechanical and Thermal breakdown composite dielectrics, Solid dielectrics used in practice.

Unit-II Insulating Materials for High Voltage

08 (L) hrs

Applications of insulating materials used in power transformers, rotating machines, circuit breakers, cables and power capacitors.

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Guru Nanak Dev Engineering College, Ludhiana
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B.Tech. 3rd Year (Electrical Engineering)

Part-B

Unit-III Generation of High Voltages

08 (L) hrs

High Voltage Direct Current (HVDC), High Voltage Alternating Current (HVAC), Power frequency and High frequency: Impulse voltage generation, Tripping and contact of Impulse Generator, Problems in dealing with high voltages.

Unit-IV Extra High Voltage (EHV) Transmission and Corona Loss

09 (L) hrs

Need for EHV Transmission, Use of bundled conductors, Corona loss, Factors affecting the corona loss, Radio Interference due to corona, Shunt and series compensation in EHV lines.

Unit-V High Voltage Direct Current (HVDC) Transmission

08 (L) hrs

Advantages, disadvantages and economics of HVDC Transmission system, Types of Direct Current (DC) links, Converter station equipment.

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

Text Books:

1. V.Kamaraju and Naidu M.S., High Voltage Engineering, Tata McGraw-Hill Education, 2004
2. E.W., Kimbark, High Voltage Direct Current Transmission, Wiley-Interscience, 2004
3. R.D Bagamudre, Extra High Voltage A.C. Transmission Engineering, New Age International Publishers, 2011
4. B.R. Gupta, Power System Engineering and Design, New Age Publishers, 2007
5. E.Kuffel, and M. Abdullah, High Voltage Engineering, Pergamon Press, 1970

References Books:

1. C. L.Wadhwa, High Voltage Engineering, New Age Publications, 2012
2. K.R Padiyar, HVDC Power Transmission Systems: Technology and System Interactions, New Age International, 1990

Online learning material:

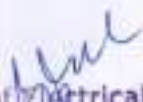
1. <http://www.cpri.in>
2. <https://onlinecourses.nptel.ac.in>

Assessed on February 10, 2026

Assessed on February 10, 2026

Supplementary SWAYAM Courses:

Sr. No.	Course Name	Instructor	Host Institute	URL
1	High Voltage Engineering	Prof. Ravindra Arora	IIT Kanpur,	nptel.ac.in/courses/108104048
2	High Voltage DC Transmission	Prof. S N Singh	IIT Kanpur	nptel.ac.in/courses/108104013

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: EEE112

Course Title: High Voltage Transmission Systems

Programme: B.Tech. (EE)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	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 Course		

Prerequisites (if any): CEE109

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 basics of EHV-AC transmission.
2	Elucidate corona effect, associated problems and remedial measures.
3	Comprehend compensation methods and design parameters of EHV-AC transmission line.
4	Evaluate the feasibility of HVDC for bulk power transfer.
5	Analyze the effect of Harmonics due to converter station.
6	Interpret the concept, types and applications of multi-terminal HVDC system.

Contents

Part-A

Unit-I Extra High Voltage (EHV) AC Transmission

12 (L) hrs

Hierarchical AC Transmission voltage levels, choices, applications. Need for EHV transmission. Challenges associated with EHV transmission system. Phenomenon of Corona: disruptive critical voltage, visual critical voltage. Effects of corona. Corona loss, factors affecting corona loss. Methods of reducing corona effects. EHV-AC transmission systems in India.

Unit-II Compensation and Design of Transmission Line

08 (L) hrs

Voltage regulation. Ferranti effect. Compensation techniques. Intermediate sub-stations. Tuned power lines. Design aspects of EHV-AC power transmission system: selection of voltage level, insulation design, conductor size and configuration, number of circuits, span length, ground wire.

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Guru Nanak Dev Engineering College, Ludhiana
An Autonomous College under UGC Act 1956
B.Tech. 3rd Year (Electrical Engineering)

Part-B

Unit-III High Voltage Direct Current (HVDC) Transmission

12 (L) hrs

Introduction, advantages and limitations of HVDC transmission. Comparison between EHV-AC and HVDC transmission system. Applications of HVDC transmission. Types of DC links. Ground return. Power flow equations. Converter connections: 6-pulse bridge, 12-pulse bridge. Converter transformer. Control equipment. HVDC transmission systems in India.

Unit-IV Multi-Terminal HVDC Systems

07 (L) hrs

Two-pole HVDC with earth return. MTDC system configurations: series and parallel connected converter system. Control of parallel-connected systems. Applications of MTDC systems.

Unit-V Harmonics and Filters

06 (L) hrs

Harmonics fundamentals. Characteristic and non-characteristic harmonics. Fourier series analysis. Harmful effects of harmonics. Harmonic filters: shunt & series filters. Resonance and quality factor.

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

Text Books

1. S. Rao, EHV-AC, HVDC Transmission & Distribution Engineering, Khanna Publishers, 1993
2. B.R. Gupta, Power System Analysis and Design, S. Chand & Sons., 2005
3. R.D Begamudre, Extra High Voltage A.C. Transmission Engineering, New Age International Publishers, 2000
4. K.R Padiyar, HVDC Power Transmission Systems: Technology and System Interactions, New Age International, 2017
5. E.W Kimbark, High Voltage Direct Current Transmission, Wiley-Inter science, 2004

References Books

1. N. G. Hingorani, L. Gyugyi, Understanding FACTS, IEEE Press, USA, 1999
2. E. Kuffel, and Abdullah, M., High Voltage Engineering, Pergamon Press, 1970
3. A.T Johns and Y.H. Song, Flexible AC Transmission System, IET Press, 1999

Online learning material

1. <http://www.cpri.in> Accessed on Feb 9, 2026
2. <http://kcl.digimat.in/nptel/courses/video/108104013/L26.html> Accessed on Feb 9, 2026
3. <https://nptel.ac.in/courses/108104013> Accessed on Feb 9, 2026

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Guru Nanak Dev Engineering College, Ludhiana
An Autonomous College under UGC Act 1956
B.Tech. 3rd Year (Electrical Engineering)

Supplementary SWAYAM Courses:

S.No.	Course Name	Instructor	Host Institute	URL
1	Electrical Power Transmission and Distribution	Dr. Navin Sam K	NIT Puducherry	https://onlinecourses.swayam2.ac.in/c
2	High Voltage DC Transmission	Dr. S.N. Singh	IIT Kanpur	https://nptel.ac.in/courses/108104013

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Guru Nanak Dev Engineering College, Ludhiana
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B.Tech. 3rd Year (Electrical Engineering)

Course Code: ESEE102
Course Title: E-Mobility

Programme: B.Tech. (EE)	L: 3 T: 1 P: 0	Credits: 4
Semester: 6	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: Engineering Science Course		

Prerequisites (if any): NIL

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 concept of electric vehicles.
2	Appreciate the concept of Electric Traction
3	Select a suitable drive scheme for developing an electric vehicle
4	Acquaint with different possible ways of energy storage.
5	Acquire knowledge of EV batteries.
6	Elucidate EV battery chargers and charging protocols.

Contents

PART-A

Unit-I Introduction

07 (L) hrs

History and benefits of electric vehicles. Fundamentals of EVs. Efficiency considerations for conventional vehicle, Hybrid Electric Vehicle and Electric Vehicle. Social and environmental importance of Electric Vehicles. Impact and benefits of EV on utility grid.

Unit-II Electric Drive Trains

07 (L) hrs

Basic concept of electric traction. Introduction to various electric drive train topologies. Power flow control in electric drive train topologies.

Unit-III Electric motors in EV

08 (L) hrs

Motors used in Electric Vehicle (PMSM, BLDC, DC Series motor, Induction motor) and their torque-speed characteristics. Motor control techniques for Electric Vehicles.

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An Autonomous College under UGC Act 1956
B.Tech. 3rd Year (Electrical Engineering)

Part B

Unit-IV Energy Storage Concepts

07 (L) hrs

Classification of Storage Technologies by Energy type, Thermal Energy: Heat Storage. Chemical Energy: Organic and non-organic. Mechanical Energy: Kinetic and Potential Energy. Electrical Energy: Electrical Potential.

Unit-V Energy Storage Systems in Modern Electrical Systems

08 (L) hrs

Battery based energy storage and its analysis. Fuel cells. Capacitors and Super capacitors. Solid state Batteries. Performance criterion for EV batteries: Energy density, Amp hour density, Energy efficiency, Cost, Operating temperature, number of life cycles, recharge and self-discharge rates and commercial availability. Regenerative Braking. Cooling System

Unit-VI Charging Infrastructure

08 (L) hrs

Classification of EV chargers and standards. Battery charging modes. Types of EV supply equipment (EVSE). Components of EV battery chargers. Charging infrastructure challenges. Introduction to semiconductor devices. Basics of isolated, non - isolated DC-DC and grid connected converters.

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

Text Books:

1. A. Emadi, "Advanced Electric Drive Vehicles", CRC Press 2014.
2. I. Husain, "Electric and Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press 2015.
3. A. Rufer, "Energy Storage systems and components", CRC press 2017.
4. J. Jiang and C. Zhang, "Fundamentals and Applications of Lithium-Ion Batteries in Electric Drive Vehicles," John Wiley & Sons 2015.
5. N. Mohan, T.M. Underland and W.P. Robbins, "Power Electronics – Converters, Applications and Design", 3rd Ed., Wiley India.2005.

Reference Books:

1. K. T. Chau, "Energy Systems for Electric and Hybrid Vehicles," IET Transportation Series, 2016.
2. E. Karden, S. Ploumen, B. Fricke, T. Miller and K. Snyder, "Energy storage devices for future hybrid electric vehicles," J. Power Sources, vol. 168, no. 1, pp. 2–11, 2007

Online learning material

1. <https://nptel.ac.in/courses/108104011> Accessed on 11 February 2026
2. <https://www.digimat.in/nptel/courses/video/108104011/L01.html>

Accessed on 11 February 2026

3. <https://vardhaman.org/wp-content/uploads/2023/08/Electric-Vehicles.pdf>

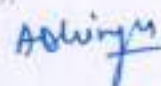
Accessed on 11 February 2026

Supplementary SWAYAM Courses:

Guru Nanak Dev Engineering College, Ludhiana
An Autonomous College under UGC Act 1956
B.Tech. 3rd Year (Electrical Engineering)

Sr.No	Course Name	Instructor	Host Institute	URL
1.	Introduction to Electric and Hybrid Vehicle	Dr. R. N. Patel and Dr Lalit Kumar Sahu	Chhattisgarh Swami Vivekanand Technical University (CSVТУ), Bhilai (CG), India.	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_ec1
2.	Electric Vehicles and Renewable Energy	Prof. Ashok Jhunjunwala, Prof. Kaushal Jha, Prof. L. Kannan, Prof. Prabhjot Kaur	IIT Madras	https://onlinecourses.nptel.ac.in/noc21_ec112/preview


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G.N.D. Engineering College,
Ludhiana-141 006.



Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech. 3rd Year (Electrical Engineering)

Course Code: FSEE101

Course Title: Corporate Readiness

Programme: B.Tech. (EE)	L: 2 T: 0 P: 0	Credits: 2
Semester: 6	Theory/Practical: Theory	Teaching Hours: 30(L) = 30 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: NA		
Duration of End Semester Examination (ESE): 3 hours		
Course Type: Project work, Seminar and Internship		

Prerequisites: NIL

Additional Material Allowed in ESE: NA

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

CO#	Course Outcomes
1	Understand corporate culture, professional ethics, and organizational behavior.
2	Demonstrate effective verbal, non-verbal, and written communication skills.
3	Apply aptitude and logical reasoning techniques to solve workplace problems.
4	Exhibit teamwork, leadership, and interpersonal skills in professional settings.
5	Prepare professional documents such as resumes, cover letters, and reports.
6	Demonstrate interview readiness, presentation skills, and career planning strategies

Contents

Part-A

Unit-I Corporate Culture & Professional Ethics

07 (L) hrs

Concept of corporate readiness and employability skills, Evolution of corporate organizations and work culture, Organizational structure, hierarchy, and reporting systems, Corporate values, mission, vision, and professionalism, Workplace ethics, integrity, and code of conduct, Time management, punctuality, and work discipline, Corporate social responsibility (CSR) and sustainability, Case studies on ethical dilemmas in organizations and Role of engineers in society and corporate accountability.

Unit-II Aptitude & Numerical Reasoning

08 (L) hrs

Importance of aptitude in recruitment and corporate decision-making, Quantitative aptitude: percentages, ratios, averages, and profit-loss, Time & work, time-speed-distance problems, Numerical reasoning and basic data and Practice sessions with corporate-style aptitude questions.

Part-B

Unit-III Logical & Analytical Reasoning

08 (L) hrs

Logical reasoning: series, coding-decoding, and analogies, Analytical reasoning and critical thinking, Problem-solving techniques for workplace scenarios and Decision-making models and applications

Unit-IV Career Readiness & Employability Skills

07 (L) hrs

Overview of career opportunities for engineering graduates, Resume writing: structure, content, and customization, Cover letter writing and professional correspondence, Interview skills: HR, technical, and behavioral interviews, Common interview questions and answering strategies, Presentation skills

Guru Nanak Dev Engineering College, Ludhiana

An Autonomous College under UGC Act 1956

B.Tech. 3rd Year (Electrical Engineering)

and public speaking techniques, Professional grooming, etiquette, and workplace behavior, Career planning, goal setting, and lifelong learning and Mock interviews, presentations, and employability exercises

Text Books:

1. K. K. Sinha, Corporate Communication, 2nd Edition, Galgotia Publishing Company, New Delhi, India.
2. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, Revised Edition, S. Chand Publishing, New Delhi, India.
3. K. Mohan and M. Banerji, Developing Communication Skills, 2nd Edition, Macmillan Education India, New Delhi, India.
4. D. Goleman, Emotional Intelligence: Why It Can Matter More Than IQ, 10th Anniversary Edition, Bantam Books, New York, USA.

References Books:

1. Lesikar, Flatley and Rentz, Basic Business Communication, McGraw-Hill Education, 2016.
2. A. Wallwork, English for Presentations at International Conferences, Springer, 2013.
3. J.L. Seglin, The Simple Art of Business Etiquette, Adams Media, 2003.
4. D. Carnegie, How to Win Friends and Influence People, Simon & Schuster, 1998.
5. S. P. Robbins, Organizational Behavior, Pearson Education, 2017.

Supplementary SWAYAM Courses:

Sr. No	Course Name	Instructor	Host Institute	URL
1	Campus Recruitment Training	Dr. K. Preetham	JAIN (Deemed to be University), Bangalore	https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg102
2	Verbal Aptitude	Dr. K. Preetham	JAIN (Deemed to be University), Bangalore	https://onlinecourses.swayam2.ac.in/e-learning/preview/imb25_mg73
3	Introduction to Logic	Dr. Arvind Jaiswal	Banaras Hindu University	https://onlinecourses.swayam2.ac.in/e-learning/preview/ini24_hs06
4	Employment Communication: A Lab-based Course	Prof. Seema Singh	IIT Kharagpur	https://onlinecourses.nptel.ac.in/no_c26_hs60/preview

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An Autonomous College under UGC Act 1956

Course Code: MC 102

Course: Essence of Indian Knowledge Tradition

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

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

CO#	Course Outcomes
1	Understand the rich heritage of Indian Knowledge Systems (IKS).
2	Explore the contributions of IKS to various fields, including science, technology, engineering, and mathematics.
3	Foster an appreciation for the cultural and societal values embedded in IKS.
4	Evaluate contribution of ancient Indian scholars in various disciplines – arts, science, Mathematics, medicine, engineering and technology.
5	Elucidate the legacy and essence of IKS.

Contents

PART A

Unit-1 Introduction to Indian Knowledge System (IKS)

6(L) hrs

Concept, scope and objectives of IKS, Historical context and evolution of major Indian knowledge traditions (IKT), Different streams of IKT, Role of IKT in shaping Indian society and education, Relevance of IKS in a globalised, knowledge-based society.

Unit-2 Indian Contributions to Science, Technology, Engineering and Mathematics

8(L) hrs

Ancient Indian advancements in mathematics: Sūtra Sūtras, Zero, Decimal System, Algebra, Astronomy: Aryabhata, Varahamihira, Panchanga systems, Metals and metalworking technology: Iron pillar, Zinc distillation, Wootz steel, Town planning and architecture: Harappan town planning, temple architecture, Water management: Stepwells, tanks, canals, and irrigation systems in Punjab, Integration of traditional knowledge with modern technology.

PART B

Unit-3 IKS in Health, and Environmental Sustainability

5(L) hrs

Ayurveda: Principles, Diagnostic tools, Integrative healthcare, Yoga and meditation: Scientific basis and global relevance, Traditional ecological knowledge: the Panchbhutas, sustainable living, sacred groves and traditional management systems.

Unit-4 IKS in Society and Culture

6(L) hrs

Indian philosophical systems and their influence on social fabric, Indian cosmology and understanding of the universe, Linguistics: Panini's grammar, Sanskrit and Prakrit traditions, Contributions to literature, arts, music and dance, Ethical and moral values in IKT, Traditional systems of governance and public administration.

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An Autonomous College under UGC Act 1956

Unit-5 Case Studies, Research and Applications

5(L) hrs

Contemporary applications of IKS in engineering, healthcare, environment, and design. Case studies- CSIR-TKDL (Traditional Knowledge Digital Library), and Ayurgenomics. Multidisciplinary research frontiers involving IKS. Future directions of IKS and integration with modern innovation systems.

Text Books

1. B. Mahadevan, Vinayak Rajat Bhat, and Nagendra Pavana R. N., "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Pvt. Ltd., Delhi, 2025.
2. Nitin Singhania, "Indian Art and Culture", 4th Edition, McGraw Hill Publication, 2022-2023.

Reference Books

1. Omprakash Mishra, "Essence of Indian Traditions", 2nd Edition, Khanna Publishers, 2021.
2. Fritjof Capra, "Tao of the Physics", 3rd Edition, HarperCollins Publishers, 2007.

Online Learning Materials

1. <https://www.education.gov.in/nep-indian-knowledge-systems> Accessed on 11th June, 2025
2. https://onlinecourses.swayam2.ac.in/imb23_mg53/preview Accessed on 11th June, 2025
3. https://onlinecourses.swayam2.ac.in/imb24_mg21/preview Accessed on 11th June, 2025
4. https://onlinecourses.swayam2.ac.in/imb24_mg20/preview Accessed on 11th June, 2025

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B.Tech. 3rd Year (Electrical Engineering)

Course Code: PREE101
Course Title: Minor Project

Programme: B.Tech. (EE)	L: 0 T: 0 P: 2	Credits: 1
Semester: 6	Theory/Practical: Practical	Teaching Hours: 15hours
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		

Prerequisites (if any): ESC101

Additional Material Allowed in ESE: NA

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

CO#	Course Outcomes
1	Acquire ability to work in team and as an individual.
2	Evaluate application of a particular tool/ component for specific application.
3	Acquire ability to apply thinking and problem-solving skills.
4	Develop habit of responsibility sharing resources.
5	Apply knowledge gained for analysis and design of circuits.
6	Learn about their social responsibility including United Nations Sustainable Development Goals.

Contents

The students are required to work in team or as individuals and are required to formulate software/ hardware-based projects showing applications of the knowledge gained during the course work. The students should be able to find out the ratings/ suitability of various components/software in their project work. The projects should be aligned towards UN SDGs and should show their concern for society.

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