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Name of Program: Bachelor of Technology in Electronics & Communication

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC601	EC	Wireless Communication	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

Motivation for the wireless systems and technology enhancement, to be in phase with outer world.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to:

1. Determine the type and appropriate model of wireless fading channel based on the system parameters and the property of the wireless medium.
2. Analyze and design receiver and transmitter diversity techniques.
3. Determine the appropriate transceiver design of multi-antenna systems and evaluate the data rate performance.
4. Design wireless communication systems with key 3G (e.g., CDMA) and 4G (OFDM) technologies.
5. Describe and differentiate four generations of wireless standard for cellular networks.

Syllabus

UNIT I **8 Hrs.**

Introduction to wireless standards (2G/3G/4G), BER performance of Communication system in AWGN channel, modeling of Wireless systems, Rayleigh fading channel, BER performance of wireless system, channel estimation.

UNIT II **8 Hrs.**

Mobile radio Propagation: Small scale fading and multipath, Impulse response model of a multipath channel, Parameters of mobile multipath channels: Time dispersion parameters, Coherence bandwidth, Doppler spread and Coherence time. Types of Small scale fading: Flat fading and Frequency Selective fading, fast and Slow Fading.

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UNIT III **8 Hrs.**

Diversity: Introduction, micro diversity, macro diversity and simulcast, combination of signals, error probability in fading channels with diversity reception, transmit diversity.
Equalizers: Introduction, linear equalizers, decision feedback equalizers, maximum likelihood sequence estimation (Viterbi detector), and comparison of equalizer structures, fractional spaced equalizers, blind equalizers.

UNIT IV **9 Hrs.**

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Spread Spectrum: Direct Sequence and Frequency Hopping, PN sequence and its properties, Time hopping impulse radio, Multi-user detection

UNIT V **9 Hrs.**

Overview of Wireless Standards: architecture and applications of GSM, GPRS, EDGE, LTE, MIMO, WCDMA

Text Books:

1. Theodore S. Rappaport, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson PHI Publication, 2009.
2. Aditya Jagannatham, "Principles of Modern Wireless Communication Systems: Theory & Practice", 1st Edition, McGraw Hill, 2016.

References:

1. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 1st Edition, 2005.
2. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 1st Edition, 2005.
3. Andreas. F. Molisch, "Wireless Communications", John Wiley – India, 2nd Edition.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC602	EC	Antenna and Microwave Engineering	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C – Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
To provide the fundamental aspects of antennas, their principle of operation and their applications and also to learn the basic theory pertaining to microwaves and other high-frequency devices and subsystems and examine some of its applications to modern communication systems.

Course Outcomes (COs):
After completion of this course the students are expected to be able to demonstrate the following knowledge, skills and attitudes

1. Elucidate the basic concepts of electromagnetic wave theory and describe basic radiating antennas.
2. Select antennas and antenna arrays as per their operating frequency ranges and radiation pattern for the specific application & mode of wave propagation.
3. Demonstrate fundamental understanding of microwave components and circuits in terms of electrical characteristics of waveguides through electromagnetic field analysis.
4. Gain proficiency in using various microwave sources, their principle of operation and measurement of various parameters and fundamental understanding of the various Semiconductor devices and Amplifiers.

Syllabus

UNIT I **8 Hrs.**

Fundamentals of Radiation: Definition of antenna parameters: Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Duality and Reciprocity theorems matching, Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi-Uda antenna.

UNIT II **8 Hrs.**

Aperture and Slot Antennas: Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna, Reflector antenna, Aperture blockage, Feeding structures, Slot antennas, Microstrip Antennas: Radiation mechanism & Applications, Numerical tool for antenna analysis.

UNIT III **9 Hrs.**

Antenna Arrays and Special Antennas: N element linear array, Pattern multiplication, Broadside and End fire array: Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array. Principle of frequency independent antennas: Spiral antenna, Helical antenna, Log periodic. Modern antennas: Reconfigurable antenna, Active antenna, Dielectric antennas.

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UNIT IV **9 Hrs.**

Waveguides & Microwave Components: General representation of EM field in terms of TEM, TE and TM components, Rectangular & Circular waveguide. Wave guide parameters, Dominant Poles, Power Loss. Microwave Components: Construction and operation of E-plane, H-plane, Magic Tee and Directional couplers. Ferrite components: Faraday rotation, Construction and operation of Gyrator, Isolator and Circulator.

UNIT V **9 Hrs.**

Microwave Tubes & Solid-State Devices: Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications. PIN Diode, Tunnel Diode, TEDs, Gunn Diodes, IMPATT diode and TRAPATT diode. Structural details, principle of operation, various modes, specifications, and applications of all these devices.

Text Books:

1. John D. Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas for all Applications", Tata McGraw-Hill Book Company, 5th Edition, 2017.
2. A. R. Harish, M. Sachidananda, "Antennas and Wave propagation", Oxford University Press, 1st Edition, 2007.
3. Samuel Y. Liao, Microwave Devices and Circuits, 3rd Edition, PHI, 2003
4. D.M. Pozar, "Microwave Engineering", John Wiley & Sons,4th Edition, 2011

References:

1. E.C. Jordan and Balmain, "Electromagnetic waves and Radiating Systems", Pearson Education / PHI, 2nd Edition, 2006.
2. G.S.N. Raju, "Antenna Wave Propagation", Pearson Education, 1st Edition, 2004.
3. Constantine A. Balanis, "Antenna Theory Analysis and Design", John Wiley, 2nd Edition, 2007.
4. A. Das and S.K. Das," Microwave Engineering", Tata McGraw Hill, 2nd Edition, 2009

List of Experiments:

1. Studying antenna parameters, Radiation pattern, Pattern beam width Radiation intensity, Directivity, Gain, Radiation efficiency, Front to back ratio.
2. To plot the radiation characteristics and to understand the concept of directivity of antenna and beam widths.
3. To learn about current distribution of center fed and end fed y/2 antenna to measure and compare the current distribution of centre fed and end fed half wave dipole antennas.
4. To verify the radiation pattern of the Yagi-Uda antenna in transmitting mode is same as that of receiving mode.
5. To plot the radiation pattern of end fire arrays.
6. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide.
7. To study the V-I characteristics of Gunn Diode.
8. Determine the S-parameter of E Plane Tee, H plane Tee and Magic Tee.
9. Measurement of isolation and insertion loss of a circulator.
10. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of Multi-Hole directional coupler.

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Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Name of Program: Bachelor of Technology in Electronics & Communication

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC603	EC	Discrete Time Signal Processing	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective:

This course will introduce the basic concepts and techniques for processing of discrete time signals. To familiarize with the important methods in DSP, including digital filter design, transform-domain processes and Multirate processing.

Course Outcome:

After completion of this course the students are expected to be able to demonstrate following attributes:

1. Student will be able to represent discrete time signal analytically and visualize them in the time & frequency domain and also understand the different transforms techniques & their significance.
2. Student will be able to analyze and design the discrete time system and design different digital filters using the concept of digital signal processing.

Syllabus:

UNIT I **10 Hrs.**

Discrete-Time Signals and Systems: Discrete-time signals, discrete-time systems, system properties (linearity, time-invariance, memory, causality, BIBO stability), analysis of discrete-time LTI systems, discrete time systems described by difference equation, solution of difference equation

UNIT II **10 Hrs.**

z-Transform: The direct z-transform, Region of Convergence , properties of ROC, properties of the z-transform, inverse z transform, analysis of linear time-invariant systems in the z- domain, pole-zero plots, time-domain responses of simple pole-zero plots, causality and stability.

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UNIT III **10 Hrs.**

Discrete Fourier Transform: DFT, Properties of the DFT, Efficient computation of the DFT: Decimation-in-time and Decimation-in frequency Fast Fourier transform algorithms, decomposition for 'N' composite number.

UNIT IV **10 Hrs.**

Digital filters Design Techniques: Design of IIR digital filters: Approximation of Derivatives, Impulse invariant and Bilinear transformation, Lowpass/Highpass Butterworth & Chebyshev filter design, Design of FIR digital filters: windowing techniques Rectangular, Hamming, Hanning windows.

UNIT V **10 Hrs.**

Multi rate digital signal processing: Introduction, design of practical sampling rate converters, Decimators, Interpolators, signal flow graph, Polyphase decompositions.

Text Books:

1 John. G Proakis & D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Application", 4th Edition, Pearson Education,2007.
2 S.Salivahanan, A Vallavaraj & C.Gnanapriya, "Digital Signal Processing", 3rd Edition, TMH, 2017.
3 A.V. Oppenheim & R.W. Schaffer, "Digital Signal Processing", 3rd Edition, PHI, 2010.

References:

1 Rabiner and Gold: Theory and Application of Digital Signal Processing, I st Edition, PHI Learning, 2009.
2 Ingle and Proakis: Digital Signal Processing- A MATLAB based Approach, 3rd Edition, Thompson, Cengage Learning, 2010.
3 S. K. Mitra, "Digital Signal Processing: A Computer Based Approach", 4th Edition, TMH, 2013.

List of Experiment:

1. Generate, analyze and plot various discrete-time signals.
2. Verify the operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implement linear time-invariant (LTI) systems and test them for stability and causality.
4. Analyze and Compute z-transforms of various discrete time signals.
5. Compute DFT of sequences and generate the phase and frequency plots.
6. Generate linear convolution of two sequences and plot the response.
7. Generate circular convolution of two sequences and plot the response.
8. Design IIR Filter for the given parameters.
9. Design FIR Filter for the given parameters.
10. Implement Up sampling and Down sampling of a sinusoidal signal and analyze the results.

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SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC614	EC	Advanced Digital Design(HDL)	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:-

The subject aims to provide the student with:

1. Learn digital design principles and practice and learn to design using building blocks such as counters, shift registers, and adders.
2. Learn design concepts of Programmable Logic Devices such as FPGAs and CPLDs.
3. Learn methods to design clocked sequential circuits using state diagrams and tables, state reduction and state assignment methods.
4. Learn to perform timing analysis at each step of the design.

Course Outcomes:-

The students will have the ability

1. To apply knowledge of mathematics, science, and engineering.
2. To design and conduct experiments, as well as to analyze and interpret data.
3. To identify, formulate, and solve engineering problems.
4. To use the techniques, skills, and modern engineering tools.

Syllabus :

UNIT I **8 Hrs.**

Review of Basic Digital Logic Design: Combinational Logic- Multiplexer, Demultiplexer, Encoder, Decoder, Structured Logic Implementation, Sequential Logic- Latches and Flip Flops, Registers, Counters, Finite State Machines, Programmable Logic Devices- PROM, PLA, PAL, CPLD and FPGA.

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UNIT II **9 Hrs.**

Design for Area: Throughput, Latency, Setup and Hold Time, Pipeline, Parallel Design, Rolling Up the Pipeline, Control Based Logic Reuse, Resource Sharing , Impact of Reset on Area, **Design for Speed-** Parallel Structures, Flatten Logic Structures, Register Balancing , Reorder Paths, **Design for Power-** Clock Skew, Input Control, Reducing the Voltage Supply, Dual Edge Triggered Flip Flops.

UNIT III **8 Hrs.**

High Level System Design: Abstract Design Technique, Graphical State Machine, Hardware Software Co-Design, **Clock Domains-** Crossing Clock Domain Problems and Solutions, Gated Clocks, **Static Timing Analysis-** Standard Analysis, Latches, Asynchronous Circuits.

UNIT IV **9 Hrs.**

Coding for Synthesis: Decision Trees, Priority Versus Parallel, Full Conditions, Multiple Control Branches, Traps- Blocking Versus Non Blocking, For Loops, Combinatorial Loops, Inferred Latches, **Synthesis Optimization-** Speed Versus Area, Resource Sharing, Pipelining, Retiming, Register Balancing, FSM Compilation.

UNIT V **9 Hrs.**

Floorplanning: Design Partitioning,Critical-Path Floorplanning, Floorplanning Dangers ,Optimal Floorplanning, **Place and Route Optimization**-Optimal Constraints, Relationship between Placement and Routing, Logic Replication, Optimization across Hierarchy,I/O Registers, Mapping Logic into RAM, Register Ordering, Placement Seed,**PCB Issues**- Power Supply, Decoupling Capacitors.

Text Books:

1. Advanced FPGA design: Architecture, Implementation, and Optimization, Steve Kilts, Wiley, 2007
2. Stephen Brown I Zvanko Vranesic :Fundamentals of Digital Logic with Verilog Design, The Mc Graw Hill, 3rd Edition 2014.

References:

1. Peter Wilson: Design Recipes for FPGA using Verilog and VHDL, Newnes Publication, 2nd Edition 2016.
2. M. Morris Mano, Michael D. Cilletti: Digital Design With An Introduction to The Verilog HDL,Pearson, 5th Edition ,2012.
3. Charles H. Roth, Jr., Larry L. Kinney :Fundamentals of Logic Design, Cengage Learning, 7th Edition, 2014.
4. William I. Fletcher, An Engineering Approach to Digital Design, PHI, 1st Edition, 2015.

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List of Experiments

Students should implement and verify digital design for –

1. Finite State Machines
2. Algorithmic State Machines
3. Pipeline Modeling
4. Retiming Strategies
5. Register Balancing
6. Priority Structuring
7. Parallel Structuring
8. Reset Strategies
9. Serial Protocol Implementation
10. Iterative Math's Functions

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Name of Program: Bachelor of Technology in Robotics and Automation

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA512		Industrial Automation	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C – Credit.
***Teacher Assessment** shall be based on following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
Provides the knowledge of the industrial automation, computer aided measurement and control system, PLC, SCADA and DCS

Course Outcomes (COs):
Students will be able to:
1. Understand the requirement of Computer in Industrial Automation and its benefits.
2. Implement Programmable Logic Controller and its various applications.
3. Apply various types of Industrial Sensors and Distributed control systems for industrial automation.

Syllabus

UNIT I **8 Hrs.**
Introduction to PLC: What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, and limitations of relays? Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

UNIT II **9 Hrs.**
Working of PLC: Basic operation and principles of PLC, Scan Cycle, Memory structures, I/O structure, Programming terminal, power supply.

UNIT III **8 Hrs.**
Instruction Set: Basic instructions like latch, master control self-holding relays. Timer instruction like retentive timers, resetting of timers, Counter instructions like up counter, down counter, resetting of counters. Arithmetic Instructions (ADD, SUB, DIV, MUL etc.) MOV instruction-RTC (Real Time Clock Function) Watch Dug Timer Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal

UNIT IV **9 Hrs.**
Ladder Diagram Programming: Programming based on basic instructions, timer, counter, and comparison instructions using ladder program.

UNIT V **8 Hrs.**

Applications of PLCs: Object counter, On-off control, Car parking, Sequential starting of motors, Traffic light control, Motor in forward and reverse direction, Star-Delta, DOL Starters, Filling of Bottles, Room Automation

Text Books:

1. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2. Introduction to PLCs by Gary Dunning. McGraw Hill
3. Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4. "Introduction to Computer Based Control Systems", IDC Technologies, 2012

References:

1. Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek
2. Jalandhar Module on "Allen Bradlag PlC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
3. Publications Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh

List of Experiments

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system.
2. Practical steps in programming a PLC (a) using a Handheld programmer (b) using computer interface.
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax.
4. Basic logic operations, AND, OR, NOT functions Study, understand and perform experiments on timers and counters.
5. Logic control systems with time response as applied to clamping operation.
6. Sequence control system e.g. in lifting a device for packaging and counting.
7. Use of PLC for an application (teacher may decide).

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC515	EC	Data Communication and Computer Networks	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Introduce the concept of communication protocols and give an overview of Data Communication Standards.
2. Allow the student to gain expertise in specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes:

Student will be able to:

1. Understand the principles of Open Systems and the Transport/Application protocols, which facilitate them.
2. Analyze the services and features of the various layers of data networks.
3. Explain the importance of data communications and the Internet in supporting business communications and daily activities.

Syllabus:

UNIT I **08 Hrs.**

Introduction: data communications, network criteria, categories of networks, network performance and transmission impairments, network devices, protocols and standards, data representation, data transmission, transmission modes, transmission media, LAN topologies, network models, layered tasks, the OSI model, TCP/IP protocol suite, addressing, encoding, switching technique and multiplexing.

UNIT II **10 Hrs.**

Data link control, point-to-point and multi-point links, flow control techniques, error control techniques, HDLC as a bit oriented link control protocol, Ethernet, fast Ethernet, gigabit Ethernet, token ring, token bus, FDDI , multiple access protocols-pure and slotted aloha, wireless LANs: IEEE &02.11 and Bluetooth, introduction to virtual circuit switching including frame relay, X.25.

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UNIT III **10 Hrs.**

Network layer design issues, routing versus forwarding, static and dynamic routing, unicast and multicast routing, distance-vector, link-state, shortest path computation, dijkstra's algorithm, congestion control algorithms, network layer protocols (IP, ICMP, ARP, RARP, DHCP, BOOTP), IP addressing, IPv4, IPv6.

UNIT IV **10 Hrs.**

UDP, TCP and SCTP, multiplexing with TCP and UDP, principles of congestion control, Approaches to congestion control, Quality of service, flow characteristics, techniques to improve QoS.

UNIT V **07 Hrs.**

Domain name system , domain name space, dynamic domain name system, electronic mail and file transfer, WWW, HTTP, SNMP, overview of digital signature and digital certificates technology, cryptography – basic concepts, public/private key encryption.

Text Books:

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw–Hill, Fourth Edition, 2011.
2. Andrew S. Tanenbaum, "Computer Networks", Pearson education, Fourth Edition, 2009.

References:

1. Prakash C. Gupta, "Data Communications and Computer Networks", PHI, Second Edition, 2014.
2. Ajit Pal, "Data Communications and Computer Networks", PHI, First Edition, 2014.
3. Wayne Tomasi , "Introduction to Data communications and Networking", Pearson education, First Edition, 2009.

List of Experiments:

1. To study of Different Types of Network Equipment's.
2. To perform data transmission using RS-232 Interface.
3. To perform Synchronous and Asynchronous transmission.
4. To perform Parallel and Serial transmission.
5. To implement Ring topology using DB-9.
6. To implement cross cable connection and straight cable connection.
7. To study of network IP.
8. To implement & simulate various types of routing algorithm using Network Simulator.
9. To simulate STOP AND WAIT Protocols on NS-2.
10. To simulate various Routing Protocol on NS-2.
11. To simulate various Network Topologies on NS-2.
12. To configure routers, bridges and switches and gateway on NS-2.

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SUBJECT CODE	Catego-ry	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC605	EC	**Programming in Embedded C**	0	0	0	30	20	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C – Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To develop programming skills using C language for development of embedded system using 8051 microcontrollers.

Course Outcomes (COs):

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

1. Interface external devices with 8051 microcontrollers.
2. Design and develop microcontroller based small scale embedded system.

Syllabus

Overview of 8051 Microcontroller: Processor Core, Memory Organization, SFR's and their functionality.
Programming Concepts: Compiler, C & Embedded C, Data Directives, Data types, Arithmetic & Logical Operators, Conditional and Control Statement, Functions, Parameter passing and return types, programming and debugging,
On-Chip Peripherals: Input/output Ports, Timers & Counters, Interrupts, UART.
External Interfaces: LED's, Switches, Seven Segment Display, LCD, Keypad Matrix.
Protocols: SPI, I2C

Text Books:

1. Mazidi and Mazidi, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd Edition, Pearson Education, 2008
2. A.K. Ray & K.M. Bhurchandi, "Advanced Microprocessors and Peripheral-Architecture, Programming and Interfacing", Tata McGraw –Hill, 3rd edition, 2012.

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References:

1. Rajkamal, "Microcontrollers Architecture, programming, interfacing and system design", Pear son education, 2011.
2. Kenneth J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded Systems using Assembly and C", Cengage Learning, 2008

List of Experiments:

1. Introduction to IDE & Development board.
2. Interface LED with 8051 then develop a program to turn on and off the LED at specific interval.
3. Interface switch with 8051 then develop a program to use switch as input device.
4. Interface and develop a program for the display characters on 7-segment display.
5. Develop 8051 C language programs for LCD Interfacing.
6. Develop 8051 C language program to generate a square wave using timers.
7. Write a program in 8051 C to interface DC motor.
8. Develop programs in 8051 C to interface different sensors.
9. Write a program in 8051 C to interface Keypad.
10. Write a program in 8051 C to establish serial communication with other peripherals.

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