

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. V Semester**

**Electronics & Communication Engineering**



Rajasthan Technical University, Kota  
Effective from session: 2019 – 2020



# 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:20, ETE:80)**  
**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Basic Structure of Computers, Functional units, software, performance issues software, machine instructions 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 point formats	5
4	Control Design, Instruction sequencing, Interpretation, Hard wired control Design methods, 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 of Cache & associative memories, Virtual memory.	5
6	System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces Concept 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: 150(IA:30, ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Transmission Lines-Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, 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: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

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: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

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 Digital Filters: 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 multirate 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)

### SEC4-05: Microwave Theory & Techniques

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

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:20, ETE:80)**

**End Term Exam: 2 Hours**

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:20, ETE:80)**

**End Term Exam: 2 Hours**

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:20, ETE:80)**

**End Term Exam: 2 Hours**

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)

### SEC5-14: Satellite Communication

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

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

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: 75(IA:45, ETE:30)**

**OL+OT+3P**

**End Term Exam: 2 Hours**

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-strip lines II. Parallel coupled strip line III. Coplanar and Slot lines Determine their field patterns and characteristic impedance.
5	Design and simulate the following: I. 3-dB branch line coupler II. Wilkinson power divider III. Hybrid ring IV. Backward wave coupler V. Low pass filters VI. Band pass filters
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: 75(IA:45, ETE:30)**

**OL+OT+3P**

**End Term Exam: 2 Hours**

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: 50(IA:30, ETE:20)**

**End Term Exam: 2 Hours**

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 VSWR meter.  (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 line setup.
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 PIN diode.
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.

Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VI Semester**

**Electronics & Communication Engineering**



Rajasthan Technical University, Kota  
Effective from session: 2019-20



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC3-01: Power Electronics

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

**Max. Marks: 100(IA:20, ETE:80)**

**End Term Exam: 2 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	SEMICONDUCTOR POWER DEVICES: Introduction. Basic characteristics & working of Power Diodes, Diac, Triac, MOSFETs, IGBT, GTO, Power Transistor and SCR- Principle of operation, V-I Characteristics, Turn-On mechanism and its applications	6
3	CONVERTERS: Basic concept, Working Principles of Single phase half Wave bridge converter, Single Phase Full Bridge Converter, 3 Phase Bridge Converter	5
4	INVERTERS: Voltage Source Inverter, Current Source Inverter, PWM Control of Voltage Source Converter and applications.	5
5	INDUSTRIAL POWER SUPPLIES: Principle of operation of choppers. Step up, Step down and reversible choppers. Chopper control techniques, High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply.	6
6	MOTOR CONTROL: Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.	5
	<b>Total</b>	<b>28</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-02: Computer Network

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Queuing Theory- Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/ $\infty$ , M/M/m, M/M/1/K and M/M/m/m queues. Little's formula.	7
3	Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts. Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical Multiplexing.	9
4	Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport - Transmission Control Protocol, Remote Procedure Call. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.	9
5	Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing	7
6	Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches. Fundamental of SDN, Open flow.	7
	<b>Total</b>	<b>40</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-03: Fiber Optics Communications

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal analysis of a step index fiber.	8
3	Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR	7
4	Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.	8
5	Optical switches - coupled mode analysis of directional couplers, electro-optic switches. Optical amplifiers - EDFA, Raman amplifier.	8
6	WDM and DWDM systems. Principles of WDM networks. Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and soliton based communication.	8
	<b>Total</b>	<b>40</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-04: Antennas and Propagation

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

**Max. Marks: 150(IA:30, ETE:120)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Fundamental Concepts-Physical concept of radiation, Radiation pattern, near and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.	7
3	Radiation from Wires and Loops-Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.	6
4	Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.	7
5	Broadband Antennas-Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.	5
6	Micro strip Antennas-Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.	6
7	Antenna Arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.	5
8	Basic Concepts of Smart Antennas-Concept and benefits of smart antennas, fixed weight beamforming basics, Adaptive beam forming.	4
9	Different modes of Radio Wave propagation used in current practice.	1
	<b>Total</b>	<b>42</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-05: Information Theory and Coding

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Basics of information theory, entropy for discrete ensembles; Shannon's noiseless coding theorem; Encoding of discrete sources.	15
3	Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.	15
4	Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolutional arithmetic codes.	10
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC5-11: Introduction to MEMS

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction and Historical Background.	1
3	Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending; Energy methods, Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems.	14
4	Scaling Effects. Micro/Nano Sensors, Actuators and Systems overview: Case studies. Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching.	14
5	Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.	10
	<b>Total</b>	<b>40</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC5-12: Nano Electronics

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Introduction to nanotechnology, meso structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.	15
3	Shrink-down approaches: Introduction, CMOS Scaling, The nano scale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).	10
4	Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Bandstructure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation	14
	<b>Total</b>	<b>40</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC5-13: Neural Network And Fuzzy Logic Control

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

**Max. Marks: 150(IA:30, ETE:120)**

**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	<b>NEUROPHYSIOLOGY:</b> Introduction: Elementary neurophysiology – From neurons to ANNs - Neuron model McCulloch-Pitts model, Hebbian Hypothesis; limitations of single-layered neural networks.Applications Of Neural Networks: Pattern classification, Associative memories, Optimization, Applications in Image Processing-Iris, finger print & face, Applications in decision making.	8
3	<b>THE PERCEPTRON:</b> The Perceptron and its learning law. Classification of linearly separable patterns. Linear Networks: Adaline - the adaptive linear element. Linear regression. The Wiener-Hopf equation. The Least-Mean-Square (Widrow-Hoff) learning algorithm. Method of steepest descent. Adaline as a linear adaptive filter. A sequential regression algorithm.Multi-Layer Feedforward Neural Networks: Multi-Layer Perceptrons. Supervised Learning. Approximation and interpolation of functions. Back-Propagation Learning law. Fast training algorithms. Applications of multilayer perceptrons: Image coding, Paint-quality inspection, Nettetalk.	9
4	<b>FUZZY LOGIC:</b> Introduction -Uncertainty & precision, Statistics and random process, Uncertainty in information, Fuzzy sets and membership. Membership Functions: Features of membership function. Standard forms and boundaries, Fuzzification, Membership value assignment – Intuition, Inference, Neural networks. Fuzzy To Crisp Conversions: Maximum membership principle.	7
5	<b>DEFUZZIFICATION METHODS-</b> Centroid method, Weighted average method, Meanmax membership. Fuzzy Rule Based Systems: Natural language, linguistic hedges, Rule based system –Canonical rule forms, Decomposition of compound rules, Likelihood and truth qualification Aggregation of Fuzzy rules. Graphical techniques of reference.	8
6	<b>FUZZY CONTROL SYSTEM-</b> Simple Fuzzy Logic controller, General FLC, Control System Design Problem Control (Decision) Surface, Assumptions in a Fuzzy Control System Design, Special forms of FLC system models, Industrial application: Aircraft Landing Control Problem.Fuzzy Engineering Process Control: Classical Feedback Control, Classical PID Control, Multi-input, Multi-output (MIMO) Control Systems, Fuzzy Statistical Process Control	9
	<b>Total</b>	<b>42</b>

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Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC5-14: High Speed Electronics

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

**Max. Marks: 150(IA:30, ETE:120)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Transmission line theory (basics) crosstalk and nonideal effects; signal integrity: impact of packages, vias, traces, connectors; non-ideal return current paths, high frequency power delivery, methodologies for design of high speed buses; radiated emissions and minimizing system noise; Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion, Intermodulation, Cross-modulation, Dynamic range	10
3	Devices: Passive and active, Lumped passive devices (models), Active (models, low vs High frequency)	6
4	RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed) Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-over distortion Efficiency RF power output stages	8
5	Mixers –Up conversion Down conversion, Conversion gain and spurious response. Oscillators Principles. PLL Transceiver architectures	8
6	Printed Circuit Board Anatomy, CAD tools for PCB design, Standard fabrication, Micro via Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges.	8
	<b>Total</b>	<b>41</b>



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-21: Computer Network Lab

**Credit: 2**  
**OL+OT+4P**

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

**End Term Exam: 2 Hours**

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	PRELIMINARIES: Study and use of common TCP/IP protocols and term viz. telnet rlogin ftp, ping, finger, Socket, Port etc.
3	DATA STRUCTURES USED IN NETWORK PROGRAMMING: Representation of unidirectional, Directional weighted and unweighted graphs.
4	ALGORITHMS IN NETWORKS: computation of shortest path for one source-one destination and one source –all destination
5	SIMULATION OF NETWORK PROTOCOLS: i. Simulation of M/M/1 and M/M/1/N queues. ii. Simulation of pure and slotted ALOHA. iii. Simulation of link state routing algorithm.
6	Case study : on LAN Training kit i. Observe the behavior& measure the throughput of reliable data transfer protocols under various Bit error rates for following DLL layer protocols- a. Stop & Wait b. Sliding Window : Go-Back-N and Selective Repeat ii. Observe the behavior& measure the throughput under various network load conditions for following MAC layer Protocols a. Aloha b. CSMA, CSMA/CD & CSMA/CA c. Token Bus & Token Ring
7	Software and hardware realization of the following: i. Encoding schemes: Manchester, NRZ. ii. Error control schemes: CRC, Hamming code.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-22: Antenna and Wave Propagation Lab

Credit: 1  
OL+OT+2P

Max. Marks: 50(IA:30, ETE:20)

End Term Exam: 2 Hours

SN	Contents
<b>PART-I (Antenna)</b>	
1	Study the gain pattern, HPBW, FNBW and Directivity of a dipole antenna.
2	Measurement of Radiation Pattern, Gain, HPBW of a folded dipole antenna.
3	Measurement of Radiation Pattern, Gain, HPBW of a loop antenna
4	Measurement of Radiation Pattern, Gain, VSWR, input impedance and reflection coefficient for given Monopole antenna
5	Measurement of Radiation Pattern, Gain, VSWR, input impedance and reflection coefficient for given Yagi antennas
6	Study of the Radiation Pattern, Gain, HPBW of a horn antenna
7	Study of the Radiation Pattern, Gain, HPBW of a reflector antennas
8	Study the radiation pattern, gain, VSWR, and input impedance of a rectangular microstrip patch antenna
9	Study the effect of inset feed on the input impedance of a rectangular patch antenna
10	Study the effect of ground plane on the radiation pattern of an antenna
11	Study antenna designing in CST Microwave Studio
12	Design a rectangular microstrip patch antenna using CST MWS
<b>PART-II (Optical Fiber)</b>	
	To perform following experiments based on Fiber Optic Trainer.
13	To set up Fiber Optic Analog link and Digital link.
14	Measurement of Propagation loss and numerical aperture.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-23: Electronics Design Lab

**Credit: 2**  
**OL+OT+4P**

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

**End Term Exam: 2 Hours**

SN	Contents
	<b>To design the following circuits, assemble these on bread board and test them and Simulation of these circuits with the help of appropriate software.</b>
1	Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate.
2	Op-Amp in inverting and non-inverting modes.
3	Op-Amp as scalar, summer and voltage follower.
4	Op-Amp as differentiator and integrator.
5	Design LPF and HPF using Op-Amp 741
6	Design Band Pass and Band reject Active filters using Op-Amp 741.
7	Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
8	Design (i) Astable (ii) Monostable multivibrators using IC-555 timer
9	Design Triangular & square wave generator using 555 timer.
10	Design Amplifier (for given gain) using Bipolar Junction Transistor.
11	Op-Amp characteristics and get data for input bias current measure the output-offsetvoltage and reduce it to zero and calculate slew rate.
12	Op-Amp in inverting and non-inverting modes.
13	Op-Amp as scalar, summer and voltage follower.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

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

### 6EC4-24: Power Electronics Lab

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

**Max. Marks: 50(IA:30, ETE:20)**

**End Term Exam: 2 Hours**

SN	Contents
1	Study the characteristics of SCR and observe the terminal configuration, Measure the breakdown voltage, latching and holding current. Plot V-I characteristics.
2	Perform experiment on triggering circuits for SCR. i.e. R triggering, R-C triggering and UJT triggering circuit.
3	Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac.
4	Study and obtain the waveforms for single-phase bridge converter.
5	Perform experiment on single phase PWM inverter.
6	Perform experiment on buck, boost and buck-boost regulators.
7	Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
8	Control speed of a single-phase induction motor using single phase AC voltage regulator.
9	I. Study single-phase dual converter. II. Study speed control of dc motor using single-phase dual converter.
10	Study single-phase cyclo converter.
11	Perform experiment on Motor control – open loop & closed loop
12	Design, observe and perform experiment on various type of pulse generation from DSP/ FPGA Platform. Perform experiment for PWM inverters and choppers.