



University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus

4th Semester Syllabus for B.Tech
(Admission Batch 2024)

Electrical & Electronics Engineering

B.Tech. 2nd Year Course Structure

4th Semester

Sl No	Type of Course	Subject Code	Subject Name	L	T	P	S	Total Contact Hours	Credit Points
Theory									
1	Basic Science Course	BSM401	Mathematics IV	3	0	0		3	3
2	Professional Core Courses	PCC-EEE 401	Electric Machine-I	3	1	0		4	3
3	Professional Core Courses	PCC-EEE 402	Digital Electronic	3	0	0		3	3
4	Professional Core Courses	PCC-EEE 403	Electrical & Electronic Measurement	3	0	0		3	3
5	Professional Core Courses	PCC-EEE 404	Signals & Systems	3	0	0		3	3
6	Mandatory Courses	MCC 471	Sustainability Climate Action and Environmental Sciences	2	0	0		2	2
7	Humanities and social sciences including Management	ESP401	Essential Studies For Professionals IV	2	0	0		2	0.5
PRACTICAL									
8	Professional Core Courses	PCC-EEE 491	Electric Machine-I Laboratory	0	0	2		2	1
9	Professional Core Courses	PCC-EEE 492	Digital Electronic Lab	0	0	2		2	1
10	Professional Core Courses	PCC-EEE 493	Electrical & Electronic Measurement	0	0	2		2	1
SESSIONAL									
11	Open Elective Courses	OEC-EEE481	A: Object Oriented Programming & Java Lab B: Programming using Python Lab	0	0	0	2	2	1
12	Humanities and social sciences including Management	SDP481	Skill Development For Professionals IV				2	2	0.5
13	Project, Seminar and Industrial Training	PW-EEE 02	Mini Project II				1	1	1
Value Added Courses									
14	Massive Open Online Courses (MOOCs)	MOOCS	Massive Open Online Courses (MOOCs)						
15	Industry and Foreign Certification (IFC)	IFC	Industry and Foreign Certification (IFC)						
16	Mandatory Additional Requirements (MAR)	MAR481	Mandatory Additional Requirements (MAR)						
Total Credit Points of Semester				19	1	6	5	31	23



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



4th Semester Syllabus for B.Tech in ECE Batch 2023-2027

Subject Name: Mathematics-IV

Credit: 3

Lecture Hours: 36

Subject Code: BSM401

Relevant Links:

[Study-material-BSM401](#)
[Coursera](#)

[NPTEL](#)

COURSE OBJECTIVES:

1. To learn about Calculus of Complex functions.
2. To learn about Fourier series and Fourier Transform.
3. To learn about Laplace transform.
4. To learn about Z-transform.
5. To develop a basic understanding of Data analysis using Python.

COURSE OUTCOMES:

CO 1: Identify different tools for differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.

CO 2: Appraise the notions of Fourier series and Transform to solve advanced engineering problems.

CO 3: Apprehend the concept of Laplace Transform together with its applications in evaluating integrals and solving ordinary differential equations.

CO 4: Relate the use of Z-Transform for discrete functions and solve difference equations using Z-Transform technique.

CO 5: Acquire an understanding of handling and analyzing datasets, creating data visualizations, solving linear equations.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1.	Calculus of Complex Functions	Complex function, Limit, Continuity and Differentiation; Analytic functions, Cauchy-Riemann equations (statement only); Harmonic functions, Harmonic Conjugate; construction of Analytic functions; elementary Analytic functions (exponential, trigonometric, logarithmic) and their properties. Statement for Cauchy's	<p>International Academia:</p> <ul style="list-style-type: none"> https://ocw.mit.edu/courses/18-04-complex-variables-with-applications-spring-2018/ <p>AICTE-prescribed syllabus:</p> <ul style="list-style-type: none"> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf <p>Industry Mapping:</p>	8	Text book 1: Chapter 19 & Chapter 20	❖ Evaluation of contour integrals using MATLAB .

		<p>Integral formula for evaluation of $\int_C f(z)dz$ where C is a circle.</p>	<p>To analyze the frequency response of filters by evaluating the behavior of complex functions that represent signals or system responses along a contour.</p> <p>https://in.mathworks.com/help/matlab/math/complex-line-integrals.html</p>			
2.	Fourier Series & Transform	<p><i>Fourier Series:</i> Even function, Odd function. Periodic function, Euler's formula, Dirichlet's conditions; Sum of the Fourier series at the point of discontinuity and end points of an interval; Half Range Sine and Cosine Series; Parseval's Theorem (statement only).</p> <p><i>Fourier Transforms:</i> Fourier Transform and its properties; Fourier Sine and Cosine Transforms, Fourier Transform of derivatives (statement only); Inverse Fourier Transform (statement only); Convolution theorem (statement only), related problems.</p>	<p>International Academia:</p> <ul style="list-style-type: none"> https://see.stanford.edu/Course/EE261 <p>AICTE-prescribed syllabus:</p> <ul style="list-style-type: none"> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf <p>Industry Mapping:</p> <p>To analyze periodic signals and transform them into frequency components.</p> <p>https://in.mathworks.com/help/matlab/math/fourier-transforms.html</p>	10	<p><i>Fourier Series:</i> Textbook 1: Chapter 10</p> <p><i>Fourier Transform:</i> Textbook 1: Chapter 22</p>	<ul style="list-style-type: none"> ❖ Perform Fourier sine and cosine transforms using MATLAB. ❖ Write Fourier series for some elementary functions using MATLAB. ❖ Compare Fourier Transform results with Spectrum Analyzer outputs in real-world signal frequency analysis.

3.	Laplace Transform	Laplace Transform and its properties; First and Second Shifting theorems; Laplace Transform of Periodic functions; Inversion of Laplace Transform by different methods, Convolution theorem; evaluation of integrals by Laplace Transform; solving boundary value problems by Laplace Transform method.	<p>International Academia:</p> <ul style="list-style-type: none"> • https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/resources/mit6_003f11_lec06/ • https://web.stanford.edu/~boyd/ee102/ <p>AICTE-prescribed syllabus:</p> <ul style="list-style-type: none"> • https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf <p>Industry Mapping:</p> <p>To analyze system dynamics, stability, and control in electrical circuits and automation.</p> <p>https://in.mathworks.com/help/symbolic/sym.laplace.html</p>	8	Textbook 1: Chapter 21	<ul style="list-style-type: none"> ❖ Perform Laplace transform of some elementary functions using MATLAB. ❖ Perform inverse Laplace transform using MATLAB. ❖ Analyze system stability using Laplace Transform and verify results through control lab experiments with real-world systems.
4.	Z-Transform	Sequence, representation of sequence, Z-Transform and its properties, Shifting theorems, Inverse Z-transform, Convolution theorem, region of convergence, concept of difference equation and their solution by Z-Transform method.	<p>International Academia:</p> <ul style="list-style-type: none"> • https://ocw.mit.edu/courses/6-003-signals-and-systems-fall-2011/64490a008c1c5c25c86044351465abf7_MIT6_003F11_lec05.pdf <p>AICTE-prescribed syllabus:</p> <ul style="list-style-type: none"> • https://www.aicte- 	6	Textbook 1: Chapter 23	<ul style="list-style-type: none"> ❖ Compute Z-transform of some elementary of some functions using MATLAB. ❖ Solve linear difference equations with constant coefficients using MATLAB.

			india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: To analyze discrete-time systems, especially in control systems and digital signal processing (DSP). https://in.mathworks.com/help/symbolic/sym.ztrans.html			
5.	Data Analysis using Python	Arithmetic, logical operations; List, tuple, dictionary, set; Managing arrays and matrices; Solving linear equations; Data handling: Import, clean, sort, filter, summarize, handle missing data; Calculating central tendency, standard deviation of dataset; Data visualization: Line plot, Bar plot, Histogram.	International Academia: <ul style="list-style-type: none"> • https://ocw.mit.edu/courses/15-075j-statistical-thinking-and-data-analysis-fall-2011/pages/lecture-notes/ • https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/readings/ Industry Mapping: <ol style="list-style-type: none"> 1. To handle datasets and visualize for real-time insights. 2. To solve systems of equations for applications like signal processing. 	4	Textbook 2:	<ul style="list-style-type: none"> ❖ Handling of data using Panda Library. ❖ Plot data using Matplotlib. ❖ Compute Matrix operations using Numpy library. ❖ Calculate central tendencies, standard deviation of a dataset.

TEXT BOOKS:

1. **B. S. Grewal**, “Higher Engineering Mathematics”, 44th Edition (2021), Khanna Publishers. (Chapter No.s: 10, 19, 20, 21, 22, 23)
2. **Wes Mckinney**, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, 2nd Edition (2017), United States: O'Reilly Media.

REFERENCE BOOKS:

1. **Biswadip Basu Mallik & Krishanu Deyasi**, “Engineering Mathematics” – Vol. 2B, 1st Edition (2020), Cengage Learning.
2. **B. K. Pal & K. Das**, “Engineering Mathematics” - Vol. IIB, 13th Edition (2019), Vol. IIIB, 8th Edition (2019), U. N. Dhur & Sons.
3. **Erwin Kreyszig**, “Advanced Engineering Mathematics”, 10th Edition (2017), John Wiley & Sons.
4. **R. K. Jain and S. R. K. Iyengar**, “Advanced Engineering Mathematics”, 5th Edition (2016), Narosa Publication House.
5. **B. V. Ramana**, “Higher Engineering Mathematics”, 11th Reprint (2017), Tata McGraw Hill.

Syllabus for B.Tech Admission Batch 2024

Subject Name: Electric Machine-I
Lecture Hours: 40

Credit: 3
Subject Code: PCCEEE401

<u>Study Material</u>	<u>Coursera</u>	<u>Nptel:</u>	<u>LinkedIn Learning:</u>
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Course Objective:

Provide a strong foundation in the principles of magnetic fields and magnetic circuits.

- Explore the relationship between magnetic materials, circuits, and energy conversion.
- Develop students' ability to analyse and interpret the magnetic field patterns and performance characteristics of DC machines.
- Analyse the performance of DC motors and generators under different operating conditions.
- Learn about transformer testing, cooling methods, and applications.

Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Review of Magnetic Field systems and toque production: Magnetic fields, Energy density and magnetic circuits; Electromagnetic force, torque and General theory of Rotating Electrical Machines	International Academia: Course Notes Electric Machines Electrical Engineering and Computer Science MIT OpenCourseWare. AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf Industry Mapping: IS/ IEC Specification t/files/Vol.%20I_UG. pdf	2	NA	I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010	2,4,5

2	<p>Construction & Working principle of a DC machine: <u>Magnetic structure</u> - stator yoke, stator poles, pole-faces or shoes, air gap and armature core. Visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. <u>Armature winding and commutation</u> - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction. Numerical Problems.</p>	<p>International Academia: Course Notes Electric Machines Electrical Engineering and Computer Science MIT OpenCourseWare.</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf</p> <p>Industry Mapping: IS Specification No. 9320: 1979 regarding Guide for testing of DC Machines</p> <p>Simulation Software: MATLAB</p>	7	1. Design and Simulation of DC Machine using MATLAB SIMULINK	I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010	7
3	<p>DC machine – Operation, Control and Efficiency Armature circuit equation for motoring and generation, Types of field excitations –, separately excited, shunt and series, Concept of Field Flashing, Open circuit characteristic of separately excited DC generator, internal and external characteristics of DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. Speed Current, Torque Current, and Torque-speed characteristics of separately excited, shunt and series motors. Three Point starter for starting of DC Motor, Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.</p>	<p>International Academia: Course Notes Electric Machines Electrical Engineering and Computer Science MIT OpenCourseWare.</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf</p> <p>Industry Mapping: IS Specification No. 9320: 1979 regarding Guide for testing of DC Machines</p> <p>Simulation Software: MATLAB</p>	8	1. Speed control of DC traction motor for a locomotive-based system using power electronics drives (Hardware/MATLAB). 2. Speed Control of DC motors for air compressor-based application (Hardware/MATLAB)	I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010	7

4	<p>Transformers – Working principle, Construction, Operation, Control and Testing : (Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses, Efficiency and all-day efficiency, efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses. <u>Three-phase transformer:-</u> construction, types of connection and their comparative features, Vector Group and connections, Parallel operation of single-phase and three-phase transformers, <u>Autotransformers</u> - construction, principle, applications and comparison with two winding transformers, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Open delta connection, Scott connection. Traction Transformer. Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers, Dry type transformer,</p>	<p>International Academia: Course Notes Electric Machines Electrical Engineering and Computer Science MIT OpenCourseWare.</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf .</p> <p>Industry Mapping: IS Specification No2026: 1981 (Part 1) for Power Transformer and IS Specification No. 11171: 1985 for Dry type transformer</p> <p>Simulation Software: MATLAB</p>	17	<ol style="list-style-type: none"> Design and assembling of a single a phase 220/12V, 20-30VA shell type transformer for EV changing. Acceptance tests of dry type transformer as per BIS11172 by undertaking <ol style="list-style-type: none"> voltage ratio test open circuit test Short Circuit test insulation test Load Sharing and flexible load management by paralleling multiple single-phase transformers. Type test of Singer Phase transformer at different load and temperature rise tests. Vector grouping of three-phase transformer as per BIS 2026. 	Prithwiraj Purkait & Indrayudh Bandopadhyay, “Electrical Machines” Oxford University Press	6,7
5	<p>Special Machines: Permanent Magnet DC (PMDC) motor, Brushless DC (BLDC) Motors, Universal Motor, Stepper Motor, Tacho</p>	<p>Simulation Software: MATLAB</p>	4	<ol style="list-style-type: none"> Design and Construction of a BLDC motor winding. IOT Based control of Brushless DC Motor (BLDC) for ceiling fan application 	Prithwiraj Purkait & Indrayudh Bandopadhyay, “Electrical Machines” Oxford University Press	15

Course Outcome:

CO1: To equip students with a solid foundation in the concept of magnetic field, electromagnetic force and torque and the ability to apply this knowledge effectively in understanding the operations of electrical machines.

CO2: To equip students with a comprehensive understanding of DC machines, enabling them to apply this knowledge effectively in various engineering fields and contribute to the design, operation, and maintenance of DC machine systems.

CO3: To equip students with a comprehensive understanding of transformers, enabling them to apply this knowledge effectively in various engineering fields and contribute to the design, operation, and maintenance of transformer systems.

CO4: To equip students with a comprehensive understanding of some special electrical machines which are currently used in various industrial and house-hold applications and enabling them to apply this knowledge effectively in various engineering fields.

Suggested sources of learning:

Text Books

1. I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.
2. Prithwiraj Purkait & Indrayudh Bandopadhyay, “Electrical Machines” Oxford University Press

Reference Books

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2021
2. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.
3. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
4. Kirtley Jr., James L. Electric Power Principles: Sources, Conversion, Distribution and Use. Wiley, 2010. ISBN: 9780470686362.

Lesson Plan:

Module No 1: Review of Magnetic Field systems and torque production (Faculty: Dr. Nirban Chakraborty)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Magnetic fields, Energy density and magnetic circuits;
2	Electromagnetic force, torque and General theory of Rotating Electrical Machines.

Module No 2: Construction & Working principle of a DC machine (Faculty: Dr. Nirban Chakraborty):

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core.
2	Visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil.
3	Visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil.
4	Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator.
5	Linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation
6	Armature reaction, air gap flux density distribution with armature reaction..
7	Numerical Problems

Module No 3: DC machine – Operation, Control and Efficiency (Faculty: Dr. Nirban Chakraborty):

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Armature circuit equation for motoring and generation.
2	Types of field excitations –, separately excited, shunt and series.
3	Concept of Field Flashing, Open circuit characteristic of separately excited DC generator.
4	Internal and external characteristics of DC generator, back EMF with armature reaction,
5	Voltage build-up in a shunt generator, critical field resistance and critical speed. .
6	Speed Current, Torque Current, and Torque-speed characteristics of separately excited, shunt and series motors.
7	Three Point starter for starting of DC Motor,
8	Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.

Module No 4: Transformers – Working principle, Construction, Operation, Control and Testing: (Faculty: Dr. Nirban Chakraborty):

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Principle, construction and operation of single-phase transformers.
2	Equivalent circuit, phasor diagram
3	Voltage regulation, losses, Efficiency and all-day efficiency,
4	Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses.
5	Vector Group and connections.

6	Vector Group and connections.
7	Parallel operation of single-phase and three-phase transformers
8	Autotransformers - construction, principle, applications and comparison with two winding transformers,
9	Autotransformers - construction, principle, applications and comparison with two winding transformers,
10	Scott Connection
11	Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current,
12	Open Delta Connection, Tertiary Winding
13	Traction Transformer, Tap-changing transformers - No-load and on-load tap-changing of transformers,
14	Cooling of transformers, Dry type transformer,
15	Numerical Problems
16	Numerical Problems
17	Numerical Problems

Module No 5: Special Machines: (Faculty: Dr. Nirban Chakraborty):

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Permanent Magnet DC (PMDC) motor.
2	Brushless DC (BLDC) Motors.
3	Universal Motor
4	Stepper Motor, Tacho

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	0	0	0	0	0	0	0
CO2	2	2	3	2	2	1	0	0	0	0	0
CO3	3	3	2	1	1	1	0	0	1	0	1
CO4	1	1	2	3	2	0	2	1	2	1	1



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Syllabus for B.Tech Admission Batch 2024-2028

Subject Name: Digital Electronic

Credit: 3

Lecture Hours: 36

Subject Code: PCCEEE402

Study material	Coursera	nptel	LinkedIn Learning	Infosys Springboard
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Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

**List of Faculty Members handling the Subject – Pratik De Sarkar
Neeta Sahay**

Pre-requisite: Basic Electronics

Course objectives:

1. To introduce basic postulates of Boolean algebra and to introduce the methods for simplifying Boolean expressions.
2. To study formal procedures for the analysis and design of combinational and sequential circuits.
3. To introduce the concept of logic families, semiconductor memories and implementation of digital circuits using programmable logic devices.
4. To illustrate the concept of synchronous and asynchronous sequential circuits.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	TEXT BOOK	Mapped Chapter
1	Number System and Logic Families	Introduction to number systems, Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, gray codes and their conversions, thermometric codes, Signed binary number representation with 1's and 2's complement methods ,basic logic functions Standard forms of logic expressions, and simplification of logic expressions using K Map. Review of TTL and CMOS families, their operations and specifications. Overview of Verilog	International Academia: (https://web.stanford.edu/class/archive/e/ee108a/ee108a.1082/schedule.html) AICTE-prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: SPICE software, Verilog	5	1. Simulation of MOS Inverter with different loads using SPICE software. 2. Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in SPICE software. 3. Introduction to programming using Verilog	Anand Kumar	2, 3, 4
2	Introduction to Boolean Algebra and K-map:	Basic Definitions and Axiomatic Definition of Boolean Algebra, Boolean Functions, Canonical and Standard Forms. The Map Method - K-map, Product of Sums and Sum of Products Simplification, NAND and NOR Implementation.	International Standards :(https://web.stanford.edu/class/archive/e/ee108a/ee108a.1082/schedule.html) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: Hardware Chipsets (IC 7408, 7432,7404), Software-TinkerCad	5	1. Design of BCD-Excess 3 code and vice-versa using basic gates (IC 7408, 7432,7404) 2. Design of basic digital circuits using Tinkercad.	Salivahanan and Arivazhagan	2

3	Designing Combinational Logic Circuits:	Arithmetic circuits (ADDER and SUBTRACTOR), multiplier, comparators, decoders, encoders, multiplexers, de-multiplexers, parity generator and checker and their use in logic synthesis; Potential hazards in combinational circuits.	<p>International Standards : (https://web.stanford.edu/class/archive/e/e/ee108a/ee108a.1082/schedule.html)</p> <p>AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</p> <p>Industry Mapping: Hardware Chipset (IC 7408, 7432,7404, 74153, 74155, 74180)</p> <p>Software: LogiSim and VHDL</p>	6	<ol style="list-style-type: none"> 1. Design of Adder and Subtractor using basic gates (IC 7408, 7432,7404) and use of IC 74LS83 as BCD adder. 2. Design of MUX and DEMUX using basic gates (IC 74153, 74155) and also study the available ICS of MUX and DEMUX. Implement logic functions using these ICs. 3. Design and implementation of 16-bit odd/even parity checker/ generator using IC 74180. 4. Implementation of combinational circuits using LogiSim and VHDL 	Salivahanan and Arivazhagan	5, 6
4	Designing Sequential Logic Circuits:	Basic memory element-S-R, J-K, D and T Flip Flops, various types of Registers and counters and their design, Design of Synchronous Sequential Circuits- State Table and State Diagrams, Design of Mealy and Moore FSM - Sequence Detection.	<p>International Standards: (https://web.stanford.edu/class/archive/e/e/ee108a/ee108a.1082/schedule.html)</p> <p>AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</p> <p>Industry Mapping: Hardware Chipset (IC 7476, 7474)</p> <p>Software: LogiSim and VHDL</p>	6	<ol style="list-style-type: none"> 1. Design of R-S, J-K, D and T Flip flops using universal gates and also study master slave J-K flip flop IC 7476. 2. Design of synchronous and asynchronous counter using Flip Flop IC 7476. 3. Design of 4-bit shift register (shift right) IC 7476/7474 4. Implementation of sequential circuits using Logisim and VHDL 	Anand Kumar	8, 9, 10, 11, 12

5	Introduction to Digital Logic Devices, ADC and DAC:	<p>Introduction of ROM and RAM, PLA, PAL and FPGA.</p> <p>IC iCE40 FPGA family</p> <p>D/A converter - specifications - weighted resistor type, R-2R Ladder type. A/D Converters specifications - Flash type-Successive Approximation type, Pipeline ADC AFE8201 16-Bit and 14-Bit Digital-to-Analog Converters (DACs) With Voltage Reference and Diagnostic ADC for Low-Power Applications</p>	<p>AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</p> <p>Industry Mapping:</p> <p>Hardware Chipset AFE8201 ADC AD570, DAC 0808 Software TinkerCad</p> <p>(https://www.ti.com/lit/ds/symlink/afe88201.pdf?ts=1700473002665&ref_url=https%253A%252F%252Fwww.ti.com%252Fdata-converters%252Fintegrated-special-function%252Fprecision-adcs-and-dacs%252Fproducts.html)</p>	4	<ol style="list-style-type: none"> 1. Design of PLA and PAL using basic logic gates (IC 7408, 7432,7404) 2. Design and testing of half/full adder and multiplexer by burning FPGA Kit. 3. Design of ADC and DAC using IC ADC AD570, DAC 0808. 4. Design of ADC and DAC using TinkerCad 	Salivahanan and Arivazhagan	10, 13
6	GEN AI for Digital Circuits Research papers and study material	<p>Introduction of GEN AI</p> <p>Use of GEN AI for Designing Digital Circuits</p> <p>Use of GEN AI for optimizing power and delay of Digital Circuits</p>		10			

Course outcome:

CO1. Describe the function of different building blocks of digital electronics, semiconductor memories and programmable logic devices.

CO2. Explain the principle of operation of combinational and sequential digital circuits.

CO3. Solve numerical problems of Boolean algebra, number system, combinational & sequential digital circuits and A/D and D/A converter.

CO4. Specify applications of combinational and sequential digital circuits.

Suggested Learning Resources:

Text Books:

1. Digital Circuits and Design, by S. Salivahanan, S. Arivazhagan, 5th Edition, Oxford University Press India. (Chapter: 2,5,6,10,13)
2. Fundamentals of Digital Circuits; Anand Kumar; PHI Publication (Chapter:2,3,4,8,9,10,11,12)
3. Digital Logic and Computer Design; M Morris Mano, Pearson Publication

Reference Books:

1. Digital Design, M. Morris. Mano & Michael D. Ciletti, PEARSON Publication
2. Digital Electronics; Tokheim; TMH Publication

Lesson Plan:

Module 1: Number System and Logic Families: 2nd Year, (Faculty : Prof. Pratik De Sarkar)

DAY	LESSON PLAN – DESCRIPTION
1	Syllabus discussion
2	Introduction to number systems, Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, gray codes and their conversions
3	Thermometric codes, Signed binary number representation with 1's and 2's complement methods ,basic logic functions
4	Standard forms of logic expressions, and simplification of logic expressions using K Map: Part 1
5	Standard forms of logic expressions, and simplification of logic expressions using K Map: Part 2
6	Review of TTL families, their operations and specifications.
7	Review of CMOS families, their operations and specifications.
8	Overview of Verilog

Module 2: Introduction to Boolean Algebra and K-map: 2nd Year, (Faculty : Prof. Neeta Sahay)

DAY	LESSON PLAN – DESCRIPTION
9	Syllabus discussion
10	Basic Definitions and Axiomatic Definition of Boolean Algebra, Boolean Functions
11	Canonical and Standard Forms.
12	The Map Method - K-map,
13	Product of Sums and Sum of Products Simplification
14	NAND and NOR Implementation.

Module 3: Designing Combinational Logic Circuits: 2nd Year, (Faculty : Prof. Pratik De Sarkar)

DAY	LESSON PLAN – DESCRIPTION
15	Arithmetic circuits (ADDER and SUBTRACTOR)
16	Multiplier, comparators, decoders, encoders
17	Multiplexers
18	De- multiplexers
19	Parity generator and checker and their use in logic synthesis
20	Potential hazards in combinational circuits.

Module 4: Designing Sequential Logic Circuits: 2nd Year, (Faculty : Prof. Neeta Sahay)

DAY	LESSON PLAN – DESCRIPTION
21	Basic memory element-S-R, J-K, D and T Flip Flops,
22	Various types of Registers
23	Counters and their design
24	Design of Synchronous Sequential Circuits- State Table and State Diagrams Part 1
25	Design of Synchronous Sequential Circuits- State Table and State Diagrams Part 2
26	Design of Mealy and Moore FSM -Sequence Detection.

Module 5: Introduction to Digital Logic Devices, ADC and DAC: 2nd Year, (Faculty : Prof. Pratik De Sarkar)

DAY	LESSON PLAN – DESCRIPTION
27	Introduction of ROM and RAM, PLA, PAL and FPGA.
28	IC iCE40 FPGA family D/A converter -specifications - weighted resistor type, R-2R Ladder type.
29	A/D Converters specifications - Flash type-Successive Approximation type,
30	Pipeline ADC AFEx8201 16-Bit and 14-Bit Digital-to-Analog Converters (DACs) With Voltage Reference and Diagnostic ADC for Low-Power Applications

Module 6: GEN AI for Digital Circuits: 2nd Year, (Faculty : Prof. Neeta Sahay)

DAY	LESSON PLAN – DESCRIPTION
31	Introduction of GEN AI
32	Use of GEN AI for Designing Digital Circuits Part 1
33	Use of GEN AI for Designing Digital Circuits Part 2
34	Use of GEN AI for optimizing power and delay of Digital Circuits Part 1
35	Use of GEN AI for optimizing power and delay of Digital Circuits Part 2

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	1	0	0	1	0	2
CO2	3	3	2	2	2	0	0	1	1	0	2
CO3	3	3	2	2	2	0	0	0	1	1	2
CO4	2	2	3	1	2	1	0	1	1	1	2



**University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus**



Syllabus and Lesson Plan for B.Tech Admission Batch 2024

Subject Name: Electrical and Electronics Measurement

Credit: 3

Lecture Hours: 36

Subject Code: PCCEEE403

Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

Relevant Links:

Study Material	Coursera	Nptel:	LinkedIn Learning:	Infosys Springboard:
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List of Faculty Members handling the Subject –

1. Prof. Dr. Manas Mukherjee

Pre-requisite: Basic Electrical Engineering, Electromagnetic Field Theory, Network Theory

Course Objective:

1. To learn techniques involved in analyzing measurement data and the errors associated with the measurement system used.
2. To learn the principle of operation of analog and digital meters.
3. To learn the basic principle of operation of instrument transformers
4. To learn the principle of operation of cathode ray oscilloscope and different sensors and transducers.
5. To learn the principle of measurement of power, energy and different electrical parameters.
6. To acquire problem solving skills to solve problems on the topics studied.

Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Measurements and Analog meters: Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments. General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments. Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers. AI in Advancements in Field Instrumentation: Enhancing Efficiency and Accuracy. AI used for Automated Calibration of Instruments.	<p>International Academia: (https://ocw.mit.edu/courses/2-693-principles-of-oceanographic-instrument-systems-sensors-and-measurements-13-998-spring-2004/pages/readings/)</p> <p>AICTE-prescribed syllabus: https://old.aicte-india.org/downloads/MODEL_SYLLABI_FOR_UG_Electrical_Engg.pdf</p> <p>Industry Mapping: Multisim, MATLAB</p>	7	<p>1. Dismantle and assemble different parts of PMMC, Dynamometer, Electro thermal and Rectifier type of instruments, Digital multimeter and various other instruments to get familiarized with their constructions.</p> <p>2. Design an unknown temperature measurement system of a Furnace using Thermocouple.</p>	A.K. Sawhney: “A Course in Electrical and Electronic Measurements and Instrumentation”, 18th Edition, Dhanpat Rai Publications	1,2,3,7,8,9
2	Instrument transformer and Measurement of Power: Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of current & potential transformer, errors. Principle of operation of Electrodynamics & Induction type wattmeter. Wattmeter errors.	<p>International Academia: (https://ocw.mit.edu/courses/2-693-principles-of-oceanographic-instrument-systems-sensors-and-measurements-13-998-spring-2004/pages/readings/)</p> <p>AICTE-prescribed syllabus: https://old.aicte-india.org/downloads/MODEL_SYLLABI_FOR_UG_Electrical_Engg.pdf</p> <p>Industry Mapping: Multisim, MATLAB</p>	9	1. Design a model short transmission system and determine its efficiency by applying Instrument Transformers.	A.K. Sawhney: “A Course in Electrical and Electronic Measurements and Instrumentation”, 18th Edition, Dhanpat Rai Publications	10,11

3	<p>Measurement of Energy, Potentiometer and AC Bridges: Construction, theory and application of AC energy meter, testing of energy meters. Principle of operation and application of Crompton's DC potentiometer, Polar and Coordinate type AC potentiometer. Application. Measurement of Inductance, Capacitance and frequency by AC bridges.</p>	<p>International Academia: (https://ocw.mit.edu/courses/2-693-principles-of-oceanographic-instrument-systems-sensors-and-measurements-13-998-spring-2004/pages/readings/) AICTE-prescribed syllabus: https://old.aicte-india.org/downloads/MODEL_SYLLABI_FOR_UG_Electrical_Engg.pdf</p> <p>Industry Mapping: Multisim, MATLAB</p>	8	<ol style="list-style-type: none"> 1. Design and calibrate a power and energy measurement system using Digital energy meter. 2. Measurement of unknown capacitance of a low pass filter circuit using De Sauty Bridge and its condition monitoring using Schering Bridge 3. Design a signal conditioning device using Arduino to measure the unknown capacitance based on the principle of a Schering Bridge 4. Design a signal conditioning device using Arduino to measure the unknown inductance based on the principle of a Anderson Bridge. 	<p>A.K. Sawhney: "A Course in Electrical and Electronic Measurements and Instrumentation", 18th Edition, Dhanpat Rai Publications</p>	12,15,16
4	<p>Cathode ray oscilloscope (CRO), Electronic Instruments and Introduction to Sensors & Transducers. Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO. Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator. Pressure Sensors: Strain gauge, Displacement Sensors: LVDT, Temperature transducers, Flow measurement using magnetic flow measurement. Introduction to Condition Monitoring. Introduction to Phasor Technology and Wide Area Monitoring System (WAMS), Phasor Measurement Unit (PMU), Block Diagram of PMU, Phasor Data Concentrator (PDC), Introduction to Basic Communication Infrastructure for data transfer to PDC. AI used for Predictive Maintenance in Industrial Equipment. Applications of AI models to flowmeters and sensors for multiphase flow metering.</p>	<p>International Academia: (https://ocw.mit.edu/courses/mas-836-sensor-technologies-for-interactive-environments-spring-2011/pages/lecture-notes/) AICTE-prescribed syllabus: https://old.aicte-india.org/downloads/MODEL_SYLLABI_FOR_UG_Electrical_Engg.pdf</p> <p>Industry Mapping: Multisim, MATLAB</p>	11	<ol style="list-style-type: none"> 1. Core displacement measurement using LVDT through Digital Storage Oscilloscope. 2. Calibration of Strain Gauge 3. Rotational speed measurement system using Photo Magnetic pick up. 4. Water level measurement system by using capacitive transducer 5. Design of an Angular Displacement Measurement system using Capacitive transducer. 	<p>A.K. Sawhney: "A Course in Electrical and Electronic Measurements and Instrumentation", 18th Edition, Dhanpat Rai Publications</p>	21,25,26

Course Outcome:

- CO1.** Understand the terms accuracy, precision, resolution, speed of response, errors in measurement loading effect, methods of measurement of power, energy by instruments and resistance, capacitance and inductance by bridges and potentiometer.
- CO2.** Understand the principle of operation of analog meters, instrument transformer, digital multimeter, digital voltmeter, digital frequency meter, signal generator, strain gauge, and LVDT and temperature transducers, different building block, principle of operation of oscilloscope and measurement techniques of voltage, current, frequency and phase by oscilloscope.
- CO3.** Understand the numerical problems related to analog meters, instrument transformer, and measurement of power, energy, resistance, inductance and capacitance
- CO4.** Understand the specify applications of analog and digital measuring instruments, sensors and transducers

Lesson Plan:

Module 1: Measurements and Analog meters: 2nd Year, (Faculty : Prof. Arijita Das)

WORKING DAY	LESSON PLAN – DESCRIPTION
Day 1	Method of measurement, Measurement system, Classification of instruments
Day 2	Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement
Day 3	Classification of errors
Day 4	loading effect due to shunt and series connected instruments
Day 5	General features, Construction, Principle of operation and torque equation of Moving coil instruments
Day 6	General features, Construction, Principle of operation and torque equation of Moving iron instruments
Day 7	General features, Construction, Principle of operation and torque equation of Electrodynamometer instruments
Day 8	General features, Construction, Principle of operation and torque equation of Induction type instruments
Day 9	Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers
Day 10	AI in Advancements in Field Instrumentation: Enhancing Efficiency and Accuracy
Day 11	AI used for Automated Calibration of Instruments

Module 2: Instrument transformer and Measurement of Power: 2nd Year, (Faculty : Prof. Arijita Das)

WORKING DAY	LESSON PLAN – DESCRIPTION
Day 1	Instrument transformer and Measurement of Power
Day 2	Instrument transformer and Measurement of Power
Day 3	Measurement of Power: Disadvantage of shunt and multipliers
Day 4	Advantages of Instrument transformers
Day 5	Principle of operation of current & potential transformer, errors
Day 6	Principle of operation of current & potential transformer, errors
Day 7	Principle of operation of Electrodynamics
Day 8	Principle of operation of Electrodynamics
Day 9	Induction type wattmeter
Day 10	Induction type wattmeter
Day 11	Wattmeter errors

Module 3: Measurement of Energy, Potentiometer and AC Bridges: 2nd Year, (Faculty: Prof. Manas Mukherjee)

WORKING DAY	LESSON PLAN – DESCRIPTION
Day 1	Syllabus Discussion, Measurement of Energy, Potentiometer
Day 2	AC Bridges: Construction, theory and application of AC energy meter, testing of energy meters,
Day 3	Principle of operation and application of Crompton's DC potentiometer
Day 4	Polar and Co-ordinate type AC potentiometer. Application.
Day 5	Measurement of Inductance, Capacitance and frequency by AC bridges.
Day 6	Term 1 Exam
Day 7	Term 1 Exam

Module 4: Cathode ray oscilloscope (CRO), Electronic Instruments and Introduction to Sensors & Transducers: 2nd Year, (Faculty : Prof. Manas Mukherjee)

WORKING DAY	LESSON PLAN – DESCRIPTION
Day 1	Cathode ray oscilloscope (CRO), Electronic Instruments and Introduction to Sensors & Transducers. Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.
Day 2	Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.
Day 3	Pressure Sensors: Strain gauge, Displacement Sensors: LVDT, Temperature transducers, Flow measurement using magnetic flow measurement. Basic concept of PMU, PDC for WAMS
Day 4	Term 2 Exam
Day 5	Practical/ Sessional Exam
Day 6	Practical/ Sessional Exam
Day 7	End Semester Exam

TEXT BOOK:

1. A.K. Sawhney: “A Course in Electrical and Electronic Measurements and Instrumentation”, 18th Edition, Dhanpat Rai Publications.

REFERENCE BOOKS:

1. David A Bell, “Electronic Instrumentation and Measurements”, Second Edition, PHI
2. Albert D.Helfrick and William D.Cooper “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	3	1	1	1	0	0	0	0	0
CO2	3	2	2	1	1	1	0	1	0	0	0
CO3	2	3	2	1	1	1	1	1	0	0	0
CO4	3	3	3	1	1	1	1	1	0	0	0



University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus



Syllabus for B.Tech Admission Batch

Subject Name: Signals & Systems
Lecture Hours: 3

Credit: 3
Subject Code: PCEEE404

Study material	Coursera	nptel	LinkedIn Learning	Infosys Springboard
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Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

List of Faculty Members handling the Subject –

1. Suman Sarkar

Pre-requisite: Mathematics

Course objectives:

1. To familiarize elementary ideas of signals and systems classification and their properties for both continuous-time and discrete-time cases.
2. To analyze the continuous and discrete linear time invariant system using impulse response.
3. To represent the continuous and discrete signals in terms of Fourier series and transform.
4. To analyze the linear time invariant system using Fourier series and transform for both continuous-time and discrete-time.
5. To analyze and investigate stability and instability of system using Laplace and Z-transforms.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	TEXT BOOK	Mapped Chapter
1	Signals	<p>Signals and their representation, classification of signals, singularity functions - Impulse, step, ramp functions, representation of signals with singularity functions, exponential functions. Systems: Definition, Classification of Systems, Convolution integral, graphical convolution.</p> <p>Signal Approximation - Approximation of a function by a set of mutually orthogonal functions, mean square error, complete set of orthogonal functions orthogonality in complex functions, Trigonometric and exponential Fourier series, representation of periodic functions by Fourier series, complex Fourier spectrum.</p>	<p>International Academia: (https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/)</p> <p>AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Final_ECE.pdf</p> <p>Industry Mapping: Matlab</p>	9	<ol style="list-style-type: none"> 1. Generate and plot basic signals: unit impulse, unit step, ramp, exponential, and sinusoidal signals. 2. linear convolution of two sequences (analytically and using MATLAB/Simulink) 	B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.	
2	Fourier Transforms and their applications to systems	<p>Fourier transform definition, properties of F.Ts, energy spectral density, Parseval's theorem, power spectral density, Hilbert transforms and properties. Linear Systems - impulse response, response of a linear system, linear time invariant system, linear time variant system, transfer function of LTI system.</p>	<p>International Academia: (https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/)</p> <p>AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Final_ECE.pdf</p> <p>Industry Mapping: Matlab</p>	8	<ol style="list-style-type: none"> 1. Choose FFT length N/MN. Use zero-padding $N \gg N$ $ggN \gg$ number of samples of pulse to get smooth spectrum 	B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.	

3	Random Variables & Processes	Probability, Joint Probability, Statistical independence, Random Variables, cumulative distribution function, probability density function, relation between probability & probability density, joint commutative distribution, average value of random variables, variance of a random variable, tchebycheffs inequality, the Gaussian probability density, the error function, Rayleigh probability density, mean & variance of the sum of random variables, correlation between random variables, central limit theorem.	<p>International Academia: (https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/)</p> <p>AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Final_ECE.pdf</p> <p>Industry Mapping: Matlab</p>	9	1. Repeat for Gaussian random variable using randn() or equivalent .	B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.	
4	Discrete Time Signals & Systems	Discrete time signals, representation, operations on sequences, Discrete time systems and classification, LTI systems, Linear Convolution, Difference equations. Z-Transforms: ROC, properties of Z-Transforms Inverse Z-Transforms, Causality and stability. Realization of Discrete Systems: Structural realization of discrete systems - Direct form - I, Direct form-II, Cascade and parallel forms.	<p>International Academia: (https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/)</p> <p>AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Final_ECE.pdf</p> <p>Industry Mapping: Matlab</p>		3. Test linearity and time invariance by applying input combinations and shifts.	B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.	
5	Applications of signal and system	Modulation for communication, filtering and so on. Advanced topics: time-frequency representation and the uncertainty principle, Short-time Fourier Transforms and wavelet transforms.	<p>International Academia: (https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/)</p> <p>AICTE-prescribed syllabus: https://www.aicte.gov.in/sites/default/files/Final_ECE.pdf</p> <p>Industry Mapping: Matlab</p>			B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.	

Course outcome:

CO1: Able to understand and solve problems involving signals and systems that arise in broad array of applications.

CO2: Able to represent any general signals as linear combination of impulses and characterization of any linear time invariant system using convolution sum and integral.

CO3: Able to apply the Fourier series and transform for analyzing of signals.

CO4: Able to apply the Laplace transform and z transform for analyzing of continuous time/ discrete time signals and systems.

Suggested Learning Resources:

Text books:

1. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
2. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.

Reference books:

1. Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International Edition: c1999.
2. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
3. R. Anand, Signals and Systems, Khanna Publishing House, 2019.
4. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.

Lesson Plan:

Module No.: 1 Signals (Faculty: Suman Sarkar)

WORKING DAY	LESSON PLAN – DESCRIPTION
Day 1	Signals and their representation
Day 2	classification of signals,
Day 3	singularity functions – Impulse, step, ramp functions, representation of signals with singularity functions, exponential functions.
Day 4	Systems: Definition, Classification of Systems,
Day 5	Convolution integral, graphical convolution.
Day 6	Signal Approximation – Approximation of a function by a set of mutually orthogonal functions,
Day 7	mean square error, complete set of orthogonal functions orthogonality in complex functions,
Day 8	Trigonometric and exponential Fourier series,
Day 9	representation of periodic functions by Fourier series, complex Fourier spectrum.

Module No.: 2 Fourier Transforms and their applications to systems (**Faculty: Suman Sarkar**)

WORKING DAY	LESSON PLAN – DESCRIPTION
DAY1	Fourier transform definition, properties of F.Ts ,
DAY2	energy spectral density, parsevals theorem, power spectral density,
DAY3	Hilbert transforms and properties.
DAY4	Linear Systems – impulse response,
DAY5	response of a linear system,
DAY6	linear time invariant system,
DAY7	linear time variant system,
DAY8	transfer function of LTI system.

Module No.: 3 Random Variables & Processes (**Faculty: Suman Sarkar**)

WORKING DAY	LESSON PLAN – DESCRIPTION
DAY1	Probability, Joint Probability,
DAY2	Statistical independence, Random Variables,
DAY3	cumulative distribution function, probability density function,
DAY4	relation between probability & probability density, joint commutative distribution,
DAY5	average value of random variables, variance of a random variable,
DAY6	tchebycheffs inequality, the Gaussian probability density,
DAY7	the error function, Rayleigh probability density,
DAY8	mean & variance of the sum of random variables,
DAY9	correlation between random variables, central limit theorem.

Module No.: 4 Discrete Time Signals & Systems (Faculty: Suman Sarkar)

WORKING DAY	LESSON PLAN – DESCRIPTION
DAY1	Discrete time signals, representation,
DAY2	operations on sequences,
DAY3	Discrete time systems and classification,
DAY4	LTI systems, Linear Convolution.
DAY5	Linear Convolution, Difference equations.
DAY6	Z-Transforms: ROC, properties of Z-Transforms Inverse Z-Transforms,
DAY7	Causality and stability.
DAY8	Realization of Discrete Systems: Structural realization of discrete systems – Direct form – I,
DAY9	Realization of Discrete Systems: Structural realization of discrete systems - Direct form-II,
DAY10	Cascade and parallel forms.

Module No.: 5 Discrete Time Signals & Systems (Faculty: Suman Sarkar)

WORKING DAY	LESSON PLAN – DESCRIPTION
DAY1	Modulation for communication, filtering and so on.
DAY2	Advanced topics: time-frequency representation and the uncertainty principle,
DAY3	Advanced topics: time-frequency representation and the uncertainty principle,
DAY4	Short-time Fourier Transforms.
DAY5	Short-time Fourier Transforms.
DAY6	Wavelet transforms

CO-PO Mapping:

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



INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA
SALT LAKE
(School of University of Engineering and Management, Kolkata)



Syllabus for B.Tech Admission Batch 2023

Subject Name: Sustainability, Climate Actions & Environmental Sciences Credit: 2

Lecture Hours: 24

Subject Code: MCC471

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[Study Material](#)

[LinkedIn](#)

[NPTEL](#)

[Coursera](#)

~~Subject Code: MCC471~~

Course Outcomes:

The concepts developed in this course will help the students in their higher studies. The course will enable the student to

CO1: [Understand fundamental concepts of environmental systems, sustainability, United Nations Sustainable Development Goals \(UNSDGs\) and their interrelationship with human society.](#)

CO2: [Apply knowledge of sustainable practices, different technical tools and existing frameworks to address environmental and societal challenges.](#)

CO3: [Analyze the challenges and strategies associated with climate change mitigation, sustainable cities, and waste management within the context of international agreements and frameworks.](#)

CO4: [Evaluate and design innovative approaches to energy, water, and waste management, considering the principles of the circular economy and global SDG progress reports.](#)

Module Number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
I	Overview - United Nations Sustainable Development Goals (UNSDGs)	Basic ideas of environment, basic concepts: man, society & environment, their interrelationship. Significance of sustainability in today's world. 17 United Nations Sustainable Development Goals (UNSDGs) - background, significance, interconnectedness of goals, global challenges and recent progress . Climate change and mitigation. Explain and evaluate the evidence for human-caused climate change, in the context of historical climate change, as well as the relevant scientific uncertainties and possible evidence to the contrary.	International Academia: https://unccelearn.org/course/view.php?id=170&page=overview https://unccelearn.org/course/view.php?id=181&page=overview Industry Mapping:	4	Assess the college campus alignment with the United Nations Sustainable Development Goals (SDGs) and rank the performance across selected goals mentioning the actionable strategies for improvement. labs
II	Sustainable Management	Sustainable management of water and sanitation- introduction, key components, challenges and innovative approaches. Ensure access to affordable, reliable, sustainable, and modern energy- introduction, importance, key targets, challenges and strategies. Sustainable Cities and Communities- Definition of sustainable cities, current challenges, strategies, innovative solution, smart city	International Academia: https://ocw.mit.edu/courses/res-env-006-teaching-with-sustainability-january-iap-2022/ Industry Mapping:	4	Design and propose innovative, sustainable solutions for managing water, energy, and urban systems, inspired by the principles of SDG 6, SDG 7 and SDG 11.

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III	Climate Action	Climate change and its consequences, international agreements on climate change, strategies and actionable step, Life Below Water- Importance of water bodies and marine ecosystem, strategies for protecting aquatic life and water bodies, Life on Land- importance of biodiversity, carbon sequestration, Food security, Strategies for Conservation and Restoration of Ecosystems, Sustainable Land Management, Biodiversity Conservation, Accountable steps for life on land. The successes and failures of past national and international efforts to address climate change, and evaluate prospects for future management of climate change. Provisions of the United Nations Framework Convention on Climate Change, Paris Agreement	<p>International Academia: https://unccelearn.org/course/view.php?id=7&page=overview&lang=en</p> <p>https://unccelearn.org/course/view.php?id=145&page=overview</p> <p>https://unccelearn.org/course/view.php?id=48&page=overview</p> <p>https://ocw.mit.edu/courses/res-env-001-climate-action-hands-on-harnessing-science-with-communities-to-cut-carbon-january-iap-2017/</p>	4	Using data analytics and modeling tools - evaluate climate change impacts, assess ecosystem health, and propose technical solutions for mitigation and conservation efforts.

IV	UN-call for Action	Focus on annual SDG Goals Report and the United Nations Secretary-General's calls for action to accelerate the progress on the Sustainable Development Goals (SDGs). Examine the global progress trends, challenges highlighted in recent reports, and key priorities proposed by the Secretary-General to achieve the 2030 Agenda.	<p>International Academia: - https://unccelearn.org/course/view.php?id=175&page=overview</p> <p>Industry Mapping:</p>	4	Using quantitative analysis, strategic planning, and innovative approaches, evaluate the global progress on the Sustainable Development Goals (SDGs) as highlighted in the annual SDG Goals Report.
VI	Environmental Systems Analysis	Environmental impact assessment - lifecycle assessment (LCA).—Using of LCA software tools – OpenLCA. Environmental, social, and governance (ESG), Integrated Impact Assessment of ESG, Carbon Management, Green Hydrogen, Importance of green building (LEED, IGBC etc.) certification. Environmental Management System (EMS) in industry - ISO 14001.	<p>International Academia: - https://www.lse.ac.uk/united-states/Assets/Documents/Syllabus-Hub-PDFs/Michael-Carbajales-Dale-Clemson-Environmental-Systems-Analysis.PDF</p> <p>https://www.igmpi.ac.in/environmental-social-governance?gad_source=1</p> <p>https://www.iso.org/standard/60857.html#:~:text=ISO%2014001%20is%20the%20internationally,continually%20improve%20their%20environmental%20performance.</p>	4	Life Cycle Assessment of a college building using OpenLCA software.

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VI	Waste Management	Waste Management Rules - Hazardous Waste, —E-waste, Municipal Solid Waste, Bio-medical waste, Plastic Waste & Construction and Demolition Waste. Management of different waste streams – collection, transportation, treatment, storage and disposal. Basel Convention, Extended producer responsibility (EPR) Energy & Resource Recovery - Incineration, Co-processing, Composting, Bio-methanation, —Management of solar photo-voltaic modules or panels or cells, Battery Waste Management Rules, Circular Economy.	<p>International Academia:</p> <p>— https://cpcb.nic.in/rules-6/ https://ocw.mit.edu/courses/ec-716-d-lab-waste-fall-2015/</p> <p>https://unccelearn.org/course/view.php?id=131&page=overview https://unccelearn.org/course/view.php?id=87&page=overview</p> <p>Industry_Mapping:</p>	5	Mapping the supply chain of different waste management system and finding the issues & challenges.

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Field works will be assigned for each and every student/ group of students, on completion of which they have to give a presentation along with a model display if possible.

Learning Resources:

Text Books:



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



4th Semester Syllabus for B.Tech Admission Batch 2024

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

Subject Code: PCC-EEE491

Course Objective(s):

The purpose of learning this course is to-

1. To learn the principle of production of electromagnetic force and torque.
2. To learn the concept of magnetic fields and magnetic circuits.
3. To learn the basic principle of operation of DC machine.
4. To learn the principle of operation and characteristics of DC motor and generator.
5. To learn the principle of operation, connections and different tests on Transformers.

Course Outcomes:

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

- CO1. Identify appropriate equipment and instruments for the experiment.
- CO2. Test the instrument for application to the experiment.
- CO3. Construct circuits with appropriate instruments and safety precautions.
- CO4. Validate different characteristics of DC machine, methods of speed control of DC motor and parallel operation of the transformer.

List of Experiment:

Expt No	Description
1	Design and assembling of a single a phase 220/12V, 20-30VA shell type transformer for EV charging.
2	Design and Construction of a Brushless DC Motor winding.
3	Speed control of DC traction motor for locomotive based system using power electronics drives (Hardware/ MATLAB).
4	Speed Control of DC motors for air compressor-based application (Hardware/MATLAB)
5	Acceptance tests of dry type transformer as per BIS11172 by undertaking. a) Voltage ratio test b) Open circuit test c) Short Circuit test d) Insulation test
6	Type test of Single-Phase transformer at different load and temperature rise test.
7	Load Sharing and flexible load management by paralleling multiple single-phase transformer.
8	Vector grouping of three-phase transformer as par BIS 2026.
9	IOT Based control of Brushless DC Motor (BLDC) for ceiling fan application.
10	Design and assembling of air core transformer.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	0	0	0	1	0	0	0	1
CO2	3	2	2	2	1	0	1	0	0	0	1
CO3	3	3	3	3	1	0	1	0	0	0	1
CO4	3	2	2	3	1	1	1	0	0	0	1

Virtual Lab. Details:

Experiment Name	Web-Link/ Software Used
Determination of the characteristics of a separately excited DC generator.	https://ems-iitr.vlabs.ac.in/exp/magnetization-characteristics-dcshunt/ https://ems-iitr.vlabs.ac.in/exp/load-characteristics-dc-shunt/
Determination of the characteristics of a DC motor.	http://emcoep.vlabs.ac.in/Exp1/Theory.html?domain=Electrical%20Engineering&lab=Welcome%20to%20Electrical%20Machines!
Study of methods of speed control of DC motor.	https://ems-iitr.vlabs.ac.in/exp/dcmotor-field-resistance-control/ https://ems-iitr.vlabs.ac.in/exp/dcshunt-motor-armature-control/
Determination of equivalent circuit of a single phase transformer and efficiency.	https://ems-iitr.vlabs.ac.in/exp/circuit-parameters-oc-test/

Simulation Based Experiments:

1. Machine Modelling of DC Shunt Motor using MATLAB/Simulink to validate constant Torque and Constant Speed Application.
2. Machine Modelling of DC traction Motor using MATLAB/Simulink for locomotive application.
3. Machine Modelling of DC generators with different excitation systems using MATLAB/Simulink.



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Syllabus for B.Tech Admission Batch(2024-2028)

Name of the Course/ Subject	Digital Electronic Lab	Subject Code:	PCC EEE 492
Semester	4th	Course Nature	Practical
Pre-Requisite(s):	Basic Electronics		
Lecture Periods / Week	Tutorial Periods / Week	Practical Periods / Week	Credits
0	0	3	1

Course Objective(s):

The objectives of this laboratory course are to:

1. **Familiarize students** with the basic digital components and logic families used in digital circuits.
2. **Enable students to implement** and verify the operation of basic logic gates and combinational logic circuits using digital ICs.
3. **Develop the ability** to design, construct, and test sequential logic circuits such as flip-flops, counters, and shift registers.
4. **Introduce students** to the process of simplifying Boolean expressions and implementing optimized digital systems.
5. **Expose students** to simulation and hardware testing tools used for analyzing digital circuits.
6. **Encourage teamwork and practical problem-solving** through experimentation, troubleshooting, and documentation of results.

Detailed Syllabus:

Experiment No.	Name of the Experiments	No of periods
01	Design of basic Logic gates using (CMOS/TTL) logic families	3
02	Design of inverter using CMOS.	3
03	Design of MUX/DEMUX using basic gates and also design inverter using MUX and also the available ICs of MUX and DEMUX	3
04	Design of BCD to Excess -3 code and vice versa using basic gates (7404,7408,7432/ 4010,4071,4081)	3
05	Design of Adder and Subtractor using basic gates (7404,7408,7432/ 4010,4071,4081) and use of IC 74LS83 as BCD adder	3
06	Design and implementation of 16 bit add/even parity checker/generator using IC 74180)	3
07	Implementation of combinational circuits using Logisim and VHDL	3
08	Design and testing of half/full adder and Multiplexer by burning FPGA trainer	3
09	Design of RS, D, T and JK flip flops using universal gates(7402 and 7400/ 4001	3
10	Design of RS, D, T and JK flip flops using universal gates(7402 and 7400/ 4001 and 4011). Also design master- slave JK flip flop by using IC (7476/ 4027)	3
11	Design of 4 bit shift register(shift right) by using IC7476/4027)	3
12	Design of ADC using IC ADC 0804	3
13	Design of DAC using IC DAC 0808	3
14	Design of 7 segment display using IC 7447/ CD4511B	3
15	Design of a decimal counter circuit and give display using IC (555, 740 & 7447/ CD4511B)	3

Course Outcomes:

CO1: Verify basic logic gates and implement Boolean expressions using logic gates.

CO2: Design and implement combinational logic circuits such as adders, subtractors, multiplexers, and decoders.

CO3: Construct and test sequential circuits such as flip-flops, counters and shift registers.

CO4: Apply digital logic concepts to develop simple real-time digital systems or applications.

Suggested Learning Resources:

Text Books:

1. Digital Circuits and Design, by S. Salivahanan, S. Arivazhagan, 5th Edition, Oxford University Press India. (Chapter: 2,5,6,10,13)
2. Fundamentals of Digital Circuits; Anand Kumar; PHI Publication (Chapter:2,3,4,8,9,10,11,12)
3. Digital Logic and Computer Design; M Morris Mano, Pearson Publication

Reference Books:

1. Digital Design, M. Morris. Mano & Michael D. Ciletti, PEARSON Publication

CO-PO Mapping:

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



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Syllabus for B.Tech Admission Batch 2024-2028

Name of the Course/Subject	Electrical and Electronics Measurement Lab	Subject Code:	PCCEEE493
Semester	IV	Course Nature	Practical
Pre-Requisite(s):	1. Statistics 2. Thermodynamics 3. Circuit Theory		
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
0	0	3	1

Course objective(s):

The purpose of learning this course is to:

1. Developed adequate knowledge of compensating circuits.
2. Introducing to measurements Techniques.
3. Familiarize students with different types of transducers and their use in measuring physical quantities.
4. Emphasis Knowledge on digital techniques used to measure voltage, current, power etc.

Experiment No.	Description	Number of Hours
1	Design a model short transmission system and determine its efficiency by applying Instrument Transformers.	3
2	Design and calibrate a power and energy measurement system using Digital energy meter.	3
3	Design an unknown temperature measurement system of a Furnace using Thermocouple.	3
4	Core displacement measurement using LVDT through Digital Storage Oscilloscope.	3
5	Measurement of unknown capacitance of a low pass filter circuit using De Sauty Bridge and its condition monitoring using Schering Bridge	3
6	Calibration of Strain Gauge.	3
7	Rotational speed measurement system using Photo Magnetic pick up.	3
8	Water level measurement system by using capacitive transducer.	3
9	Design of an Angular Displacement Measurement system using Capacitive transducer.	3
10	Dismantle and assemble different parts of PMMC, Dynamometer, Electro thermal and Rectifier type of instruments, Digital multimeter and various other instruments to get familiarized with their constructions.	3

Course Outcomes:

After completion of this course, the learners will be able to

- CO1 Developed adequate knowledge of compensating circuits.
- CO2 Develop and calibrate different transducer-based measurement systems for physical parameter measurement.
- CO3 Examine and interpret characteristics of electrical and electronic instruments through experimental setups involving instrument transformers and bridges.
- CO4 Illustrate the functioning and internal construction of different types of measuring instruments.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	2	2	0	0	0	1	0	2
CO2	3	2	3	3	2	0	0	0	1	0	2
CO3	3	3	2	3	2	0	0	0	1	0	2
CO4	2	2	2	2	1	0	0	0	1	0	1



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Syllabus for B.Tech Admission Batch 2024-2028



Subject Name: Programming using Python Lab
Lecture Hours: 40

Credit: 3
Subject Code: OECEEE481A

Study Material	Coursera	Nptel	LinkedIn Learning	Infosys Springboard:
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Course Objective:

1. To apply the concepts of classes.
2. To understand and implement packages and interfaces.
3. To handle I/O and exception handling.
4. To understand file processing operations.
5. To develop applications using event handling

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1.	<p>Familiarity with the programming environment: Understanding the build system, IDE, debugging, profiling and source code management. Introduction to various programming paradigms, advantages of OOP, comparison of OOP with Procedural Paradigm</p>	<p>International Academia: (https://drive.google.com/file/d/10z00dMd26WjiPThhCercGbsi6u3ciE62/view?usp=drive_link) (https://drive.google.com/file/d/1k3qrfDL9p5_IJR_iP2mt6c6AzwmByNtf/view?usp=sharing) A ICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse</p>	2+4	<p>Familiarity with terminal/command prompt, using git commands and github to pull/commit/push/merge code, writing, compiling and running simple programs, debugging by setting breakpoints</p>	<p>Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson</p>	1

		<i>IDE will be use</i>				
2	<p>Basic principles of the object-oriented development process: Introduction to Object-Oriented Paradigm: Data encapsulation, modularity, code reuse, identifying classes, attributes, methods and objects, class relationships</p>	<p>International Academia:(https://drive.google.com/file/d/1Rc1KOzkVRHqLEWApFBplwz7s8IwsyFlf/view?usp=sharing)(https://drive.google.com/file/d/1e8g7D6nuMwEruToXtNDbh68vx2VKUrgS/view?usp=sharing)AICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_C%20UG%20CSE.pdf)Industry Mapping:<i>Hackerrank,TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used</i></p>	4+4	<p>Importing pre-written classes using the this keyword, calling and defining methods, writing and instantiating classes, setter/getter methods, instance variables, returning values, debugging using print function, containment and association, scope and parameter passing</p>	<p>Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson</p>	2

3	<p>Advanced features of OOP: Interfaces, inheritance, polymorphism, abstract classes, immutability, copying and cloning objects. Polymorphism and AI-driven Adaptability</p>	<p>International Academia: International Standards Mapping (MIT Open Courseware): String: immutability, BufferedReader, StringBuilder (https://ocw.mit.edu/ans7870/6/6.005/s16/classes/09-immutability/) Polymorphism : Methods : Overloading and overriding Methods, overloading constructors(https://ocw.mit.edu/courses/6-088-introduction-to-c-memorymanagement-and-c-objectoriented-programming-januaryap-2010/67b1aec3f2867734ec0fb33034c8b5c8_MIT6_088IAP10_lec05.pdf) AICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf) Industry Mapping: Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used</p>	2+6	Parameter polymorphism, method resolution, declared v/s actual type, partially and fully overriding methods, calling superclass constructor from child class constructor, protected fields and methods, using an abstract parent class v/s an interface with default and abstract methods, object equality check, object comparison (Comparable/Comparator interface), Cloneable interface/copy constructor	Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson	3
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4	<p>Using language APIs: Language supported libraries for handling advanced data structures. Abstraction: abstract class, design debugging interface, multiple inheritance, packages Access control, class scope, packages, Java API</p>	<p>International Academia:(https://drive.google.com/file/d/1yFNf2IBXgy6ch47hR6TGHZddvCPfVm8p/view?usp=sharing)AICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)Industry Mapping:<i>Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.</i></p>	2+3	<p>Big-O notation, Java collection framework (or Boost libraries), sorting objects, iterating over objects</p>	<p>Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson</p>	4
5	<p>Defensive program: Exception handling, assertions, Java Thread Programming</p>	<p>International Academia:(https://drive.google.com/file/d/1kbRGF396sQPdQbA4wN81EIKU_bdGgFs/view?usp=sharing)AICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)Industry Mapping:<i>Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used</i></p>	2+3	<p>Exception handling using try/catch block, nesting try/catch blocks, throw and throws keywords, rethrowing exceptions, handling checked exception, user defined exceptions. Thread Synchronization and Thread Communication</p>	<p>Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson</p>	5

6	<p>Modeling and Design pattern: Basic modeling techniques –e.g. Class diagram, sequence diagram, use case diagrams, etc. Introduction to design patterns: iterator, singleton, flyweight, adapter, strategy, template, prototype, factory, façade, decorator, composite, proxy, chain of responsibility, observer, state)</p> <p>Model View Controller</p>	<p>International Academia:(https://drive.google.com/file/d/1DQVPfhmcyKog-PryPdZbxufUC7D0Cfl/view?usp=sharing)AICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)Industry Mapping:<i>Hackerrank, TCS Codevita projects, GitHub platform. NetBeans and Eclipse IDE will be used.</i></p>	2+6	UML modeling.	Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson	6
7	<p>Basic Android Programming: Android Components – Activity, Services, Content Provider, Broadcast Receiver; Simple UI Design, Applet and Swin</p>	<p>International Academia:(https://online.stanford.edu/courses/cs108-object-oriented-systemsdesign)AICTE-prescribed syllabus: (https://www.aicteindia.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf)Industry Mapping:<i>Hackerrank, TCS Codevita projects, GitHub platform,. Android Studio will be used.</i></p>	2+6	Android app making	Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson	7

Course Outcome:

CO1: Build software development skills using java programming for real-world applications

CO2: Develop and implement Java programs for simple applications that make use of classes, packages and interfaces

CO3: Develop and implement Java programs using Inheritance and Interfaces.

CO4: Develop and implement Java programs using array list, exception handling and multithreading.

Suggested sources of learning:

TEXT BOOK:

1. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
2. E. Balagurusamy – " Programming With Java: A Primer" – 3rd Ed. – TMH

REFERENCE BOOKS:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	1	2	2	1	2
CO2	3	2	1	1	3	0	1	2	1	3
CO3	3	3	3	2	3	0	2	2	1	3
CO4	3	3	3	2	3	0	2	2	1	3



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Syllabus for B.Tech Admission Batch 2024

Subject Name: Programming using Python Lab

Lecture Hours: 40

Credit: 3

Subject Code: OECEEE481B

Study Material	<u>Coursera</u>	<u>Nptel</u>	<u>LinkedIn Learning</u>	<u>Infosys Springboard</u>
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Course Objective:

1. To develop logical skills and basic technical skills so that students should be able to solve basic computing problems.
2. The students should be able to learn the basic of any computer programming language.

Course Outcome:

CO1: Understand real world problems and developing computer solutions for those.

CO2: Understand the basics of python.

CO3: Apply python for solving basic programming solutions.

CO4: Create algorithms using learnt programming skills.

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Introduction to Python Data Types, Operators, Expression, Indexing & Slicing, Strings, Conditionals, Functions, Control Flow, Nested Loops, Sets & Dictionaries.	<i>International Academia:</i> https://tinyurl.com/bdass3 <i>AICTE-prescribed syllabus:</i> https://tinyurl.com/32a8mp5t <i>Industry Mapping:</i> Jupyter Notebook	8	<ol style="list-style-type: none"> Hands-on exploration of core Python data types for analysing 10-year climate dataset. Hands-on experiments to implement and apply arithmetic and logical operators in power calculations of thermal power plant using Python. Design Python indexing techniques in image processing in healthcare. Developing real-time decision-making systems for healthcare solutions using conditional statements, control flow, and nested loops using Python. Design a dictionary to manage student records, mapping roll numbers to scores using Python. Designing sets to find students enrolled in common or unique subjects using Python. 	David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler, “Python Basics: A Practical Introduction to Python 3”, 4th Edition, Real Python.	3,4,5,6,8,9

2	<p>Introduction to Machine Learning Machine Learning Vs Statistical Modelling, Supervised vs Unsupervised Learning, Supervised Learning, Classification, Unsupervised Learning, Reinforcement Learning, Applications, Python libraries suitable for Machine Learning: Pandas, Numpy, Scikitlearn, Visualization libraries: matplotlib etc.</p>	<p><i>International Academia:</i> https://tinyurl.com/2jphac8c</p> <p><i>AICTE-prescribed syllabus:</i> https://tinyurl.com/32a8mp5t</p> <p><i>Industry Mapping:</i> Spyder, SK Learn, Mat Plot Lib, NumPy, Pandas</p>	8	<ol style="list-style-type: none"> 1. Create and analyse features relevant to the design parameters of solar cells using Python. 2. Design mathematical transformations to preprocess and enhance data for anomaly detection in industrial windmill performance using Python. 3. Create insightful visualizations of data distributions: (a) Scatter plots of customer segmentation for marketing, (b) Heatmaps for supply chain optimization and (c) Trend analysis in stock prices using Python. 4. Use of Eigenvalues and Eigenvectors in Principal Component Analysis (PCA) for dimensionality reduction in machine learning using Python. 5. Matrix Rank in detecting redundancy in industrial sensor data using Python. 6. Create 'Training' and 'Testing' using Python by treating algorithms like decision trees and nearest neighbours as black boxes, focusing on their application in healthcare domain. 	<p>Manaranjan Pradhan and U Dinesh Kumar, “Machine Learning using Python”, First Edition, Wiley India Pvt. Ltd.</p>	1
3	<p>Regression Model using Python Simple Linear Regression, Multiple Linear Regression, Nonlinear Regression, Model Evaluation in Regression Models, Evaluation Metrics in Regression Models.</p>	<p><i>International Academia:</i> https://tinyurl.com/9d4brw22</p> <p><i>AICTE-prescribed syllabus:</i> https://tinyurl.com/32a8mp5t</p> <p><i>Industry Mapping:</i> Spyder, Regression ML Algorithms</p>	8	<ol style="list-style-type: none"> 1. Create a Linear Regression and a Non-linear Regression model to predict the performance of a solar cell under different lighting conditions using Python. 2. Create a Non-linear Regression model to predict the suitable material to design a highly efficient solar cell using Python. 3. Performance evaluation of different Regression Models suitable for fault detection of a solar power plant using Python. 	<p>Manaranjan Pradhan and U Dinesh Kumar, “Machine Learning using Python”, First Edition, Wiley India Pvt. Ltd.</p>	4

4	<p>Classification Model using Python</p> <p>Introduction to Classification, K-Nearest Neighbour, Decision Trees, Logistic Regression, Support Vector Machines, Logistic regression vs Linear regression, Evaluation Metrics in Classification.</p>	<p><i>International Academia:</i> https://tinyurl.com/9d4brw22</p> <p><i>AICTE-prescribed syllabus:</i> https://tinyurl.com/32a8mp5t</p> <p><i>Industry Mapping:</i> Spyder, Classification on ML Algorithms</p>	8	<ol style="list-style-type: none"> 1. Design a K Nearest Neighbour Classifier that categorizes data points of disease diagnosis in healthcare using Python. 2. Create a Decision Tree algorithm to help in load forecasting, energy demand prediction, and dynamic adjustment of power distribution to prevent overloads using Python. 3. Design a Logistic Regression model that can analyze energy usage data and suggest or implement optimal energy-saving strategies for smart thermostats or lighting systems using Python. 4. Design Support Vector Machine models that are trained on historical fault data and can automatically detect abnormalities or anomalies in real-time data of short circuits or voltage imbalances in power grids using Python. 5. Performance evaluation of different Classification Models suitable for predicting peak usage times and adjusting energy distribution or prices dynamically to prevent power shortages using Python. 	<p>Manaranjan Pradhan and U Dinesh Kumar, “Machine Learning using Python”, First Edition, Wiley India Pvt. Ltd.</p>	5
5	<p>Unsupervised Learning using Python</p> <p>Introduction to Clustering, K-Means Clustering, Hierarchical Clustering, Density-Based Clustering, Content-based recommender systems, Collaborative Filtering.</p>	<p><i>International Academia:</i> https://tinyurl.com/9d4brw22</p> <p><i>AICTE-prescribed syllabus:</i> https://tinyurl.com/32a8mp5t</p> <p><i>Industry Mapping:</i> Spyder, Clustering ML Algorithms</p>	8	<ol style="list-style-type: none"> 1. Design a K-Means Clustering model that detects anomalies in equipment behaviour; predictive maintenance models help prevent costly downtime and improve the lifespan of machinery. using Python. 2. Design a Hierarchical Clustering model that enhances image clarity, reduces errors, and improves the efficiency of diagnostic equipment using Python. 3. Design a Based Clustering model that results in more accurate and reliable sensor systems, improving the performance of Smart irrigation system. 4. Develop a system that recommends the most suitable electronic components (resistors, capacitors, transistors, etc.) for a given circuit design based on specific requirements (e.g., power rating, tolerance, capacitance). 5. Develop a collaborative filtering-based system to recommend settings or features for smart home devices (e.g., thermostats, lighting, or security cameras) based on user behaviour and preferences. 	<p>Andreas C. Muller and Sarah Guido, “Introduction to Machine Learning with Python”, First Edition, O’Reilly Media, Inc.</p>	3

Projects:

1. Develop a machine learning model to predict failures or maintenance needs of electrical equipment (motors, transformers, etc.) based on sensor data.
2. Create a model to predict energy consumption patterns in smart grids based on historical usage data.
3. Use machine learning to predict the output of solar panels based on weather and environmental data.
4. Develop a machine learning model to optimize the placement and operation of EV charging stations.
5. Build a condition monitoring system for transformers using ML to predict transformer failures and optimize their operation.

Suggested sources of learning:

TEXT BOOK:

1. David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler, “Python Basics: A Practical Introduction to Python 3”, 4th Edition, Real Python.
2. Manaranjan Pradhan and U Dinesh Kumar, “Machine Learning using Python”, First Edition, Wiley India Pvt. Ltd.
3. Andreas C. Muller and Sarah Guido, “Introduction to Machine Learning with Python”, First Edition, O’Reilly Media, Inc.

REFERENCE BOOKS:

1. Mark Lutz, “Learning Python”, Fourth Edition, O’Reilly Media, Inc.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	1	1	2	2	1	2
CO2	3	2	1	1	3	0	0	1	2	1	3
CO3	3	3	3	2	3	0	1	2	2	1	3
CO4	3	3	3	2	3	0	1	2	2	1	3