B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140711/ 200711	DE	Satellite & Radar Communication	50	10	20	20	-	-	-	100	3	-	_	3

Satellite & Radar Communication (140711/200711)

Course Objective: The main objective of the course is to provide a comprehensive and state of the art knowledge in the area of satellite communication and radar Systems.

Unit I Introduction: Introduction to Satellite Communication, Origin and History of Satellite Communication, Current State of Satellite Communication, Orbital Aspect of Satellite Communication , Orbital Mechanism, Equation of Orbit, Locating Satellite in Orbit , Orbital Elements ,Orbital Perturbation , Frequency Allocations and Applications.

Unit II Space Craft Sub System and Earth Station: Altitude and Orbit Control System , Telemetry Tracking and Commend Power System, Communication Sub System, Earth Station Design , Antenna Tracking, LNA, HPA,RF, Multiplexing Factor Affecting Orbit Utilization, Tracking, Equipment for Earth Station.

Unit III Satellite Link Design: Satellite Link Design, System Noise Temperature and G/T Ratio, Downlink Design, Domestic Satellite System, Uplink Design, Earth Path Propagation Effect, Losses in Link Design.

Unit IV Introduction to RADAR: Principles of RADAR, Radar Frequencies, Pulse RADAR, RADAR Range Equation, RADAR Application, RADAR Cross Section of Targets RADAR Indicator, Noise Figure of Receiver, Mixer Duplexer, Line Pulsar.

Unit V Operational RADAR: MTI RADAR, Delay Line Canceller, Digital Signal Processing, Limitation of MTI RADAR, CW RADAR, FM CW RADAR.

Text Book:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. RADAR System –Skolnik, 4th Edition, Tata McGraw-Hill, 2006.

References Books:

1. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed, 2007.
3. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Course Outcomes

After the completion of this course students will be able to:

CO1. **Explain** Basic Concepts and Terminologies of Satellite Communication
CO2. **Design** the Earth Station and Space Craft System
CO3. **Calculate** the Link Power Budget Including Propagation Effects in Satellite.
CO4. **Evaluate** the Various Performance Factors Related to the RADAR
CO5. **Explain** target Detection and Tracking using Radar Systems.

B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140715/200715	DE	Embedded Systems Design	50	10	20	20	-	-	-	100	3	-	_	3

Embedded Systems Design (140715/200715)

Course Objectives: To introduce the basic concepts of microcontroller and to develop assembly language programming skills along with the introduction of microcontroller applications.

UNIT-I: Introduction: Embedded system architecture, classification, challenges and design issues, fundamentals of embedded processor and microcontrollers, Von Neumann/Harvard architectures, CISC vs. RISC, microcontrollers types and their selection, Overview of the 8051 family, architecture, pin description, Flags, Register Banks, Internal Memory Organization, I/O configuration, Special Function Registers, addressing modes.

UNIT II: **Assembly programming and instruction of 8051:** An Overview of 8051 instruction set, Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

UNIT III: Introduction to ARM Microcontroller: Introduction to pipelining based processors, applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, and stack operation.

UNIT IV: Interfacing real world devices with 8051 microcontroller: Memory address decoding, 8051 interfacing with memory, 8051 interface with 8255 PPI and various interfacings like: LCD and Matrix Keyboard interfacing with 8051 microcontroller, ADC, DAC and Temperature Sensor interfacing with 8051 microcontroller, Stepper motor interfacing.

Unit V: Embedded System Design with Arduino Board: Overview of Arduino, Configuration, Interfacing, Board layout, Atmega328 specifications, Interfacing of Arduino with LED, Switches, Light dependent resistor (LDR), PWM, 16*2 LCD, Serial, L293D for motor interfacing, ADC.

Text Books:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C" Pearson Education India, 2nd Edition.
2. Shibu K V," Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited.

Reference Books:

1. Kenneth Ayal, "The 8051 Microcontroller", Architecture, Programming and Applications.
2. Subrata Ghoshal, "Embedded Systems and Robots, Projects using the 8051 Microcontroller".
3. David A Patterson and John L. Hennessy, "Computer Organization and Design ARM edition".

Course Outcomes:

After successful completion of the course, students will be able to:

CO1. **Explain** the architecture of embedded system and 8051 microcontroller.
CO2. **Develop** programming skill for 8051 microcontroller.
CO3. **Understand** the 32-bit pipelined architecture of ARM microcontroller.
CO4. **Design** Interfacing circuitry for memory and I/O devices using different interfacing with 8051.
CO5. **Develop** skill in programming for Arduino with different peripherals.

B.Tech. VII Semester (Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
200716	DE	Telecom Switching and Networks	50	10	20	20	-	-	-	100	3	-	_	3

Telecommunication Switching and Networks (200716)

Course Objectives: To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access and to introduce a mathematical model for the analysis of telecommunication traffic.

Unit 1 Introduction: Evolution of Telecommunications, Simple Telephone Communication, Manual switching system, Strowger Switching System, Crossbar Switching System, major telecommunication Networks (PSTN, ISDN, WLAN, Ad Hoc Network).

Unit 2 Switching: Circuit Switching, Store and Forward Switching, Electronic Space Division Switching, Stored Program Control, Centralized SPC, Distributed SPC.

Unit 3 Traffic Engineering: Network Traffic load and parameters, Grade of service and blocking probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization.

Unit 4 Telephone Networks: Subscriber Loop Systems, Switching Hierarchy and Routing, Signaling Techniques, In channel signaling, common channel signaling, Cellular mobile telephony.

Unit 5 Data networks: Data transmission in PSTNs, Modems, ISO-OSI/TCP-IP Reference Model, Satellite based data networks, Data network standards (ISDN, DSL / ADSL, Token Ring, Token BUS , Bluetooth , WLAN, ZigBee, SONET / SDH).

Text Book :

1. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications.

Reference Books:

1. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education.
2. John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications

Course Outcomes

After the completion of this course students will be able to:

CO1. Describe fundamentals of telecommunication systems and associated technologies
CO2. Design multi stage switching structures involving time and space switching stages
CO3. Analyze and evaluate the fundamental telecommunication traffic models.
CO4. Examine the working of Telephone Networks.
CO5.Demonstrate broad knowledge of fundamental principles and technical standards underlying Data Networks.

B.Tech. VII Semester (Electronics Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140716	DE	Stochastic Processes	50	10	20	20	-	-	-	100	3	-	_	3

Stochastic Processes (140716)

Course Objectives: To understand the concepts of basic probability, random variables, some standard distributions and random process.

Unit I Probability
Introduction, Experiment, Sample Space, Event, Properties of probability, Joint Probability & MAP detection, Conditional probability, Probability of statistically independent events, Bay's theorem.

Unit II Random Variables
Discrete random variable, Continuous random variable, Probability distribution function of discrete random variable, Cumulative distribution function, properties of CDF, CDF for discrete random variables, Probability density function (PDF), properties of PDF, Joint cumulative distribution function, properties of joint CDF, Joint Probability density function, properties of joint PDF, relationship between joint PDF and probability.

Unit III Statistical Average of random variable
Mean value of continuous random variable, Mean value of discrete random variable, Moments and variance, Uniform distribution, Gaussian distribution, Properties of Gaussian PDF, Rayleigh distribution, complementary error function.

Unit IV Random Process
Ensemble averages, time averages, Random process, Stationary and Non stationary random processes, Wide Sense Stationary process, Ergodic process, Gaussian process, sum of random processes.

Unit V Spectral Density Functions
Correlation function, Autocorrelation function, properties of Autocorrelation, Power spectral densities, Energy spectral densities, response of linear systems to random inputs.

Course Outcomes
After the completion of course student will be able to
CO1: Understand the basic concepts of probability.
CO2: Gain knowledge about statistical distributions of one and two dimensional random variables.
CO3: Understand the basic concepts of Statistical Average of random variable
CO4: Understand the purpose of random processes.
CO5: Gain knowledge about spectral density function

Text Books:
1. John G. Proakis and Masoud Salehi, Digital Communications, TataMcGraw-Hill, 5th Edition, 2014.
2. Simon Haykin, Digital Communications, John Wiley India Pvt., Ltd, 2008.
3. Singh, R.P. & Sapre, S.D, "Communication Systems: Analog & Digital", Tata McGraw-Hill, 5th reprint, 2000.

Reference Books:
1. A. Papoulis, and Unni krishna Pillai, "Probability, Random Variables and Stochastic Processes", Fourth Edition, McGraw Hill, 2002.
2. J. Ravichandran, "Probability and Random Processes for Engineers", First Edition, IK International,2015.

B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
910218	OC	Mobile Communication and 5G Standard	50	10	20	20	-	-	-	100	3	-	_	3

Mobile Communication and 5G Standard (910218)

Course Objective: The objective of the course is to provide an understanding of wireless communication system, its evolution, standards, and comparison of recent technologies and overview of 5G technology.

Unit I: Introduction to cellular mobile systems: Basic Cellular System, Cellular communication infrastructure: Cells, Clusters, Cell Splitting, Frequency reuse concept, Cellular system components, Operations of cellular systems, Handoff/Handover, Channel assignment, Fixed and dynamic, Cellular interferences: Co-Channel and adjacent channel and sectorization.

Unit II: Channel Models: Properties of mobile radio channels – Intersymbol interference – Multipath and fading effects – Interleaving and diversity – Multiple access schemes (TDMA, FDMA, CDMA, SDMA) – Interuser interference – Traffic issues and cell capacity.

Unit III: Modulations techniques for mobile communication: Pulse shaping, Linear and non-linear Modulation techniques, constant envelop modulation, QPSK, MSK, GMSK. Spread spectrum modulation techniques - Direct sequence and Frequency Hopping Spread Spectrum and their applications.

Unit IV: Introduction to modern cellular standards: 2G Architecture such as GSM and CDMA based – 2.5G – GPRS: GPRS and its features –3G standard details such as UMTS – Introduction to LTE, Basic concept of massive MIMO.

Unit V: Overview of 5G Broadband Wireless Communications: 5G potential and applications; Usage scenarios: enhanced mobile broadband (eMBB), ultra reliable low latency communications (URLLC), massive machine type communications (MMTC), D2D communications, V2X communications; Spectrum for 5G and sharing.

Text Books:

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons.
2. 4G, LTE-Advanced Pro and The Road to 5G Third Edition, Elsevier publication

Reference Books:

1. V.K.Garg, J.E.Wilkes, "Principle and Application of GSM", Pearson Education, 5th edition, 2008.
2. T.S. Rappaport ,"Wireless Communications: Principles and Practice", second edition, Prentice Hall publication, 2002.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1. Describe mobile communication system.
CO2. Compare multiple access techniques for signal transmission.
CO3. Explain modulation techniques for mobile communication system.
CO4. Analyze modern cellular standards.
CO5. Discuss 5G technology in mobile communication.

B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
910217	OC	Consumer Electronics	50	10	20	20	-	-	-	100	3	-	_	3

Consumer Electronics (910217)

Course objectives: Objective of this course is to make the students understand the technology behind consumer electronics appliances. The units in the course are designed to impart the concepts of Audio Video systems, Television and other domestic appliances like Microwave ovens and air-conditioning system.

Unit I Introduction to Audio Systems: Microphone, Carbon, Crystal and Moving Coil Microphone. Loudspeakers: Permanent Magnet Loudspeaker and its Construction, Introduction to Woofers and it's Operation, Audio System, Anatomy of Hi-Fi System.

Unit II Television System: Elements of Television System, Scanning Process, Persistence of Vision and Flicker, Vertical and Horizontal Resolution. Introduction to LCD and Plasma Display. Introduction to LED TV Technology.

Unit III Landline and Mobile Telephony: Telecommunication Systems, Modulation Techniques: Analog and Digital Methods, Radio System Characteristics, Telephone Receiver and Handset.

Unit IV Cellular and Mobile Communication: Cellular Communications, Transmitting Receiving Antenna, Digital Cellular Phone Block Diagram, Types of Mobile Phones, Cellular Systems.

Unit V Domestic Appliances: Microwave Oven: Microwaves, Transit Time, Magnetrons, Wave Guides, Microwave Oven Block Diagram. Air Conditioning System: Components of Air Conditioning System, All-Water Air Conditioning System, All-Air Air Conditioning System.

Text Book:

1. S. P. Bali, "Consumer Electronics" Pearson Education India, 2nd Edition.

Reference Books:

1. Electronic communication systems by Roy Blake, Thomson Delmar, Cengage Learning, inc; 2nd edition, 2011
2. Color Television by R.R. Gulati, New Age international; Second edition, 2007
3. How Electronic Things Work.& What to Do When They Don't –Robert L. Goodman, TMH, 1998
4. Digital Satellite Television Handbook By Mark E. Long, Newnes; Pap/Cdr edition, 1999.

Course Outcome:

After completion of the course the students will be able to:

CO1. **Describe** various types of Audio Systems.
CO2. **State** the working principle of Television System.
CO3. **Analyze** the operation of a Landline Telephone System.
CO4. **Explain** the working of Cellular and Mobile System.
CO5. **Explain** the working of various Consumer Electronic appliances.

B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Mark	Lab work & Sessional Marks	Skill based mini project		L	T	P	
140705/ 200705	DLC	Creative Problem Solving	25	25	-	50	-	-	6	3

Creative Problem Solving (140705/ 200705)

Lab Objective:

The lab comprises two modules each of which students need to finish passing this course. These 02 modules are named as

1. Communication Systems
2. Antenna Design

Tools Required:

Network Simulator, QualNet, CST Design Studio

List of Experiments

Communication Module:

1. Program in NS(network simulator)/QualNet to implement different topology
2. Program in NS(network simulator)/QualNet for connecting multiple routers and nodes and building a hybrid topology
3. Program in NS(network simulator)/QualNet to implement FTP using TCP bulk transfer
4. Program in NS(network simulator)/QualNet for connecting multiple routers and nodes and building a hybrid topology and then calculating network performance
5. To analyse network traces using Wireshark software.

Antenna Module

1. Study and overview of CST simulation tool.
2. Design and Simulation of Microstrip Antenna Using CST Tool.
3. Design and Simulation of Microstrip Transmission Line Using CST Tool.
4. Design and Simulation of Waveguide Using CST Tool.
5. Design and Simulation of Half Wave Dipole Antenna Using CST Tool.

Course Outcomes:

After the successful completion of this course students will be able to:

CO1. **Write** a program in Network Simulator for various topologies.
CO2. **Design** a network using NS2 or QualNet.
CO3. **Design** an antenna of given specification.

B.Tech. VII Semester (Electronics Engineering/Electronics and Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
140704/ 200704	DLC	Embedded Systems Design Lab	60	20	20	100	-	-	6	3

Embedded Systems Design Lab (140704/ 200704)

Course Objectives: The objective of this course is to provide students with hands-on experience in designing, implementing, and testing embedded systems using microcontrollers.

List of Experiments

1. Write an assembly language program to transfer a block of data bytes from source memory to destination memory and demonstrate on 8051 microcontroller board.
2. Write an assembly language program to perform Addition/subtraction of a given number and demonstrate on 8051 microcontroller board.
3. Write an assembly language program to demonstrate conditional bit jump, conditional byte jump, unconditional jump, call and return instructions on 8051 microcontroller board.
4. Write an assembly language program to demonstrate the basic interface between an LCD display and 4 x 4matrix key board and demonstrate on 8051 microcontroller board.
5. Write an assembly language program to implement a basic temperature sensor using an ADC output is displayed on a 2x16 LCD and demonstrate on 8051 microcontroller board.
6. Write an assembly language program to implement the basic wave form generation using DAC, output is displayed on a CRO and demonstrate on 8051 microcontroller board.
7. Write an Arduino IDE program for Blinking an LED with a delay of 2 seconds and demonstrate on 8051 microcontroller Ardunio board.
8. Write an Arduino IDE program for to demonstrate automatic traffic light control using Ardunio board. Turn ON Red LED for 4 seconds, Green LED for 5 seconds, Yellow for 2seconds.
9. Write an Arduino IDE program for Blinking an 5 LEDs with a delay of 2 seconds in a sequence.
10. Write an Arduino IDE program for connecting a servo motor to Arduino board and rotate in clockwise and anti-clockwise direction using switches.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1. **Develop** 8051 assembly language programming skills for the various arithmetic and logical operations.
CO2. **Demonstrate** interfacing of 8051 microcontroller board with various interfacing devices.
CO3. **Design** Arduino board based automated electronic systems.

Skill based mini project

1. Design and simulate Arduino based Temperature and Humidity monitoring system with DHT22 sensor on Proteus.
2. Design and simulate Arduino Password Based Door Lock System on Proteus.
3. Design and simulate Digital voltmeter using Arduino UNO Range: 0-50 volt Using SIMULINO UNO on Proteus.
4. Design and simulate Automatic Door Open System With Vistor Counter using ARDUINO UNO R3 on Proteus.
5. Design and simulate Arduino based light sensor using LDR on Proteus.