1.1.3

List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

Colour Codes		
Employability Contents	**Green**	
Entrepreneurship Contents	**Light Blue**	
Skill Development Contents	**Pink**	
Name of the Subjects/Related to all three Components (Employability/ Entrepreneurship/ Skill Development)	**Yellow**	

List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Pure and applied physics*

Programme Name : Master of Science in Electronics

Academic Year : 2017-18

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	El-101	Electronic Materials
02.	El-103	Integrated Devices And Circuits
03.	El-104	Digital Electronics
04.	El-201	Signals And System
05.	El-202	Electronic Communication Methods & Radar
06.	El-203	Semiconductor Devices & Fabrication
07.	El-204	Computer Application In Electronics
08.	El-301	Communication Electronics
09.	El-302	Fiber Optics & Optical Comm.
10.	El-303	Digital Communication & Networking
11.	El-304	Sensor And Transducers

Scheme and Syllabus

COURSE STRUCTURE OF M. SC. ELECTRONICS			
First Semester	CODE	SUBJECT	MARKS
Paper–I	El-101	Electronic Materials	100
Paper-II	El-102	Electrodynamics	100
Paper-III	El-103	Integrated Devices And Circuits	100
Paper-IV	El-104	Digital Electronics	100
Paper-V	El-105	Basic Electronic Laboratory	100
Paper-VI	El-106	Minor Project Work	100
Second Semester			
Paper-I	El-201	Signals And System	100
Paper-II	El-202	Electronic Communication Methods & Radar	100
Paper-III	El-203	Semiconductor Devices & Fabrication	100
Paper-IV	El-204	Computer Application In Electronics	100
Paper-V	El-205	Digital & Communication Electronic Laboratory	100
Paper-VI	El-206	Minor Project Work	100
Third Semester			
Paper-I	El-301	Communication Electronics	100
Paper-II	El-302	Fiber Optics & Optical Comm.	100
Paper-III	El-303	Digital Communication & Networking	100
Paper-IV	El-304	Sensor And Transducers	100
Fourth Semester			
Paper-I	El-401	Major Project Work With Dissertation	100
Paper-II	El-402	Practical Training In Any of the Following Fields	100

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

M.Sc (Electronics)

FIRST SEMESTER

Objective - The subject of Electronic Materials has been one of the key drivers for the advancement of Science and Technology. This course aims to build the foundation and inspire the interest of freshmen enrolled. This course will focus on fundamental concepts and basic principles that are related to the Materials for Electronics and the latest progress in this field.

Paper –I : EL-101 Electronic Materials

Unit-1 Fundamentals of materials science – Relative stability of Phases, Phase rule, Phase Diagram, **Phase Transformations:** Elementary idea of Nucleation and Growth, methods of crystal growth.

Defects in crystals: Elementary idea of point, line and planar defects.

Materials in thin film form: Concept of thin films, preparation of thin films, and deposition of thin film using sputtering methods (RT and Glow discharge).

Unit-2 Special Materials in Electronics:

Composite material: Composites of glasses, polymers metals and ceramics,properties and applications.

Polymers: Mechanism of polymerization, conducting polymers, application of polymers inelectronics.

Metallic Materials: Functional gradient materials, shape memory alloys, amorphous materials, ICpackage materials.

Liquid crystal polymers: Optical properties of cholesteric and chiral nematics liquidcrystal displays, optical fiber materials.

Unit-3 Dielectric and Ferroelectric Materials:

Dielectric materials as capacit ive elements, polar dielectrics, properties an applications in electronics.

Ferroelectrics: physical properties and classification, properties modifications, non-linearities, applications in electronic devices.

Unit-4 Magnetic materials:

Ferro magnetic materials and their application transition metals and alloys as ferro-magnets, hardand soft magnetic materials.

Ferrites: Elementary idea of spinels. Garnets and Hexagonal ferrites, application offerrites in electronics, magnetic bubbles.

Outcomes - The course provides an introduction to materials that are used in the realization of electronic devices. The materials encountered include semiconductors, dielectrics, and organic materials. The electrical, thermal and physical properties of these materials are covered with reference to their applications in electronic devices. The course will also cover typical synthesis and characterization methods for these

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materials. Recent advances in the applications of these materials for energy, optical, and flexible devices will be presented.

Books Recommended:

1. Material science in engineering :V. Raghavan
2. Element of material science and Engineering :L.H.Van Vlanck
3. The structure and properties of materials : R.M. Rose and J. Wulf
4. Liquid Crystal : S.Chandrasekhar
5. Material Science, C.M. Gupta.

Paper -III: EL-103 : INTEGRATED DEVICES AND CIRCUITS

Objective –

- To study the basic principles, configurations and practical limitations of op-amp.
- To understand the various linear and non-linear applications of op-amp
- To analyze and deign op-amp oscillators, single chip oscillators and frequency generators

Unit-I The feedback concept, generalized voltage and current feedback (series and shunt). General characteristic of negative feedback amplifiers, current and voltage feedback circuit s, Emitter follower, Amplifier distortion, amplifier classification and characteristics, power and efficiency of amplifiers, Direct and Transformer coupled amplifiers, theory and applications of class A push-pull amplifier, working principle of class-B push-pull amplifier.

Unit-II Basic operational amplifier, Differential amplifier, transfer characteristics of a differential amplifier, IC operational amplifier, OP- AMP parameters and their frequency response. Application of OP- AMP as adder, Substractor, active filter, Noise in OP- AMP.

Unit-III Differentiating and Integrating circuit s, Clipping and Clamping circuits, co mparators, Multi-vibrators, waveform generators (sine, square and triangular), Frequency to voltage and Voltage of frequency conversion.

Unit-IV Active filters, Butterworth and Chebyshy, Salen and Key filters, Low and High Band Pass/Reject filters.

Fundamental definitions related to Opto-electronic devices, photo conductive sensors, application of photodiode and pho to-transistors (light operated relays and paper tape reader). Photo-multiplier tube. Light emitting diode, photo couplers.

Outcomes –

1. This course provides the foundation education in operational amplifier and other linear integrated circuits. Through lecture, laboratory, and out-of-class assignments, students are provided learning experiences that enable them to:
2. To discuss the op-amp's basic construction, characteristics, parameter limitations, various configurations and countless applications of op- amp.

Books Recommended:

1.Integrated Electronics : Millman & Haikias

2.Electronic Devices & circuit s : Mottershed

Paper- IV:EL-104: DIGITAL ELECTRONICS

Objective –

1. To understand number representation and conversion between different representation in digital electronic circuit.
2. To analyze logic process and implement logical operation using combinational and sequential logic circuit.

Unit-I Logic gates, Boolean Algebra, Simplification of logic circuits using Karnaugh map, Number system and codes, Signed Binary Numbers, Representation of fractions, Arithmetic circuits, Adder, Substractor, Code Convertor-decoder, Multiplexers and De- multiplexer, Seven segment and Dot matrix display.

Unit-II Logic families, TTL circuits, Totem-pole output, TTL parameters, TTL NAND gate, Open collector gates, Tri-state TTL Devices, external drive for TTL load, MOS Logic, Enhancement type MOSFET , CMOS characteristics, TTL and C-MOS interfacing.

Unit-III Flip- Flops R-S, D, T, J-K and Master slave J- K . Flip- Flops Registers, Buffer and shifts Registers, Binary Ripple counter of Mod-N. Synchronous counters, Ring counters, semiconductor memories, Memory Addressing logic, ROM, EPROM & RAM memories.

Unit-IV D-A Conversion: Weighted Register and Ladder Method, Sample and hold Circuit, A-D convertor, Simulation methods, Continuous method, Counter method, Successive approximation. A-D Accuracy, Resolution, Digital clock, Digit al Volt meter, Digit al Frequency meter.

Outcomes –

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze design and implements combinational and sequential logic circuits.

Books Recommended:

1. Digit al Principles & Application : Malvino & Leach
2. Compter System Architecture : Moris Mano
3. Digit al Electronic : Schaum Series
4. Digit al Electronics Circuits : Samuel Lee
5. Digit al Electronics : R.J.Tossi (PHI)

SECOND SEMESTER

Paper -I : EL-201:SIGNALS AND SYSTEM

Objective-

- The fundamentals of basic communication system need of modulation, modulation processes and different amplitude modulation schemes.
- Different angle modulation schemes with different generation and detection methods.

UNIT-1 Signal and System Modeling Concepts: Introduction of signal and system analysis, few examples of system, signals models, classification of signals, energy and power signals, energy and power spectral densities

UNIT –II System modeling and Analysis in Time Domain: Introduction to system modelling concepts, The superposition integral for fixed linear system , Convolution integral, Evaluation of convolution integral , Impulse response of a fixed linear system, superposition integral in terms of step response , stability of linear system modelling and simulation .

UNIT –III State Variable Techniques: Introduction, state variable concepts from the state equation, Time domain solution of state equation, frequency domain solution of state equations, finding the state transition matrices, equations for discrete system .

UNIT –IV Discrete time signal and system: Introduction analog to digital conversion, Z- Transform, difference equations and discrete time system, examples of a discrete system.

Outcomes -After successful completion of the course, students will be able to: • How to know about signal and system, to differentiate and to relate them, their types and properties. • System modelling with examples of mechanical and electrical circuit using differential and difference equation.

Books Recommended:

1) Signal and system: Continuous and discrete Second Edition. Maxwell Macmillan - Internal Edition 1990: Rodger , E- Ziemer .
2) Electronic signal and system (English Lanuage book society, Mac Millan low priced edition, 1990) : Paul A. Lynn .
3) Introduction to signal and systems (Second edition): Edward W. Kamen .
4) Signal and System: Copper.

Paper- II : EL- 202 : ELECTRONIC COMMUNICATION METHODS & RADAR

Objective- The fundamentals of basic communication system need of modulation, modulation processes and different amplitude modulation schemes. • Different angle modulation schemes with different generation and detection methods. • Various radio receivers with their parameters. • Generation and detection of pulse modulation techniques and multiplexing. • Study different RADAR and its supporting systems.

UNIT –I Amplitude modulation and Demodulation: Amplitude modulation: Current collector modulation, Square law modulation, Suppressed carrier balance modulator. Study of amplitude modulated transmission, square law detector, distortion in linear diode detector

UNIT –II Frequency Modulation and Detection: Reactance tube modulators, frequency modulation varactor diode, Armstrong Method of frequency modulation , frequency stabalization , F.M. receiver receivers , Limiters , F.M. detectors .

UNIT – III Introduction to digital communication, Sampling and Quantization, Time division multiplexing. Pulse Code Modulation, PCM encoding, delta modulation, Different ial PCM , Adapt ive delta modulat ion.

UNIT-IV Radar Communication: Contineous and pulse Radar system , General study of pulse Radar using a type indicator, Radar performance factors, Radar Transmitting systems, Rotatory spark gap modulators , Hard value pluser, Radar waveform range determination, Radar Antenna Duplexer , Radar receiver , Automatic tracking Radar, Doppler effect in Radar.

Outcomes-Understand different blocks in communication system. • Distinguish between different amplitude modulation schemes with their advantages, disadvantages and applications. • Analyze generation and detection of FM signal and comparison between amplitude and angle modulation schemes. • Identify different radio receiver circuits and role of AG.

Books Recommended:

1) Modern Electric Communication : Miller .
2) Electronics Communication : Raddv . G. and Collen . J.
3) Electronic Fundamental & Application : Kennedy
4) Principle of Communication System : Taub & Schilling .
5) Electronic Fundamental & Application : Ryder I.D.

Paper- III : EL-203 SEMICONDUTOR DEVICES & FABRICATION

Objective-Provide basic understanding on Semiconductor. • Introduce semiconductor process flow from wafer fabrication to package assembly and final test, and what the semiconductor device failure analysis is and how it is conducted.

UNIT–I Junction & Contacts: P-N homo junctions, Thermal equilibrium, Depletion region, I-V Characteristics, Heterojunction model, current transport, Heterojunction parameter and criterion for material selection, Application of Heterojunctions, Ohmic contacts, Metal Semiconductor contacts.

UNIT–II Devices and application: SET, MOSFET, MOS–Diode, Microwave devices, Tunnel diode, IMPATT, Light emitting diode, Photovoltaic so lar cell, Characteristics, efficiencies, Fill factor, voltage factor, effect of series and shunt resistance, Material selection

UNIT–III Materials For Integrated Circuits and Fabrication Technology: Classification of IC's, Electronic grade silicon, Silicon shaping lapping polishing and wafer preparation, Vapour phase epitaxy, Molecular beam epitaxy, Optical lithography, Photomask, Photoresist and process, Limitation of optical Lithography, Idea of electron and X-ray Lithography, Wet chemical etching, reactive plasma etching.

UNIT-IV Microelectronic Fabrication: Fabrication of mono lithic diodes, Fabrication of integrated transistors, idea of burried layer fabrication, Monolithic circuit layout and design rule, Isolation methods, Monolithic FET, MOSFET, Processing idea of HEMT (High Electron Mobility transistor), CCD, MOS integrated circuit, Large and medium scale integrated, Hybrid Integrated circuit.

Outcomes - After successful completion of the course students will be able to : • Know the physics of semiconductor junctions, metal-semiconductor junctions and metal-insulator-semiconductor junctions. • Know the physics and application of semiconductor hetero junctions and quantum-confined structures. • Understand the fundamental principles and applications of modern electronic and optoelectronic semiconductor devices

Books Recommended:

1) Integrated Electronics : Milliman and Taub
2) Microelectronics : Milliman and Gros
3) Thin film Phenomenon : K.L. Chopra
4) Hand Books Of Thin Film : Marshe l and Gland
5) Physics of Semiconductor devices : Michel Shur

Paper- IV : EL-204 COMPUTER APPLICATION IN ELECTRONICS

Objective – To understand basic architecture of 16 bit microprocessor. • To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system designs. • To provide complete basic knowledge of C language. Students will be able to develop logics which will help them to create program.

UNIT-I Architecture of 8085: Organization of microprocessor(8085), General purpose resistors and register pairs, Concept of slage and their uses, General processing unit of microprocessors, Timing and control unit , Fetch and execute cycle, General discussions about input/output of microprocessors, I/O Sect ion, Useful I/O facilities and their control Concept of interfacing ,Types of interfacing devices, Interrupt facility advantage and disadvantage of interrupts, Simple interrupts system ,Direct Memory Access(DMA).

UNIT-II Assembly Language Programming: Concept of assembly language and assembler, The instruction of 8085,Op-codes, Mnemonics, Machine language and instruct ion cycle, Addressing techniques , Direct immediate, Relative indirect and indexed addressing, single address computer Organization, The memory reference instruct ions, Loop jump, Instruct ions Addressing Modes Stack, Call, Return instruct ion and their routines.

UNIT-III Introduction to Computer System & "C" Programming : Basic idea of computers, I/O devices, Programming concepts "C" Programming structure, Data types, Constant , Variable, Assignment declarations & expressions, Statement, Symptoic Constant, Different types of operators, Integers, Floating point in "C" , Data input and output controls, Print f and Scanf function, Putchar, Getchar, Arrays.

UNIT-IV Control statements and Decision making in "C" , If-else statement, Nesting of If in statement, While loop, do-while loop, For loop , Nesting of for loop, Newton-Raphson iteration method as example of "C" program, User defined Function, Function and structured programming, Local and global Variables, Declaration funct- ion, Arrays, Declarat ion , Init ializat ion and processing of Arrays.

Outcomes - Design system using memory chips and peripheral chips for 16 bit 8086 microprocessor and write programs to run on 8085 based systems. • Understand the device techniques for faster execution of instructions. • The students will be able to develop applications on C programing.

Books Recommended:

1) Digital Computer Electronics and Microprocessor : A.P. Malvino
2) Introduction to Microprocessor : A.P. Mathur

THIRD SEMESTER

PAPER- I : EL-301: COMMUNICATION ELECTRONICS

Objective- 1. To apply circuit theorems to simplify and find solutions to electrical circuits.
2. To solve simple circuits using ohm's law, Kirchhoff's laws and the properties of the elements.
3. To build up basic problem solving skills through organizing available information and applying circuit laws.

Unit-I Microwave Electronics. Characteristics. feature of microwave Application of microwave, Generation of microwave by tubes, Limitation of conventional tubes, Klystron ,Reflex Klystron, Magnetron, Travelling wave tube.

Unit -II Definition of microwave, Microwave - power- measurement, Impedance measurement, Frequency measurement, VSWR measurement in wave guide, Isolator, Modulator. Directional Coupler, Magic tree.

Unit -III Transmission Lines: Voltage and Current equation for transmission lines, Reflect ion and transmission coefficient, Standing wave and standing wave ratio, Impedance matching.

Unit -IV Antenna Theory: Radiation Mechanism, Elementary doublet, Current and Voltage antennas, Resonant/ Non Resonant Antennas, Antenna Gain, Beam width , Polarization, Directivity, Radiation Resistance, self and mutual Impedance , Dipole array, Hog Antenna.

Outcomes- students will be able to Identify, formulate and solve complex problems to achieve demonstrated conclusions using mathematical principles and engineering sciences.

Books Recommended:

1. Microwave: K.C. Gupta
2. Microwave circuit s: A. Y. Liyo
3. Electronics communicat ion system; George Kenedy
4. Electronics communication: Sanjeeva Gupta
5. Antenna (MGH): Kraus

PAPER- II :EL-302: FIBRE OPTIC'S & OPTICAL COMMUNICATION.

Objective- To prepare students to compete for a successful career in Electronics and Communication profession through global education standards. • To produce skillful students to analyze, design and develop a optical fiber based communication system /component/ process to cater the essential communication need of the society

UNIT-I Optical fibre modes and configuration, fibre types, Ray optics, representation, mode of the circular waveguide, Waveguide equation, Wave equation for Step index fibre, Model equation, modes in step index fibre, power flow in step index fibre.

UNIT -II Fibre Material fabrication attenuation, Absorption, Scattering losses. Radiative losses, Core & Cladding Losses, Signal distortion in optical waveguide, Information capacity determination, Group delay, Material Dispersion, Wave Guide Dispersion.

UNIT-III Light Emitting Diode, Light source Material, Internal Quantum Efficiency, Modulation capability, Transient Response, Power band width product, LASER diode, LASER -diode structure and Threshold Conditions, Model properties and radiation pattern modulation.

UNIT -IV Temp. effects, Idea of power launching and coupling idea of integrated optics, Fundamental receiver operation, Digital, signal transmission, Error sources, Receiver configuration Digit al receiver performance calculation, Receiver noise ; Shot noise, Pre-amplifier design, High impedance FET amplifier.

Outcomes- To train the students to approach ethically any multidisciplinary challenges with economic, environmental and social contexts. • To create awareness among the students about the need for lifelong learning to succeed in their professional career as Electronics and Communication service Engineers.

Books Recommended:

1. Optics Fibre: G. Keiser
2. Opto electronics : Ghatak

PAPER- III : EL-303 DIGITAL COMUNICATION & NETWORKING

Objective - Investigate the fundamental issues driving network design • learn about dominant network technologies.

UNIT-I Digital Modulation Techniques: Introduction, BPSK, DPSK, QPSK M-ary FSK minimum shift keying, Duo binary co ding. Coding: Introduction, Parity check bit, coding for error detection and correction, Binary block codes, coding and decoding, Examples of algebraic code, Burst error correction, Convocation coding & decoding.

UNIT-II Noise and Information Theory Regmter Noise: Noise temperature: Noise band width, Noise figure & noise bandwidth cascaded amplifier. Information Entropy, Mutual information, information rate coding to increase- average information per bit, Shannon's theorem, channel capacity, capacity of Gaussain's Channel.

UNIT -III Computer network & communication Transmission media, data transmission circuit, Types of network (Packet and message switching techniques), Network topologies, wide' metropolitan and local area network, layered network, architecture, network protocols, network interfaces and standards modems, RS-232 C, X-25, IEEE 802.

UNIT-IV Advanced Communication System: Evolution of Internet, internet Architecture; goals and key issues related to internetworking technologies; internet connectivity (dial up, dedicated lines, broadband, DSL, radio, VSAT etc.) Domain name-scheme, Techno logy and tools relevant for web access- (FTP, E- mail, search tools etc.). Internet Security. Satellite communication, Mobile Radio, Optical communicat io n, ISPN, View of Telecommunication.

Outcomes- Demonstrate the ability to unambiguously explain networking as it relates to connection of computers media and devices(routing) • Distinguish between analog and digital signals and understand their characteristics (Fourier representation signals)

Books Recommended:

1. Communication system: Simo n I Laykins.
2. Principle of Communication system: Taub & Shilling
3. Electronic Communication: Kenedy
4. Electronic Communication: D.Roddy &Toolen
5. Computer Network: Tanenbaum

PAPER- IV : EL-304 SENSOR AND TRANSDUCERS

Objective- To make students familiar with the constructions and working principle of different types of sensors and transducers. • To make students aware about the measuring instruments and the methods of measurement and the use of different transducers. • To know the construction and working of frequently used equipment's like CRO, Signal generator, spectrum analyzer etc.

UNIT-I Optical sensors: Spectral response, Photoconductive sensors, Junction type photoconductors (PIN and PIN diode, NPN), Photo diode, photo resister, Application of photodiodes and photo resister in light operated relays, Electro-optics, shaft encoder, Photo-voltaic sensors, Photo emissive-sensors.

UNIT-II Transducers-I. Classification of transducers, Selecting a transducers, strain gauge, Gauge factor, Metallic sensing element, Gauge configuration, Idea of displacement transducers, capacitive and inductive transducers, Variable differential transformer, Oscillat ion, transducer.

UNIT-III Ttansducers-II: Photoelectric transducers, Piezoelectric transducers, potentiometric transducers, velocity transducers, resistive thermometer, thermocouples, thermister characteristic, Thermister application, photosensitive devices, filled phototube, multiplier phototube.

UNIT-IV Oscilloscopes: Cathode ray tube, Electrostatic. Screen of CRT, Idea of CRT circuits, Vertical deflection system, Horizontal deflection system, Delay line, Oscilloscope probes and transducers, Determination of frequency phase angle: and time delay measurements, Idea of storage oscilloscope, sampling Oscilloscope.

Outcomes- At the end of the course, a student will be able to: • Use concepts in common methods for converting a physical parameter into an electrical quantity. • Classify and explain with examples of Sen s ors. • Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light. • Locate different type of sensors used in real life applications and their importance • To be familiar with various computers controlled test systems.

Books Recommended:

1. Electric Instrumentation a nd M easur ment Techniques : W.D. C ooper & A. D Helfric.
2. Understanding Oscillos copes : Sahny, Kuls hr est ha, Gupta.