ELECTRONICS ENGINEERING DEPARTMENT

इलेक्ट्रानिक्स अभियांत्रिक विभाग

SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT

सरदार वल्लभभाई नेशनल इन्स्टीयुट ओफ टेक्नोलोजी, सुरत

क्रमांक: ECED/ / 2014-15 दिनांक: 08/01/2015

Appendix – 1

B.Tech. III(E&C), V Semester

Sr. No.	Course Name	Code	Teaching Scheme			Credit	Examination Scheme			Total
			L	T	P		Theory	Tutorial	Practical	
1	DIGITAL COMMUNICATION	EC 301	3	1	2	5	100	25	50	175
2	DIGITAL SIGNAL PROCESSING	EC 303	3	1	2	5	100	25	50	175
3	ANALOG INTEGRATED CIRCUITS	EC 305	3	1	2	5	100	25	50	175
4	ELECTROMAGNETIC WAVES & RADIATING SYSTEMS	EC 307	3	1	2	5	100	25	50	175
5	EIS-I	EC 3XX	3	0	0	3	100	--	--	100
	Total		15	04	08	23	500	100	200	800
	Total Contact Hours per week									

EIS - I:INTERDISCIPLINARY ELECTIVE SUBJECTS		
1.	EC 309	Audio - Video Engineering Applications
2.	EC 311	Neural Networks & Applications
3.	EC 313	Sensors & Transducers
4.	EC 315	VLSI Technology
5.	EC 317	Statistical Signal Analysis
6.	EC 319	Laser Technology

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Appendix 2

B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	
EC 301:DIGITAL COMMUNICATIONs(NEW)	**3**	**1**	**2**	**5**	

BASEBAND TRANSMISSION TECHNIQUES	**(08 Hours)**
Formatting Text,Sampling And Analog To Digital Conversion, Quantization Techniques- Uniform and Non-Uniform, A-law and mu-Law, Pulse Code Modulation (PCM), Digital Telephony Example: PCM In T1/E1 Carrier System, Digital Multiplexing, DPCM And ADPCM, Delta Modulation.	
PRINCIPLES OF DIGITAL DATA TRANSMISSION	**(08 Hours)**
Digital Communication System, Line Coding, Pulse Shaping For Optimum Transmission, ISI And ISI-Free Signals, Band-limiting Of Rectangular Pulses, Raised Cosine Filtering, Duo binary Signaling, Scrambling, Regenerative Repeaters, Matched Filter And Equalizers, Timing Extraction, Eye Diagrams: An Important Tool, PAM: M-ary Baseband Signaling For Higher Data Rate.	
INTRODUCTION TO INFORMATION THEORY	**(08 Hours)**
Measure Of Information, Source Encoding, Error-Free Communication Over Noisy Channel, Channel Capacity Of Discrete As Well As Continuous Memoryless Channel, Shannon's Equation, Frequency Selective Channel Capacity.	
CODING	**(04 Hours)**
Introduction to Entropy and Source Coding Techniques For Digital Signal, Introduction to Channel Coding Techniques And Error Correcting Codes.	
BANDPASS SIGNAL TRANSMISSION-DIGITAL CARRIER SYSTEM	**(08 Hours)**
Representation Of Digital Modulated Signal, ASK, PSK, FSK, QAM with Mathematics and Constellation Diagram, Spectral Characteristics Of Digitally Modulated Signals. M-Ary Digital Carrier Modulation.	
BANDPASS SIGNAL RECEPTION	**(06 Hours)**
Synchronization, Decision Theory, Bandpass Receiving Filter, Error Performance Of Bandpass Systems, Performance Evaluation Of Communication Systems, BER.	
	(Total Contact Time:42 Hours)

PRACTICALS
01) Study of Sampling Theorem.
02) Study of Pulse Code Modulation And Demodulation.
03) Study of PAM/PWM/PPM Modulation.
04) Study of Delta Modulation And Demodulation.
05) Study of ASK, FSK, PSK, QAM With Performance Analysis Under Channel Effects And BER.
06) Study of Line Coding Techniques.
07) Study and Implement the Effect Of Raised Cosine Filter.
08) Study Of Eye Diagram, Constellation Diagram, Etc.
09) Source Coding And Error Control Coding Techniques.

BOOKS RECOMMENDED
1. Bhattacharya Amitabh, "Digital Communication", Tata McGraw-Hill, 1st Ed., 2006.
2. Lathi B.P. and Ding Zhu, "Modern Digital And Analog Communication Systems", Oxford University Press, 4th Ed., 2010
3. Sklar Bernard, "Digital Communications — Fundamentals and Applications", Pearson Education-LPE, 2nd Ed., 2009
4. Proakis J. and Satoh' M., "Fundamentals Of Communication Systems", PHI/Pearson Education-LPE, 2nd Ed., 2006
5. Leon W. Couch, II, "Digital And Analog Communication Systems", Pearson Education-LPE, 6th Ed., 2004
6. Glover Lan and Grant Peter, "Digital Communications", Pearson Education-LPE, 1st Ed., 2008

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EC 303: DIGITAL SIGNAL PROCESSING (NEW)	**3**	**1**	**2**	**5**	

REVIEW OF DISCRETE-TIME SIGNALS AND SYSTEMS	**(04 Hours)**
Discrete - Time Signals, Signal Classification, Discrete - Time System And Analysis Of Discrete —Time Linear Time Invariant Systems, Correlation Of Discrete - Time Signals.	
FAST FOURIER TRANSFORM	**(06 Hours)**
Introduction, Direct Evolution Of DFT, The Fast Fourier Transform, Decimation-In-Time Algorithm, Summary Of Steps Of Radix-2 DIT-FFT Algorithm, Decimation-In-Frequency Algorithm, Summary Of Steps Of Radix-2 DIF-FFT Algorithm.	
FINITE IMPULSE RESPONSE FILTERS	**(07 Hours)**
Causality And Its Implications, Linear Phase FIR Filters, Frequency Response Of Linear Phase FIR Filters, Location Of The Zeros Of Linear Phase FIR Filters, The Fourier Series Method Of Designing FIR Filters, Design Of FIR Filter Using Windows, Digital Differentiator, Hilbert Transformers, Frequency Sampling Method Of Designing FIR Filters, Optimum Equi-ripple Approximation Of FIR Filters.	
INFINITE IMPULSE RESPONSE FILTERS	**(09 Hours)**
Introduction, Frequency Selective Filter, Design Of Digital Filter From Analog Filter, Analog Low Pass Filter Design, Analog Low Pass Butterworth Filter, Analog Low Pass Chebyshev Filter, Comparison Between Butterworth Filter And Chebyshev Filter, Frequency Transformation In Analog Domain, Design Of High Pass, Bandpass And Bandstop Filters, Design Of IIR Filters From Analog Filters, Approximation Of Derivatives, Design Of IIR Filter Using Impulse Invariance Technique, Design Of IIR Filter Using Bilinear Transformation, Frequency Transformation In Digital Domain.	
FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS	**(04 Hours)**
Floating Point Numbers, Block Floating Point Numbers, Quantization Noise, Input Quantization Error, Product Quantization Error, Coefficient Quantization Error, and Quantization In Floating Point Realization Of IIR Digital Filters, Finite Word Length Effect In FIR Digital Filters.	
REALIZATION OF DIGITAL FILTER	**(07 Hours)**
Realization Of FIR Filters, Transversal Structure, Linear Phase Realization, Lattice Structure Of An FIR Filter, Polyphase Realization Of FIR Filter, Realization Of Digital Filter, Direct Form-I Realization, Direct Form-11 Realization, Signal Flow Graph, Transposition Theorem And Transposed Structure, Cascade Form, 6 Parallel Form Structure, Lattice Structure Of IIR System, Comb Filter, All Pass Filter, Minimum Phase, Maximum Phase And Non-minimum Phase Systems.	
MULTIRATE SIGNAL PROCESSING	**(07 Hours)**
Introduction, Down Sampling, Spectrum Of The Down Sampled Signal, Up Sampling Spectrum Of The Up-Sampled Signal, Anti-Imaging Filter, Cascading Sample Rate Converters, Efficient Transversal Structure For Decimator, Efficient Transversal Structure For Interpolator, Polyphase Structure Of Decimator, Polyphase Decimation Using The Z- Transform, Polyphase Structure Of Interpolator, Polyphase Interpolation Using The Z-Transform, Multistage Implementation Of Sampling Rate Conversion, Introduction to Multiresolution Processing, Waveletes and Sub-Band Representation.	
	(Total Contact Time:42 Hours)

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PRACTICALS
01) Find DFT Of A System Using MATLAB.
02) Implement FFT Algorithm Using MATLAB.
03) Find Solution of Difference Equation Using MATLAB.
04) Find Circular Convolution of Given System.
05) Design FIR Filter.
06) Design IIR Filter.
07) Study Of 6000 Series DSP Processor.
08) Implement FIR Filter Using Code-Composer Studio.
BOOKS RECOMMENDED
1. Proakis J. G. and Manolakis D. G., &qout;Digital Signal Processing: Principles, Algorithms And Applications&qout;, Pearson Education, 3rd Ed., 2003.
2. Babu Ramesh P., &qout;Digital Signal Processing&qout;, SciTech Publication, 41fl Ed., 2008.
3. Mitra Sanjit K., &qout;Digital Signal Processing: A Computer Based Approach&qout;, 3rd Ed., Tata McGraw-Hill, 2008.
4. Oppenhein A. V. and Shafer R. W., &qout;Discrete-Time Signal Processing&qout;, PHI, 2nd Ed., 2000.
5. Shaliwahan S., Vallavaraj A. and Gnanapriya C., &qout;Digital Signal Processing&qout;, Tata McGraw-Hill, 2nd Ed., 2001.
6. Padmanabhan K.,&qout;A Practical Approach to Digital Signal Processing&qout;, New Age International, 1st Ed., 2001.

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EC 305: ANALOG INTEGRATED CIRCUITS (NEW)	**3**	**1**	**2**	**5**	

DIFFERENTIAL AMPLIFIERS	**(06 Hours)**
BJT/MOSFET Differential Amplifier, DC Transfer Characteristics Of An Emitter-Coupled Pair / Source - Coupled Pair, Current Mirrors (Bipolar / MOS), Bipolar Widlar Current Source/ MOS Widlar Current Source, Cascaded Differential Amplifier Stages And Level Translator, AC And DC Analysis Of Cascade Amplifier.	
OPERATIONAL AMPLIFIER FUNDAMENTALS	**(06 Hours)**
Operational Amplifier, Basic Op-Amp Configuration, An Op-Amp With Negative Feedback, Voltage Series And Voltage Shunt Configurations, Difference Amplifiers, Instrumentation Amplifier, Specification Of An Op-Amp, Offset Voltages And Currents, CMRR, Slew Rate, PSRR, Frequency Response, GBW Product, Input Bias And Offset Currents, Error Caused By lb and los Input Offset Voltage, Errors Caused By V„, Low Input Offset Voltage OpAmps, DC Error Model Of Different Circuit, Input Offset-Error Compensation.	
GENERAL LINEAR APPLICATIONS	**(05 Hours)**
Summing, Scaling And Averaging Amplifiers, Voltage To Current Converter With Floating And Grounded Load, Current To Voltage Converter, Integrator And Differentiator.	
ACTIVE FILTERS AND OSCILLATORS	**(08 Hours)**
First Order Active Filters, Second-Order Active Filters, Multiple—Feedback Filters (Band Pass And Band Reject Filters), All Pass Filter, State Variable And Biquad Filter, Cascade Design Of Filters, Oscillators, Phase Shift And Wien Bridge Oscillators, Square, Triangular And Saw Tooth Wave Generators.	
NON-LINEAR CIRCUITS	**(04 Hours)**
Schmitt Trigger, Voltage Comparator, Voltage Limiters And Window Detector, Clippers And Clampers, Peak Detector, Precision Rectifiers, Analog Switches.	
SPECIALIZED IC APPLICATIONS	**(06 Hours)**
The 555 Timer, Application of 555 Timer Circuit, Phase Locked Loops, ICL8038 Function Generator, Voltage Controlled Oscillator.	
D-A AND A-D CONVERTERS	**(06 Hours)**
Introduction, Analog And Digital Data Conversion, Specification Of D/A Converter, Basic D/A Conversion Techniques, Sample And Hold Circuit, Performance Specifications of ND Converters, Classification of AID Converter, Parallel Comparator, Counter Type ND, Successive approximation Conversion, Dual Slope AID And High Speed A/D Converters, Microprocessors Compatible ND Converters, ADC080X Series ND Converters.	
LINEAR POWER SUPPLIES	**(02 Hours)**
Introduction, Three-Terminal Regulator (Fixed Regulator), Voltage Adjustment And Current Boosting Of Fixed Regulator, Merits And Drawbacks Of Linear Regulators.	
	(Total Contact Time:42 Hours)
PRACTICALS	
01) Zero Crossing Detector.	
02) Inverting And Non-Inverting Amplifier.	
03) Summing, Scaling And Averaging.	
04) Integrator And Differentiator.	

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05) Active Filters.
06) Oscillator.
07) Application of Timer IC 555.
08) Voltage Regulator.
09) Simulate Above Experiments on Multisim Circuit Simulation Software.
BOOKS RECOMMENDED
1. Sergio Franco, "Design With Operational Amplifiers And Analog Integrated Circuits", McGraw- Hill, 3rd Ed., Reprint 2007.
2. Coughlin and Driscol, "Op-Amps And Linear Integrated Circuits", PHI, 6th Ed., 2003
3. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed., 2004.
4. Gayakwad Ramakant, "Op-Amps And Linear Integrated Circuits", PHI, 4th Ed., 2003.
5. Gray and Meyer, "Analysis And Design Of Analog Integrated Circuits"; John Wiley & Sons, 4th Ed., 2005.
6. Salivahanan S., "Linear Integrated Circuits", McGraw-Hill. 4th Reprint, 2010.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	
EC 307: ELECTROMAGNETIC WAVES & RADIATING SYSTEMS (NEW)	**3**	**1**	**2**	**5**	

MAXWELL'S EQUATIONS	**(03 Hours)**
Introduction, The Equation of Continuity For Time-Varying Fields, Inconsistency Of Ampere's Law, Maxwell's Equation, Condition At a Boundary Surface.	
ELECTROMAGNETIC WAVES	**(08 Hours)**
Solution For Free-Space Conditions, Uniform Plane Waves & Propagation, The Wave Equations For A Conducting Medium, Sinusoidal Time Variations, Conductors And Dielectrics, Polarization, Reflection By A Perfect Conductor Normal Incidence & Oblique Incidence, Reflection By A Perfect Dielectric — Normal Incidence & Oblique Incidence, Reflection At The Surface Of A Conductive Medium.	
RADIATION	**(05 Hours)**
Potential Functions And Electromagnetic Field, Potential Functions For Sinusoidal Oscillations, Alternating Current Element, Power Radiated By Current Element, Application To Short Antennas, Radiation From A Monopole Or Dipole.	
ANTENNA FUNDAMENTALS	**(06 Hours)**
Directional Properties Of Dipole Antennas, Two Element Array, Linear Arrays, Multiplication Of Patterns, Binomial Array, Antenna Gain, Effective Area, Transmission Loss Between Antennas, Space Communications.	
ANTENNA ARRAYS	**(04 Hours)**
Mathematics Of Linear Arrays, Antenna Synthesis, Tchebyscheff Distribution.	
MICROWAVE ANTENNAS	**(10 Hours)**
Reflector Antennas, Lens Antenna, Helical Antennas, TV Receiving Antennas, Loop Antennas, Horn Antennas, Microstrip Antennas.	
GROUNDWAVE PROPAGATION	**(03 Hours)**
Plane-Earth Reflection, Spherical-Earth Propagation, Tropospheric Waves.	
IONOSPHERIC PROPAGATION	**(03 Hours)**
The Ionosphere, Reflection And Refraction Waves By The Ionosphere, Regular And Irregular Variations Of The Ionosphere.	
	(Total Contact Time:42 Hours)
PRACTICALS	
01) To Study Radiation Pattern of Dipole Antenna in Two Planes.	
02) To Study Effects of Parasitic Elements in Yagi-Uda Antenna.	
03) To Study Current Distribution on Dipole Antenna.	
04) To Study Radiation Pattern of Microstrip Antennas.	
05) To Design & Test Helical Antennas.	
06) To Design & Test Loop Antennas	
07) To Study Gain of Different Antennas.	

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08) To Study Impedance Characteristics of Antennas.
09) Measurement of Insertion Loss and VSWR of Antennas.
BOOKS RECOMMENDED
1. Jordan E. C. and Balmain K. G.,"Electromagnetic Waves And Radiating Systems", Prentice Hall, Reprint, 2010.
2. Kraus John D. Marhefka Roland J. and Khan Ahmed S., "Antennas for All Applications", Tata McGraw-Hill, 3rd Ed., 2006.
3. Kraus John D., Marhefka Roland J. and Khan Ahmed S., "AntennasAnd Wave Propagation", Tate McGraw-Hill, 4th Ed., 2006.
4. Balanis Constantine A., "Antenna Theory, Analysis And Design", John Wiley & Sons, 2nd Ed., 2001.
5. Raju G. S. N., "Antenna And Wave Propagation", Pearson Education, 1st Ed., 2005.
6. Harish A. R. and Sachindananda M., "Antennas And Wave Propagation", Oxford University Press, 1st Ed., 2007.

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EIS - I: INTERDISCIPLINARY ELECTIVE SUBJECTS

B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	
EC 309:AUDIO-VIDEO ENGINEERING & APPLICATIONS (NEW)	**3**	**0**	**0**	**3**	

AUDIO ENGINEERING	**(10 Hours)**
Characteristics Of Sound, Microphones And Loudspeakers, Magnetic Recording And Reproduction, Noise Distrotion And High Fidelity, Stereo Tape Recording And Reproduction, Stereo Control, Public Address System(Audio Power Amplifiers), Surround Sound System.	
VISION CHARACTERISTICS, SCANNING SYSTEM AND ANALOG VIDEO	**(08 Hours)**
Introduction To Basic Television Systems, Characteristics Of Human Eye, Resolution Of Brightness, Perception, Persistence Of Vision Scanning, Aspect Ratio, Flicker, The Keel Factor, Horizontal And Vertical Resolution, Video Bandwidth, Interlaced Scanning, Composite Video Signal:Video Siganl Components, Video Modulation, Vestigal Side Band Signal, Sound Modulation And Inter-Carrier System, Reception Of Vestigal Side Band Signal, Television Broadcast Channels And Standards.	
COLOUR TELEVISION	**(06 Hours)**
Colour Fundamental, Colour TV Transmission And Reception, PAL, NTSC, SECAM, World Standards.	
CD AND DVD PLAYERS	**(02 Hours)**
DIGITAL TELEVISIONS	**(06 Hours)**
Advance Television Systems and Digital Studio Equipments, 3D TV, LCD TV, HDTV, Flat Panel Display TV, LED TV, Plasma Screen TV, New Era Projection TV.	
DIGITAL BROADCASTING STANDARDS AND SYSTEMS	**(10 Hours)**
DAB, DVB-S, C, T, HDradio, DTH.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Gulati R.R.,"Monochrome And Colour TV", New Edge International Publication, 1st Ed.,2002.
2. Gulati R.R., "Colour Television Principles & Practice", New Edge International Publication, 1st Ed.,2005.
3. Whitaker Jerry, "Standard Handbook Of Video And Television Engineering", McGraw-Hill, 3rd Ed.,2000.
4. Whitaker Jeery and Benson Blair K., "Mastering Digital Television", McGraw-Hill, 4th Ed.,2003.
5. Whitaker Jeery and Benson Blair K., "Standard Handbook Of Audio Engineering", McGraw-Hill, 2nd Ed.,2001.
6. Kelth Jack, "Video Demystified", Penram International Publication, 1st Ed., 2001.
7. Luther Arc C. and Ingis Andrew, "Video Engineering", McGraw-Hill, 3rd Ed., 1999.

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EC 311: NEURAL NETWORKS AND APPLICATIONS(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS	**(08 Hours)**
Artificial Neuron Model and Linear Regression, Gradient Descent Algorithm, Nonlinear Activation Units and Learning Mechanisms, Associative memory, Associative Memory Model, Condition for Perfect Recall in Associative Memory.	
STATISTICAL ASPECTS OF LEARNING	**(03 Hours)**
Typical Examples, Importance of V.C. Dimensions Structural Risk Minimization.	
SINGLE-LAYER PERCEPTIONS, UNCONSTRAINED OPTIMIZATION	**(03 Hours)**
Gauss-Newton's Method, Linear Least Squares Filters, Least Mean Squares Algorithm, Perception Convergence Theorem.	
BAYES CLASSIFIER & PERCEPTRON	**(06 Hours)**
Distribution, Back Propagation Algorithm, Practical Consideration in Back Propagation Algorithm,Solution of Non-Linearly Separable Problems Using MLP,Heuristics For Back-Propagation,Multi-Class Classification Using Multi-layered Perceptions .	
RADIAL BASIS FUNCTION NETWORKS	**(08 Hours)**
Cover's Theorem, Radial Basis Function Networks: Separability And Interpolation, Radial Basis Function as ill-Posed Surface Reconstruction, Solution of Regularization Equation: Greens Function, Use of Greens Function in Regularization Networks, Regularization Networks and Generalized RBF, Comparison Between MLP and RBF, Learning Mechanisms in RBF	
INTRODUCTION TO PRINCIPAL COMPONENTS AND ANALYSIS	**(07 Hours)**
Dimensionality reduction Using PCA, Hebbian-Based Principal Component Analysis, Introduction to Self Organizing Maps, Cooperative and Adaptive Processes in SOM, Vector-Quantization Using SOM.	
CLASSICAL & FUZZY SETS	**(03 Hours)**
Introduction To Classical Sets: Properties, Operations And Relations; Fuzzy Sets, Membership, Uncertainty, Operations, Properties, Fuzzy Relations, Cardinalities, Membership Functions.	
FUZZY LOGIC SYSTEM COMPONENTS	**(04 Hours)**
Fuzzification, Membership Value Assignment, Development Of Rule Base And Decision Making System, Defuzzification To Crisp Sets, Defuzzification Methods.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Rajasekharan S. and Vijayalakshmi Pal G. A., "Neural Networks, Fuzzy Logic, Genetic Algorithms: Synthesis And Applications", PHI Publication, 3rd Ed., 2004.

2. Simon Haykin, "Neural Networks- A Comprehensive Foundation", Pearson Education, 3rd Ed., 2001.

3. Sivanandam S. N., Sumathi S. and Deepa S. N., "Introduction to Neural Networks Using MATL4B 6.0", TMH, 1st Ed., 2006.

4. Freeman James A. and Skapura Davis, "Neural Networks", Pearson Education, ist Ed., 2002.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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5. Ross Timothy J.., "Fuzzy Logic With Engineering Applications", Wiley India Publishers, 2nd Ed., 1997.

B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	
EC 313: SENSORS & TRANSDUCERS(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION TO SENSOR- BASED MEASUREMENT SYSTEMS	**(06 Hours)**

General Concepts And Terminology, Sensor Classification, General Input-Output Configuration, Static Characteristics Of Measurement Systems, Dynamic Characteristics, Other Sensor Characteristics, Primary Sensors, Materials For Sensors, Microsensor Technology.

RESISTIVE, REACTANCE VARIATION, ELECTROMAGNETIC SENSORS	**(08 Hours)**

Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Magnetoresistors, Light-Dependent Resistors (LDRs), Resistive Hygrometers, Resistive Gas Sensors, Liquid Conductivity Sensors, SignaF Conditioning for Resistive Sensors: Resistance Measurement, Voltage Dividers, Dynamic Measurements, Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors.

FLOW, PRESSURE AND LEVEL TRANSDUCERS	**(08 Hours)**

Flow Transducers Like Differential Pressure, Variable Area, Positive Displacement, Electromagnetic, Anemometer, Ultrasonic Flow meter, Turbine Flow meter, Vortex Flow meter, Electromagnetic Flow meter, Coriolis Effect Flow meter, Pressure Transducers Like Mercury Pressure Sensor, Bellows, Membranes And Thin Plates, Piezoresistive Sensors, Capacitive Sensors, VRP Sensors, Optoelectronic Sensors, Vacuum Sensors, Level Transducers Like Displacer, Float, Pressure Gages, Balance Method, Time-Of-Flight Measurements, Level Measurements By Detecting Physical Properties.

SELF-GENERATING TEMPERATURE SENSORS	**(09 Hours)**

Thermoelectric Sensors: Thermocouples, Piezoelectric Sensors, Pyroelectric Sensors, Electrochemical Sensors, Acoustic Temperature Sensors, Nuclear Thermometer, Magnetic Thermometer, Semiconductor Types, Thermal Radiation, Quartz Crystal, NQR, Spectroscopic Noise Thermometry, Heat Flux Sensors.

DIGITAL AND SEMICONDUCTOR SENSORS	**(06 Hours)**

Position Encoders, Resonant Sensors, SAW Sensors, Sensors Based On Semiconductor Junctions, Sensors Based On MOSFET Transistors, Charge-Coupled And CMOS Image Sensors, Fiber-Optic Sensors, Ultrasonic-Based Sensors, Biosensors.

SENSORS FOR ROBOTICS	**(06 Hours)**

Proximity Sensors: Typical Sensor Characteristics, Technologies For Proximity Sensing, Electro-Optical Sensors, Capacitive Sensors, Magnetic Sensors.

(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Patranabis D., "Sensors And Transducers", Prentice-Hall India, 2nd Ed., 2004.

2. Ramon Pallas & John G. Webster, "Sensors and Signal Conditioning", John Wiley & Sons, 2nd Ed., 2001.

3. Webster John G., "Instrumentation and Sensors Handbook", CRC Press, 1st Ed., 1999.

4. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs and Applications", Springer, 3rd Ed., 2004.

5. Shawhney A. K., "Electrical And Electronics Measurements And Instrumentation", Dhanpat Rai & Sons, 1994.

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B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	
EC 315: VLSI TECHNOLOGY(NEW)	**3**	**0**	**0**	**3**	

ENVIRONMENT FOR VLSI TECHNOLOGY	**(04 Hours)**
Clean Room And Safety Requirements, Lattice structures, Wafer Growing, Wafer Cleaning Processes And Wet Chemical Etching Techniques.	
IMPURITY INCORPORATION	**(05 Hours)**
Solid State Diffusion Modeling And Technology, Ion Implantation Modeling And Technology, Damage Annealing, Characterization Of Impurity Profiles.	
OXIDATION	**(07 Hours)**
Kinetics Of Silicon Dioxide Growth Both For Thick, Thin And Ultra Thin Films, Oxidation Technologies In VLSI And ULSI, Characterization Of Oxide Films, High K And Low K Dielectrics For ULSI.	
LITHOGRAPHY	**(06 Hours)**
Photolithography, E-Beam Lithography And Newer Lithography Techniques For VLSI / ULSI, Mask Generation.	
CHEMICAL VAPOUR DEPOSITION TECHNIQUES	**(06 Hours)**
CVD Techniques For Deposition Of Polysilicon, Silicon Dioxide, Silicon Nitride And Metal Films, Epitaxial Growth Of Silicon, Modeling And Technology.	
METAL FILM DEPOSITION	**(04 Hours)**
Evaporation And Sputtering Techniques, Failure Mechanisms In Metal Interconnects, Multi- Level Metallization Schemes.	
PLASMA AND RAPID THERMAL PROCESSING	**(06 Hours)**
PECVD, Plasma Etching And RIE Techniques, RTP Techniques For Annealing, Growth And Deposition Of Various Films For Use In ULSI.	
PROCESS INTEGRATION	**(05 Hours)**
NMOS, CMOS And Bipolar Circuits, Advanced MOS Technologies.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Chang C.Y. and Sze S. M., "VLSI Technology", McGraw-Hill, 1996.

2. Ghandhi S. K., "VLSI Fabrication Principles", John Wiley Inc., New York, 1983.

3. Sze S. M., "VLSI Technology", McGraw-Hill, 2'd Ed., 1988.

4. Campbell Stephen A., "The Science & Engineering of Microelectronics Fabrication", Oxford University Press, 2rid Ed., 2001.

5. Peter Van Zant, "Microchip Fabrication: A Practical Guide To Semiconductor Processing", McGraw-Hill, 4th Ed., 2000.

B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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EC 317: STATISTICAL SIGNAL ANALYSIS(NEW)	**3**	**0**	**0**	**3**	

REVIEW OF PROBABILITY THEORY AND EVENTS	**(03 Hours)**
Probability As Frequency Of Occurrence, Sample Space And Axiomatic Probability, Mutually Exclusive Events, Joint Probability, Conditional Probability And Statistical Independence, Bays Theorem.	
RANDOM VARIABLES AND PROBABILITY FUNCTIONS	**(10 Hours)**
Continuous And Discrete Variables, Cumulative Distribution Function (CDF), Probability Density Function (PDF), Relation Between Probability And Probability Density, Transformations Of Random Variables, Joint And Conditional Cumulative Distribution And Probability Density, Correlation Between Random Variables, Central Limit Theorem, Sequences Of Random Variables, Convergence Of Sequences Of Random Variables. PDF Of A Sequence Of Random Pulses.	
STATISTICAL AVERAGES	**(04 Hours)**
Means, Moments And Expectation, Standard Deviation And Chebyshev's Inequality, Multivariate Expectations, Characteristic Functions, Mean And Variance Of The Sum Of Random Variables.	
PROBABILITY MODELS	**(05 Hours)**
Gaussian Probability Density Function, Error Function, Rayleigh Probability Density Function, Binomial Distribution, Poisson Distribution, Bivariate Gaussian Distribution.	
STOCHASTIC PROCESSES	**(06 Hours)**
Stationary, Non-Stationary, Strict-Sense And Wide-Sense Stationary Processes, Gaussian Processes, Poisson Processes, The Markov Processes With Examples.	
EXPECTED VALUES OF A RANDOM PROCESS	**(08 Hours)**
The Mean Value, Autocorrelation, Auto-Covariance, Power Spectral Density, Joint Statistical Averages Of Two Random Processes, Cross Correlation And Cross Covariance, Ergodicity, Mean Square Continuity, Mean Square Derivative And Mean Square Integral Of Stochastic Processes, Ergodic Processes.	
STOCHASTIC SYSTEMS	**(06 Hours)**
Response Of Linear Dynamic Systems (E.g. State Space Or ARMA Systems) To Stochastic Inputs; Estimation Process And Methods, Introduction To Linear Least Square Estimation, Wiener Filtering And Kalman Filtering.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Papoulis A., "Probability, Random Variables And Stochastic Processes", McGraw-Hill, 41h Ed., 2006.

2. Larson H. J. and Schubert B.O., "Probabilistic Models In Engineering Science - Vol. Random Variables and Stochastic Process - Vol. II and Random Noise Signals And Dynamic Systems", Wiley, lst Ed., 1982.

3. Gardener W., "Stochastic Processes", McGraw-Hill", 1st Ed. 1986.

4. Montgomery and Ruger, "Applied Statistics And Probability For Engineers", John Wiley, 1st Ed., 2006.

5. Hayes Monson H., "Statistical Digital Signal Processing", John Wiley, 1st Ed., 1996.

6. Carlson Bruce A., "Communication Systems—An Introduction To Signals And Noise In Electrical Communication", McGraw-Hill, 5th Ed., 2009.

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B. Tech - III(EC), Semester - V	**L**	**T**	**P**	**C**	
EC 319: LASER TECHNOLOGY(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION OF LASERS	**(08 Hours)**

Laser Components (Pump, Gain Medium And Cavity), Varieties Of Laser And Properties Of Laser Light, Laser Oscillation, Oscillation Condition; Threshold Condition; Passive Cavity Frequencies; Frequency Pulling, 3 And 4 Level Lasers, Power To Maintain Threshold, Power In Laser Oscillators And Optimum Output Coupling, Multi-Mode Laser Oscillation, Differences Between Homogeneous And Inhomogeneous; Spectral Hole Burning; Spatial Hole Burning.

LASER CAVITY AND MODES	**(08 Hours)**

Gaussian Modes; M2; High Order Transverse Modes; Frequencies Of Oscillation; Laguerre-Gaussian Modes, Mode Stability, Non-Linear Optics, Production Of Second Harmonic Light And Interactivity Frequency Doubling.

ISSUES IN LASER SYSTEM DESIGN	**(04 Hours)**

Specifying Optical Components, Specifying Lasers And Light Detectors In Detail, Passive And Active Photonics Components From Mirrors To Acoustic-Optical Modulators.

CHARACTERIZATION, MEASUREMENT AND CONTROL OF LASER PROPERTIES	**(14 Hours)**

Wavelength And Spectrum, Measurement Of Wavelength To Different Degrees Of Precision, Spectrometer, Wavemeters, Spectrum Analyzer And Photon Correlation Techniques, Time And Frequency Standards, Technique For Tuning Lasers. Single Mode Lasers, Nonlinear Optics, Polaris Ability Tensor, Second Harmonic Generation, Phase- Matching, Coupled Wave Equations, Optical Parametric Amplifiers And Oscillators, Beam Spatial Profile, Transverse Modes And Control, Beam Profiling, Measurement OF Beam Quality And M2, Laser Resonators, Stable And Unstable Cavities, Beam Temporal Profile Dynamics Of C. W. And Pulsed Lasers, Gain-Switching, Q-Switching, Mode-Locking, Ultrafast Laser Systems, Laser Power, Laser Amplifiers, Injection-Locking, Regenerative Amplifiers, Chirped Pulse Amplification, Lasers For Nuclear Fusion, High Power Industrial Lasers For Materials, Processing, Optimizing Lasers For Applications, Theoretical And Practical Limits, High Brightness, High Stability And Narrow Linewidth, Noise And Solutions, Statistical Optics And Photon Statistics.

SELECTED STATE OF THE ART APPLICATIONS	**(08 Hours)**

Optical Clocks And Frequency Combs, Laser Cooling And Trapping, Free Electron Lasers, Laser Gyroscopes, Laser Guide Stars, Holography, Laser Induced Breakdown, Spectroscopy LIBS, Fiber Lasers And Erbium-Doped Fiber Amplifiers, Microlasers On A Silicon Chip Practical Laser Systems — Hene, Nd:YAG, Ar6, Dye, Excimer, Etc, Laser In Medicine, Cavity Ringdown Spectroscopy, Developments In X-Ray Lasers And Attosecond Pulse, More Exotic Applications: Laser Trapping, Laser Tweezering; Different Form Of Measurement.

(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Jeff Hetch., "Understanding Lasers — An Entry Level Guide", IEEE Press/John Wiley & Sons, 1 at Ed., 2008.

2. Devic C., "Lasers and Electro-Optics Fundamentals and Engineering", Cambridge University Press, 1st Ed., 1996.

3. Wilson K. and Hawkes H., "Optoelectronics", Pearson, 314 Ed., 1998.

4. Milonni C. And Ederly N., "Lasers", John Wiley, 1st Ed., 1988.

5. Koechner W., "Solid State Laser Engineering", Springer, 1st Ed., 1999.

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Appendix-1

B.Tech. III(EC), VI Semester

Sr. No.	Course Name	Code	Teaching Scheme			Credit	Examination Scheme			Total
			L	T	P		Theory	Tutorial	Practical	
1	DATA COMMUNICATION & NETWORKS	EC 302	3	1	2	5	100	25	50	175
2	DIGITAL INTEGRATED CIRCUITS	EC 304	3	0	2	4	100	--	50	150
3	EMBEDDED SYSTEMS	EC 306	3	1	2	5	100	25	50	175
4	FIBER OPTIC COMMUNICATION	EC 308	3	1	2	5	100	25	50	175
5	EIS-II	EC 3XX	3	0	0	3	100	--	--	100
	Total		15	03	08	22	500	75	200	800
	Total Contact Hours per week									

EIS - II:INTERDISCIPLINARY ELECTIVE SUBJECTS		
1.	EC 312	Nanotechnology
2.	EC 314	Multimedia Communication Technology
3.	EC 316	Image Processing & Computer Vision
4.	EC 318	Process Instrumentation
5.	EC 322	MEMS
6.	EC 324	Scientific Computing

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Appendix 2

B. Tech - III(EC), Semester - VI	L	T	P	C	
EC 302: DATA COMMUNICATION & NETWORKS(NEW)	3	1	2	5	

DATA COMMUNICATION AND NETWORKING OVERVIEW	**(05 Hours)**
A Communication Model, Data Communication, Data Communication Networking Concept, Topology And Transmission Media, Subnet, Concept Of Client And Server, An Example Configuration.	
PROTOCOL ARCHITECTURE	**(04 Hours)**
The Need For Protocol Architecture, A Simple Protocol Architecture, OSI Reference Model, The TCP/IP Protocol Architecture.	
DIGITAL DATA COMMUNICATION ISSUES	**(05 Hours)**
Asynchronous And Synchronous Transmission, Concept Of Frames And Packets, Types Of Errors, Error Detection, Error Correction, Line Configurations, Interfacing, Physical, Logical And Port Address.	
DATA LINK CONTROL	**(06 Hours)**
Medium Access Control (Mac) And Logical Link Control (LIC) Sublayer Issues, Flow Control, Error Control, Sliding Window Protocol, Polling, High-Level Data Link Control (HDCL), Performance Issues.	
LOCAL AREA NETWORK — OVERVIEW	**(08 Hours)**
LAN Protocol Architecture, Bridges, Emergence Of High — Speed Lans, Ethernet, Token Bus, Token Ring, Wireless LAN Technology(Wi-Fi).	
ROUTING AND CONGESTION CONTROL IN SWITCHED NETWORKS	**(06 Hours)**
Routing In Circuit-Switching Networks, Routing In Packet-Switching Networks, Broadcasting, Multicasting, Flooding, Routing Algorithm, Effects Of Congestion, Congestion Control In Packet-Switching Networks.	
INTERNETWORK PROTOCOLS	**(04 Hours)**
Basic Protocol Functions, Principles Of Internetworking, Fragmentation Concept, Connectionless Internetworking, Gateway And Routers, The Internet IPv6.	
TRANSPORT PROTOCOLS	**(05 Hours)**
Quality Of Service Parameter, TCP And UDP Protocols.	
NETWORK SECURITY	**(05 Hours)**
Security Requirement And Attacks, Confidentiality With Encryption, Message Authentication And Hash Functions, Public-Key Encryption And Digital Signatures.	
DISTRIBUTED APPLICATIONS	**(08 Hours)**
File Transfer Protocol (FTP), Electronic Mail - SMTP And MIME, Hyper Transfer Protocol (HTTP), Network Management - SNMP, Domain Name Server (DNS), URL, WWW, ATM And ISDN Networks.	
	(Total Contact Time:56 Hours)
PRACTICALS	
01) PC To PC Serial Link Using Corn Port.	
02) Hamming Code For Error Detection And Correction.	
03) Cyclic Redundancy Check (CRC) Method For Error Detection.	

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04) Packet Format Generation And Transmission.
05) Bit Stuffing.
06) Sliding Window Protoco.
07) Shortest Path Routing Algorithm.
08) Multipath Routing Algorithm For Congestion Control.
09) Stop And Wait Protocol.
10) Ciphertext Generation And Deciphering.
11) LAN Trainer kit.
BOOKS RECOMMENDED
1. Tanenhaun Andrew S., "Computer Networks", PHI, 3rd Ed., 1998.
2. Stalling William., "Data And Computer Communications", PHI, 3rd Ed., 2000.
3. Forouzen Behrouz A., "Data Communications And Networking", Tata Mcgraw-Hill, 2nd Ed., 2000.
4. Gallager R. G. And Bertsekas D., "Data Networks", PHI, 1st Ed., 1992.
5. Garcia Leon And Widjaja 1., "Communication Networks", Tata Mcgraw-Hill, 15t Ed., 2000.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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ELECTRONICS ENGINEERING DEPARTMENT

इलेक्ट्रानिक्स अभियांत्रिक विभाग

SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT

सरदार वल्लभभाई नेशनल इन्स्टीयुट ओफ टेक्नोलोजी, सुरत

B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 304: DIGITAL INTEGRATED CIRCUITS(NEW)	**3**	**0**	**2**	**4**	

BJT MODELING AND LOGIC FAMILIES	**(10 Hours)**
Modeling Of P-N Junction Diode And BJT, Diode And BJT Model Parameter Extraction, Schottky Transistor, BJT Inverter, DC Switching Characteristic, Introduction to RTL, DTL TTL, Schottky TTL, I2L and ECL Logic Family, Concept of Noise margin, Fan Out and Propagation Delay, Basic BiCMOS Circuits: Static Behavior, Switching Delay in BiCMOS Logic Circuits.	
MOS TRANSISTOR	**(06 Hours)**
MOS Structure And Operation, MOSFET Structure And Operations, MOSFET Current- Voltage Characteristics, Channel Length Modulation, Substrate Bias Effect, MOSFET Capacitances, MOSFET Model.	
NMOS LOGIC DESIGN	**(05 Hours)**
Resistive-Load Inverter, Saturated-Loaded Inverter, Linear Loaded Inverter, Depletion Loaded Inverter, Graphical Determination Of VTC, Calculation Of VTC Critical Points, Power Dissipation And Rise Time - Fall Time, NMOS Logic Gates.	
CMOS LOGIC DESIGN	**(04 Hours)**
CMOS Inverter Technology, Static Characteristics, Dynamic Behavior, Static And Dynamic Power Dissipation, Power-Delay Product. CMOS Gates, TTL-CMOS Interfacing.	
PROCESSING TECHNOLOGY	**(06 Hours)**
Fabrication Process Flow, CMOS N-Well Process, Layout Design Rules, Full-Custom Mask Layout Design, Stick Diagram.	
INTRODUCTION OF FPGA ARCHITECTURE	**(03 Hours)**
SEMICONDUCTOR MEMORIES	**(06 Hours)**
Type Of Memories, Implementation Of ROMs, MOS ROM Cells, MOS EPROM and EEPROM Applications, Static and Dynamic Read - Write Memories, Organization Of RAM, Paralleling Of Semiconductor Memory Integrated Circuit Chips.	
	(Total Contact Time:42 Hours)
PRACTICALS	
01) Introduction to SPICE Circuit Simulator.	
02) Realization Of NOR Gate Using RTL Logic. Obtain & Plot its Transfer Characteristics And Determine Noise Margins, Fan-Out and Propagation Delay.	
03) Realization of NAND Gate Using TTL Logic. Obtain & Plot Its Transfer Characteristic And Determine Noise margins, Fan-out and Propagation Delay.	
04) Realization Of Wired NAND Gate Using DTL and MDTL Logic. Obtain & Plot Its Transfer Characteristic And Determine Noise margins, Fan-out and Propagation Delay.	
05) Implementation of NMOS Inverter, Obtain & Plot Its Transfer Characteristics And Determine Noise margins And Measure Propagation Delay.	
06) Implementation of CMOS Inverter. Obtain & Plot Its Transfer Characteristics, Determine Noise Margins and Measure Propagation Delay.	

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07) Realization of MOSFET Characteristics Using Circuit Simulator Characteristics and BSIM Models.
08) Realization Of Inverter Gate Using BiCMOS Logic, Obtain & Plot Its Transfer Characteristics, Determine Noise Margins.
09) Realization Of CMOS Static & Dynamic Characteristics Using Circuit Simulator Characteristics And BSIM Models.
10) Design And Implementation of TTL-CMOS & CMOS-TTL Interfacing.
11) Design And Implement of 1-Bit RAM CELL Using JK & SR Flip-Flop.
12) Layout of CMOS Inverter And Parasitic Extraction and Obtain VTC of Extracted Net List.
BOOKS RECOMMENDED
1. Taub H. and Schilling D., "Digital Integrated Electronics", McGraw-Hill, International Ed., 2008.
2. Sung-Mo Kang and Leblebici Y., "CMOS Digital Integrated Circuits: Analysis And Design", Tata McGraw-Hill; 3rd Ed., 2003.
3. Rabaey Jan, Chandrakasan Anantha Nikolic, "Digital Integrated Circuits: A Design Perspective", Pearson Education, 2nd Ed., 2nd Impression, 2008.
4. Hodges D. A. and Jackson H. G. "Analysis And Design Of Digital Integrated Circuits", 3rd Ed., McGraw-Hill, 2004.
5. Baker R. J., Li H. W. and Boyce D. E., "CMOS Circuits Design Layout and Simulation", PHI 2nd 2005.

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B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 306: EMBEDDED SYSTEMS(NEW)	**3**	**1**	**2**	**5**	

INTRODUCTION TO 8-BIT MICROCONTROLLER	**(09 Hours)**
8051 Architecture, I/O Pins, Ports, External Memory, Counters & Timers, Serial Data Input/Output, Interrupts Moving Data, Logical Operations, Arithmetic Operations, Jump And Call Instructions, Embedded "C" PIC, AVR Microcontroller Architecture Overview With Applications Examples.	
APPLICATIONS OF 8051	**(09 Hours)**
8051 Microcontroller Design, Applications Like Keys, Switched And LED/LCD Displays, Pulse Measurement, ADC And DAC, Serial Data Communication, CAN, I2C And SPI Serial Bus Protocols.	
REAL TIME OPERATING SYSTEMS	**(09 Hours)**
Hard And Soft Real Time Systems, Introduction To RTOS, Process And Thread, System Call, Process Scheduling And Scheduling Algorithms, Resource Access Control, Deadlock And Its Prevention RTOS Case Study: RT-Linux And Win-CE, Device Driver Programming RTOS Porting On ARM Board.	
ARM PROCESSOR ARCHITECTURE AND PROGRAMMING	**(09 Hours)**
ARM Processor Architecture, Pipeline Characteristics, ARM Addressing Modes, ARM Instruction Set, Programming Techniques, Exception Modes And Handling, Thumb Instructions, Cortex Architecture Overview.	
EMBEDDED SOFTWARE DESIGN TECHNIQUES	**(06 Hours)**
Embedded Software Requirements, Software Modeling With FSM, State Charts And Petri- Nets, Examples Of Software Modeling, Various Data Structure (FIFO, LIFO And Stack) Handling.	
	(Total Contact Time:42 Hours)

PRACTICALS
01) Program Set For (Arithmetic & Logical Group) -8051.
02) Program Set For (Conditional Instructions)-8051.
03) Program Set For (Code Conversion Group) -8051.
04) Program Set For (Interrupts & Timers)-8051.
05) Interfacing of LEDs & Switches with 8051.
06) ADC, DAC, Serial Communication Using 8051.
07) Hands-on programming of ARM/pSOC(Set I).
08) Hands-on programming of ARM/pSOC(Set II).
09) Hands-on programming of ARM/pSOC(Set Ill).
10) Hands-on programming of ARM/ pSOC (Set IV).
11) Task Profiling on RT-Linux.
12) Device Driver programming RT-Linux.
13) RTOS porting on ARM Board.

BOOKS RECOMMENDED
1. Kenneth J. Ayala and Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded System Using Assembly And C", Cenage Learning, India Edition, 2nd impression, 2010.
2. Mazidi A. M., Mazidi J. G. and McKinley R. D., "The 8051 Microcontrolier And Embedded Systems-Using Assembly And C", Pearson Education, 2nd Ed., 2008.
3. Raj Kemal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Publications, 2nd Ed., 2008.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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4. Sloss A. N., Symes D. and Wright C., "ARM System Developer's Guide", Morgan Kaufmann Publishers, 1st Ed., 3rd Reprint, 2006.
5. Jonathan W. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing"; Thomson Learning, INDIA Edition, 2nd Reprint, 2007.
6. Alex Doboll and Edward H. Currie, "Introduction To Mixed-Signal Embedded Design"; Springer, 131 Ed., 2007.
7. Shibu K. V., "Introduction To Embedded System"; TMH, 1st Ed., 2009.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 308: FIBER OPTICS COMMUNICATION(NEW)	**3**	**1**	**2**	**5**	

INTRODUCTION TO FIBER OPTIC COMMUNICATION	**(07 Hours)**
Nature Of Light, Basic Optical Laws, Propagation Of Light In Fiber, Elements Of Fiber Optic Communication, Optical Spectrum, Wavelengths, Frequencies, Channel Spacing, Optical Power, Types of Optical Fiber, Fiber Fabrication, Fiber Cables.	
SIGNAL DEGRADATION IN OPTICAL FIBERS	**(08 Hours)**
Degradation Of Signals In Optical Fiber, Attenuation, Absorption Losses, Scattering Losses, Bending Losses, Effect Of Dispersion On Pulse Transmission, Intermodal Dispersion, Dispersion, Waveguide Dispersion, Total Dispersion And Maximum Transmission Rates, Nonlinear Effects In Fiber.	
OPTICAL SOURCES	**(06 Hours)**
Basic Structure, Principle And Operation of Light Emitting Diode, Laser Diode, Comparison Between LED And ILD.	
POWER LAUNCHING & COUPLING	**(06 Hours)**
Source To Fiber Power Launching, Lensing Schemes, Fiber To Fiber Joints, Connectors, Splicing.	
DIGITAL LINKS	**(03 Hours)**
Concept Of Digital Link, Point To Point Link, System Design Considerations, Link Power Budget, Rise Time Budget, Power Penalty.	
PHOTO DETECTORS AND RECEIVER SYSTEM	**(05 Hours)**
PIN Photodiode, Avalanche Photodiode, Comparison Between PIN Photodiode And APD, Fundamental Receiver Operation, Receiver Sensitivity, System Performance Evaluation Criteria, Eye Diagram, BER, OSNR, And Q-Factor.	
WDM CONCEPTS AND COMPONENTS	**(08 Hours)**
Principles Of WDM, WDM System Configuration, Types of WDM System, WDM Components, Applications of WDM Systems.	
OPTICAL AMPLIFIERS	**(03 Hours)**
Principle Of Optical Amplification, Erbium—Doped Fiber Amplifiers, Raman Amplifiers, Semiconductor Optical Amplifiers.	
MEASUREMENTS	**(06 Hours)**
Refractive Index Measurements, Attenuation Measurement, Dispersion Measurement, OTDR Field Applications.	
	(Total Contact Time:66 Hours)
PRACTICALS	
01) Introduction To FOT Kit.	
02) Setting Of Fiber Optic Analog Link Using OFT Kit.	
03) Setting Of Fiber Optic Digital Link Using OFT Kit.	
04) Finding The Losses And NA For Given Optical Fiber Using OFT Kit.	
05) Study Of The,Light Source And Power Meter.	
06) Plotting The Characteristics Of LED And Photo Transistor.	
07) Introduction To Photonics CAD 1.6.	

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08) Performance Analysis Of Single Channel Fiber Optic Communication Link Using Photonics CAD 1.6.
09) Performance Analysis Of Multichannel WDM Link Using Photonics CAD 1.6.
10) Mini Project.
BOOKS RECOMMENDED
1. Vivekanand Mishra, Sunita Ugle, "Optic Communication: Systems And Component", Wiley India Pvt Ltd , 1st edition 2012
2. Gerd Kaiser, "Optical Fiber Communication", McGraw Hill, 41h Ed., 2008.
3. Senior J. M., "Optical Fiber Communication - Principle And Practice", PHI, 2nd Ed., 15th Indian Reprint, 2003.
4. Agrawal G.P., "Fiber Optic Communication Systems", John Wiley & Sons, 4th Ed., 2010.
5. Mynbave and Scheiner, "Fiber Optics Communications Technology", Pearson Education Ed.s, is Indian Reprint, 2001.
6. Ramaswami Rajiv and Sivarajan K. N., "Optical Networks A Practical Perspective", Elsevier, Morgan Kaufmann Publishers, 3rd Ed:, 2009.

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B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 312: NANOTECHNOLOGY(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION TO MINIATURIZATION	**(05 Hours)**
Scaling Laws In Mechanics, Electricity, Electromagnetism And Optics, The Basics Of Quantum Mechanics: Atomic Orbitals, Electromagnetic Waves, The Quantization Of Energy, Atomic Spectra And Discreetness, The Photoelectric Effect, Wave-Particle Duality, The Uncertainty Principle, Particle In A Well.	
NANOSCALE PHYSICS	**(08 Hours)**
Electrons in Solids, Fermi Energy, Density Of States For Solids, Changing The Behavior Of The Solids, Quantum Confinement, Tunneling, Single Electron Phenomenon, Molecular Electronics.	
INTRODUCTION TO NANOSTRUCTURES AND NEMS	**(09 Hours)**
Nanostructures Like Particles, Wires, Films, Layers And Coatings, Porous Materials, Small Grained Materials And Molecules, Historical Background And Review of NEMS.	
NANOELECTRONIC DEVICES	**(07 Hours)**
Structure, Operation And Principle Of Working Of Resonant Tunneling Diode, Quantum Cascade Laser, Single Electron Transistor, Carbon Nanotube Devices.	
NANOELECTRONIC SYSTEMS	**(05 Hours)**
Sensors And Actuators, Physical Microsensors And Actuators, Their Principles, Design Issues And Examples.	
APPLICATONS AREAS	**(08 Hours)**
Nanoscale Biosensors, Biogenic and Bioanalogous Architectures, Nanoelectronics And Nanocomputers, Nanophotonics, Photonic Properties Of Nanomaterials, Near-Field Light, Optical Tweezers, And Photonic Crystals.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Rogers, Pennathur and Adams, "Nanotechnology: Understanding Small Systems", CRC Press, Tayler And Francis Group, 1st Ed., 2008.

2. Fahmer W. R. (Ed), "Nanotechnology And Nanoelectronics: Materials, Devices, Measurement Techniques", Springer Publications, 1st Ed., 2005.

3. Kumar Vijay, "Nanosilicon"; Elsevier Ltd., 1 st Ed., 2008.

4. Kohler and Fritzsche, "Nanotechnology: An Introduction To Nanostructuring Techniques", Wiley — VCH, 1st Ed., 15t Reprint, 2004.

5. Mahalik N. P., "Micromanufacturing and Nanotechnology", Springer, 1st Ed., 2006.

6. IL Hanson G. W., "Fundamentals Of Nanoelectronics", Pearson Education, 15t Ed., 2010.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 314: MULTIMEDIA COMMUNICATION TECHNOLOGY(NEW)	**3**	**0**	**0**	**3**	

MULTIMEDIA COMMUNICATIONS	**(07 Hours)**
Introduction, Revision Of Fourier Transform, OFT and DCT, Multimedia Communication Model, Elements Of Multimedia Systems, User Requirements, Multimedia Terminals, Input And Output Devices.	
AUDIO-VISUAL INTEGRATION	**(07 Hours)**
Human Speech Generation Model, Synthetic Speech Generation, Media Interaction, Bimodality Of Human Speech, Speech Signal Properties, Visual Properties, Lip Reading, Speech-Driven Talking Heads, Lip Synchronization, Lip Tracking, Audio-To-Visual Mapping, Bimodal Person Verification, Joint Audio-Video Coding.	
MULTIMEDIA PROCESSING IN COMMUNICATIONS	**(13 Hours)**
Digital Media, Digital Audio, Digital Image And Video, DPI And PPI, Signal Processing Elements, Challenges Of Multimedia Information Processing, Lossless and Lossy Coding Techniques, Perceptual Coding, Perceptual Coding of Digital Audio Signals, Transform Audio Coders, Audio Sub-Band Coders, Speech Coder Attributes, CD Audio Coding For Multimedia Applications, Image Coding, Video Coding, Water Marking, Organization, Storage And Retrieval Issues, Signal Processing For Network Multimedia, Multimedia Processors.	
MULTIMEDIA COMMUNICATION STANDARDS	**(07 Hours)**
JPEG, MPEG Amd ITU standards.	
MULTIMEDIA COMMUNICATIONS ACROSS NETWORKS	**(07 Hours)**
Network Requirements, Real Time Packet Transfer Concept, Multimedia Requirements And ATM Networks,Packet AudioNideo In The Network Environment, Video Transport Across Generic Networks, VOIP Application.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Rao K. R., Bojkovic Zoran S. and Milovanovic Dragorad A. "Multimedia Communication Systems: Techniques, Standard And Networks", PHI, 1st Ed., 2002.

2. Vaseghi Saeed V., "Multimedia Signal Processing Theory And Application In Speech, Music And Communications", Wiley, 1st Ed., 2007.

3. Rao Kamisetty, Bojkovic Zoras and Dragorad, "Introduction To Multimedia Communications", Wiley, 1st Ed., 2006.

4. Ohm and Jens R., "Multimedia Communication Technology", Springer, 1st Ed., 2004.

5. Mihaela Vander Scharr and Chow Philip A., "Multimedia Over 1P And Wireless Networks— Compression, Networking And Systems", Academic Press, 1st Ed., 2007.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 316: IMAGE PROCESSING & COMPUTER VISION(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION	**(02 Hours)**
Digital Image, Image Processing Origins; Imaging In X-Rays, Ultraviolet, Visible Infrared, Visible, Microwave And Radio Bands; Fundamentals Of Image Processing; Components Of Image Processing Systems.	
DIGITAL IMAGE FUNDAMENTALS	**(08 Hours)**
Visual Perception — Human Eye, Brightness Adaptation And Discrimination, Electromagnetic Spectrum; Image Sensing And Acquisition — Single, Strip And Array Sensors, Image Formation Models; Image Sampling And Quantization — Basic Concepts, Representation Of Image, Special And Gray Level Resolution, Aliasing, Zooming And Shrinking; Relationships Between Pixels — Nearest Neighbor, Adjacency, Connectivity, Regions, And Boundaries; Distance Measures; Image Operations On A Pixel Basis; Linear And Nonlinear Operations.	
IMAGE ENHANCEMENT IN SPATIAL DOMAIN AND FREQUENCY DOMAIN	**(08 Hours)**
Gray Level Transformations - Image Negatives, Log, Power-Law And Piecewise Linear Transformation Functions; Histogram Processing — Equalization, Matching; Enhancement Operations - Arithmetic, Logic, Subtraction And Averaging; Spatial Filtering — Linear And Order-Statistics For Smoothing, First And Second Derivatives/Gradients For Sharpening, 2-D Fourier Transform, Its Inverse And Properties; Discrete And Fast Fourier Transform; Convolution And Correlation Theorems; Filtering In Frequency Domain - Low Pass Smoothing, High Pass Sharpening, Homomorphic Filtering.	
IMAGE RESTORATION	**(08 Hours)**
Image Degradation And Restoration Processes; Noise 'Models - Spatial Properties, Noise Probability Density Functions, Periodic Noise, Estimation Of Noise Parameters; Restoration In The Presence Of Noise and Mean Filters, Order-Statistics Filters, Adaptive Filters; Linear Position-Invariant Degradations And Estimation; Geometric Transformations - Spatial Transformation, Gray-Level Interpolation.	
MORPHOLOGICAL IMAGE PROCESSING	**(06 Hours)**
Preliminaries-Set Theory And Logic Operations In Binary Images; Basic Morphological Operations - Opening, Closing Operators, Dilation And Erosion; Morphological Algorithms - Boundary Extraction, Region Filling, Extraction Of Connected Components, Convex Hull, Thinning, Thickening, Skeletons; Extension Of Morphological Operations To Gray-Scale Images.	
IMAGE SEGMENTATION	**(06 Hours)**
Detection Of Discontinuities — Point, Line And Edges; Edge Linking And Boundary Detection - Local Processing, Global Processing Using Hough Transform; Thresholding - Local, Global And Adaptive; Region-Based Segmentation - Region Growing, Region Splitting And Merging; Motion Detection.	
IMAGE REPRESENTATION AND DESCRIPTION	**(04 Hours)**
Representations - Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeletons; Boundary Descriptors - Shape Numbers, Statistical Moments; Regional Descriptors - Topological, Texture And Moments Of 2-D Functions.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Gonzalez R. C. and Woods R. E, "Digital Image Processing", Pearson Prentice Hall, 3n1 Ed., 2008.

2. Linda Shapiro and Stockman George, "Computer Vision", Prentice Hall, 15t Ed., 2001.

3. Forsyth D. and Ponce J., "Computer Vision - A Modern Approach", Prentice-Hall, 1st Ed., 2003.

4. Sonka M. Hlavac V., Boyle R., "Image Processing, Analysis and Machine Vision", Cengage Learning, 2r4 Indian Reprint, 2009.

5. Jain R., Kasturi R. and Schunk B., "Machine Vision", McGraw - Hill, 1st Ed., 1995.

6. Jain A. K., "Fundamentals Of Digital Image Processing", PHI, 1st Ed., 1989.

B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 318: PROCESS INSTRUMENTATION(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION TO PROCESS CONTROL	**(05 Hours)**

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Introduction to Process Control, Examples of Surge Tank, Shower, Use of Instrumentation, in Process Control, Process Model and Dynamic Behavior.	
FEEDBACK CONTROL	**(10 Hours)**
Digital and Analog Controller (On-Off Control, Proportional, Integral And Derivative Control), Development Of Control System Block Diagram, Reason Of Set Point Changes, PID Controller, Turning of Feedback Controllers, Ziegler-Nichols Open Loop Method, Cohen-Coon Parameters, Self-Tuning Intelligent Control and Statistical Process Control.	
CASCADE AND FEED FORWARD CONTROL	**(07 Hours)**
Background, Introduction To Cascade Control, Cascade Control Analysis And Design, Feed Forward Control, Feed Forward Control Design And Examples Of Feed Forward Control.	
COMPLEX CONTROL SCHEMES	**(08 Hours)**
Ratio Control, Selective And Over Ride Control, Split — Range Control, Multivariable Control.	
COMPUTER CONTROL SYSTEMS	**(12 Hours)**
Computer Process Control, Mathematical Tools For Computer Control System: Pulse Transfer functions, Sample-Data Feedback Control Systems, Modified Z-Transform, Design of Computer Control Systems: Development Of Control Algorithms, Feedback Algorithms With Dead-Time Compensation, Automatic Controller Tuning, Model-Reference Control, Industrial Communication: Fieldbus.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Patranbis D., "Principle Of Industrial Instrumentation", McGraw-Hill, 2nd Ed., 1999.

2. Bequefte B. Wayne, "Process Control: Modeling Design And Simulation", Prentice Hall of India, 1st Ed., 2003.

3. Johnson Curtis D., "Process Control Instrumentation Technology", Prentice-Hall Of India, 7th Ed., 2003.

4. Carlos A. Smith and Armando B. Corripio, "Principles and Practice of Automatic Process Control"; John Wiley & Sons, 2nd Ed., 2006.

5. Wolfgang Altmann, "Practical Process Control For Engineers and Technician", Newnes, 1st Ed., 2005.

6. Shawhney A. K., "A Course in Electrical And Electronics Measurement And Instrumentation"; Dhanpat Rai & Co., 11th Ed., 1999.

फोन नं: संस्थान कार्यालय: २२२३३७१-७४, फेक्स नं: २२२८३९४, २२२७३३४ विभागीय प्रमुख: २२०१५५१, विभाग कार्यालय: २२०१५५२

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ELECTRONICS ENGINEERING DEPARTMENT

इलेक्ट्रानिक्स अभियांत्रिक विभाग

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सरदार वल्लभभाई नेशनल इन्स्टीयुट ओफ टेक्नोलोजी, सुरत

B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 322: MEMS(NEW)	**3**	**0**	**0**	**3**	

MEMS OVERVIEW	**(04 Hours)**
An Introduction To Micro Sensors And MEMS, Evolution Of Micro Sensors And MEMS, Micro Sensors And MEMS Applications, Introduction To MOEMS.	
MEMS MATERIALS & FABRICATION METHODS	**(08 Hours)**
MEMS Materials Properties, Microelectronic Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, fabrication of Micromachined Microstructure, Microstereolithography.	
MICROMACHINING AND SENSORS	**(08 Hours)**
Microelectronic Technologies For MEMS, Micromachining Technology, Surface, Bulk Micromachining, Other Micromachining Techniques, New Materials From MEMS ; Micro Machined Micro Sensors: Mechanical, Inertial, Biological, Chemical And Acoustic.	
BASIC MEMS OPERATING PRINCIPLES	**(07 Hours)**
Mechanics, Dynamics, Electrostatics, Advanced MEMS Operating, Principles For Sensing And Actuation Including Piezoresistive, Piezoelectric, Thermo-Mechanical, Microfluidics: Flow, Heat And Mass, Transfer At Small Scales; Electro kinetics.	
MICROSYSTEMS TECHNOLOGY	**(07 Hours)**
Microsystems Technology, Integrated Smart Sensors and MEMS, Interface Electronics for MEMS, MEMS Simulators, MEMS for RE Applications.	
MEMS TECHNOLOGY	**(08 Hours)**
Wafer Bonding, Chemical Mechanical Polishing ,Bonding & IC Packaging Of MEMS, Micro Scaling Considerations, Applications In Automotive Industry, Mechanical, Optical, Biomedical & Chemical Transducers, Optical MEMS, Bio MEMS, Plastic MEMS. Multi Disciplinary Applications. Future Developments.	
	(Total Contact Time:42 Hours)

BOOKS RECOMMENDED

1. Stephen D. Senturia, "Microsystem Design", Kluwer Academic Publishers, 1st Ed., 2001.

2. Marc Madou, "Fundamentals of Microfabrication" , CRC Press, 1st Ed., 1997.

3. Gregory Kovacs, "Micromachined Transducers Sourcebook", WCB McGraw-Hill, Boston, 1 st Ed., 1998.

4. M. H. Bao, "Micromechanical Transducers: Pressure sensors, accelerometers, and gyroscopes" by Elsevier, New York, 1st Ed., 2000.

5. Julian W. Gardner, "Microsensors — Principles and Applications", John Wiley and Sons, inc., NY, 1st Ed., 1994.

6. Maluf N., "An Introduction to Micro electromechanical Systems Engineering", Norwood, MA: Artech House, 2000.

7. Julian W. Gardner, "Micro sensors - Principles and Applications", John Wiley & Sons, Inc.1997.

8. Ljubisa Ristic, "Sensor Technology and Devices", Artech House, 1994.

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B. Tech - III(EC), Semester - VI	**L**	**T**	**P**	**C**	
EC 324: SCIENTIFIC COMPUTING(NEW)	**3**	**0**	**0**	**3**	

INTRODUCTION	**(08 Hours)**
Approximations: Sources,of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy. Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point Systems, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmatic, Cancellation	
SYSTEMS OF LINEAR EQUATIONS	**(04 Hours)**
Linear Systems, Solving Linear Systems, Norms and Condition Numbers, Accuracy of Solutions, Iterative Methods for Linear Systems.	
LINEAR LEAST SQUARES	**(04 Hours)**
Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, Gram-Schmidt Orthogonalization.	
EIGENVALUES AND SINGULAR VALUES	**(06 Hours)**
Eignvalues and Eigenvectors, Methods for Computing All Eignvalues, Jacobi Method, Methods for Computing Selected Eignvalues, Singular Values Decomposition, Application of SVD.	
OPTIMIZATION	**(04 Hours)**
Optimization Problems, One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares.	
INTERPOLATION	**(04 Hours)**
Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation.	
NUMERICAL INTEGRATION AND DIFFERENTIATION	**(02 Hours)**
INITIAL VALUE PROBLEMS FOR ODES	**(02 Hours)**
BOUNDARY VALUE PROBLEMS FOR ODES	**(02 Hours)**
PARTIAL DIFFERENTIAL EQUATIONS	**(02 Hours)**
FAST FOURIER TRANSFORM	**(02 Hours)**
RANDOM NUMBERS AND SIMULATION	**(02 Hours)**
	(Total Contact Time:42 Hours)
BOOKS RECOMMENDED	

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1. Heath Michael T., "Scientific Computing: An Introductory Survey', McGraw-Hill, 2' Ed., 2002.
2. Press William H., Saul A. Teukolsky, Vefterling William T and Brian P. Flannery, "Numerical Recipes: The Art of Scientific Computing", Cambridge University Press 3rd Ed., 2007.
3. Xin-She Yang (Ed.), "Introduction To Computation Mathematics", World Scientific Publishing Co., 2nd Ed., 2008.
4. Kiryanov D. and Kiryanova E., "Computational Science", Infinity Science Press, 1st Ed., 2006.
5. Quarteroni, Alfio, Saler'Faust°, Gervasio and Paola, "Scientific Computing With MATLAB And Octave", Springer, 3r a., 2010.

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