Shri VaishnavVidyapeethVishwavidyalaya, Indore

Name of Program: Bachelor of Technology in Electronics & Communication

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEE503	EE	Control System Engineering	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 Educational Objectives (CEOs):

The course will provide understanding of open loop and closed loop systems. Students will understand the stability, time and frequency domain responses of first and second order system inputs.

Course Outcomes (COs):

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

1. Demonstrate the understanding of basic elements and modeling of the control system.
2. Determine mathematical models of physical systems.
3. Analyze the stability in time domain and frequency domain.
4. Design the controllers and compensators for the system.

Syllabus

UNIT I **9 Hrs.**

Introduction: Basic Elements of Control System, Open loop and Closed loop systems, Differential equation, Transfer function, Modeling of Electrical systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph, Constructional and working concept of ac servomotor.

UNIT II **9 Hrs.**

Time Domain Analysis: Standard test signals, Time response of first order systems, Characteristic Equation of Feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants. P, PI, PD and PID Compensation.

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UNIT III **8 Hrs.**

Stability Analysis and Root locus: The concept of stability – Routh's stability criterion: qualitative stability and conditional stability, limitations of Routh's stability. The root locus concept: construction of root loci, effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT IV **9 Hrs.**

Frequency domain Analysis: Frequency domain specifications: Bode diagrams, determination of Frequency domain specifications and Phase margin and Gain margin, Stability Analysis from Bode Plots, Polar Plots, Nyquist Plots Stability Analysis. Compensation techniques: Lag, Lead, Lead-Lag Controllers design in frequency Domain.

UNIT V **9 Hrs.**

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations, State Transition Matrix and it's Properties, Concepts of Controllability and Observability.

Text Books:

1. J.Nagrath and M.Gopal," Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.

References:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition, 1995.
2. M.Gopal, "Digital Control and State Variable Methods", 2nd Edition, TMH, 2007. Schaum's Outline Series, "Feedback and Control Systems", Tata McGraw- Hill, 2007.
3. John J.D'azzo & Constantine H.Houpis, "Linear control system analysis and design", Tata McGrow-Hill, Inc., 1995.
4. Richard C. Dorf & Robert H. Bishop, "Modern Control Systems", Addidon – Wesley, 1999.

List of Experiments:

1. To generate step response of a transfer function.
2. To generate impulse response of a transfer function.
3. To generate ramp response of a transfer function.
4. To determine the torque speed characteristics and transfer function of a DC servomotor.
5. To analyze the characteristics of a small AC servomotor and determine its transfer function.
6. To determine the transient and frequency response of a second order system.
7. To analyze the performance of various types of controllers used to control the temperature of an oven.

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8. To analyze the stability using Nyquist plot from a transfer function.
9. To generate root locus from a transfer function.
10. To analyze the stability using Bode plot from a transfer function.
11. To analyze the performance characteristics of analog PID Controller using simulated system.
12. To design different cascade compensation network for a given system.

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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*				
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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			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	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 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 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.

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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.

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. Sachidanada, "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 Desin, John Wiley, 2nd Edition, 2007.
4. A.Das and S.K.Das,"Microwave Engineering", Tata McGraw Hill, 2nd Edition, 2009
5. R.E.Collins, "Foundations of Microwave Engineering", IEEE Press, John Wiley, 2nd Edition,2002
6. S. Vasuki, "Microwave Engineering", Tata McGraw Hill, 1st Edition, 2015

List of Experiments:

Experiments for Antenna:

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.

Experiments for Microwave Engineering:

1. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide.
2. To study the V-I characteristics of Gunn Diode.
3. Determine the S-parameter of E Plane Tee, H plane Tee and Magic Tee.
4. Measurement of isolation and insertion loss of a circulator.
5. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of Multi-Hole directional coupler.

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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*				
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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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC624	EC	Television and RADAR Engineering	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 Educational Objectives:-

The objective of this course is to-

1. To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
2. To study the principles of Monochrome Television Transmitter and Receiver systems.
3. To study the various Color Television systems with a greater emphasis on PAL system.
4. To study the advanced topics in Television systems and Video Engineering
5. To study the basic working of RADAR.
6. To study princle of various types of RADAR.

Course Outcomes:-

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

1. To understand the basics of colour TV broadcasting.
2. To understand the characteristics of Digital TV system.
3. To understand the concepts of colour picture tubes.
4. To understand different TV technologies.
5. To understand the operation of MTI & Pulse Doppler RADAR.

Syllabus:

UNIT I **8 Hrs**

Elements of Television system:

Picture transmission and reception, synchronization, composite Video signal, Fundamental of Monochrome and Colour television system, Modulation Schemes, aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal: Horizontal and vertical sync, scanning sequence, Bandwidth requirement, Frequency allocation, Standard of monochrome & Colour TV System, Camera tubes, monochrome picture tubes, TV transmission Antennas.

UNIT II **8 Hrs**

Fundaments of Color Television:

Compatibility, colour perception, colour television display tubes- delta gun, precision in line and Trinitron colour picture tubes, purity and convergence, automatic degaussing circuit- grey scale tracking, colour signal transmission, bandwidth,modulation of colour difference signals, significance of

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selecting (R-Y) and (B-Y) signal, Formation of chrominance signal, NTSC, PAL-D & SECAM systems - merits and demerits, colour television receiver, ghost images during propagation of television signals, block schematic and function requirements for television receivers

UNIT III **8 Hrs**

Advanced Television Systems:

Introduction to cable T.V. Systems, HDTV, CCTV, satellite T.V., digital television – Transmission and reception, projection Television – Flat panel display, 3D T.V., Displays devices - LCD - LED - OLED - operation & comparison.

UNIT IV **8 Hrs**

RADAR & its Types:

Introduction, Maximum Unambiguous Range, Radar Waveforms,. Simple form of the Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of Radar.
Introduction to Doppler and MTI radar, Doppler frequency shift, CW Radar, FM-CM Radar, Moving-target-detection, Pulse Doppler radar.

UNIT V **8 Hrs**

Tracking with RADAR:

Types of Tracking Radar Systems, Monopulse Tracking- Amplitude Comparison Monopulse (one-and two-coordinates), Limitation of tracking accuracy, Phase Comparison Monopulse, Low angle tracking.

Text Book

1. R R Gulati, "Monochrome and Colour Television" New Age International Publishers, 3rd edition 2014
2. A.M.Dhake, "TV and Video Engg." TMH, 2nd Edition -2006
3. A K Sen, "Radar system & Radio aids to Navigations", Khanna publication 7th edition, 2016
4. M. Kulkarni, "Microwave & Radar Engineering", Umesh publication, 3rd edition, 2015

References:

1. R.R.Gulati "Modern Television Practice – Transmission, Reception, Applications" New Age International 5th Edition, 2015
2. B. Grob and C.E. Herndon, "Basic Television and Video Systems" , McGraw Hill, 6th Edition1999.
3. S.P.Bali, "Color TV, Theory and practice", TMH, 1994.
4. Manohar Lotia & Pradeep Nair "Modern VCD-Video CD Player Introduction, servicing and troubleshooting", BPB Publications 2002.
5. Skolnik "Introduction to Radars" , TMH, 2nd edition, 2017

List of Experiments:

1. To demonstration of T. V. Trainer.
2. To learn about the R. F. (radio frequency) Section.
3. To understand the working of Video-IF section.
4. To learn the operation of Video & Chroma section.
5. To study the Function of Horizontal oscillator section and horizontal output section.

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6. To Learn about the working of sound section.
7. To study of Doppler Effect.
8. To study application of Radar as object counter.
9. To Measure Speed of a fan and various Other things.
10. To Simulate the Variable Speed of Moving Objects using Velocity Simulator.

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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*				
BTEI604		Digital Image 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 Educational Objectives (CEOs):

1. To understand the fundamentals of digital image processing.
2. To create awareness about various types of Image transform used in digital image processing.
3. To give knowledge about the different types of Image enhancement techniques used in digital image processing.
4. Aware of the Image compression and Segmentation used in digital image processing.

Course Outcomes (COs):

Student will be able to:

1. Understand origin and use of digital image processing.
2. Explain the image fundamentals and mathematical transforms necessary for image processing.
3. Apply the image enhancement, compression, and restoration techniques.
4. Implement the image segmentation and representation techniques.

Syllabus:

UNIT I **9 Hrs**

Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels. Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, K-L Transform.

UNIT II **8 Hrs**

Gray level transformations, Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering. Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

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UNIT III **9 Hrs**

Image Restoration: Model of Image Degradation/restoration process, Noise models, Inverse filtering, Least mean square filtering, Constrained least mean square filtering, Blind image restoration, Pseudo inverse, Singular value decomposition.

UNIT IV **8 Hrs**

Image Segmentation: Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds basic concepts, Dam construction, Watershed segmentation algorithm.

UNIT V **10 Hrs**

Need for data compression, Huffman coding, Run Length Encoding, JPEG standard, MPEG. Variable length coding, LZW coding, Bit plane coding, predictive coding.

Color Imaging: Color fundamentals, Color models, Color transformation, Smoothing and Sharpening, Color segmentation

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 4th Edition, Pearson, 2018.
2. Wilhelm Burger, "Principles of Digital Image Processing: Advanced Methods", 2012.

References:

1. Rafael C. Gonzalez, Richard E. Woods & Steven L. Eddins, "Digital Image Processing using MATLAB", 2nd Edition, 2010.
2. Munesh Chandra Trivedi, "Digital Image Processing", 1st Edition, 2014.
3. Ikvinderpal Singh, "Digital Image Processing", 1st Edition, 2015.
4. Ashish Jain, "Digital Image Processing (Implementation Using MATLAB)", 2012.

List of Experiments:

1. Study of Matlab Image processing Toolbox.
2. Analysis of Pixel distance measurement Methods
3. Implementation of Image Input Output Techniques.
4. Perform Image representation Techniques.
5. Analysis of Image Display Techniques.
6. Perform Image reshaping Techniques.
7. Implementation Image filtering Techniques.
8. Analysis of Image Compression.
9. Analysis of Image Segmentation.
10. Analysis of Image Restoration.

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Name of Program: Bachelor of Technology in Electronics & Communication

SUBJECT CODE	Catego-ry	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*				
BTEC605	EC	Programming in Embedded C	0	0	0	60	40	0	0	2	1

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):

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

Course Outcomes (COs):

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

1. Interface external devices with 8051 microcontroller.
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.

References:

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

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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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