MINOR SPECIALIZATIONS

D. ELECTRONICS & COMMUNICATION ENGINEERING

Minor-D Electronics & Communication Engg.	L	T	P	To	C
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EC223 ELECTRONIC DEVICES

Course Description and Objectives:

As part of this course, to deliver the knowledge about switches and relays, knowledge about physics of basic semiconductor devices. To enhance comprehension capabilities of students through understanding of electronic devices, introduce and motivate students to the use of basic power electronic devices and understand DC biasing needed for various applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

a. Ability to understand switches and relays
b. Ability to understand semiconductor devices through energy band diagrams
c. Ability to analyze characteristics of semiconductor junctions
d. Ability to differentiate between bipolar and unipolar conduction
e. Students will be able to understand and the usefulness of semiconductor devices.

UnitI -Surface Mounted Devices (SMDs)

Connectors, Relays and Switches: Various types of switches, e.g. Slide, rotary, push, Toggle etc, their symbols and applications. Concept of 'make' and 'brake' contacts in relays. Various types of relays and applications. Various types of connectors, their functions and applications

UnitII - Semiconductor Physics:

Intrinsic semiconductors, Conductivity, atomic and crystal structure of germaniumand silicon, covalent bonds, generation and recombination, effect of temperature on conductivity of intrinsic Semiconductors, energy levels diagram of conductor, insulators and intrinsic semiconductors, Extrinsic semiconductor materials - Doping of impurity, P and N type semiconductors and their conductivity, Minority and majority carriers~ Drift and Diffusion currents.

Unit III-Semiconductor Diodes & Rectifiers

P-N junction diode, mechanism of current flow in P-N junction, behaviour of P-N junction characteristics, Zenor diode, zener and avalanche breakdown, Tunnel diode, Schottky diode, Varactor diode,Light emitting diode.

Rectifiers: Half wave Rectifier, Full wave rectifier, Bridge rectifier and their comparisions

Unit IV- Introduction to Bipolar Transistor & FET & MOSFET

Introduction to Bipolar Transistorconcept of bipolar transistor as two junction three terminal device PNP and NPN transistors, their symbols. Input and output characteristics. Common emitter, base, Collector configurations.

FET: Construction, operation, characteristics and equivalent circuit of JFET and its circuit applications

MOSFET: Construction, operation, characteristics and equivalent circuit of MOSFET in depletion and enhancement modes and is circuit applications. Comparison of JFET, MOSFET, BJT.

Unit V-Regulators and Power semiconductor devices

Simple Zener Regulators, UJT, SCR, TRIAC DIAC, GTO, PUT, IGBT, SCS, SUS, RCT, LASCR

TEXT BOOKS:

1. S. Salivahanan “Electronic Devices and Circuits” Tata Mcgraw-Hill second edition
2. R.L.Boylestad and Lovis Nashelsky , “Electronic Devices and Circuits Theory”, 10th ed., Pearson Education, 2010.

REFERENCE BOOKS :

1. R.L.Boylestad and LovisNashelsky , “Electronic Devices and Circuits Theory”, 10th ed., Pearson Education, 2010.
2. N.N.Bhargava, “Basic Electronics and Linear Circuits”, 1st ed.,Tata McGraw-Hill, 2009.
3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, 5th ed.,Oxford University Press,2006

Minor-D Electronics & Communication Engg.	L	T	P	To	C
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EC250 ELECTRONIC CIRCUITS

***Course Description & Objectives**:*

As part of this course, students to understand Diode switching circuits, to understand usefulness of the devices for various applications like amplifiers, oscillators etc. and understanding theoretical concepts of biasing and stabilization.

Course Outcome:

Upon successful completion of this course, students should be able to:

1. Students will be able to understand and the usefulness of semiconductor devices in circuit making.
2. Students will be Able to understand the Diode switching circuits.
3. They will be able to analyze the multistage electronic circuits.
4. They will be able to use these basic circuits to develop various useful applications.

UNIT I DIODE SWITCHING CIRCUITS

Diode as a switch, Diode clippers & Clampers. Clamping circuit theorem, practical clipping and clamping circuits. Realization of Logic Gates using Diodes: AND, OR gates using Diodes.

UNIT II- BIASING AND STABILIZATION

Dc load line, Ac load line and selection of operating point, need for biasing, various biasing techniques: fixed bias, collector to base bias and self bias with stability factors. Various compensation circuits, thermal runaway and thermal stability.

UNIT III- FEEDBACK CIRCUITS

Feedback Amplifiers: Concept and types of feedback, effects of negative feedback, Different topologies.

Oscillators: Barkhausen's crieterion for oscillations, frequency of oscillations for Hartley , Colpitts, RC phase shift,Wein bridge and Crystal oscillators.

UNIT IV -POWER AMPLIFIERS

Classification of Power Amplifiers, Operation and Efficiency of Class A Series fed & transformer coupled, Class B Push Pull & Complimentary Symmetry, Class C Amplifiers and Comparisons.

UNIT V- MULTIVIBRATORS

Astable, Monostable and Bistable Multivibrators, Schmitt trigger using transistors.

TEXT BOOKS:

1. J. Millman and C.C. Halkias, “Integrated Electronics”, 1st ed., Tata McGraw-Hill , 2009.
2. Donald A. Neaman, “Electronic Circuit Analysis and Design”, 3rd ed.,Tata McGraw-Hill, 2009.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” – 9th ed.,Pearson/Prentice Hall, 2006.
2. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, 5th ed., Oxford University Press, 2006.
3. M.H. Rashid, “Micro Electronic Circuits: Analysis and Design”, 1st ed.,Thomson PWS Publ., 1999

Minor-D Electronics & Communication Engg.	**L**	**T**	**P**	**To**	**C**
	4	0	-	4	4

EC228 DIGITAL ELECTRONICS

Course Description &Objectives:

To introduce the concepts and techniques associated with the number systems and codes and minimize the logical expressions using Boolean postulates. To design various combinational and sequential circuits and provide with anSufficient Number of applications for the techniques and mathematics used in this course.

Course Outcomes:

Upon successful completion of this course, students should be able to:

a. Determine the philosophy of number systems and codes.
b. Simplify the logic expressions using Boolean laws and postulates and design them by using logic gates.
c. Minimize the logic expressions using map method and tabular method.
d. Design of combinational logic circuits using conventional gates.
e. Design of sequential logic circuits.
f. Design the FSM for completely specified and incompletely specified sequential machines.
g. Knowledge of the nomenclature and technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGAs, etc.

UNIT I - Number Systems and Boolean Algebra

Review of number systems, Conversions, Arithmetic operations, Binary codes: parity code, hamming code, Fundamental concepts of Boolean algebra, Basic theorems and properties, canonical and standard forms, logic gates, Algebraic simplification and realization with basic gates and universal gates.

UNIT II-Minimization of Switching Functions

Minimization of Switching Functions, Map method, prime implicants, don't care combinations, minimal SOP and POS forms, Tabular method, prime implicant chart.

UNIT III-Combinational Logic Design

Design using conventional Logic gates, Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, code converters, (Designing with gates along with mention of IC numbers), Basic PLDs : PAL, PLA, ROM, PROM

UNIT IV-Sequential Logic Design

Classification of sequential circuits, Latches, Flip-Flops: SR, JK, T, D; triggering and Excitation tables, Design of Sequential circuits: Shift Registers, counters, FSM, Sequence Detectors.

UNIT V-Logic Families

Introduction to logic families, CMOS logic, Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families

TEXT BOOKS:

1 Morris Mano, “Digital Logic & Computer Design”, 1st ed., Pearson, 2005.
2 John F walkerly, Digital Design Principles and Practices, 3rd ed., PHI/Pearson Education, 2005.

REFERENCE BOOKS:

1. John M. Yarbrough, “Digital Logic Applications and Design”,1sted.,Thomson Publications, 2006.
2. Fletcher, “An Engineering Approach To Digital Design” , 1st ed.,Prentice Hall of India. 2009.
3. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
4. D. Roy Chowdhury, “Linear Integrated Circuits”, 2nd ed., New Age International(p)Ltd, , 2003.

Minor-D Electronics & Communication Engg.

L	T	P	To	C
4	0	-	4	4

EC333 COMMUNICATION SYSTEMS - I

***Course Description & Objectives**:*

As part of this course, to familiarize students with the fundamentals of analog and digital communication systems and provide students with tools for communication signal analysis. To familiarize students with various techniques for amplitude modulation and demodulation of analog signals .

Course Outcomes:

Upon successful completion of this course, students should be able to:

a. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
b. Describe the basic theory and operation of analog communication systems, especially AM and FM modulation.
c. The student will know the constituents of a digital communications system .
d. An ability to identify, formulate and solve engineering problems.

UNIT I - Basic Signals and Fourier spectrum

Block diagram of communication system, Radio frequency spectrum: Classification of signals, Fourier Transform of various signals, Fourier Spectrum, power spectral Density, Autocorrelation and Cross-correlation.

UNIT II - Amplitude Modulation and Demodulation

Modulation, Need for modulation, Amplitude modulation: AM. DSBSC, SSBSC and power and Bandwidth requirements; Generation of AM, DSB-SC, SSB - SC, Demodulation of AM: Envelope detector

UNIT III - Angle Modulation and Demodulation

Concept of Instantaneous frequency, Frequency and phase modulations, relationship and comparison between FM and PM. Narrowband and wideband FM. Generation of FM: Direct method, indirect method. Demodulation of FM: Phase locked loop (PLL).

UNIT IV -Digital communications

Sampling, Nyquist rate, Sampling theorem, Time Division multiplexing (TDM). Block diagram of PCM, Signal to Quantization noise ratio, Delta Modulation.

UNIT V - Digital Modulation

ASK, FSK, PSK and their modulation and Demodulations. Comparison between ASK, FSK and PSK with constellation diagrams.

TEXT BOOKS:

1. B.P Lathi, Zhi Ding, “Modern Digital and Analog Comm. System” 1st ed., Oxford Press.
2. Taub, Schilling, “Principles of Communication Systems”, 3rd ed., Tata McGraw-Hill,2008

REFERENCE BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.
3. Communication Systems Second Edition – R.P. Singh, SP Sapre, TMH, 2007.
4. Communication Systems – B.P. Lathi, BS Publication, 2006.
5. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

Minor-D Electronics & Communication Engg.	L	T	P	To	C
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EC335 LINEAR IC APLICATIONS

***Course Description & Objectives**:*

This subject introduces the theoretical & circuit aspects of Op-amp, which is the backbone for the basics of linear integrated circuits. To study the basic principles, configurations and practical limitations of op-amp and analyzing the designs and explain the characteristics and applications of active filters, including the switched capacitor filter understanding the operation of the most commonly used D/A and A/D converter types and its applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

a. *Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.*
b. *Elucidate and design the linear and non-linear applications of an opamp and special application Ics.*
c. *Explain and compare the working of multivibrators using special application IC 555 and general purpose opamp.*
d. *Classify and comprehend the working principle of data converters.*
e. *Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication.*

UNIT I- Basics of Op-amp

Classification of Integrated circuits, basic information of Opamp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, features of 741 op-amp, modes of operation : inverting, non-inverting and differential.

UNIT II - OP-AMP Applications

Basic application of Op-amp, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators.

UNIT III -Active FilterS & Oscillators

Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters.

Oscillators: Types and principle of operation – RC& Wien, waveform generators – triangular, saw- tooth, square wave.

UNIT IV-D/A and A/D Converters

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications. Data Acquisition: Instrumentation Amplifier.

UNIT V -Timers & Phase Locked Loops

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

TEXT BOOKS :

1. D. Roy Chowdhury, “Linear Integrated Circuits”, 2nd ed., ANew Age International (p) Ltd, 2003.
2. JohnWalkerly, “Digital Design Principles & Practice”, 3rd, Pearson Education, 2010.

REFERENCE BOOKS :

1. Tahira Parveen, “Operational Transconductance Amplifier and Analog Integrated Circuits “ , I K International Publishing House Pvt. Ltd .,2010
2. G.B.Clayton, Operational Amplifiers, Butterworth, 1971.
3. Sergio Franco, “Design with Operational Amplifiers & Analog Integrated Circuits”, McGraw Hill,1988.
4. Millman, “Micro Electronics”, McGraw Hill, 1988

Minor-D Electronics & Communication Engg.	L	T	P	To	C
	4	0	-	4	4

EC336 MICROPROCESSORS AND INTERFACING

***Course Description & Objectives**:*

As part of this course, students learn about the *History of Microprocessors. Difference between microprocessors, micro controllers. To study the architecture and addressing modes of 8086 and to write assembly language programs of 8086. To study the architecture and addressing modes of 8051 and to write assembly language programs of 8051 and various interfacing circuits necessary for various applications.*

Course Outcome

Upon successful completion of this course, students should be able to:

a. *To give an overview on the architecture and basic concepts of microprocessor*
b. *To impart knowledge on the architecture and software aspects of microprocessor 8086*
c. *To write assembly language program in 8086 for various application.*
d. *To give an overview on the architecture and basic concepts of microcontroller*
e. *To write assembly language program in microcontroller 8051 for various application*

UNIT I - Introduction to Microprocessors

Evolution of Microprocessors, 8086 Microprocessor Architecture: Register organization, Instruction queue, and Physical address calculation. Addressing Modes, Pin description of 8086.

UNIT II - Instruction set

Assembly Language Programs: for arithmetic operations, logical operations, CALL-RET operations, Intra and inter segment calls, sorting and string operations. Interrupts of 8086.

UNIT III - Introduction to Microcontroller

Differences between microprocessor and microcontrollers, 8051

Architecture, Internal & External memory organization, Pin diagram, addressing modes, on board RAM, Special Function Register area, Addressing modes of 8051, interrupts of 8051, interfacing external memory to 8051

Unit IV - PROGRAMMING

8051 Instruction set and assembly language programming, Example programs

UNIT V- INTERFACING

Micro processor interfacing: Key board and Display Interfacing, A/D and D/A converter interfacing, traffic light,

Micro controller interfacing**:** 7-seg LED interfacing, Key board interfacing, LCD interfacing, Stepper motor interfacing.

TEXT BOOK:

1. Douglas V.Hall, "Microprocessors & Interfacing", 2nd ed., TMH, 2003
2. Mazidi "The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/E" Pearson education.

REFERENCE BOOKS:

1. A K Ray and K M Bhurchandi, "Advanced Microprocessors & Peripherals", 2nd ed., TMH,2006.
2. Raj Kamal, "Microcontroller architecture, programming, Interfacing and System Design", Pearson Education, 2005
3. The 8051 Microcontroller and Embedded Systems using Assembly and C – Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
4. Barry B.Brey: Intel Microprocessor Architecture, Programming and Interfacing- 8086/8088, 80186, 80286, 80386 and 80486, PHI,1995.

Minor-D Electronics & Communication Engg.	L	T	P	To	C
	4	0	-	4	4

EC338 COMMUNICATION SYSTEMS-II

Course Description & Objectives:

As part of this course, students will study the basic principles of cellular mobile system, Optical and Satellite Communications and basic principles of Radar systems. To impart knowledge on wave propagation and information theory.

Course Outcomes:

*Upon successful completion of this course, stu*dents should be able to:

a. To understand the basic principles of Telec*ommunications.*
b. To understand the basic principles of cellular mobile system.
c. To understand the basic principles of Optical and Satellite Communications.
*d. To u*nderstand the basic principles of Radar *systems.*

Unit I - Information Theory

*Concept of amoun*t of information and its properties. Average information, Entropy and its properties. Information rate, Basics of Channel, Concept of Mutual information and its properties, Shannon's theorem, channel capacity, capacity of a Gaussian channel, bandwidth –S/N trade off.

Unit II - Radio Wave Propagation

Ground wave Propagation, Space wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Radio-Horizon, Duct Propagation, Ionosphere Propagation, Gyro frequency, Critical Frequency, Skip Distance, Maximum Usable Frequency.

UNIT III - Introduction to Radar Engineering

Applications of Radars, Block Diagram of Simple Radar , Radar range equation,, Block diagram of Pulse Radar, Pulse Doppler Radar, Doppler Effect, CW Radar, FMCW Radar, MTI Radar

UNIT IV - Introduction to Satellite Communications

Satellite orbit, Keppler's Laws, look Angles, Geo stationary satellite, Satellite communication systems, Satellite subsystems, Satellite earth station, GEO, MEO, LEO, Applications of satellites.

UNIT V - Introduction to Optical Communications

Advantages of fiber optic system, Fiber optic communication system, spectrum of light, Characteristics and behavior of light, How light travels in a cable, snells law, fiber optic cables, fiber materials, Mechanical properties of fiber, optical fiber configuration,.

TEXT BOOKS

1. M. Kulkarni, "Micro Wave and Rad**ar Engineer**ing", Umesh Publications, 1998.
2. John Wiley, R.E. Collin, "Foundations for Microwave Engineering", 2nd ed., IEEE Press, 2002.

REFERENCES BOOKS

1. Ghatak, K. Thyagarajan, In**troduction To Fib**er Optics, Foundation Books, 2002 (Indian Edition).
2. Satellite Communication" by T. Pratt and C. W. Bostiern
3. M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., "Microwave Circuits and Passive Devices", New Age International Publishers Ltd., 1995.
4. Peter A. Rizzi, "Microwave Engineering Passive Circuits", PHI, 1999.

Minor-D Electronics & Communication Engg.	**L**	**T**	**P**	**To**	**C**
	4	0	-	4	4

EC461 SENSORS AND TRANSDUCERS

Course Description & Objectives:

As part of this course, students *understand the basic working principles of different sensors and understand the basic working principles of* transducers. To explain the operation of oscilloscopes and the basic circuit blocks in the design of an oscilloscope and to introduc*e the operation of various electronic Instruments which are used to measure the basic parameters.*

Course Outcome

Upon successful completion of this course, students should be able to:

a. *Ability to understand the basic working principles* Actuators.
b. *Able to know different instruments*
c. *To familiar with oscilloscope operations*
d. *To identify various sensors, Transducers and their brief Performance specifications.*
e. *To understand principle of working of various transducers used to measure Temperature, Displacement, Level, and various miscellaneous other sensors.*

UNIT I - Sensor - I
Basic sensor technology, sensor systems, Characteristics, conditioning bridge circuits, amplifiers for signal conditioning, different ADCs. Temperature sensors: RTD, thermister, thermocouple, basic principles, resistance temperature, characteristics, material required, application comparison, Position sensor. Displacement: capacitive sensors, potentiometer sensors. Speed: Hall Effect sensors.

UNIT II - Sensor – II
IR sensors for distant measurement: basic principle and applications. Accelerometer: characteristic, shock, vibration, pressure sensors, Flow, level, force, weight, sensors. Bio sensors, humidity, optical and thermal infrared detectors.

Unit III- Electronic instrumentation
Instrumentation and measurement systems, measurement system performance, static calibration, errors in measurement, true value, accuracy and precision, linearity, hysteresis, Errors in ammeters and voltmeters, permanent magnet moving coil, ohmmeters, measurement of self inductance, Schering bridge, measurement of frequency, sources of errors in bride circuits,

Unit IV - Electronic Measurements
CRO: Electro static deflection, post deflection acceleration of electron beam, observation of wave forms on CRO, measurements of voltages and currents, multi input oscilloscopes, Negative resistance oscillators, square wave and pulse generators, Function generator, Q meter.

UNIT V - Transducers
Classification of Transducers, stain gauges, photoelectric transducers, capacitive, inductive transducers, LVDT Thermoelectric transducers, load cell, light and proximity sensors, data acquisition systems.

TEXT BOOKS:

1. A.K Sawhney “Electrical and Electronic Measurements and Instrumentation” Dhanpat Rai & Co.
2. Sensors and actuators: control systems instrumentation Clarence W. De Silva CRC Press, 2007

REFERENCES BOOKS:

1. David A. Bell, “Electronic Instrumentation & Measurements”, 2nd ed., PHI, 2003.
2. A.K. Sawhany, “Electrical and Electronics Measurements & Instrumentation”, Dhanpath Roy & Co, 2005