University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus

7th Semester Syllabus for B.Tech
(Admission Batch 2023)

Electrical & Electronics Engineering									
B.Tech. 4th Year Course Structure									
7th Semester									
Sl No	**Type of Course**	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**S**	**Total Contact**	**Credit Points**
Theory									
1	Humanities and social sciences including Management	HMEEE701	Economics for Engineers	3	0	0		3	3
2	Professional Elective Courses	PEEE701	A.Power System Dynamics and Control/ B.Antennas and Propagation	3	0	0		3	3
3	Open Elective Courses	OEEE701	A.Embedded System/ B.Nano Electronics	3	0	0		3	3
4	Open Elective Courses	OEEE702	A.Computer Networks/ B.Wavelet Transforms	3	0	0		3	3
5	Humanities and social sciences including Management	ESPEE701	Essential Studies For Professionals VII	2	0	0		2	0.5
SESSIONAL									
6	Project. Seminar and Industrial Training	PWEEE781	Project stage-I				6	6	2
7	Project. Seminar and Industrial Training	INP781	Internship I						4
8	Humanities and social sciences including Management	SDP781	Skill Development For Professionals VII				2	2	0.5
Value Added Courses									
9	Massive Open Online Courses (MOOCs)	MOOCS	Massive Open Online Courses (MOOCs)						
10	Industry and Foreign Certification (IFC)	IFC	Industry and Foreign Certification (IFC)						
11	Mandatory Additional Requirements (MAR)	MAR781	Mandatory Additional Requirements (MAR)						
Total Credit Points of Semester				**12**	**0**	**2**	**8**	**22**	**19**

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

Syllabus for B.Tech Admission Batch 2023-2027

Subject Name: Economics for Engineers
Lecture Hours: 40

Credit: 3
Subject Code: HMEEE701

List of Faculty Members handling the Subject –

1. Prof. Nirban Kumar Saha

Study Material	Coursera	Nptel	LinkedIn Learning	Infosys Springboard:

Course Objective:

1. To understand the process of economic decision making
2. To understand the basic financial management aspects
3. To develop the skills to analyze financial statements
4. To understand the basic of accounting
5. To understand the process of economic decision making

Course Outcome:

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

CO1. Evaluate the economic theories, cost concepts and pricing policies.
CO2. Explain the market structures and integration concepts
CO3. Apply the concepts of financial management for project appraisal
CO4. Explain accounting systems, the impact of inflation, taxation, depreciation

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Economic Decisions Making – Overview, Problems, Role, Decision making process. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models – Per Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.		6	NA	Economics for Engineers, H L Bhatia, S N Maheswari, Third Edition, Vikas Publishing House	Chapter 1,2
2	Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value Of Money, Debt repayment, Nominal & Effective Interest. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate Of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.		10	NA	Economics for Engineers, H L Bhatia, S N Maheswari, Third Edition, Vikas Publishing House	Chapter 3,4
3	Uncertainty In Future Events - Estimates And Their Use In Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.		10	NA	Economics for Engineers, H L Bhatia, S N Maheswari, Third Edition, Vikas Publishing House	Chapter 5
4	Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life Of A New Asset, Marginal Cost, Minimum Cost Life Problems. Inflation And Price Change – Definition, Effects, Causes, Price Change With Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.		8	NA	Economics for Engineers, H L Bhatia, S N Maheswari, Third Edition, Vikas Publishing House	Chapter 3,7
5	Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.		6	NA	Economics for Engineers, H L Bhatia, S N Maheswari, Third Edition, Vikas Publishing House	Chapter 12

Lesson Plan:

Module	Working Day	Lesson Plan – Description
Module 1: Economic Decisions Making		
	1	Syllabus discussion: Overview of the course structure, objectives, and outcomes
	2	Overview, Problems, Role, Decision making process
	3	Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs
	4	Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs
	5	, Cash Costs vs Book Costs, Life-Cycle Cost
	6	Case Studies in IoT: Smart homes, industrial automation, innovative IoT projects
	7	Types Of Estimate, Estimating Models – Per Unit Model
	8	Segmenting Model
	9	Cost Indexes, Power-Sizing Mode
	10	Improvement & Learning Curve, Benefits.
Module 2: Cash Flow, Interest and Equivalence: Cash Flow		
	11	Diagrams, Categories & Computation
	12	Time Value Of Money, Debt repayment
	13	Nominal & Effective Interest. Present Worth Analysis
	14	End-Of-Year Convention, Viewpoint Of Economic Analysis Studies
	15	Borrowed Money Viewpoint, Effect Of Inflation & Deflation
	16	Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives
	17	Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value
	18	,Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate Of Return
	19	Incremental Analysis; Best Alternative Choosing An Analysis Method
	20	Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis

Module 3: Uncertainty In Future Events		
	21	**Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks**
	22	**Estimates And Their Use In Economic Analysis**
	23	**Range Of Estimates, Probability, Joint Probability Distributions**
	24	**Expected Value, Economic Decision Trees, Risk**
	25	**Risk vs Return, Simulation, Real Options. Depreciation - Basic Aspects**
	26	**Deterioration & Obsolescence, Depreciation And Expenses**
	27	**Types Of Property, Depreciation Calculation Fundamentals**
	28	**Depreciation And Capital Allowance Methods**
	29	**Straight-Line Depreciation Declining Balance Depreciation**
	30	**Common Elements Of Tax Regulations For Depreciation And Capital Allowances**
Module 4: Replacement Analysis		
	31	**Replacement Analysis Decision Map, Minimum Cost Life Of A New Asset,**
	32	**Marginal Cost, Minimum Cost Life Problems**
	33	**Inflation And Price Change – Definition, Effects, Causes, Price Change With Indexes**
	34	**Types of Index, Composite vs Commodity Indexes**
	35	**Use of Price Indexes In Engineering Economic Analysis**
	36	**Cash Flows that inflate at different Rates.**
	37	**Cash Flows that inflate at different Rates.**
Module 5: Accounting		
	38	**Accounting**
	39	**Function, Balance Sheet**
	40	**Smart Grid and Energy Optimization: IoT in energy management, examples of smart grids**
	41	**IoT in Healthcare: Wearable health monitoring devices, remote health diagnostics**

	42	**Real-World Design Constraints: Scalability, security, cost issues, overcoming real-world IoT challenges**
	43	**Capstone Project Review: Discussion of project ideas, course wrap-up, future trends in IoT**
	44	**Advanced IoT Applications: Exploration of cutting-edge IoT applications and technologies**

Suggested sources of learning:

TEXT BOOK:

1. Economics for Engineers, H L Bhatia, S N Maheswari, Third Edition, Vikas Publishing House

REFERENCE BOOKS:

1. Sociology & Economics for Engineers, Premvir Kapoor, Khanna Publishing House.
2. Engineering Economics, James L.Riggs, David D. Bedworth, Sabah U. Randhawa 4e , McGrawHill Education.
3. Engineering Economics Analysis, Donald Newnan, Ted Eschembach, Jerome Lavelle , OUP
4. Principle of Engineering Economic Analysis, John A. White, Kenneth E.Case,David B.Pratt , Wiley
5. Engineering Economy, Sullivan and Wicks, Koelling, Pearson
6. Engineering Economics, R.Paneer Seelvan, PHI
7. Engineering Economics Analysis, Michael R Lindeburg, ,Professional Pub

CO-PO Mapping:

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

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

Syllabus for B.Tech Admission Batch 2023

Subject Name: Power System Dynamics and Control **Credit: 3**
Lecture Hours: 40 **Subject Code: PEEE701A**

Study Material	Coursera:	Nptel:

List of Faculty Members handling the Subject –

Prof. Nirban Chakraborty

Pre-requisite: PCEEE502, PCEEE503, PCEEE601

Course Objective:

To develop an understanding of the fundamental dynamic behaviour of power systems to perform basic stability issues

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book	Mapped Chapter
1	Power system stability	Introduction to power system stability problems, and analysis of stability in single and multi-machine systems	**Academia Mapping:** https://ocw.mit.edu/courses/6-241j-dynamic-systems-and-control-spring-2011// https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf **Industry Mapping:** MATLAB	5	K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.	Chapter 1
2	Modeling	Dynamic model of the synchronous machine. Synchronous machine primary and secondary controls include automatic voltage regulators, turbine, and turbine governors, under and over-excitation limiters, and power system stabilizers. Voltage control, transient stability control, dynamic stability control, and Modeling, Modeling of power system components, such as generators, transmission lines, excitation, and prime mover controllers, Synchronous machine secondary controls including automatic generator controllers and secondary voltage regulators. Tertiary frequency control Transformer dynamic model and controllers including under-load tap-changers and phase shifters, magnetic field.	**Academia Mapping:** https://ocw.mit.edu/courses/6-241j-dynamic-systems-and-control-spring-2011// https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf **Industry Mapping:** MATLAB	10	K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.	Chapter11,12,13,14

3	Control	Secondary control principles, including setpoint control of active power and voltage, active reserves, and load following control	**Academia Mapping:** https://ocw.mit.edu/courses/6-241j-dynamic-systems-and-control-spring-2011// https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf **Industry Mapping:** MATLAB	5	K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.	Chapter 9
4	Stability Analysis	Transient stability, small signal stability, and voltage stability, Power system control and emergency control VSC model and controls. Control of shunt and series FACTS devices. Distributed energy sources control with particular emphasis on models and controllers of wind turbines and photovoltaic panels (MPPT, voltage control, frequency control.	**Academia Mapping:** https://ocw.mit.edu/courses/6-241j-dynamic-systems-and-control-spring-2011// https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf **Industry Mapping:** MATLAB	10	K.R. Padiyar, "Power System Dynamics, Stability and Control", B. S. Publications, 2002.	Chapter 10

Lesson Plan:

Module 1: Power system stability, Year 2026 (Faculty: Dr. NIRBAN CHAKRABORTY)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Introduction to power system stability problems
2	Introduction to power system stability problems
3	Analysis of stability in single and multi-machine systems
4	Analysis of stability in single and multi-machine systems
5	Analysis of stability in single and multi-machine systems

Module 2: Modelling, Year 2026 (Faculty: Dr. NIRBAN CHAKRABORTY)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Dynamic model of the synchronous machine.
2	Dynamic model of the synchronous machine.
3	Synchronous machine primary and secondary controls include automatic voltage regulators, turbine, and turbine governors, under and over-excitation limiters, and power system stabilizers
4	Synchronous machine primary and secondary controls include automatic voltage regulators, turbine, and turbine governors, under and over-excitation limiters, and power system stabilizers
5	Voltage control, transient stability control, dynamic stability control.
6	Modeling, Modeling of power system components, such as generators, transmission lines, excitation.
7	Prime mover controllers, Synchronous machine secondary controls including automatic generator controllers and secondary voltage regulators.
8	Tertiary frequency control.
9	Transformer dynamic model and controllers including under-load tap-changers and phase shifters.
10	Transformer dynamic model and controllers including under-load tap-changers and phase shifters.

Module 3: Control, Year 2026 (Faculty: Dr. NIRBAN CHAKRABORTY)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Secondary control principles.
2	Set point control of active power and voltage.
3	Active reserves control
4	Load following Control
5	Load following Control .

Module 4: Stability analysis, Year 2026 (Faculty: Dr. NIRBAN CHAKRABORTY)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Transient stability, small signal stability.
2	Transient stability, small signal stability.
3	Voltage stability, Power system control.
4	Emergency control VSC model and controls
5	Control of shunt and series FACTS devices.
6	Distributed energy sources control with particular emphasis on models.
7	Distributed energy sources control with particular emphasis on models.
8	Wind turbines and photovoltaic panels (MPPT, voltage control, frequency control.
9	Wind turbines and photovoltaic panels (MPPT, voltage control, frequency control.
10	Wind turbines and photovoltaic panels (MPPT, voltage control, frequency control.

Course Outcome:

At the end of the course, the students will be able to-
CO1. Understand the problem of power system stability and its impact on the system.
CO2. Analyse linear dynamical systems and use of numerical integration methods.
CO3. Model the different power system components for the study of stability.
CO4. Understand the methods to improve stability.

Suggested Learning Resources:

Text Books

1. K.R. Padiyar, “Power System Dynamics, Stability and Control”, B. S. Publications, 2002.

Reference Books

2. P. Kundur, “Power System Stability and Control”, McGraw Hill, 1995.

3. P.M. Anderson and A. A. Fouad, “Power System Control and Stability”, Galgotia Publications, New Delhi, 2003 or P.M. Anderson and A. A. Fouad, “Power system control and stability”, IEEE Press

4. R. Ramanujam, “Power Systems Dynamics”- PHI Publications.

5. M. A. Pai and W. Sauer, “Power System Dynamics and Stability”, Pearson Education Asia, India, 2002.

6. I.J. Nagrath, D.P. Kothari, “Modern Power System Analysis”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1994.

CO-PO Mapping:

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

.

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

Syllabus for B.Tech Admission Batch 2023

Subject Name: Antennas and Propagation Credit: 3 Lecture Hours: 40

Subject Code: PEEE 701B

Study material	Coursera	nptel	LinkedIn Learning	Infosys Springboard

List of Faculty Members handling the Subject – Dr. Swati Chowdhuri

Pre-requisite: Electromagnetic Field Theory, Microwave Theory & Technique

Course objectives:

- To introduce the fundamental electromagnetic principles that form the basis of antenna theory.
- To develop an understanding of antenna characteristics.
- To familiarize students with different antenna structures and arrays.
- To enable students to analyze radiation fields and array behaviour.
- To provide a comprehensive understanding of radio wave propagation mechanisms.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	TEXT BOOK	Mapped Chapter
1	**Introduction to Antenna Characteristics**	Review of Maxwell's Equation; Radiation of e.m waves and introducing Antenna; Vector Potential and Retarded Vector Potential; Radiation fields of a Hertzian dipole(electric); Duality Principle, Radiation fields due to short magnetic dipole. Antenna Characteristics: Radiation Pattern, Beam Width; Radiation Resistance and efficiency; Directivity and Gain; Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna.	***International Academia:*** (https://ocw.mit.edu/courses/res-ll-002-adaptive-antennas-and-phased-arrays-spring-2010/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** software: Matlab, CST/ HFSS.	8			
2	**Radiation fields and Characteristics and Antenna Arrays.**	**A.** Radiation fields and Characteristics of λ/2 dipole; discussion on λ/4 monopole antenna; Current distribution and Radiation patterns of center-fed dipoles of length λ, 3λ/2 and 2 λ. Horizontal and Vertical antennas over a plane ground. **B.** Antenna Arrays: electric Field due to 2 element arrays, 3 element Arrays; Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Phased array.	**International Standards** : (https://ocw.mit.edu/courses/res-ll-002-adaptive-antennas-and-phased-arrays-spring-2010/) ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** Software: Matlab, CST/ HFSS.	12			

3	**Characteristics and properties**	Characteristics and properties of :Travelling Wave Antenna, Helical Antenna, Folded Dipole, Yagi-Uda Array, Loop Antenna, Electrically Short Antennas, Broad Band Antenna (Log periodic Antenna), Microstrip Patch Antenna. Radiation from an aperture: Sectoral and Pyramidal Horn Antennas, Design of Optimum Horn Antenna; Parabolic and Corner Reflectors and feed systems. [Major stress on Characteristics features, applications (including frequency at which used), advantages and disadvantages, major design principles and equations (without long and detailed derivations].	***International Standards*** : (https://ocw.mit.edu/courses/res-ll-002-adaptive-antennas-and-phased-arrays-spring-2010/) ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** Software: Matlab, CST/ HFSS.	12			
4	**Ground Wave Propagation**	Methods of Propagation: Ground Wave Propagation, Components of ground wave, Field strength dependence on physical factors. Sky wave Propagation; Ionospheric Layers; Virtual Height, Critical Frequency, MUF, Skip distance, Sporadic Reflections. Space wave propagation: Tropospheric Scatter, Ducting Super refraction, Sub refraction. Friss Transmission Formula, SNR of a Radio Link. Physical (Medium) effects on Radio wave Propagation: Absorption, Refraction and Radio Horizon, Diffraction, Multipath Propagation and fading, Noise, Doppler effect.	***International Standards:*** (https://ocw.mit.edu/courses/res-ll-002-adaptive-antennas-and-phased-arrays-spring-2010/) ***AICTE prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** Hardware: Yagi - Uda Antenna, Horn Antenna, Folded Dipole Antenna, Dipole Antenna. Software: Matlab, CST/ HFSS	8			

Course outcome:

CO1: Students would be able to understand basic electromagnetic principles and analyze the fundamentals of antenna theory.
CO2: Students would be able to understand antenna arrays and radiation properties of antennas.
CO3: Students would be able to understand the characteristic properties of different types of antennas with their applications and respective radiation mechanism.
CO4: Students would be able to apprehend and analyze the atmospheric and terrestrial effects on radio wave propagation.

Suggested Learning Resources:

Text Books:

1. Antennas and Wave Propagation by G. S. N. Raju", 4th ed., Oxford university pub.
1. Antenna (for all application), John D. Kraus and Ronald J. Marhcfka; Tata- MacGraw Hill, 3rd Edition
2. Antenna & Wave Propagation, K.D Prasad; Satya Prakashan, New Delhi, 3rd Edition
3. Antenna Theory: Analysis & Design, Constantine A. Balanis; Willey, 3rd Edition

Reference Book

1. Elements of Electromagnetics; Mathew N.O. Sadiku, Oxford University Press, 5th Edition(2010)
2. Electromagnetic Waves & Radiating Systems, EC Jordan & K.G. Balmain; Pearson Education, 2nd Edition (2009)
3. Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)

CO-PO Mapping:

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

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

Syllabus and Lesson Plan for B.Tech Admission Batch 2023-2027

Subject Name: Embedded System **Credit: 3** **Lecture Hours: 40**

Subject Code: PEEE701B

List of Faculty Members handling the Subject –

1. Prof. Dr. Tanmay Sinha Roy

Pre-requisite:

Analog Electronics, Digital Electronics, Microprocessor and Microcontroller.

Course Objective:

1. Able to design and use advanced controllers in real-life situations.
2. Able to design the interfacing of the systems with other data handling / processing systems.
3. Able to operate antenna design software tools and to be able to design the antenna of required specifications.

Course Outcome:

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

CO1. Understand the concept of embedded system, microcontroller, different components and their interactions
CO2: Get familiarized with programming environment to develop embedded solutions
CO3. Design interfacing of the systems with other data handling / processing systems.
CO4. Appreciate engineering constraints like energy dissipation, data exchange speeds etc.

Relevant Links:

Study Material	Coursera	Nptel	LinkedIn Learning:	Infosys Springboard:

Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	The concept of embedded systems design, Embedded microcontroller cores, embedded memories. Examples of embedded systems.	***International Academia:*** 6.08: Intro to EECS via Interconnected Embedded Systems | MIT Admissions ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/ Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** *Microcontroller, Arduino, ARM Processor*	8	NA	R. Kamal, "Embedded Systems", McGraw Hill, 2020	1,2
2	Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, digital signal processing.	***International Academia:*** 6.08: Intro to EECS via Interconnected Embedded Systems | MIT Admissions ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/ Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** *Microcontroller, Arduino, ARM Processor*	8	NA	R. Kamal, "Embedded Systems", McGraw Hill, 2020	3,4
3	Sub-system interfacing, interfacing with external systems, user interfacing.	***International Academia:*** 6.08: Intro to EECS via Interconnected Embedded Systems | MIT Admissions ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/ Model_Curriculum/UG-1/ug-vol1.pdf) ***Industry Mapping:*** *Microcontroller, Arduino, ARM Processor*	8	NA	J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Cengage Learning India Private Limited, 2011	3,7-9

4	Design tradeoffs due to process compatibility, thermal considerations, etc.	***International Academia:*** 6.08: Intro to EECS via Interconnected Embedded Systems | MIT Admissions ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG- 1/ug-vol1.pdf) ***Industry Mapping:*** *Microcontroller, Arduino, ARM Processor*	8	NA	R. Kamal, "Embedded Systems", McGraw Hill, 2020	7
5	Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.	***International Academia:*** 6.08: Intro to EECS via Interconnected Embedded Systems | MIT Admissions ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/UG- 1/ug-vol1.pdf) ***Industry Mapping:*** *Microcontroller, Arduino, ARM Processor*	8	NA	R. Kamal, "Embedded Systems", McGraw Hill, 2020	8-10

Lesson Plan:

Module 1: Year 2026 , (Faculty : Prof. Dr. Tanmay Sinha Roy)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	The concept of embedded systems design,
2	Hardware units and device, embedded software
3	Design process in embedded system
4	Classification and example
5	8-bit microcontroller, real world interfacing
6	Memory type, memory maps and addresses
7	Processor and memory organization
8	Processor and memory selection

Module 2: Year 2026 , (Faculty : Prof. Dr. Tanmay Sinha Roy)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	IO types and example
2	Serial communication devices,
3	Parallel device ports
4	Wireless devices
5	Timer and counter, watchdog timer, real time clock
6	Bus communication protocols
7	Interrupt service mechanism
8	Digital signal processing.

Module 3: Year 2026 , (Faculty : Prof. Dr. Tanmay Sinha Roy)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Introduction and definition
2	RS232 specification
3	SCI software interface
4	Synchronous transmission and receiving using the SPI
5	Input switches and keyboards
6	Output LEDs
7	Computer controlled relays and DC motor
8	Memory interface example

Module 4: Year 2026 , (Faculty : Prof. Dr. Tanmay Sinha Roy)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Multiple process in an application
2	Multiple threads in an application
3	Task, states and data
4	Concept of semaphores
5	Interprocess communication
6	Massage queue, mailbox, pipe, socket function
7	Design tradeoffs due to process compatibility
8	Thermal considerations, etc.

Module 5: Year 2026 , (Faculty : Prof. Dr. Tanmay Sinha Roy)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Real time OS, Process management
2	Timer function, event function
3	Memory management
4	Device file and IO subsystem management
5	Interrupt routine in RTOS
6	Basic design using an RTOS
7	RTOS task scheduling model
8	OS security issue

CO-PO Mapping:

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

TEXT BOOK:

1. R. Kamal, “Embedded Systems”, McGraw Hill, 2020
2. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Cengage Learning India Private Limited, 2011.

REFERENCE BOOKS:

1. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
2. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
3. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.
4. K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.

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

Syllabus for B.Tech Admission Batch 2023

Subject Name: Nano Electronics **Credit: 3**

Lecture Hours: 23 **Subject Code: OEEE701B**

Study material	Coursera	nptel	LinkedIn Learning	Infosys Springboard

List of Faculty Members handling the Subject –
Prof. Suman Sarkar

Pre-requisite: Basic Electronics, Semiconductor Physics

Course objectives:

The purpose of learning this course is to-

1. To get introduced to Nanoelectronics and nanotechnology.
2. Understand working of Nano scale devices such as transistors.
3. Understand modeling aspects of Nanoscale devices from the perspective of circuit applications.
4. Design of Carbon based Nanoelectronic devices

Apply statistical tools for process control and optimization in semiconductor fabrication.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	TEXT BOOK	Mapped Chapter
1	Introduction to nanotechnology	Introduction to nanotechnology, meso structures , Basics of Quantum Mechanics: Schrodinger equation, Density of States.Particle in a box Concepts, Degeneracy.Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.	***International Standards:*** ***(***Syllabus | Introduction to Nanoelectronics | Electrical Engineering and Computer Science | MIT OpenCourseWare) ***AICTE prescribed syllabus:*** ***(***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final%20Minor%20VLSI.pdf***)*** ***Industry Mapping:*** ***(***Intel, Samsung, Texas Instruments, STMicroelectronics***)***	8		K. K. Chattopadhyay and A. N. Banerjee, *Introduction to Nanoscience and Nanotechnology*. New Delhi: PHI Learning Pvt. Ltd	1
2	Shrink-down approaches	Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.),	***International Standards: (***Syllabus | Introduction to Nanoelectronics | Electrical Engineering and Computer Science | MIT OpenCourseWare) ***AICTE prescribed syllabus:*** ***(***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final%20Minor%20VLSI.pdf***)*** ***Industry Mapping:***	7		K. K. Chattopadhyay and A. N. Banerjee, *Introduction to Nanoscience and Nanotechnology*. New Delhi: PHI Learning Pvt. Ltd	2
3	**Nanoelectronics Applications**	Resonant Tunneling Diode, Single electron transistors, Carbon nano tube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation	***International Standards:*** ***(***Syllabus | Introduction to Nanoelectronics | Electrical Engineering and Computer Science | MIT OpenCourseWare) ***AICTE prescribed syllabus:*** ***(***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final%20Minor%20VLSI.pdf***)*** ***Industry Mapping:*** ***(***Intel, Samsung, Texas Instruments, STMicroelectronics***)*** ***Software: SEMulator 3D***	8		K. K. Chattopadhyay and A. N. Banerjee, *Introduction to Nanoscience and Nanotechnology*. New Delhi: PHI Learning Pvt. Ltd	3

Course outcome:

After completion of this course, the learners will be able to
CO1: Explain quantum mechanics principles and band theory underlying nanoscale phenomena.
CO2: Analyse CMOS scaling limits and compare advanced MOSFET device architectures.
CO3: Apply quantum transport concepts to analyse RTDs, SETs, and CNT-based devices.

CO4: Evaluate 2D semiconductor devices and use atomistic simulation for nanoelectronics.

Suggested Learning Resources:

TEXT BOOK:

1. K. K. Chattopadhyay and A. N. Banerjee, *Introduction to Nanoscience and Nanotechnology*. New Delhi: PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
2. W. Ranier, Nano electronics and Information Technology (Advanced Electronic Material and Novel Devices), Wiley-VCH, 2003.
3. K.E. Drexler, Nano systems, Wiley, 1992.
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press,1998.
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

Lesson Plan:
Module No.1: Introduction to nanotechnology Year 2026, (Faculty: Suman Sarkar)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Introduction to nanotechnology
2	meso structures
3	Basics of Quantum Mechanics: Schrodinger equation
4	Density of States
5	Particle in a box Concepts, Degeneracy
6	Band Theory of Solids
7	Kronig-Penny Model
8	Brillouin Zones

Module 2: Shrink-down approaches Year 2026, (Faculty: SUMAN SARKAR)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Shrink-down approaches: Introduction
2	CMOS Scaling
3	The nanoscale MOSFET
4	Finfets
5	Vertical MOSFETs
6	limits to scaling
7	system integration limits (interconnect issues etc.)

Module 3: Nanoelectronics Applications Year 2026 , (Faculty : Suman Sarkar)

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Resonant Tunneling Diode
2	Single electron transistors
3	Carbon nano tube electronics
4	Band structure and transport, devices, applications
5	Band structure and transport, devices, applications
6	Band structure and transport, devices, applications
7	2D semiconductors and electronic devices
8	2D semiconductors and electronic devices

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	2	1	1	—	—	—	1	—
CO2	3	3	3	2	2	2	2	1	1	2	2
CO3	3	3	2	3	2	1	1	1	1	1	1
CO4	3	2	2	3	3	2	1	1	2	2	1

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

Syllabus and Lesson Plan for B.Tech Admission Batch 2023

Subject Name: Conputer Networks **Credit: 3**

Lecture Hours: 33 **Subject Code: OEEE701A**

List of Faculty Members handling the Subject –

Pre-requisite:

1. Analog Communication
2. Digital Communication
3. Wireless Networks
4. Embedded systems
5. Operating Systems

Course Objective:

To expose the students to the following:

1. Learn the functions of the different layer of the OSI Protocol.
2. Able to draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3. Able to develop the network programming for a given TCP/IP protocol.

Course Outcome:

Upon completion of this course, students should be able to:

1. CO1: Remember functional block diagram of different network.
2. CO2: Explain the functions of the different layer of the OSI Protocol
3. CO3: Apply TCP/IP protocol for the network programming
4. CO4: Analyze the configuration of DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open-source available software and tools

Relevant Links:

Coursera Hyperlinked	Nptel	LinkedIn Learning:	Infosys Springboard:

Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.	Academic Mapping: CTE Model Curriculum for (aicte-india.org) **Industry Mapping:**	7		Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill	Ch 1, Ch 2
2	Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.	Academic Mapping: CTE Model Curriculum for (aicte-india.org) **Industry Mapping:**	8		Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill	Ch 10, Ch 11, Ch 12, Ch 13, Ch 14, Ch 15, Ch 16, Ch 17, Ch 18
3	Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	Academic Mapping: CTE Model Curriculum for6(aicte-india.org) **Industry Mapping:**	6		Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill	Ch 19, Ch 20, Ch 21, Ch 22
4	Transport Layer-Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.	Academic Mapping: CTE Model Curriculum for (aicte-india.org)	6		Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill	Ch 23, Ch 24

5	Application Layer-Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.	Academic Mapping: CTE Model Curriculum for (aicte-india.org) **Industry Mapping:**	6		Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill	Ch 25, Ch 26, Ch 27, Ch 29

CO-PO Mapping:

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

TEXT BOOK:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill.

REFERENCE BOOKS:

1. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
2. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
3. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
4. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

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

Syllabus for B.Tech Admission Batch 2023

Subject Name: Wavelet Transform Credit: 3 Lecture Hours: 3

Subject Code: OEEE702

Study material	Coursera	nptel	LinkedIn Learning	Infosys Springboard

List of Faculty Members handling the Subject – Dr. Swati Chowdhuri

Pre-requisite: Linear algebra (vectors, orthogonality), Fourier transform basics, Signals and systems

Course objectives:

To understand the fundamental principles of wavelets and multiresolution analysis for effective signal representation.
To analyze signals in the time-frequency domain and recognize the limitations of classical methods such as the Fourier Transform.
To study the design and implementation of wavelet transforms using filter banks and multirate signal processing techniques.
To apply wavelet-based methods for real-world signal processing tasks such as denoising, compression, and feature extraction.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	TEXT BOOK	Mapped Chapter
1	Fundamentals of Wavelets and Function Spaces	Introduction to Wavelets, Origin of Wavelets, Haar Wavelet, Dyadic Wavelet, Dilates and Translates of Haar Wavelets, L^2 Norm of a Function, Piecewise Constant Representation of a Function , Ladder of Subspaces, Scaling Function for Haar Wavelet, Vector Representation of Sequences	**International Academia:** https://ocw.mit.edu/courses/18-327-wavelets-filter-banks-and-applications-spring-2003/ **Industry Mapping:** MATLAB Wavelet Toolbox, PyWavelets, Kymatio (deep learning + wavelet hybrid models)	7	NA	Wavelets and Wavelet Transform Systems and Their Applications by Cajetan M. Akujuobi, Springer	2,3
2	Filter Banks and Frequency Analysis	Introduction to Filter Banks, Haar Analysis Filter Bank in Z-domain, Haar Synthesis Filter Bank in Z-domain, Moving from Z-domain to Frequency Domain, Frequency Response of Haar Low-Pass Filter, Frequency Response of Haar High-Pass Filter Ideal Two-Band Filter Bank, Limitations of Ideal Filter Banks, Realizable Two-Band Filter Banks	**International Academia:** https://ocw.mit.edu/courses/18-327-wavelets-filter-banks-and-applications-spring-2003/ **Industry Mapping:** MATLAB Wavelet Toolbox, PyWavelets, Kymatio (deep learning + wavelet hybrid models)	8	NA	Wavelets and Wavelet Transform Systems and Their Applications by Cajetan M. Akujuobi, Springer	6,7
3	Multirate Systems and Perfect Reconstruction	Upsampling and Downsampling Concepts, Z-domain Analysis of Upsampling and Downsampling, Z-domain Analysis of Two-Channel Filter Banks, Aliasing: Causes and Effects, Methods to Avoid Aliasing, Perfect Reconstruction Concept, Perfect Reconstruction in Haar MRA	**International Academia:** https://ocw.mit.edu/courses/18-327-wavelets-filter-banks-and-applications-spring-2003/ **Industry Mapping:** MATLAB Wavelet Toolbox, PyWavelets, Kymatio (deep learning + wavelet hybrid models)	7	NA	Wavelets and Wavelet Transform Systems and Their Applications by Cajetan M. Akujuobi, Springer	9, 10
4	Wavelets and Wavelet Transform Application to Compression	2D Wavelet Transform Sub-band Decomposition (LL, LH, HL, HH) Multi-Level Decomposition of Images Energy Compaction in Wavelet Domain, Lossless vs Lossy Compression Compression Metrics Redundancy in Image Data Transform Coding Basics	**International Academia:** https://ocw.mit.edu/courses/18-327-wavelets-filter-banks-and-applications-spring-2003/ **Industry Mapping:** MATLAB Wavelet Toolbox, PyWavelets, Kymatio (deep learning + wavelet hybrid models)	10	NA	Wavelets and Wavelet Transform Systems and Their Applications by Cajetan M. Akujuobi, Springer	11

5	Application of wavelet to video compression	Probability Density Function in Signal Analysis, Mean, Variance, and Signal Localization,Time-Bandwidth Product and Its Properties, Optimal Time-Frequency Functions, Limitations of Optimal Functions, Time-Frequency Plane and Tiling, Short-Time Fourier Transform (STFT), Continuous Wavelet Transform (CWT), Effect of Signal Transformations on Statistical Measures	**International Academia:** https://ocw.mit.edu/courses/18-327-wavelets-filter-banks-and-applications-spring-2003/ **Industry Mapping:** MATLAB Wavelet Toolbox, PyWavelets, Kymatio (deep learning + wavelet hybrid models)	8	NA	Wavelets and Wavelet Transform Systems and Their Applications by Cajetan M. Akujuobi, Springer	12

Course outcome:

- Understand theoretical foundations of wavelets and multiresolution analysis
- Design and analyze filter banks for signal decomposition
- Apply perfect reconstruction principles in multirate systems
- Perform time-frequency analysis using wavelets and STFT
- Apply concepts to real-world signals such as images and biomedical signals

Suggested Learning Resources:

Text books:

1. Wavelets and Wavelet Transform Systems and Their Applications by Cajetan M. Akujuobi, Springer

Reference books:

2. Wavelet transforms and their applications by Lokenath Debnath, Birkhäuser, 2002.
3. Wavelet Transforms and Their Applications Recent Advances, Francisco Bulnes, 2022
4. Discrete Wavelet Transforms: Theory and Applications, Juuso T. Olkkonen, IntechOpen

CO-PO Mapping:

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