24EC511	DIGITAL SIGNAL PROCESSING	PCC	L T P C 3 0 0 3
Prerequisite:	**24EC407**		

COURSEOBJECTIVES:

✓	To apply the fundamental concepts of discrete-time signals and systems, including sampling theorem, LTI system analysis, convolution, and DFT.
✓	To apply the properties of DFT and use efficient techniques such as Radix-2/4 FFT, DIT, and DIF algorithms.
✓	To design and implement IIR digital filters using analog-to-digital transformation techniques.
✓	To design linear phase FIR filters using windowing and frequency sampling methods.
✓	To analyze the effects of finite word length, multirate DSP systems, and DSP processor architectures in real-time applications.
✓	To understand the role of business statistics and emerging trends in digital signal processing.

UNIT-1	BASICS OF DIGITAL SIGNAL PROCESSING & TRANSFORMS	8

Applications: *Audio and Speech Processing Systems, Biomedical Signal Monitoring, Home Appliances, Embedded Systems and IoT Devices, Communication Systems*

Review of signals and systems - Concept of frequency in continuous-time and discrete-time signals - Sampling theorem - Discrete-time signals - Discrete-time systems - Analysis of Linear Time - Invariant (LTI) systems - Convolution and Correlation - Z-transform - Introduction to Discrete Fourier Transform (DFT) - Direct computation of DFT and Inverse DFT.

UNIT-2	FAST FOURIER TRANSFORM & APPLICATIONS	8

Applications: *Biomedical Signal Analysis, Image Processing and Computer Vision, Power System Harmonic Analysis, pattern recognition*

Properties of DFT - Filtering long data sequences - Overlap save and overlap add method - Fast computation of DFT - Radix-2 and Radix-4 FFT algorithms - Decimation in Time (DIT) -Decimation in Frequency (DIF) algorithms - Applications of FFT in Linear Filtering and Correlation.

UNIT-3	DESIGN OF IIR FILTERS	8

Applications: *Biomedical Instrumentation, Communication Systems, Power Electronics and Control Systems, Embedded and Real-Time DSP Systems, Seismic and Vibration Signal Processing*

Characteristics of practical frequency selective filters - Characteristics of commonly used analog filters - Butterworth filters, Chebyshev filter – Design of IIR filters from analog filters(LPF, HPF,BPF,BRF) – Approximation of derivatives, Impulse invariance method, Bilinear transformation

- Frequency transformation in the analog domain – Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

UNIT-4	DESIGN OF FIR FILTERS & FINITE WORD LENGTH EFFECTS	8

Applications: *Audio and Speech Processing, Radar and Sonar Systems, Quantization Noise Analysis, Control Systems and Digital Controllers, Communication Hardware Design*

FIR Filters:

Frequency response of FIR filters - Linear phase FIR filters - Windowing techniques - Rectangular, Triangular, Hamming, Hanning, Blackman and Kaiser windows - Frequency sampling technique - Structure for FIR systems - Applications.

Finite Word Length Effects:

Representation of numbers - Fixed point and floating point - Comparison - Errors due to truncation and rounding-off - Quantization noise and noise power derivation - Coefficient quantization error - Product quantization error - Round-off effects - Limit cycle oscillations.

UNIT-5	MULTIRATE DSP & DIGITAL SIGNAL PROCESSORS	8

Applications: *Communication Systems, Image and Video Processing, Real-Time Embedded Systems, Defense and Satellite Communication*

Interpolation and Decimation - Decimation by an integer factor - Interpolation by an integer factor - Sampling rate conversion by a rational factor - Adaptive Filters: Introduction, Applications of adaptive filtering to equalization - Sub-band coding - Introduction to DSP processors - Architecture of TMS320C5X and TMS320C54X - Black fin Processor - Overview of DSP instruction set - Applications of DSP.

UNIT-6	BUSINESS STATISTICS AND CURRENT TRENDS	5

Market Growth Analysis: Global market statistics and projected growth trends - Market segmentation Statistical Tools & data analytics - Current and emerging technological trends in DSP - Case Studies.

TOTAL: 45PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Apply the fundamentals of discrete-time signals and systems using convolution, correlation, Z-transform, and DFT.
2.	Apply FFT algorithms for efficient computation in spectrum analysis, filtering, and correlation.
3.	Design IIR digital filters using bilinear and impulse invariant transformation techniques.
4.	Design FIR digital filters using window and frequency sampling methods.

5.	Analyze multirate signal processing and adaptive filtering for efficient real-time DSP implementations and processor architectures.
6.	Understand current trends and emerging applications in Digital signal processing.
TEXTBOOKS:	
1.	John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing Principles, Algorithms and Applications, 2021, 5th edition, Pearson Education, Noida, India.
2.	Mitra, S.K., Digital Signal Processing: A Computer-Based Approach, 4th edition, McGraw-Hill, 2011 (Reprint: 2013).
3.	Oppenhiem. A. V and Schaffer R.W, Discrete–Time Signal Processing, 2021,3rd edition, Pearson.
REFERENCES:	
1.	D. Sundararajan., "Digital Signal Processing: An Introduction", Springer, 2024.
2.	Maurice Bellanger & Benjamin Enge., "Digital Signal Processing", Wiley, 10th Edition, 2024
3.	B. Venkataramani and M. Bhaskar, Digital Signal Processors: Architecture, Programming and Applications, 2nd Edition, McGraw Hill Education, 2015.
4.	S. Palani., "Principles of Digital Signal Processing", Springer, 2nd Edition, 2022.
5.	E. S. Gopi., "Digital Signal Processing for Wireless Communication using MATLAB", Springer, 2021
OTHERSOURCES:	
1.	https://www.classcentral.com/course/youtube-electrical-digital-signal-processing-47650
2.	https://www.analog.com/en/resources/analog-dialogue/articles/dsp-101-part-1.html
3.	https://in.mathworks.com/help/dsp/index.html
4.	https://www.mindluster.com/course/15416/Digital-signal-Processing

CO –PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	-	-	-	-	-	-	-	-	-	3	1	-
2	3	2	-	-	-	-	-	-	-	-	-	3	2	-
3	3	3	3	2	2	-	-	-	-	-	-	3	3	-
4	3	3	3	2	2	-	-	-	-	-	-	3	3	-
5	3	2	2	1	1	-	-	-	-	-	1	3	2	1
6	2	1	1	1	1	-	-	-	-	2	3	2	1	3
Low(1) Medium(2) High(3)														

Assessment Weightage:

Formative Assessment		Summative Assessment
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA – Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	10%	15%	10%	10%	15%	15%
U	25%	25%	20%	20%	35%	75%
Ap	55%	60%	40%	40%	35%	-
An	10%	-	-	-	15%	10%
E	-	-	-	-	-	-
C	-	-	30%	30%	-	-

Suggested experiential learning assessment activities

Vertical I (5marks)	Vertical II (5marks)	Vertical III (10marks)
1. Poster presentation 2. Multiple choice quizzes 3. Open book/problem solving exams	1.Self-study– NPTEL/MOOC/ Swayam 2. Online certifications	1. Simulation and design projects 2. Market survey
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
III	Date:28/01/2026	XX	Date:

24EC512	MICROCONTROLLER AND EMBEDDED SYSTEM	PCC	L T P C 3 0 0 3
Prerequisite:	**24EC303, 24EC408**		

COURSE OBJECTIVES:

✓	To study the architecture and programming concepts of 8051 microcontroller
✓	To study the architecture of 16-bit and 32-bit microcontrollers
✓	To understand the fundamentals, characteristics, and design flow of embedded systems.
✓	To understand embedded system architecture, peripheral devices, and interfacing techniques.
✓	To learn and understand the communication protocols and RTOS concepts
✓	To learn and understand the current industry trends including Edge-AI and RISC-V.

UNIT - 1	8051 MICROCONTROLLER	8

Applications: *Home appliances (washing machine, microwave), Automatic street light control, Designing embedded boards ,Smart devices*

Microcontrollers for embedded systems - Overview of 8051 microcontroller - Architecture and functional block diagram - CPU organization and register set - Addressing modes - Instruction set - Program memory and data memory organization - Stack operation and subroutine handling - Interrupt structure and priority - Timers/Counters - Assembly language programming concepts.

UNIT - 2	16-BIT & 32-BIT MICROCONTROLLER ARCHITECTURE	8

Applications: *Consumer electronics (washing machines, ovens), Communication handling (UART, SPI,I2C), Medical monitoring equipment*

16-bit microcontrollers (MSP430 architecture overview) - PIC microcontrollers (8/16-bit architecture overview) - 32-bit ARM Cortex-M architecture - CPU organization - Register set - Memory organization and memory map - Interrupts and exception handling - Clock system and reset circuits - Development tools: Keil and STM32CubeIDE.

UNIT - 3	INTRODUCTION TO EMBEDDED SYSTEMS	8

Applications: *Automotive electronics (ABS, airbags),smart phones, traffic signals, ECG monitor, microwave oven*

Embedded systems vs general computing systems - History and evolution - Purpose of embedded systems - Classification of embedded systems - Major application areas: automotive, medical,

consumer and industrial systems - Embedded system design flow - Common design metrics - Hardware components: processor, memory and I/O devices - Processor technology: general purpose processor, application specific processor and single purpose processor - Real-time systems: hard and soft real-time systems.

UNIT - 4	EMBEDDED SYSTEM ARCHITECTURE AND PERIPHERAL DEVICES	8

Applications: *Controlling LEDs, motors, relays, Servo control in robots, Smart energy meters*

Embedded system architecture - Von Neumann and Harvard architecture - Instruction Set Architecture (ISA) - CISC and RISC architectures - Basic embedded processor architecture - Input, output and peripheral devices - Timers and counters - Interrupt controller - PWM - Keyboard controller - Analog-to-Digital Converter (ADC) - Real-Time Clock (RTC).

UNIT - 5	COMMUNICATION PROTOCOLS AND REAL-TIME EMBEDDED SYSTEMS	8

Applications: *Controlling LEDs, motors, relays, Servo control in robots, Smart energy meters*

Serial communication fundamentals - UART communication - SPI protocol - I2C protocol – Introduction to CAN protocol - Basics of USB in embedded systems - Sensor interfacing using I2C and SPI - Real-Time Embedded Systems - Introduction to RTOS -Task management and scheduling - Context switching - Inter-task communication mechanisms - Introduction to Free RTOS – Multitasking application development.

UNIT - 6	BUSINESS STATISTICS AND CURRENT TRENDS	5

Market Trends: • AI & Edge Intelligence on Microcontrollers
Government policies: India Semiconductor Mission (ISM) & allied schemes, Design-Linked Incentive (DLI) Scheme, Schemes Supporting Electronics & Component Manufacturing: PLI, SPECS, EMC 2.0, etc.
Current Trends: Edge-AI / TinyML on Microcontrollers, Open-source ISAs & Architectures: Rise of RISC‑V and Open-Hardware Ecosystems

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Understand the architecture and programming of the 8051 microcontroller.
2.	Understand the architecture of 16-bit and 32-bit microcontrollers.
3.	Understand the basic concepts, characteristics, and design process of embedded systems.

4.	Use embedded system architecture and interface peripheral devices like timers, ADC, PWM, and interrupts.
5.	Understand and use communication protocols such as UART, SPI, I2C, CAN, and basic RTOS concepts.
6.	Understand current industry trends like Edge-AI and RISC-V in embedded systems.
TEXT BOOKS:	
1.	Mohammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D.McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Second Edition, Pearson Education, 2015.
2.	McKinlay, The 8051 Microcontroller and Embedded Systems - using assembly and C, PHI, 2006 / Pearson, 2006
3.	Kenneth J. Ayala, Dhananjay V. Gadre, The 8051 Microcontroller and Embedded Systems - using assembly and C, Cengage Learning, 2010
REFERENCES:	
1.	Elecia White., *"*Making Embedded Systems: Design Patterns for Great Software" 2nd edition, O'Reilly, 2024.
2.	Jacob Beningo**,** *"*Embedded Software Design: A Practical Approach to Architecture, Processes, and Coding Techniques", Apress (Springer Nature), 2022.
3.	Jonathan Valvano, "Embedded Systems: Introduction to ARM Cortex-M Microcontrollers" 5th edition, Create Space (Amazon) 2021.
4.	Rohit Manglik**,** *"*Microcontrollers and Embedded Systems",EduGorilla Publication, 2024.
5.	Ankaj Gupta**,** *"*Microcontroller and Embedded Systems", 2nd Edition, S.K. Kataria & Sons, Reprint 2024.
OTHER SOURCES:	
1.	https://www.edx.org/
2.	https://www.embedur.ai/embedded-system-ecosystem/
3.	https://www.coursera.org/
4.	https://www.embedded.com/
5.	https://www.emertxe.com/?utm_source

CO – PO MAPPING

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	2	2	1	1	-	-	-	-	-	-	3	1	-
2	3	3	2	2	2	-	-	-	-	-	-	3	2	-
3	3	3	3	2	1	1	-	-	-	-	-	3	2	1
4	3	3	3	2	2	-	-	-	-	-	-	3	3	1
5	3	3	3	3	3	1	-	-	-	-	-	3	3	1
6	2	2	2	1	1	2	2	1	-	-	3	2	3	3
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment		**Summative Assessment**
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA- Continuous Internal Assessment

Assessment of course outcome

Cognitive level	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
R	40%	30%	30%	30%	30%	10%
U	60%	50%	60%	60%	60%	30%
Ap		20%	20%	20%	20%	40%
An						20%
E						
C						

Suggested experiential learning assessment activities

Vertical I (5 marks)	Vertical II (5 marks)	Vertical III (10 marks)
1. Seminar with Virtual presentation 2. Assignments 3. Multiple Choice quizzes	1. Self-study – NPTEL /MOOC/SWAYAM 2. Online Certifications 3. Design Challenges (Hackathons)	1. Case Studies 2. Simulation and design Projects 3. Hackathons 4. Technical Projects
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
III	Date:28/01/2026	XX	Date:

24EC513	CONTROL SYSTEM ENGINEERING	PCC	L T P C 3 0 0 3
Prerequisite:	**24MA101, 24MA202**		

COURSEOBJECTIVES:

✓	To understand the components of control systems and their mathematical representations and compute the transfer function of different physical systems.
✓	To analyze the time-domain response of control systems using standard techniques.
✓	To analyze the frequency-domain response of control systems using various methods.
✓	To analyze the stability of control systems using various stability analysis techniques.
✓	To analyze control systems using state-variable modeling and analysis methods.
✓	To understand recent trends and emerging technologies in control system engineering.

UNIT - 1	INTRODUCTION	8

Applications: *Speed control of motors in conveyors, Manufacturing industries, Aerospace and defense systems, Control of electrical machines*

Control System: Terminology and Basic Structure - Open and closed loop control system - Transfer function - Need for mathematical modeling - Electrical and Mechanical Transfer Function Models - Block diagram reduction - Signal flow graphs - DC and AC servo Systems - Multivariable control system.

UNIT-2	TIME RESPONSE ANALYSIS	8

Applications: *Automation and process industries, Robotics and motion control, Continuous process control, Quality control in manufacturing, Tracking accuracy in missile guidance*

Standard test signals - Type and order of a system - Transient response - Steady state response - Measures of performance of the standard first order and second order system - Time domain specifications - Transient and Steady state error analysis - Static and dynamic error coefficients - Analytical design for PD, PI, PID control systems.

UNIT-3	FREQUENCY RESPONSE ANALYSIS	8

Applications: *Power system voltage and frequency control, Communication system amplifiers, Designing PID controllers in industries, Stability analysis of power grids*

Closed loop frequency response - Frequency domain specifications - Frequency response of standard second order system - Bode plot - Polar plot - Nyquist plots - Design of compensators using Bode plots - Lag, Lead, Lag-Lead.

UNIT-4	STABILITY ANALYSIS	8

Applications: *Aircraft and spacecraft control system, Power electronic converters, Industrial process control loops, Robotic speed and position control, Servo motor control*

Poles and zeros of the system - S Plane - Concept of stability - Bounded Input, Bounded Output stability - Routh stability criterion - Relative stability - Root locus concept - Root locus plot for a system - Nyquist stability criterion.

UNIT-5	CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS	8

Applications: *Aircraft and spacecraft dynamics modelling, Digital control of DC/AC motors, Embedded control systems in automobiles, Digital motor drives*

State variable representation - Conversion of state variable models to transfer functions - Conversion of transfer functions to state variable models - Solution of state equations - Concepts of Controllability and Observability - Equivalence between transfer function and state variable representations - State variable analysis of digital control system - Digital control design using state feedback.

UNIT-6	BUSINESS STATISTICS AND CURRENT TRENDS	5

Fundamentals of business statistics for control engineers - Market growth analysis: Global market statistics and projected growth trends - Current and emerging technological trends in Control system engineering - Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Explain control system components, develop mathematical models, and compute transfer functions of physical systems.
2.	Analyze the time domain specification and calculate the steady state error
3.	Analyze the frequency-domain response of control systems using various methods.
4.	Analyze the stability of control systems using various stability analysis techniques
5.	Analyze various transfer functions of digital control system using state variable models
6.	Understand recent trends and emerging technologies in control system engineering.

TEXTBOOKS:	
1.	Control Systems Engineering: A Practical Approach (3rd edition) by Norman S. Nise, Wiley, 2022.
2.	Feedback Control of Dynamic Systems (9th edition) by J. David Powell, Abbas Emami-Naeini, and Christina M. Ivler Pearson, 2025.
3.	Automatic Control Systems (10th edition) by Farid Golnaraghi and Benjamin C. Kuo McGraw-Hill, 2021.
REFERENCES:	
1.	Modern Control Engineering (6th edition) by Katsuhiko Ogata ,Pearson, 2024.
2.	Control Systems Engineering (9th edition) by Norman S. Nise ,Wiley, 2023.
3.	Digital Control Systems: Analysis and Design (3rd edition) by M. Sami Fadali and Antonio Visioli, Academic Press, 2022.
4.	Linear Control System Analysis and Design with MATLAB (7th edition) by John J. D'Azzo and Constantinos H. Houpis , CRC Press, 2024.
5.	Feedback Control of Dynamic Systems (9th edition) by Gene F. Franklin, J. David Powell, and Abbas Emami-Naeini , Pearson, 2024 .
OTHERSOURCES:	
1.	https://onlinecourses.nptel.ac.in/noc20_ee90/preview
2.	https://www.coursera.org/learn/modeling-feedback-systems
3.	https://ocw.mit.edu/courses/16-30-feedback-control-systems-fall-2010/pages/lecture-notes/
4.	https://www.edx.org/learn/engineering/universitat-politecnica-de-valencia-dynamics-and-control

CO –PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	2	2	-	-	-	2	2	3	2	1
2	3	3	3	3	2	2	-	-	-	2	2	3	2	1
3	3	3	3	3	2	2	-	-	-	2	2	3	2	1
4	3	3	3	3	2	2	-	-	-	2	2	3	2	1
5	3	3	3	3	2	2	-	-	-	2	2	3	2	2
6	1	2	1	1	1	1	-	-	-	1	3	1	1	1
Low (1); Medium (2); High (3)														

ASSESSMENT WEIGHTAGE:

FORMATIVE ASSESSMENT		SUMMATIVE ASSESSMENT
CIA	Experiential Learning	End semester examination
20%	20%	60%

CIA - Continuous Internal Assessment

ASSESSMENT OF COURSE OUTCOME

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	20%	10%	10%	10%	10%	
U	40%	10%	10%	10%	10%	40%
Ap	40%	60%	60%	60%	60%	20%
An		20%	20%	20%	20%	20%
E						20%
C						

SUGGESTED EXPERIENTIAL LEARNING ASSESSMENT ACTIVITIES

Vertical I (5marks)	Vertical II (5marks)	Vertical III (10marks)
1. Seminar with Virtual presentation 2. Assignments 3. Multiple Choice quizzes	1Self-study – NPTEL /MOOC/SWAYAM 2. Online Certifications 3. Design Challenges (Hackathons)	1.Case Studies 2. Simulation and design Projects 3. Hackathons 4. Technical Projects
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
III	Date: 28/01/2026	XX	Date:

24EC514	ELECTROMAGNETICS AND TRANSMISSION LINES	PCC	L T P C 3 0 0 3
Prerequisite:	**Basic Mathematics, 24PH102, 24EC302**		

COURSE OBJECTIVES:

✓	To understand the fundamentals of static electric fields through the application of relevant laws and theorems.
✓	To understand the principles of static magnetic fields and their associated laws.
✓	To analyze time-varying electric and magnetic fields using Maxwell's equations.
✓	To understand the concepts, behavior, and characteristics of transmission lines and apply same for practical problems.
✓	To apply impedance matching techniques using stubs and the Smith Chart.
✓	To familiarize students with recent developments and advancements in electromagnetic field theory and transmission lines.

UNIT - 1	ELECTROSTATICS	8

Applications: *Television, Particle Accelerator, Photocopiers, Laser Printers, Ink Jet Printers*

Basics of coordinate systems - Gradient - Divergence - Curl - Divergence theorem - Stokes theorem - Coulombs law - Electric field intensity - Fields due to different charge distributions - Electric flux density - Gauss law and its applications - Electric potential - Capacitance - Electric boundary conditions - Poisson's and Laplace's equations.

UNIT - 2	MAGNETO STATICS	8

Applications: *Generators, Transformers, Speakers, Telephones, Radios*

Lorentz force equation - Biot- Savart law - Ampere's law - Magnetic field intensity - Vector magnetic potential - Magnetic circuits - Magnetic materials and permeability - Boundary conditions - Inductance and inductors - Magnetic energy - Forces and torques.

UNIT - 3	TIME-VARYING FIELDS AND ELECTROMAGNETIC WAVES	8

Applications: *Magnetic tape, MRI Scan, Built computers, Actuators*

Faraday's law - displacement current - Maxwell -Ampere law, Maxwell's equations (integral and differential forms) - Electromagnetic boundary conditions - Wave equations - Time-harmonic fields - Plane electromagnetic waves in lossless and lossy media - Group velocity - Poynting vector - Power flow - Wave propagation concepts.

UNIT - 4	TRANSMISSION LINE THEORY	8

Applications: *Voltage Transformers, Antenna Feed Lines, Printed Circuit Boards*

General theory of transmission lines - Line parameters - General solution - Infinite line - Wavelength and velocity of propagation - Waveform distortion - Distortionless line - Loading methods - Reflection coefficient - Input and transfer impedance - Open and short-circuited lines - Power delivered and transmission efficiency.

UNIT - 5	**HIGH FREQUENCY TRANSMISSION LINES AND IMPEDANCE MATCHING**	**8**

Applications: *Microphones, Telephone Grids, Telephone Grids, Voltmeters*

Transmission lines at radio frequencies - Lossless and low-loss lines - Voltage and current distribution - Standing waves - Nodes - VSWR - S parameters - Impedance and power measurements - Reflection losses - Impedance matching using quarter-wave, half-wave and one-eighth wave transformers - Single and double stub matching - Smith Chart – Configuration and applications.

UNIT - 6	**BUSINESS STATISTICS AND CURRENT TRENDS**	**5**

Recent trends in transmission power systems - Smartphone manufacturing - Government schemes to boost transmission lines - EMF protection bracelet market - Transmission Line Market Research, 2032 - Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

1.	Apply basic electrostatic laws and theorems to solve problems involving static electric fields.
2.	Apply the principles of static magnetic fields to solve engineering problems.
3.	Analyze time-varying electric and magnetic fields using Maxwell's equations.
4.	Apply transmission line concepts to solve practical engineering problems.
5.	Use impedance matching techniques like stubs and the Smith Chart for transmission line problems.
6.	Identify and understand recent developments in electromagnetic field theory and transmission lines.

TEXT BOOKS:

1.	R.L. Yadav, "Electromagnetic Fields and Waves", 2nd edition, Khanna Book

	Publishing, 2021.
2.	Robert A. Strangeway, Steven S. Holland, James E. Richie., "Electromagnetics and Transmission Lines: Essentials for Electrical Engineering", John Wiley & Sons, 2nd Edition, 2022**.**
3.	William H. Hayt Jr. and John A. Buck., "Engineering Electromagnetics", 9th edition, McGraw Hill, 2020.
REFERENCES:	
1.	Matthew N.O. sadiku and S.V. Kulkarni ., " Principles of Electromagnetics", 6th edition, Oxford University Press, Asian Edition, 2015.
2.	S.Salivahanan & S.Karthie, "Electromagnetic Fields and Waves", 3rd edition, Pearson India, 2024.
3.	Nathan Ida, "Engineering Electromagnetic", 4th Edition, Springer, 2021**.**
4.	Weng Cho Chew., **"**Lectures on Electromagnetic Field Theory: A Comprehensive Overview",Purdue University Press, 2026.
5.	Dr.P. Dananjayan, "Electromagnetic Fields", Lakshmi Publication, 2023.
OTHER SOURCES:	
1.	https://www.getyoureducation.net/course/electromagnetic-theory
2.	https://ocw.mit.edu/
3.	https://www.edx.org/
4.	http://www.nptelvideos.in/2012/12/transmission-lines-and-em-waves.html
5.	https://www.allaboutcircuits.com/

CO – PO MAPPING

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**1**	**1**	**1**	**1**	**3**	**1**	**1**
2	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**1**	**1**	**1**	**1**	**3**	**1**	**1**
3	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**2**	**3**	**2**	**2**
4	**3**	**3**	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**2**	**2**
5	**3**	**2**	**2**	**1**	**3**	**-**	**-**	**1**	**1**	**1**	**2**	**3**	**2**	**2**
6	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**1**	**3**
Low (1); Medium (2); High (3)														

Assessment Weightage:

Formative Assessment		Summative Assessment
CIA	Experiential Learning	End semester examination
20%	20%	60%

*Continuous internal assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	10%	10%	10%	10%	10%	-
U	40%	40%	20%	20%	40%	40%
Ap	50%	50%	40%	40%	50%	20%
An			30%	30%		20%
E						20%
C						

Suggested experiential learning assessment activities

Vertical I (5 marks)	Vertical II (5 marks)	Vertical III (10 marks)
1. Seminar with Virtual presentation 2. Assignments 3. Multiple Choice quizzes 4. Open book/Problem – solving exams	1. Self-study – NPTEL /MOOC/SWAYAM 2. Online Certifications 3. Design Challenges (Hackathons)	1. Case Studies 2. Simulation and design Projects 3. Hackathons 4. Technical Projects
The course instructor can choose different assessment activities based on students interest with reference to standing committee meeting SCM III & Academic council meeting ACM III.		

Recommended by BOS		Approved by ACM	
III	Date: 28/01/2026	XX	Date:

24EC515	DIGITAL SIGNAL PROCESSING LABORATORY	PCC	L T P C 0 0 4 2
Prerequisite:	**24EC407**		

COURSE OBJECTIVES:

✓	Implement fundamental DSP operations such as signal generation, convolution, correlation, and frequency analysis using discrete-time techniques.
✓	Design digital filters using standard methods and demonstrate their filtering characteristics for various applications.
✓	Gain practical exposure to DSP processor architecture and operations, including MAC operations, addressing modes, and sampling rate conversion techniques.

LIST OF EXPERIMENTS: (MATLAB / EQUIVALENT SOFTWARE PACKAGE / DSP PROCESSOR BASED IMPLEMENTATION)	**30**

CYCLE I (MATLAB / EQUIVALENT SOFTWARE EXPERIMENTS)

1.	Generation of elementary Discrete-Time sequences.
2.	Linear and Circular convolutions.
3.	Auto correlation and Cross Correlation.
4.	Frequency Analysis using DFT.
5.	Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation.
6.	Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations.

CYCLE II (DSP PROCESSOR EXPERIMENTS)

7.	Perform MAC operation using various addressing modes.
8.	Generation of various signals and random noise.
9.	Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band Stop filtering.
10.	Design and demonstration of Butterworth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering.
11.	Implement an Up-sampling and Down-sampling operation in DSP Processor.

TOTAL: 30PERIODS

COURSE OUTCOMES:

At the end of the course the students is expected to be able to

1.	Generate discrete-time signals and evaluate their behavior in time and frequency domains using DFT and correlation techniques.
2.	Design and implement FIR and IIR digital filters (LPF, HPF, BPF, BSF) and validate their performance through simulation and practical experimentation.
3.	Apply DSP processor concepts such as architectural features, addressing modes, MAC operations, and multirate signal processing (up-sampling and down-sampling) in real-time signal processing tasks.

CO –PO MAPPING

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3	2	2	3	-	-	-	1	1	-	3	2	2
2	3	3	3	2	3	-	-	-	1	1	-	2	3	3
3	3	2	2	2	3	-	-	-	2	1	1	2	3	3
Low(1) Medium(2) High(3)														

Assessment Weightage:

Formative Assessment			**Summative Assessment**
CIA	Innovative Project / Field visit	Experimental practices	End semester examination
20%	10%	20%	50%

CIA – Continuous Internal Assessment

Assessment of course outcome

Cognitive level	**CO1**	**CO2**	**CO3**
R	10%	5%	5%
U	20%	15%	15%
Ap	35%	40%	45%
An	25%	20%	20%
E	5%	5%	5%
C	5%	15%	10%

Recommended by BOS		Approved by ACM	
III	28/01/2026	XX	

24EC516	MICROCONTROLLER AND EMBEDDED SYSTEM LABORATORY	PCC	L T P C 0 0 3 1.5
Prerequisite:	**24EC512**		

COURSE OBJECTIVES:

✓	To develop programming skills using the 8051 Microcontroller for solving basic computational and data processing problems.
✓	To understand and implement interfacing of peripheral devices such as displays, motors, ADC/DAC, and communication modules.
✓	To provide practical exposure to embedded system design, including timers, interrupts, and communication protocols like UART, I2C, and SPI.

LIST OF EXPERIMENTS:		**30**
1.	Write and execute programs for arithmetic operations (addition, subtraction, multiplication, division of 8-bit numbers).	
2.	Write a program to find the maximum value in an array and perform sorting (ascending/descending)**.**	
3.	Implement code conversion (HEX to ASCII) and basic data manipulation programs.	
4.	Interface and display output using a seven-segment display.	
5.	Interface and control LEDs, relays, and stepper motor using 8051.	
6.	Study and implementation of timers/counters and internal interrupts**.**	
7.	Interface ADC and DAC for analog signal acquisition and generation.	
8.	Implement serial communication using **UART** between two systems.	
9.	Interface devices using I2C / SPI (simulation or hardware).	
10.	Mini project: Real-time embedded application (e.g., traffic light controller / smart street light / home automation).	

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students is expected to be able to

1.	Develop and execute programs using the 8051 Microcontroller for arithmetic operations, data processing, and problem-solving.
2.	Interface and control peripheral devices such as displays, motors, ADC/DAC, and implement timers, counters, and interrupts in embedded applications.

3.	Implement communication protocols like UART, I2C, and SPI, and develop real-time embedded system applications.

CO – PO MAPPING

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	1	2	-	-	-	1	1	2	3	-	-
2	3	3	3	2	3	-	-	-	1	1	2	3	-	-
3	3	3	3	2	3	1	-	-	2	1	3	3	3	-
Low (1) Medium (2) High (3)														

Assessment Weightage:

Formative Assessment			Summative Assessment
CIA	Innovative project/ Field visit	Experimental practices	End semester examination
20%	10%	20%	50%

CIA- Continuous Internal Assessment

Assessment of course outcome

Cognitive level	CO1	CO2	CO3
R	10%	5%	5%
U	20%	15%	15%
Ap	35%	40%	45%
An	25%	20%	20%
E	5%	5%	5%
C	5%	15%	10%

Recommended by BOS		Approved by ACM	
III	28/01/2026	XX	

24HSS05	ENGLISH FOR COMPETITIVE EXAMS	HSMC	L T P C 2 0 0 2
Prerequisite:	Basic reading and writing skills, basic proficiency, including fundamental grammar and vocabulary in English are desirable.		

COURSE OBJECTIVES:

✓	To enhance functional vocabulary in exam-oriented contexts.
✓	To enhance functional grammar usage in exam-oriented contexts.
✓	To strengthen intermediate-level verbal ability skills required for competitive examinations and campus placements.
✓	To develop reading comprehension and logical interpretation skills.
✓	To improve sentence construction, error detection, and verbal reasoning abilities.
✓	To prepare students for time-bound English language sections in recruitment and entrance exams.

UNIT - 1	**VOCABULARY & WORD USAGE**	**2**

Practices on

Synonyms and antonyms - One-word substitutions - Idioms and phrases - Commonly confused words

UNIT - 2	**GRAMMAR & SENTENCE STRUCTURE**	**2**

Practices on

Parts of speech - Subject–verb agreement - Tenses and verb forms - Articles and prepositions - Active and passive voice - Conversion into Direct/ Indirect narration

UNIT - 3	**SENTENCE LEVEL VERBAL ABILITY**	**2**

Practices on

Fill in the blanks - Sentence types and structure - Sentence completion - Cloze tests (basic to moderate level) - Para-jumbles (short passages) - Sentence rearrangement

UNIT - 4	**READING COMPREHENSION**	**2**

Practices on

Short and medium passages - Main idea and supporting details - Vocabulary in context - Factual and inferential questions - Passage-based grammar

UNIT - 5	**VERBAL REASONING & LOGICAL ABILITY**	**2**

Practices on

Analogies - Word classification - Logical sequence of sentences - Statement and conclusion (basic level) - Cause and effect

UNIT - 6	COMPETITIVE EXAM PRACTICE & STRATEGIES	2
Practices on English section patterns in placement and competitive exams - Time management strategies - Common exam traps and errors - Accuracy vs. speed techniques		
		TOTAL: 12 PERIODS

COURSE OUTCOMES:	
At the end of the course the students would be able to	
1.	Use appropriate vocabulary in competitive exam questions.
2.	Use appropriate grammar in competitive exam questions.
3.	Identify and correct common grammatical and contextual errors.
4.	Understand and analyze reading passages with improved speed.
5.	Solve intermediate-level verbal reasoning questions accurately
6.	Apply exam strategies to improve performance in verbal sections
TEXT BOOKS:	
1.	S.P. Bakshi, Objective General English, Arihant
2.	Wren & Martin, High School English Grammar and Composition
3.	Arun Sharma, Verbal Ability and Reading Comprehension
REFERENCES:	
1.	Wren & Martin, High School English Grammar and Composition
2.	M. Ashraf Rizvi – Effective Technical Communication
3.	Previous year question papers (Banking, SSC, GATE, PSU)
OTHER SOURCES:	
1.	https://learnenglish.britishcouncil.org/
2.	https://www.indiabix.com/
3.	https://www.grammarly.com/blog
4.	https://dictionary.cambridge.org/

CO – PO MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
2	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
3	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
6	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
	Low (1) Medium (2) High (3)														

Assessment of course outcome

Cognitive level	CO1	CO2	CO3	CO4	CO5	CO6
R	60%	60%	40%	40%	40%	40%
U	40%	40%	60%	60%	40%	60%
Ap					20%	
An						
E						
C						

Recommended by BOS		Approved by ACM	
XX	Date:	XX	Date: