B.Tech
III Year VI Semester

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS

B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0418	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand architecture details of 8085
CO2: Review and analyze details of 8085 and 8086 architecture
CO3: Illustrate brief details of 8086 operations
CO4: Determine Importance of low power MSP 430 and its advancements
CO5: Analyze Inbuilt peripherals of MSP 430 also Power management features.

UNIT-1
OVERVIEW OF 8085 MICROPROCESSOR
Overview of microcomputer systems and their building blocks, Introduction to 8-bit microprocessor (8085) Architecture, Addressing modes, Instruction set, Machine cycles, instruction cycle and timing states.

UNIT-II
INTRODUCTION TO 8086
Introduction-8086 Architecture-Block Diagram, Register Organization, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagrams, Memory Segmentation, Interrupt structure of 8086 and Interrupt Vector Table. Memory organization and memory banks accessing.

UNIT-III
PROGRAMMING OF 8086
Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives- Macros and Procedures.- Sorting, Multiplication, Division and multi byte arithmetic code conversion. String Manipulation instructions-Simple ALPs.

UNIT-IV
INTRODUCTION TO LOW POWER RISC MSP 430
Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, Addressing modes, Instruction set Memory address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

UNIT-V
PERIPHERAL DEVICES OF MSP 430
I/O ports pull up/down resistors concepts, Interrupts, Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active Vs Standby current consumption. Timer & Real Time Clock (RTC), timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

Text Books:
1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996.
2. Douglas V. Hall, “Microprocessors and interfacing: Programming and hardware”, 2nd Edition. Tata McGraw Hill, 1991.
3. “Microprocessor and Microcontrollers”, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1st Edition, 2010
4. “The X86 Microprocessors , Architecture, Programming and Inerfacing” , Lyla B. Das, Pearson Publications, 2010
5. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition, 2008

Reference Books:

1. Carl Hamacher, ZvonksVranesic, SafwatZaky, “Computer Organization” 5th Edition, McGraw Hill, 2002.
2. Andrew S.Tanenbaum, “Structured Computer Organization”,4th Edition PHI/Pearson
3. John L.Hennessy and David A.Patterson, “Computer Architecture a quantitative approach”, Fourth Edition Elsevier
4. Joseph D. Dumas II, “Computer Architecture: Fundamentals and Principals of Computer Design”, BS Publication.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.4	1.4.1
	PO 3: Design/Development of solutions	3.1	3.1.1
CO2	PO 1: Engineering knowledge	1.4	1.4.1
	PO 3: Design/Development of solutions	3.4	3.4.1
	PO 4: Conduct investigations of complex problems	4.1	4.1.1
	PO 5: Modern tool usage	5.1	5.1.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.2	2.2.3
	PO 3: Design/Development of solutions	3.2	3.2.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
	PO 4: Conduct investigations of complex problems	4.1	4.1.3
	PO 5: Modern tool usage	5.1	5.1.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
	PO 4: Conduct investigations of complex problems	4.2	4.2.1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0419	DIGITAL SIGNAL PROCESSING	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Analyze discrete signals and systems in time and frequency domains.

CO2: Apply FFT algorithms to efficient computation of DFT.

CO3: Implement and realize various structures of IIR and FIR systems.

CO4: Design & analyze various Analog Filters and Digital Filters.

CO5: Understand and apply the basics of multi rate digital signal processing.

UNIT I: Introduction to DSP

Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.

Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Frequency analysis of signals using the DFT.

UNIT II: Fast Fourier Transform

Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, Quantization errors in the computation of DFT.

UNIT III: Analog & Digital Filters

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT IV: Realization of Filters

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Linear Phase Realization and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, lattice – Ladder structure.

UNIT V: Multirate DSP

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of band pass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, Algorithms and applications,” Pearson Education/PHI, 4th ed., 2007.
2. Sanjit K Mitra, “Digital signal processing, A computer base approach,” Tata McGraw Hill, 3rd edition, 2009.

REFERENCES:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, “Discrete Time Signal Processing,” 2nd ed., Pearson Education, 2012.
2. B. P. Lathi, “Principles of Signal Processing and Linear Systems,” Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, “Digital Signal Processing, Fundamentals and Applications,” Academic Press, Second Edition, 2013.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
			2.4.3
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
			2.4.3
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.1	2.1.1
			2.1.3
		2.3	2.3.1
			2.3.2
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
			3.3.2
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0420	MICROWAVE AND OPTICAL COMMUNICATIONS	3	0	0	3

Course Outcomes:

Upon completion of the course students will be able to

CO1: Review different fields in rectangular waveguides and performance of Gunn diode.

CO2: Understand working of different waveguide components and analyze S parameters of waveguide junctions.

CO3: Analyze the operation of O type tubes and measure different parameters of microwave test bench setup.

CO4: Compare different optical fiber modes.

CO5: Exemplify Optical sources, detectors and their working principles.

UNIT I:

RECTANGULAR WAVE GUIDE

Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides-Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, dominant and degenerate modes, Mode characteristics- Phase and Group velocities, wavelengths and impedance relations, Gunn diode-principles, RWH theory.

UNIT II:

WAVEGUIDE COMPONENTS AND APPLICATIONS

Coupling mechanisms- probe, loop. Wave guide discontinuities-waveguide Windows, tuning screws and posts, matched loads. Waveguide attenuators-resistive card, rotary vane Attenuators; waveguide phase shifters-dielectric, rotary vane phase shifters. Wave guide multiport junctions and scattering parameters-E plane and H plane Tees, Magic Tee, Directional couplers-2-hole, Bothe hole types.

UNIT III:

MICROWAVE TUBES

Limitations and losses of conventional tubes at microwave frequencies. O type tubes: 2 cavity klystrons-structure, Applegate diagram, velocity modulation process, bunching process. Reflex Klystrons-structure, Applegate diagram, Velocity Modulation, mathematical theory of bunching.

MICROWAVE MEASUREMENTS

Description of Microwave bench-different blocks and their features, errors and precautions, Measurement of attenuation, Power, low and high VSWR, impedance.

UNIT IV:

INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system, element of an Optical Fiber Transmission link, Ray Optics, optical Fiber Modes and Configurations, Mode theory of Circular Wave guides, Single Mode and Multimode Mode Fiber structures.

UNIT V:

OPTICAL FIBER SOURCES AND RECEIVERS

Direct and indirect bandgap structures, Light Emitting Diode (LED) Structures, Laser Diode structures, PIN and APD, Fiber to Fiber Joints, Fiber Splicing, Fiber Connectors. Optical Isolators and Circulators.

Text Books:

1. Microwave devices and circuits-Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave principles-Herbert J. Reich, J. G. Skalnik, P. F. Ordung and H. L. Krauss, CBS publishers and distributors, New Delhi,2004.
3. Gerd Keiser,"Optical Fiber Communication"McGraw–Hill International,Singapore,3rd ed., 2000.
4. J. Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

Reference Books:

5. Foundations for microwave engineering-R. E. Collin, IEEE press, John Wiley, 2ndedition, 2002.
6. Microwave circuits and passive devices-M. L. Sisodia and G. S. Raghuvanshi, Wiley Eastern Ltd., New age international publishers Ltd., 1995.

7. Max Ming-Kang Liu, “Principles and Applications of Optical Communications”, TMH, 2010.
8. S. C. Gupta, “Text book on optical fiber communication and its applications”, PHI, 2005.
9. Satish Kumar, “Fundamentals of Optical Fiber communications”, PHI, 2009.

List of Cos	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Conduct investigations of complex problems	4.3	4.3.3
CO: 2	PO 4: Conduct investigations of complex problems	4.3	4.3.3
CO: 3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO: 4	PO 1: Engineering knowledge	1.3	1.3.1
CO: 5	PO 1: Engineering knowledge	1.3	1.3.1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APE0404	LOW POWER VLSI CIRCUITS AND SYSTEMS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Remember concepts of MOS transistor logic and various sources of power dissipation.
CO2: Analyze different sources of power dissipation and supply voltage scaling for low power.
CO3: Estimate Low power design approaches for various circuit level measures.
CO4: Verify various switched capacitance minimization methods.
CO5: Illustrate various Leakage power minimization techniques.

UNIT I:
Introduction: Historical background, why low power, sources of power dissipations, low power designmethodologies**.**
MOS Transistors: Introduction, the structure of MOS Transistor, the Fluid model, Modes of operation of MOS Transistor, Electrical characteristics of MOS Transistors, MOS Transistors as a switch.

UNIT II:
MOS Inverters: Introduction, inverter and its characteristics, configurations, inverter ratio in different situations, switching characteristics, delay parameters, driving parameters, driving large capacitive loads.
MOS Combinational Circuits: Introduction, Pass-Transistor logic, Gate logic, MOS Dynamic Circuits**.**

UNIT III:
Sources of Power Dissipation: Introduction, short-circuit power dissipation, switching power dissipation, glitching power dissipation, leakage power dissipation.
Supply voltage scaling for low power: Introduction, device features size scaling, architecture-level approaches, voltage scaling, multilevel voltage scaling, challenges, dynamic voltage and frequency scaling, adaptive voltage scaling.

UNIT IV:
Minimizing Switched Capacitance: Introduction, system-level approaches, transmeta's Crusoe processor, bus encoding, clock gating, gated-clock FSMs, FSM state encoding,FSM Partitioning, operand isolation, precomputation, logic styles for low power.

UNIT V:
Minimizing Leakage Power: Introduction, fabrication of multiple threshold voltages, approaches for minimizing leakage power, Adiabatic Logic Circuits, Battery-Driven System, CAD Tools for Low Power VLSI Circuits.

TEXT BOOKS:

1.Ajit. Pal, Low power VLSI Circuits and systems,springer.
2. Sung Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata McgraHill.
3. Neil H.E.Weste and K. Ehraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley.
4. A. Bellamour, and M. I. Elmasri, Low Power VLSI CMOS Circuit Design, Kluwer Academic Press, 1995.
5. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic.

REFERENCES:

1. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley Interscience, 2000.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.1	2.1.2
CO2	PO 2: Problem analysis	2.1	2.1.3
CO3	PO 3: Design/Development of solutions	3.1	3.1.1
CO4	PO 3: Design/Development of solutions	3.4	3.4.1
	PO 4: Conduct Investigation of Complex Problems	4.1	4.1.2
CO5	PO 5:Modern Tool Usage	5.1	5.1.1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APE0405	MEMS AND MICROSYSTEMS	3	0	0	3

Course Outcomes:
Upon completion of the course students will be able to
CO1: Understand the Micro sensors and different material properties
CO2: Illustrate micro machine process for different techniques
CO3: Compare various characteristics in different types of Micro sensors
CO4: Analyze MEMS accelerometers functionality and know its applications.
CO5: Determine the use of MEMS devices in various applications.

UNIT I:
Introduction: Introduction to MEMS & Microsystems, Introduction to Microsensors, Evaluation of MEMS, Microsensors, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties.

UNIT II:
Microelectronic Technology for MEMS: Microelectronic Technology for MEMS, Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micro machined Microstructure, Micro stereo lithography.

UNIT III:
Micro Sensors: MEMS Microsensors, Thermal Microsensors, Mechanical Micro machined Microsensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micro machined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor.

UNIT IV:
MEMS Accelerometers: Micromachined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezo resistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application.

UNIT V:
MEMS Applications: Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Introduction to Bio MEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS).

Text Books:

1. Nadim Maluf Kirt Williams "An Introduction to Micro electro mechanical Systems Engineering", Second Edition, Artech House, Inc. Boston London, International Standard Book Number: 1-58053-590-9.
2. Varadan, V KandVaradan "Microsensors, actuators, MEMS, and electronics for smart structures" Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Micro fabrication, SPIE Optical Engineering Press

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 2	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 3	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 4	PO 3: Design/Development of Solutions	3.4	3.4.1
CO: 5	PO 3: Design/Development of Solutions	3.4	3.4.1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APE0406	INDUSTRIAL ELECTRONICS	3	0	0	3

Course Outcomes:

Upon completion course students will be able to

CO1: Review of semi-conductors and understand the operation of Diodes
CO2: Analyze the operation of Semiconductor Devices.
CO3: Illustrate the characteristics of AC to DC converters.
CO4: Identify the techniques of Heating and Welding methods.
CO5: Implement various applications in Ultrasonics.

UNIT I: Review of Semiconductors & Diodes

Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semiconductor, Open-circuited p-n junction, Diode resistance, Zener diode, Photoconductors and junction photo diodes, Light emitting diodes (LED)

UNIT II: Transistor Characteristics

Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor-α, Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.

UNIT III: Rectifier, Filter & Regulators

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.

UNIT IV: Welding & Heating

Resistance welding controls: Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, Electronic welding control used in Resistance welding, Energy storage welding. Induction heating: Principle of induction heating, Theory of Induction heating, merits of induction heating. Dielectric heating: Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating.

UNIT V: Ultrasonics

Ultrasonics: Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection, Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, separation of mixtures by ultrasoni8c waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Thermal effects of Ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying.

Text Books:

1. G. K. Mithal, “Industrial Electronics”, Khanna Publishers, Delhi, 2000.
2. J. Gnanavadivel, R.Dhanasekaran, P.Maruthupandi, “Industrial Electronics”, Anuradha Publications,

2011.

Reference Books:

1. F. D. Petruzulla, “Industrial Electronics”, McGraw Hill, Singapore, 1996.
2. M. H. Rashid, “power Electronics Circuits, Devices and Application”, PHI, 3rd edition, 2004.
3. G. M. Chute and R. D. Chute, “Electronics in Industry”, McGraw Hill Ltd, Tokyo, 1995.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0421	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	0	0	3	1.5

Course Outcomes:

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

CO1: Apply Assembly language instructions of 8086 microprocessor to describe the concept of programming and its applications to real world.

CO2: Demonstrate the steps in executing an assembly language program using an assembler.

CO3:Implement some specific real time applications Using MSP 430 low power microcontroller.

CO4: Program MSP 430 for designing any basic Embedded System

CO5: Examine concepts of Power management in MSP 430 Controllers

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

Part A: 8086 Microprocessor Programs using MASM/8086 microprocessor kit.

1. Introduction to MASM Programming.
2. Programs using arithmetic and logical operations
3. Programs using ASCII arithmetic operations
4. Programs for code conversion
5. Sorting of the given numbers
6. String operations

Part B: Embedded C Experiments using MSP430 Microcontroller

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs, push buttons)
2. Usage of Low Power Modes: (Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. Interfacing potentiometer with MSP430
5. Using ULP advisor in Code Composer Studio on MSP430
6. Low Power modes and Energy trace++

Note: Any FIVE experiment from Part A and FIVE experiments from Part B are to be conducted

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 3: Design/Development of Solutions:	3.3	3.3.1
CO: 2	PO 4: Conduct investigations of complex problems:	3.3	3.3.2
CO: 3	PO 5: Modern tool usage:	5.1	5.1.2
CO: 4	PO 5: Modern tool usage:	5.2	5.2.1
CO: 5	PO 5: Modern tool usage:	5.3	5.3.2

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0422	DIGITAL SIGNAL PROCESSING LABORATORYORATORY	0	0	3	1.5

Course Outcomes (COs): Student will be able to

CO1: Analyze Power or Energy of a discrete time sequence.
CO2: Compute convolution & Correlation of discrete time sequences
CO3: Compute Fourier Transform of discrete time sequence
CO4: Design and analyze various Analog Filters
CO5: Design and analyze various Digital Filters

List of Experiments: (Minimum of 5 experiments are to be conducted from each part)

Software Experiments

(Part – A)

1 Power or Energy of a discrete time sequence.
2 Convolution & Correlation of discrete time sequences
3 DTFT of a discrete time signal/sequence
4 N – Point Fast Fourier Transform Algorithm
5 Design of Analog filters and verify the frequency response
6 Design of Digital IIR filters and verify the frequency response
7 Design of Digital FIR filters using Windowing Technique

Using DSP Processor kits (Floating point) and Code Composure Studio (CCS)

(Part – B)

1 Power or Energy of a discrete time sequence.
2 Convolution & Correlation of discrete time sequences
3 DTFT of a discrete time signal/sequence
4 N – Point Fast Fourier Transform Algorithm
5 Design of Analog filters and verify the frequency response
6 Design of Digital IIR filters and verify the frequency response
7 Design of Digital FIR filters using Windowing Technique

Equipment/Software Required:

1 Licensed MATLABORATORY software with required toolboxes for 30users.
2 DSP floating Processor Kits with Code Composure Studio (8nos.)
3 Function Generators
4 CROs
5 Regulated Power Supplies.

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 4: Conduct investigations of complex problems	4.3	4.3.1
			4.3.2
			4.3.3.
			4.3.4
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
			2.4.3
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO3	PO 2: Problem analysis	2.4	2.4.1
			2.4.2
	PO 5: Modern tool usage	5.2	5.2.1
			5.2.2
CO4	PO 3: Design/Development of solutions	3.3	3.3.1
			3.3.2
CO5	PO 3: Design/Development of solutions	3.3	3.3.1
			3.3.2

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20APC0423	MICROWAVE AND OPTICAL COMMUNICATIONS LABORATORYORATORY	0	0	3	1.5

Course Outcomes:
Upon completion of the course students will be able to
CO1: Apply and test Microwave Concepts/ Microwave components.
CO2: Analyze Microwave Active Devices by conducting experiments and measuring various parameters.
CO3: Perform and measure various parameters of an Antenna.
CO4: Design and analyze an optical fiber communication link.
CO5: Analyze the characteristics of Optical Sources and Optical fiber by conducting experiments and measuring various parameters.

Microwave Laboratory (PART – A) --- Any Six (6) Experiments
1. Reflex Klystron Mode Characteristics.
2. Reflex Klystron Voltage Characteristics.
3. Gunn Diode Characteristics.
4. Fixed Attenuation Measurement.
5. Variable attenuation measurement
6. Directional Coupler Characteristics.
7. Frequency and Wavelength measurements using slotted section.

Optical Fiber Laboratory (PART – B) --- Any four (4) Experiments
1. Characterization of LED.
2. Characterization of Laser Diode.
3. Measurement of Numerical Aperture of the given fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of losses for Analog Optical link.

Equipment required for Laboratoryoratories:
1. Regulated Klystron Power Supply 6 nos.
2. VSWR Meter 6 nos.
3. Milli/Micro Ammeters 10 nos.
4. Multi meters 10 nos.
5. CROs 8 nos.
6. GUNN Power Supply, Pin Moderator4 nos.
7. Relevant Microwave components--
8. Fiber Optic Analog Trainer based LED3 nos.
9. Fiber Optic Analog Trainer based laser2nos.
10. Fiber Optic Digital Trainer 1 no.
11. Fiber cables - (Plastic, Glass)

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO: 1	PO 4: Conduct investigations of complex problems	4.3	4.3.1
CO: 2	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO: 3	PO 4: Conduct investigations of complex problems	4.3	4.3.3
CO: 4	PO 4: Conduct investigations of complex problems	4.2	4.2.1
CO: 5	PO 4: Conduct investigations of complex problems	4.3	4.3.3

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AK20-REGULATIONS

B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20ASA0501	BASICS OF CLOUD COMPUTING	1	0	2	2

Course Outcomes:
Upon completion of the course students will be able to
CO1: Ability to understand various service delivery models of a cloud computing architecture.
CO2: Understanding cloud service providers.
CO3: Configure various virtualization tools such as Virtual Box, VMware workstation.
CO4: Analyze authentication, confidentiality and privacy issues in cloud computing.

UNIT I:

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, a Service Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models, Challenges Ahead, and Historical Developments.

1. To study in detail about cloud computing.
2. Working of Google Drive to make spreadsheet and notes.
3. Installation and Configuration of Just cloud.
4. Working in Cloud9 to demonstrate different language.

UNIT II:

Cloud Architecture, programming model: NIST reference architecture, architectural styles of cloud applications, deployment models-public, private, hybrid, community; Types of cloud computing: utility computing, cluster; computing Cloud services: Amazon, Google, Azure, online services Applications of cloud computing

1. Install Google App Engine. Create hello world app and other simple web applications using Python/java.
2. Deployment and Configuration options in Google Cloud
3. Deployment and Configuration options in Microsoft Azure

UNIT III:

Cloud Service Models: Defining Clouds for the Enterprise- Storage-as-a-Service, Databases- as-Service, Platform-as-a-Service, Pros and Cons of PaaS, Infrastructure-as-a-Service. Pros and Cons of IaaS, Software as a Service, Pros and Cons of SaaS, Other Cloud Service Models.

Programs on SaaS

1. Create an word document of your class time table and store locally and on the cloud with doc,and pdf format . (use www.zoho.com anddocs.google.com)
2. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula DA=10% OF BASIC HRA=30% OF BASIC PF=10% OF BASIC IF BASIC<=3000 12% OF BASIC IF BASIC>3000 TAX=10% OF BASIC IF BASIC<=1500 =11% OF BASIC IF BASIC>1500 AND BASIC<=2500 =12% OF BASIC IF BASIC>2500 (
3. use www.zoho.com and docs.google.com) NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX
4. Prepare a ppt on cloud computing –introduction, models, services, and architecture PPT should contain explanations, images and at least 20 pages (use www.zoho.com and docs.google.com)
5. Create your resume in a neat format using Google and zoho cloud

Programs on PaaS

1. Write a Google app engine program to generate n even numbers and deploy it to google cloud
2. Google app engine program multiply two matrices
3. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into Google cloud

UNIT IV:

Cloud resource virtualization: Basics of virtualization, types of virtualization techniques, merits and demerits of virtualization, Full vs. Para - virtualization, virtual machine monitor/hypervisor. Virtual machine basics, taxonomy of virtual machines, process vs. system virtual machines.

1. Install Virtual box/VMware Workstation with different flavours of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and executes Simple Programs

UNIT V:

Security: Disaster Recovery, Privacy Design, Data Security, Network Security, Compromise Response Disaster Recovery, Disaster Recovery, Planning, Cloud Disaster Management.

Case Study: PAAS (Face book, Google App Engine), AWS Case Study: Amazon.com

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Cloud Computing – Web Based Applications That Change the way you Work and ColLaboratoryorate Online – Michael Miller, Pearson Education.
3. Cloud Application Architectures, 1st Edition by George Reese O'Reilly Media.

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

Online Learning Resources:

https://nptel.ac.in/courses/106105167

CO No.	PO No. and Keyword	Competency Indicator	Performance Indicator
CO1	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO2	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO3	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO4	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1
CO5	PO 1: Engineering knowledge	1.3	1.3.1
	PO 2: Problem analysis	2.3	2.3.1
	PO 3: Design/Development of solutions	3.3	3.3.1

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B. Tech III Year VI Semester

Course Code	Course Title	L	T	P	Credits
20AMC9903	ENVIRONMENTAL STUDIES	2	0	0	0

Course Outcomes:

Upon completion of the course students will be able to

CO1: Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

CO2: Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.

CO3: Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

CO4: Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage.

CO5: To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT – I

Multidisciplinary Nature of Environmental Studies: Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable energy resources – Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

Energy resources: Renewable and non-renewable energy resources.

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Causes, effects and its control measures of: Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.

UNIT – V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

REFERENCES:

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:2	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:3	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:4	PO1:Apply the knowledge of Basic science	1.2	1.2.1
CO:5	PO1:Apply the knowledge of Basic science	1.2	1.2.1