

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. V Semester**

**Electronics & Communication Engineering**



Rajasthan Technical University, Kota

Effective from session: 2025 – 2026



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC3-01: Computer Architecture

**Credit:2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30,ETE:70)**

**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic Structure of Computers, Functional units, software, performance issues software, machineinstructions and programs, Types of instructions, Instruction sets: Instruction formats,Assembly language, Stacks, Ques, Subroutines.	6
3	Processor organization, Information representation, number formats. Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating pointformats.	5
4	Control Design, Instruction sequencing, Interpretation, Hard wired controlDesignmethods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit.	6
5	Memory organizations, device characteristics, RAM, ROM, Memory management, Concept ofCache & associative memories, Virtual memory.	5
6	System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfacesConcept of parallel processing, Pipelining, Forms of parallel processing, interconnect network.	5
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-02: Electromagnetics Waves

Credit:3

Max. Marks: 100(IA:30,ETE:70)

3L+0T+0P

End Term Exam: 3Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Transmission Lines-Equations of Voltage and Current on TXline, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TXline, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.	08
3	Maxwell's Equations-Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.	03
4	Uniform Plane Wave-Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.	08
5	Plane Waves at a Media Interface-Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.	07
6	Waveguides- Wave propagation in parallel plate waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.	08
7	Radiation-Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna.	07
	<b>Total</b>	<b>42</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-03: Control system

Credit:3

3L+0T+0P

Max. Marks: 100(IA:30,ETE:70)

End Term Exam: 3Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to control problem- Industrial Control examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.	8
3	Feedback control systems- Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feedforward and multi-loop control configurations, stability concept, relative stability, Routh stability criterion.	7
4	Time response of second-order systems- steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.	6
5	Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.	8
6	State variable Analysis- Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability.	6
7	Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, tracking problem. Nonlinear system – Basic concept & analysis.	6
	<b>Total</b>	<b>42</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-04: Digital Signal Processing

**Credit:3**  
**3L+0T+0P**

**Max. Marks: 100(IA:30,ETE:70)**

**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems.	10
3	Discrete Fourier Transform (DFT), Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems.	9
4	Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR DigitalFilters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.	10
5	Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to mult-irate signal processing. Application of DSP.	10
	<b>Total</b>	<b>40</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-05: Microwave Theory & Techniques

Credit:3

3L+0T+0P

Max. Marks: 100(IA:30,ETE:70)

End Term Exam: 3Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/EMC.	4
3	Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.	5
4	Analysis of RF and Microwave Transmission Lines-Coaxial line, Rectangular waveguide, Circular waveguide, Strip line, Micro strip line.	4
5	Microwave Network Analysis-Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters.	4
6	Passive and Active Microwave Devices-Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator. Microwave active components: Diodes, Transistors, Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes. Microwave Tubes: Klystron, TWT, Magnetron.	6
7	Microwave Design Principles-Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.	6
8	Microwave Measurements-Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.	6
9	Microwave Systems-Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.	6
	<b>Total</b>	<b>42</b>

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC5-11: Bio-Medical Electronics

**Credit:2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30,ETE:70)**  
**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Brief introduction to human physiology. Biomedical transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.	9
3	Bio-electrodes and biopotential amplifiers for ECG, EMG, EEG, etc.	7
4	Measurement of blood temperature, pressure and flow. Impedance plethysmography. Ultrasonic, X-ray and nuclear imaging. Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.	11
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC5-12: Embedded Systems

**Credit:2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30,ETE:70)**

**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	The concept of embedded systems design, Embedded microcontroller cores, embedded memories.	5
3	Examples of embedded systems, Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, digital signal processing. Sub system interfacing, interfacing with external systems, user interfacing.	10
4	Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.	12
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC5-13: Probability Theory & Stochastic Process

**Credit:2**  
**2L+0T+0P**

**Max. Marks: 100(IA:30,ETE:70)**

**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.	5
3	Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions;	6
4	Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;	6
5	Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem	5
6	Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.	4
	<b>Total</b>	<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC5-14: Satellite Communication

**Credit:2**

**2L+0T+0P**

**Max. Marks: 100(IA:30,ETE:70)**

**End Term Exam: 3Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.	4
3	Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.	4
4	Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.	5
5	Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift. Satellite link budget	5
6	Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.	4
7	Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.	4
	<b>Total</b>	<b>27</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-21: RF Simulation Lab

**Credit:1.5**

**Max. Marks: 100(IA:60,ETE:40)**

**OL+OT+3P**

**End Term Exam: 2Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Study of field pattern of various modes inside a rectangular and circular waveguide.
3	Find the change in characteristics impedance and reflection coefficients of the transmission line by changing the dielectric properties of materials embedded between two conductors.
4	Design and simulate the following Planar Transmission Lines: I. Strip and micro-striplines II. Parallel coupled stripline III. Coplanar and Slotlines Determine their field patterns and characteristic impedance.
5	Design and simulate the following: I. 3-dB branch line coupler II. Wilkinson powerdivider III. Hybridring IV. Backward wavecoupler V. Low passfilters VI. Band passfilters
6	Design RF amplifier using microwave BJT.
7	Design RF amplifier using microwave FET.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-22: Digital Signal Processing Lab

Credit:1.5

Max. Marks: 100(IA:60,ETE:40)

OL+OT+3P

End Term Exam: 2Hours

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Generation of continuous and discrete elementary signals (impulse, unit-step, ramp) using mathematical expression.
3	Perform basic operations on signals like adding, subtracting, shifting and scaling.
4	Perform continuous and discrete time Convolution (using basic definition).
5	Checking Linearity and Time variance property of a system using convolution, shifting.
6	To generate and verify random sequences with arbitrary distributions, means and variances for following: (a) Rayleigh distribution (b) Normal distributions: $N(0, 1)$ . (c) Gaussian distributions: $N(m, x)$ (d) Random binary wave.
7	To find DFT / IDFT of given DT signal.
8	N-point FFT algorithm.
9	To implement Circular convolution.
10	MATLAB code for implementing z-transform and inverse z-transform.
11	Perform inverse z-transform using residuez MATLAB function.
12	MATLAB program to find frequency response of analog LP/HP filters.
13	To design FIR filter (LP/HP) using windowing (rectangular, triangular, Kaiser) technique using simulink.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

III Year - V Semester: B.Tech. (Electronics & Communication Engineering)

### 5EC4-23: Microwave Lab

**Credit:1**  
**OL+OT+2P**

**Max. Marks: 100(IA:60,ETE:40)**

**End Term Exam: 2Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Study of various microwave components and instruments like frequency meter, attenuator, detector and VSWRmeter.  (a) Measurement of guide wavelength and frequency using a X-band slotted line setup. (b) Measurement of low and high VSWR using a X-band slotted linesetup.
3	Introduction to Smith chart, measurement of SWR, shift in minimum standing wave with unknown load and calculation of unknown load impedance using Smith chart.
4	Study the behavior of terminated coaxial transmission lines in time and frequency domain.
5	(a) Draw the V-I characteristics of a Gunn diode and determine the output power and frequency as a function of voltage. (b) Study the square wave modulation of microwave signal using PINdiode.
6	Study the square wave modulation of microwave signal using PIN diode. Study and measure the power division and isolation characteristics of a microstrip 3dB power divider.
7	Study of rat race hybrid ring (equivalent of waveguide Magic-Tee ) in micro-strip.
8	(a) To study the characteristics of micro-strip 3dB branch line coupler, strip line backward wave coupler as a function of frequency and compare their bandwidth. (b) Measure the microwave input, direct, coupled and isolated powers of a backward wave strip line coupler at the centre frequency using a power meter. From the measurements calculate the coupling, isolation and directivity of the coupler.