INSTITUTE OF ENGINEERING & MANAGEMENT

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DEPARTMENT OF ELECTRICAL ENGINEERING

SEMESTER WISE CURRICULAM

4th YEAR- 7th SEMESTER

Semester VII [Fourth year]
Branch/Course: Electrical Engineering

Sl No	Type of Course	Course Code	Course Name	L	T	P	S	Total Contact Hours	Credit Points
Theory									
1	Professional Elective Courses	PEC-EE 701	A. Digital Signal Processing B. Digital Control System C. Electric Drives	3	0	0		3	3
2	Open Elective Courses	OEC-EE 701	A. Embedded system B. VLSI Circuits	3	0	0		3	2
3	Open Elective Courses	OEC-EE 702	A. Big Data Analysis B. Computer Network	2	0	0		2	2
4	Humanities and social sciences including Management	HSMC-701	Human Resource Development & Organisational Behaviour	3	0	0		2	2
5	Humanities and social sciences including Management	ESPEE 701	Essential Studies for Professionals VII	2	0	0		2	0.5
SESSIONAL									
6	Project. Seminar and Industrial Training	PI-EE 781	Industrial Training/Internship				0	0	4
7	Humanities and social sciences including Management	HSMC 781	Skill Development for Professionals VII				2	2	0.5
8	Project. Seminar and Industrial Training	PWEE781	Project (Phase I)				6	6	3
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				**13**	**0**	**0**	**8**	**20**	**17**

University of Engineering and Management

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

Syllabus and Lesson Plan for B.Tech Admission Batch 2022

Subject Name: Digital Signal Processing **Credit: 3** **Lecture Hours: 40**

Subject Code: PEC-EE 701 A

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

List of Faculty Members handling the Subject –

1. Dr. Madhumita Pal

Pre-requisite: Basic knowledge of signals and systems, Fundamentals of Fourier and Laplace transforms, Basic calculus and linear algebra

Course Objective: To impart a solid foundation in discrete-time signal processing including the analysis and design of LTI systems, understanding Z-transforms, DFTs, FFTs, and digital filter design, along with exposure to DSP hardware and FPGA implementation.

Course Outcome: Upon successful completion of this course, students will be able to:

1. Analyze and classify discrete-time signals and systems.
2. Apply Z-transform and convolution for system analysis.
3. Understand and implement DFT/FFT algorithms.
4. Design digital IIR and FIR filters.
5. Familiarize with DSP processors and FPGA implementation of DSP algorithms.

Relevant Links:

1. **Link for Study Material:** **https://drive.google.com/file/d/1e3gU_siRBoFanXwnIPvlk25NkTpXqfsZ/view?usp=sharing**
2. **https://drive.google.com/file/d/1dyPN5xsfm_5LDQMyqKk_5HPc3q2_P_6w/view?usp=sharing**
3. **Link for NPTEL Course:** https://archive.nptel.ac.in/courses/108/101/108101174/
4. **Link for Coursera Course:** **https://www.coursera.org/learn/dsp1**

5. **Link for LinkedIn Learning Course:** **https://www.linkedin.com/pulse/teaching-digital-signal-processing-ai-part-1-alvaro-pardo-2lqcf/**

6. Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Discrete-time signals and LTI systems: Sampling, sequences, operations,	Aligns with signal processing in communication and control	9	Signal generation, convolution (manual and	Oppenheim & Schafer / Proakis & Manolakis	Ch. 1, 2

	convolution, LTI properties	systems, foundational in courses by MIT, Coursera		MATLAB), LTI system verification		
2	Z-Transform, DFT & FFT: ROC, properties, inverse, DFT/IDFT, convolution, FFT algorithms	Used in DSP chip design, MATLAB DSP toolbox, IEEE courses on Z-transform and FFT	15	Z-transform and DFT computation, circular convolution, FFT with signal samples	Proakis & Manolakis	Ch. 3, 4, 5
3	Filter Design: IIR/FIR design, impulse invariant, bilinear transformation, windowing methods	Industry filter design tools (e.g., FDA Tool in MATLAB), used in audio/image systems	5	FIR/IIR filter design using MATLAB, verification of frequency response	Proakis & Manolakis	Ch. 6, 7
4	DSP Processor & FPGA: Architecture, instruction set, algorithm mapping	Matches Texas Instruments' DSP courses, Xilinx FPGA design flows	7	Writing basic code for DSP operations, mapping simple algorithms on FPGA	TMS320C54xx Docs / FPGA Literature	Manuals + Supplement Notes

Lesson Plan:

Module 1: Discrete-Time Signals and LTI Systems

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Introduction to discrete-time signals, sampling and reconstruction concepts
2	Periodic, energy, power signals; basic sequences (unit-step, ramp, etc.)
3	Arithmetic operations on sequences
4	Introduction to LTI systems and impulse response
5	Convolution concepts: graphical, analytical, overlap-add methods
6	Properties of convolution and interconnections of LTI systems
7	Stability and causality in LTI systems
8	Recursive and non-recursive systems

Module 2: Z-Transform, DFT, FFT

WORKING DAY	LESSON PLAN – DESCRIPTION
9	Definition of Z-transform, s-plane/z-plane mapping, ROC
10	Properties of Z-transform with examples
11	Inverse Z-transform: power series, contour, partial fractions
12	Convolution and correlation via Z-transform
13	DFT and IDFT definitions, twiddle factors, matrix form
14	Circular convolution: graphical and matrix methods

15	Linear filtering using DFT, aliasing error
16	Overlap-Save and Overlap-Add methods
17	FFT: Introduction, Radix-2 DIT and DIF algorithms
18	FFT butterflies, signal flow, bit reversal examples

Module 3: Filter Design

WORKING DAY	LESSON PLAN – DESCRIPTION
19	IIR vs FIR filters, system functions, difference equations
20	IIR filter design using impulse invariant and bilinear transforms
21	FIR filter design – linear phase concepts, number of taps
22	FIR filter design using rectangular and Hamming windows
23	FIR design using Blackman window; practical filter specification

Module 4: DSP Processor and FPGA

WORKING DAY	LESSON PLAN – DESCRIPTION
24	Architecture of TMS320C5416/6713 DSP processor
25	Instruction set and writing basic assembly programs
26	Introduction to FPGA architecture and design flow
27	Sub-systems and algorithm mapping on FPGA
28	Case study and design example on FPGA-DSP integration
29	Revision and Q&A

Text Books:

1. **John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, 4th Edition, Pearson Education.**
2. **Sanjit K. Mitra, *Digital Signal Processing: A Computer-Based Approach*, 4th Edition, McGraw-Hill.**

Reference Books:

1. **Alan V. Oppenheim and Ronald W. Schafer, Discrete-Time Signal Processing, 3rd Edition, Pearson Education.**

QUESTION PAPER PATTERN AND DATES

QUESTION PAPER PATTERN AND DATES

EXAMINATION	Dates	PART – A	PART – B	PART – C	TOTAL MARKS
Mid Term 1	**August 11, 2025** **August 22, 2025**	Attempt 5 out of 10 questions; Each question carries 2 marks (2 × 5)	Attempt 2 out of 4 questions; Each question carries 5 marks (5 × 2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10 × 1)	**30**

Mid Term 2	**October 7, 2025 October 17, 2025**	Attempt 5 out of 10 questions; Each question carries 2 marks (2 × 5)	Attempt 2 out of 4 questions; Each question carries 5 marks (5 × 2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10 × 1)	**30**
End Semester Examination	**November 17, 2025 December 2, 2025**	Attempt 10 out of 15 questions; Each question carries 2 marks (2 × 10)	Attempt 6 out of 9 questions; Each question carries 5 marks (5 × 6)	Attempt 5 out of 8 questions; Each question carries 10 marks (10 × 5)	**100**

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Syllabus and Lesson Plan for B.Tech Admission Batch 2022

Subject Name: Digital Control System Credit: 3 Lecture Hours: 40

Subject Code: PEEE701B

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

List of Faculty Members handling the Subject –

1. Dr. Madhumita Pal

Pre-requisite: control systems, discrete-time signals and systems, and Laplace/Z-transform techniques.

Course Objective: To introduce the principles and design techniques of digital control systems, with emphasis on discrete-time modeling, stability analysis, and controller design in the z-domain.

Course Outcome: Upon completion, students will be able to:

1. Model and analyze discrete-time control systems.
2. Design digital controllers using pole placement and frequency-domain techniques.
3. Evaluate system stability and performance in the z-domain.
4. Implement digital control strategies in real-time systems.

Relevant Links:

7. **Link for Study Material:** https://drive.google.com/file/d/1e3gU_siRBoFanXwnIPvlk25NkTpXqfsZ/view?usp=sharing
8. https://drive.google.com/file/d/1dyPN5xsfm_5LDQMyqKk_5HPc3q2_P_6w/view?usp=sharing

9. **Link for NPTEL Course:** https://nptel.ac.in/courses/108103008

10. **Link for Coursera Course:** https://www.coursera.org/learn/modeling-feedback-systems

11. **Link for LinkedIn Learning Course:** https://www.linkedin.com/pulse/digital-control-systems-redouane-kanazy-lawte/

Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	Discrete Representation of Continuous Systems	Aligned with industrial automation and embedded digital controllers	6	Sample-and-hold modeling, quantization, and ZOH in MATLAB	Ogata, Kuo	Ogata Ch. 1, Kuo Ch. 2
2	Discrete System Analysis	Matches with modeling and analysis of discrete-time systems in DSP applications	6	Z-transform and inverse operations, pulse transfer functions	Ogata, Kuo	Ogata Ch. 2–3

3	Stability of Discrete Time Systems	Used in control systems for aerospace and robotics; Jury's test widely adopted	4	Jury test implementation and stability check using MATLAB	Ogata	Ch. 4
4	State Space Approach for Discrete-Time Systems	Related to modern control theory and model-based design in Mechatronics	10	Controllability and observability verification using MATLAB	Kuo, Ogata	Kuo Ch. 5, Ogata Ch. 5
5	Design of Digital Control System	Widely used in PLC, embedded, and motion control design platforms	8	PID tuning, state feedback design, observer simulation	Ogata	Ch. 6
6	Discrete Output Feedback Control	Reflects current research in fast output sampling, periodic feedback in smart grids	8	FOS-based controller and output feedback design in simulation tools	Research articles + Kuo supplementary	Supplementary Notes

Lesson Plan:

Module1 : Introduction to Digital Control Systems

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Introduction to digital control and discrete-time systems
2	Sample and Hold circuit – structure and working
3	Quantization and sampling frequency effects
4	Mathematical modeling of S/H circuit and ZOH equivalent
5	Recap and simulation assignment discussion
WORKING DAY	**LESSON PLAN – DESCRIPTION**
6	Z-transform definition and properties
7	Inverse Z-transform techniques and examples
8	Pulse transfer function derivation
9	Mapping from s-plane to z-plane
10	Discrete-time system response computation
11	Closed-loop system representation and analysis
WORKING DAY	**LESSON PLAN – DESCRIPTION**

12	Jury stability test – introduction and algorithm
13	Stability analysis using Jury's test – examples
14	Bilinear transformation and its use in stability testing
15	Deadbeat controller – design steps
WORKING DAY	**LESSON PLAN – DESCRIPTION**
16	Introduction to state-space models of discrete systems
17	Time-domain analysis using state-space
18	Controllability and reachability criteria
19	Observability and reconstructibility
20	Lyapunov stability theory for discrete systems
21	Effect of pole-zero cancellation on control properties
22	Simulation and design exercise
WORKING DAY	**LESSON PLAN – DESCRIPTION**
23	Design of discrete PID controllers
24	Discrete state-feedback controller design
25	Design of set-point tracker and its advantages
26	Observer design in discrete domain
27	Discrete compensator design and tuning
23	Design of discrete PID controllers
24	Discrete state-feedback controller design
25	Design of set-point tracker and its advantages
26	Observer design in discrete domain
27	Discrete compensator design and tuning

Text Book:

- **K. Ogata, *Discrete-Time Control Systems*, Pearson Education, 2nd Edition**
- **B.C. Kuo, *Digital Control Systems*, Oxford University Press**

Reference Books:

G.F. Franklin, J.D. Powell, M. Workman, *Digital Control of Dynamic Systems*, Pearson

QUESTION PAPER PATTERN AND DATES

EXAMINATION	Dates	PART – A	PART – B	PART – C	TOTAL MARKS
Mid Term 1	**August 11, 2025 August 22, 2025**	Attempt 5 out of 10 questions; Each question carries 2 marks (2 × 5)	Attempt 2 out of 4 questions; Each question carries 5 marks (5 × 2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10 × 1)	**30**
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Syllabus and Lesson Plan for B.Tech Admission Batch 2022

Subject Name: Electrical Drives **Credit: 3** **Lecture Hours: 30**

Subject Code: PEC-EE 701C

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

List of Faculty Members handling the Subject –

1. Prof. Sanjoy Mondal

Pre-requisite: Electrical Machines, Power Electronics

Course Objective:

1. To understand basic concept, classification and principle of operation of Electric Drive.
2. To understand methods of starting and braking of Electric Drive.
3. To understand methods of control of speed of DC and AC machines
4. To solve problem related to Electric Drive

Course Outcome:

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

PEC-EE701C.1. Understand the fundamental principles of electric drives and their applications in various industries and systems.

PEC-EE701C.2. Understand the performance and characteristics of various electric machines and their associated drives.

PEC-EE701C.3. Understand the principles and operation of different power electronic converters used in electric drives and apply this knowledge to select and design suitable converters for specific applications.

PEC-EE701C.4. Analyze and solve problems related to Electric Drives

Relevant Links:

1. **Link for Study Material:**
   https://drive.google.com/file/d/1KCQXWfe89NC-dOdq0VzvKtclsjFdGO_I/view?usp=drive_link
2. **Link for NPTEL Course: (Electrical Drives : Prof. Shyama Prasad Das)**

https://archive.nptel.ac.in/courses/108/104/108104140/

3. **Link for Coursera Course: (Electrical Drive system)**

https://www.coursera.org/videos/electric-vehicle-operation-and-diagnosis/cIztu?query=electrical+drives&source=search

4. **Link for LinkedIn Learning Course:**
   i)https://www.linkedin.com/learning/troubleshooting-common-pc-issues-for-users-13981629/troubleshoot-pc-issues-yourself?u=229219690

Detailed Syllabus:

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	**DC motor characteristics** Review of emf and torque equations of DC machine, review of torque-speed characteristics of separately excited dc motor, change in torque-speed curve with armature voltage, example load torque-speed characteristics, operating point, armature voltage control for varying motor speed, flux weakening for high speed operation.	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/ **Industry:** MATLAB, PSIM	**5**	Not applicable	Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.	**1, 2**
2	**Chopper fed DC drive** Review of dc chopper and duty ratio control, chopper fed dc motor for speed control, steady state operation of a chopper fed drive, armature current waveform and ripple, calculation of losses in dc motor and chopper, efficiency of dc drive, smooth starting.	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/ **Industry:** MATLAB, PSIM	**4**	Not applicable	Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.	**4**

3	**Multi-quadrant DC drive** Review of motoring and generating modes operation of a separately excited dc machine, four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking.	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/ **Industry:** MATLAB, PSIM	**8**	1.Model and simulate the speed control of a DC motor using a chopper- controlled drive in electric vehicles. Focus on how speed is controlled in response to varying loads and terrain	Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.	**5**

4	**Closed-loop control of DC Drive** Control structure of DC drive, inner current loop and outer speed loop, dynamic model of dc motor – dynamic equations and transfer functions, modeling of chopper as gain with switching delay, plant transfer function, for controller design, current controller specification and design, speed controller specification and design.	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/ **Industry:** MATLAB, PSIM	**6**	1.Simulat e the speed control of an induction motor by adding external resistance in the rotor circuit using a chopper. This is used in variable-speed drive systems, such as those in rolling mills, crushers, or conveyors.	Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.	**6**
5	**Induction motor characteristics** Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque-speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, typical torque-speed curves of fan and pump loads, operating point, constant flux operation, flux weakening operation.	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/ **Industry:** MATLAB, PSIM	**4**	1.Model and simulate the performance of a brushless DC motor in an electric vehicle or a high- efficiency fan.	Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.	**7, 8, 9**
6	**Scalar control or constant V/f control of induction motor** Review of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidal modulation, space vector theory,	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/	**3**		Electric Drives Concepts and Applications, Vedam Subrahmanyam,	**7**

	conventional space vector modulation; constant V/f control of induction motor, steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation	**Industry:** MATLAB,			2nd Edition, TMH.	
7	**Control of slip ring induction motor** Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery.	**International Academia:** https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/ **Industry:** MATLAB,			Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.	**7, 8, 9**

Lesson Plan:

Module 1: Electric Drive: 4th Year,Sec A

WORKING DAY	LESSON PLAN – DESCRIPTION
1	Concept, classification, parts and advantages of electrical dives.
2	Types of Loads, Components of load toques, Fundamental torque equations
3	Equivalent value of drive parameters for loads with rotational and translational motion.
4	Determination of moment of inertia, Steady state stability,

	Transient stability.
5	Multi quadrant operation of drives. Load equalization.

Module 2: Motor power rating: 4th Year,Sec A

WORKING DAY	LESSON PLAN – DESCRIPTION
6	Thermal model of motor for heating and cooling,
7	Classes of motor duty, determination of motor rating
8	Torque and power methods of determination of rating for fluctuating and intermittent loads.
9	Effect of load inertia & environmental factors.

Module 3: DC motor drives: 4th Year,Sec A

WORKING DAY	LESSON PLAN – DESCRIPTION
10	DC motor and their performance, Starting, Braking
11	Transient analysis
12	Speed control, Single phase, three phases fully controlled and half controlled DC drives
13	Dual converter control of DC drives.
14	Power factor, supply harmonics and ripple in motor current.

15	Chopper controlled DC motor drives.
16	Closed loop control of DC drives.
17	Applications of AI in speed control of DC motor drive.

Module 4: Induction motor drives:4th Year,Sec A

WORKING DAY	LESSON PLAN – DESCRIPTION
18	Starting an Breaking of three phase induction motor
19	Stator voltage variation by three phase controllers
20	Speed control using chopper resistance in the rotor circuit
21	slip power recovery scheme.
22	Pulse width modulated inverter fed and current source inverter fed induction motor drive.
23	Applications of AI in speed control of induction motor drive.

Module 5: Special motor drives: 4th Year,Sec A

WORKING DAY	LESSON PLAN – DESCRIPTION
24	Variable frequency and Self-Control of synchronous motor
25	Brushless DC motor drive

26	Solar and Battery Powered Drive
27	Stepper motor and Switched Reluctance motor drive

Module 6: Industrial application: 4th Year,Sec A

WORKING DAY	LESSON PLAN – DESCRIPTION
28	Drive consideration for Textile mills, Steel rolling mills
29	Cement mills, Paper mills, Machine tools.
30	Cranes & hoist drives. Design the control circuit of a Lift mechanism

Text Books:

1. Fundamental of Electrical Drives, G.K. Dubey, 2nd Edition, Narosa Publishing House.
2. Electric Drives Concepts and Applications, Vedam Subrahmanyam, 2nd Edition, TMH

Reference Books:

1. Electric Drives Concepts and Applications, Vedam Subrahmanyam, 2nd Edition, TMH.
2. A first course on Electrical Drives, S.K. Pillai, New Age International Publication.
3. Electric Drives, N.K. De, P.K.Sen, PHI Learning Pvt. Ltd.

QUESTION PAPER PATTERN AND DATES

QUESTION PAPER PATTERN AND DATES

EXAMINATION	Dates	PART – A	PART – B	PART – C	TOTAL MARKS
Mid Term 1	**August 11, 2025 August 22, 2025**	Attempt 5 out of 10 questions; Each question carries 2 marks (2 × 5)	Attempt 2 out of 4 questions; Each question carries 5 marks (5 × 2)	Attempt 1 out of 2 questions; Each question carries 10 marks (10 × 1)	**30**
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Syllabus for B.Tech Admission Batch 2023

Subject Name: Embedded system **Credit: 3** **Subject Code: OECEE701A**
Lecture Hours: 40

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

List of Faculty Members handling the Subject –

1. Prof. Norban Kumar Saha

Study Material	Coursera	Nptel	LinkedIn Learning	Infosys Springboard:

Course Objective:

The purpose of learning this course is-

1. To introduce the Building Blocks of Embedded System.
2. To Educate in Various Embedded Development Strategies.
3. To Introduce Bus Communication in processors, Input/output interfacing.
4. To impart knowledge in various processor scheduling algorithms.
5. To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

Course Outcome:

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

CO1. Acquire a basic knowledge about fundamentals of microcontrollers and programming and system control to perform a specific task.
CO2. Acquire knowledge about devices and buses used in embedded networking and develop programming skills in embedded systems for various applications.
CO3. Acquire knowledge about basic concepts of circuit emulators.
CO4. Acquire knowledge about Life cycle of embedded design and its testing.

Module number	Topic	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Text Book	Mapped Chapter
1	**Introduction to Embedded systems**: Introduction – Features – Microprocessors – ALU - Von Neumann and Harvard Architecture CISC and RISC - Instruction pipelining. Microcontroller: characteristics and Features, Overview and architectures of Atmel 89C52 and Microchip PIC16F877 and 18F452. Examples of embedded Systems: Bar-code scanner, Laser printer, Underground tank monitoring.		10	NA	Embedded Systems Architecture, Programming and Design, Ral Kamal TMH, 2008	Chapter 1,2
2	**PIC Microcontroller:** PIC Microcontrollers: 16F877 Architecture and Instruction Set. External Interrupts, Timers, watch-dog timer, I/O port Expansion, analog-to-digital converter, UART, I2C and SPI Bus for Peripheral Chips, Accessories and special features		8	NA	Embedded Systems Architecture, Programming and Design, Ral Kamal TMH, 2008	Chapter 3,4
3	**Software architecture and RTOS:** Software Architecture: Round Robin- Round Robin with interrupts -Function Queue. Scheduling Architecture RTOS: Architecture -Tasks and Task States -Tasks and Data -Semaphores and Shared Data Message Queues -Mail Boxes and pipes -Timer Functions -Events -Memory Management Interrupt Routines		8	NA	Embedded Systems Architecture, Programming and Design, Ral Kamal TMH, 2008	Chapter 5
4	**Basic design using a real time operating system**: Overview. General principles. Design of an embedded system.		6	NA	Embedded Systems Architecture, Programming and Design, Ral Kamal TMH, 2008	Chapter 3,7

5	**Software development tools and debugging techniques:** Development Tool: Cross-Compiler, Cross-Assemblers, Linker/locator. PROM Programmers, ROM Emulator, In-Circuit Emulators. Debugging Techniques. Instruction set simulators. The assert macro. Testing using laboratory tools.		8	NA	Embedded Systems Architecture, Programming and Design, Ral Kamal TMH, 2008	Chapter 12

Lesson Plan:

Module	Working Day	Lesson Plan – Description
Module 1: Introduction to Embedded systems		
	1	**Syllabus discussion: Overview of the course structure, objectives, and outcomes**
	2	Introduction – Features – Microprocessors
	3	ALU - Von Neumann and Harvard Architecture
	4	CISC and RISC - Instruction pipelining
	5	Microcontroller: characteristics and Features
	6	Overview and architectures of Atmel 89C52
	7	Microchip PIC16F877 and 18F452
	8	Examples of embedded Systems: Bar-code scanner
	9	Laser printer
	10	Underground tank monitoring.
Module 2: PIC Microcontroller		
	11	IoT Networking Basics: Overview of internet communications, M2M communication
	12	MQTT Protocol: Basics, message structure, application examples in IoT
	13	CoAP and REST API: Introduction to CoAP, RESTful architecture, use in lightweight IoT systems
	14	Other Communication Protocols: RFID, IEEE 802.15.4, Zigbee; Comparison and use cases

	15	LoRa and Bluetooth: Low-power wireless technologies for IoT, application scenarios
	16	6LoWPAN and WiFi: Features and benefits for IoT, integration in IoT devices
	17	gRPC Protocol: Introduction, role in IoT communication, practical examples
	18	IoT Connectivity Technologies: Comparative study, design considerations
	19	Standards in IoT: International standards and regulations, role in global IoT deployment
	20	Lab Session on IoT Protocols: Practical implementation of MQTT and CoAP, network simulation tools
Module 3: Software architecture and RTOS		
	21	Introduction to Arduino Programming: Basics of Arduino IDE, simple LED and sensor programming
	22	Integration of Sensors: Interfacing analog and I2C sensors with Arduino, practical examples
	23	ESP8266 WiFi Module: Features, applications, connecting to Arduino for IoT projects
	24	Introduction to Python for IoT: Basics of Python programming, Python libraries for IoT
	25	MicroPython Programming: Overview, examples with ESP8266 and sensors
	26	Introduction to Raspberry Pi: Setup, features, basic IoT applications using Raspberry Pi
	27	Introduction to Pico: Features of Raspberry Pi Pico, IoT examples using MicroPython
	28	Implementation of Raspberry Pi using MicroPython: Part 1
	29	Implementation of Raspberry Pi using MicroPython: Part 2
	30	Lab Session on Microcontrollers: Hands-on integration of sensors and WiFi modules, IoT project simulation
Module 4: Basic design using a real time operating system		
	31	Introduction to Cloud Computing: Overview of cloud models and implementation, role in IoT data management
	32	IoT Data Storage and Analytics: Methods for storing and analyzing IoT data, challenges and solutions

	33	Machine Learning in IoT: Overview of ML concepts for IoT, applications in predictive analytics
	34	Selected ML Algorithms in IoT: Implementing algorithms like k-NN, regression, real-world use cases
	35	Cloud Platforms for IoT: Examples like AWS IoT Core, Google Cloud IoT, practical examples and integration
	36	IoT Analytics: Part 1
	37	Lab Session on Cloud Analytics: Uploading IoT data to the cloud, visualizing data using analytics tools
Module 5: Software development tools and debugging techniques		
	38	Home Automation and Precision Agriculture: Smart homes (lights, appliances, security systems), agriculture (irrigation, crop monitoring)
	39	Smart Vehicles and Traffic Management: IoT in autonomous vehicles, traffic optimization systems
	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 Learning Resources:

Text Books

1. G. K. Dubey, “Fundamentals of Electrical Drives”, CRC Press, 2002.
2. R. Krishnan, “Electric Motor Drives: Modeling, Analysis and Control”, Prentice Hall, 2001.

Reference Books

1. Bimal K. Bose, “Modern power electronics and AC drives”, Prentics Hall, 2002.
2. W. Leonhard, “Control of Electric Drives”, Springer Science & Business Media, 2001.
3. G. K. Dubey, “Power Semiconductor Controlled Drives”, Prentice Hall, 1989.

QUESTION PAPER PATTERN AND DATES

QUESTION PAPER PATTERN AND DATES

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End Semester Examination	**November 17, 2025 December 2, 2025**	Attempt 10 out of 15 questions; Each question carries 2 marks (2 × 10)	Attempt 6 out of 9 questions; Each question carries 5 marks (5 × 6)	Attempt 5 out of 8 questions; Each question carries 10 marks (10 × 5)	**100**

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University of Engineering and Management

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

Syllabus and Lesson Plan for B.Tech Admission Batch 2022

Subject Name: VLSI Circuits **Credit: 3** **Lecture Hours: 40**

Subject Code: OEC-EE 701 B

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

List of Faculty Members handling the Subject –

1. Dr. Unmesha Roy

Pre-requisite: Analog and Digital Electronics

Course Objective:

The purpose of learning this course is-

1. To design digital systems
2. To understand and implement verilog code.
3. To analyse Design of Arithmetic function

Course Outcome:

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

OEC-EE 701 B.1. Apply arithmetic function

OEC-EE 701 B.2. Obtain the Algorithmic State Machine Charts,

OEC-EE 701 B.3. Design of memories

OEC-EE 701 B.4. Obtain simulation, Synthesis, Place and Route, and Back Annotation

Detailed Syllabus

Module No	Description	Lecture Hours
1	**Review of digital design :** MUX based digital design (1), Design using ROM, Programmable Logic Arrays (PLA) and Programmable Array Logic (PAL) (2), Sequential circuits and timing - Setup and hold times (1), Sequential circuit design - design of Moore and Mealy circuits (2), Design of a pattern sequence detector using MUX, ROM and PAL (1), and Design of a vending machine controller using PAL (1).	8
2	**Introduction to Verilog coding:** Introduction to Verilog (1), Realization of Combinational and sequential circuits (2), RTL coding guidelines (1), Coding organization and writing a test bench (2).	6
3	**Simulation, Synthesis, Place and Route, and Back Annotation** Design flow (1), Simulation using Modelsim (4), Synthesis using Synplify (4), Place and Route, and Back Annotation using Xilinx (3)	12
4	**Design using Algorithmic State Machine Charts, Design of memories**	8

	Derivation of ASM charts (1), Design examples such as dice game, etc. using ASM charts (3), Implementation of ASM charts using microprogramming (2), and Verilog design of bus arbitrator (1) Verilog realization of Read Only Memory (ROM) (1), Verilog realization of Random Access Memory (RAM) , and Verilog coding of controller for accessing external memory (2).	
5	**Design of Arithmetic functions** Pipelining concept, Verilog design of a pipelined adder/subtractor (1), Design of Multipliers (3), and Verilog design of a pipelined multiplier (1). Testing combinational and sequential logic (1), Boundary scan testing, and Built-in self test (2). Design of a traffic light controller using Verilog (1), and Design of discrete cosine transform and quantization processor for video compression using Verilog (3).	**11**
Total		**40**

Suggested Learning Resources:

Text Books

1. N. Weste and K. Eshranghian, Principles of CMOS VLSI Design, Addison Wesley. 1985
2. L. Glaser and D. Dobberpuhl, The Design and Analysis of VLSI Circuits, Addison Wesley, 1985

Reference Books

1. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979.
2. J. Rabaey, Digital Integrated Circuits: A Design Perspective, Prentice Hall India, 1997.

D. Perry, VHDL, 2nd Ed., McGraw Hill International, 1995

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University of Engineering and Management

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

Syllabus for B.Tech Admission Batch 2022

Subject Name: Big Data Analysis **Credit: 3** **Lecture Hours: 48**

Subject Code: OEC-EE 702 A

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

List of Faculty Members handling the Subject –

1.

Pre-requisite: Data base management system

Course Objective(s):

The purpose of learning this course is-

1. Understand big data for business intelligence.
2. Learn business case studies for big data analytics.
3. Understand nosql big data management.
4. Perform map-reduce analytics using Hadoop and related tools

Course Outcomes:

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

OEC-EE 702 A.1 Describe big data and use cases from selected business domains
OEC-EE 702 A.2 Explain NoSQL big data management
OEC-EE 702 A.3 Install, configure, and run Hadoop and HDFS
OEC-EE 702 A.4 Perform map-reduce analytics using Hadoop

Detailed Syllabus

Module	Content	Hour
1	What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.	8
2	Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.	8

3	Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures	9
4	MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats	10
5	Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.	7
6	Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.	6
Total		48

Suggested Learning Resources:

Text Books

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging
2. V.K. Jain, Big Data and Hadoop, Khanna Publishing House, New Delhi (2017)

Reference Books:

1. V.K. Jain, Data Analysis, Khanna Publishing House, New Delhi (2019).
2. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.

Alan Gates, "Programming Pig", O'Reilley, 2011.

QUESTION PAPER PATTERN AND DATES

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University of Engineering and Management

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

Syllabus and Lesson Plan for B.Tech Admission Batch 2022

Subject Name: Computer Network **Credit: 3** **Lecture Hours: 40**

Subject Code: OEC-EE 702 B

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

List of Faculty Members handling the Subject –

1.

Pre-requisite: Data Structure and Algorithm , Operating System

Course Objective(s):

The purpose of learning this course is-

1. To understand the fundamental concepts of data communication and computer networking.
2. To understand different layers of OSI, TCP/IP model in networking.

Course Outcomes:

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

OEC-EE 702 B.1 Explain the functions of the different layer of the OSI Protocol.

OEC-EE 702 B.2 Draw the functional block diagram of wide-area networks (WANs),local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.

OEC-EE 702 B.3 For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component

OEC-EE 702 B.4 For a given problem related TCP/IP protocol developed the network programming.

OEC-EE 702 B.5 Configure DNSDDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Detailed Syllabus

Module No	Description	Lecture Hours
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.	12

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–NARQ, Selective Repeat ARQ, Sliding Window, Piggy backing, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA	**10**
3	**Network Layer :** Switching, Logical addressing–IPV4, IPV6;Address mapping–ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	**6**
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.	**6**
5	**Application Layer:** Domain Name Space(DNS), DDNS, TELNET, EMAIL, File Transfer Protocol(FTP),WWW ,HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography	**6**
Total		**40**

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University of Engineering and Management

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

Syllabus for B.Tech Admission Batch 2022

Subject Name: Human Resources Development & Organisational Behaviour Credit: 3
Lecture Hours: 24

Subject Code: HSMC- 701

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

List of Faculty Members handling the Subject –

1. Prof. Riya Barui

Pre-requisite: English, Basic knowledge of Management

Course Objectives:

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

1. Build up Organizational Behaviour, Personality and Attitude
2. Develop Group Behaviour & Communication skill
3. Handle the Organizational Politics.
4. Improve Organizational Design structure

Course Outcomes:

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

CO1. know how to behave in organization, to develop attitude, personality, perception, motivation
CO2. know about Group Behaviour, communication, leadership
CO3. know about Organizational Politics, conflict management
CO4. Design of organisation

Detailed Syllabus

Module	Content	Hour
1	Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB.	2
2	Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.	2
3	Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual electivity, Link between Perception and Decision Making.	2
4	Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.	4
5	Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making.	2
6	Communication: Communication Process, Direction of Communication, Barriers to Effective Communication.	2
7	Leadership: Definition, Importance, Theories of Leadership Styles.	2
8	Organizational Politics: Definition, Factors contributing to Political Behaviour.	2

9	Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process.	2
10	Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Conceptsof Organizational Climate and Organizational Culture	4

Suggested Learning Resources:

Text Books:

1. Organizational Behavior, Robbins, S. P. & Judge, T.A, Pearson Education
2. Organizational Behavior, Luthans, Fred, McGraw Hill

Reference Books:

1. Understanding Organizations – Organizational Theory & Practice in India, Shukla, Madhukar, PHI
2. Principles of Organizational Behaviour, Fincham, R. & Rhodes, P. , OUP

Management of Organizational Behavior Leading HumanResources, Hersey, P., Blanchard, K.H., Johnson, D.E.- PHI