GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University, Estd. u/s 3 of UGC Act 1956)

VISAKHAPATNAM*HYDERABAD*BENGALURU

Accredited by NAAC with 'A^{+}' Grade

REGULATIONS and SYLLABUS

of

MASTER OF SCIENCE
in
ELECTRONICS

(w.e.f 2020-2021 Admitted Batch)

Website: www.gitam.edu

Program Educational Objectives

PEO-1: To build strong fundamental knowledge amongst student to pursue higher education and continue professional development in Electronics & interdisciplinary fields and develop self-reliance and independent learning skills.

PEO-2: Develop technical competence to move in pace with rapid changes in technology.

PEO-3: To enable graduates to innovate, design and develop hardware and software components.

PEO-4: Adhere to ethics to contribute for betterment of the society. To develop a good human resource ready to serve the society with sound technical knowledge.

PROGRAM OUTCOMES

PO-1: At the time of completion of the programme, the student will be able to develop extensive knowledge in various areas of Electronics.

PO-2: Understand solutions for electronic and allied systems and design system modules or processes that meet the specified needs with appropriate societal consideration.

PO-3: Choose and apply appropriate modern tools/frameworks/platforms, software simulators, techniques, resources, and modern engineering and IT tools for solving problems with an understanding of the limitations

PO-4: Students will demonstrate their ability of advanced programming to design and test programs for various applications

PO-5: Student will be able to work with various designs and simulation platforms.

PO-6: Student will be able to develop innovative electronics systems.

PROGRAM SPECIFIC OUTCOMES

PSO-1: An ability to use latest hardware and software tools, along with analytical skills to arrive at cost effective and appropriate solutions.

PSO-2: Skill development by undertaking supervised projects by students with a flexibility to balance between research- and application-oriented work that require innovative approaches.

PSO-3: To create post-graduates with sufficient capabilities in Electronics who can become researchers and developers to satisfy the needs of the core Electronics industry.

PSO-4: To provide opportunity to students to learn the latest trends in Electronics and make them ready for life-long learning process.

PSO-5: To develop ability among students to formulate, analyze and solve real life problems faced in Electronics industry.

1. ADMISSION

1.1 Admission into M.Sc Electronics program of GITAM (Deemed to be University) is governed by GITAM (Deemed to be University) admission regulations.

2. ELIGIBILITY CRITERIA

2.1 A pass in B.Sc with Mathematics, Physics / Electronics and any other subject with a minimum aggregate of 50% marks or BE/B.Tech in ECE/ E&I/ EEE with a minimum aggregate of 50% marks or B.Sc Electronics honors with a minimum aggregate of 50% marks or B.Sc Data analytics/IoT with a minimum aggregate of 50% marks or any other equivalent examination (or Degree) approved by GITAM University.

2.2 Admission into M.Sc Electronics will be based on all India GITAM Science Admission Test (GSAT) conducted by GITAM deemed to be university and the rule of reservation, wherever applicable.

3. CHOICE BASED CREDIT SYSTEM

Choice Based Credit System (CBCS) is introduced with effect from the admitted batch of 2015-2016 based on UGC guidelines in order to promote:

- Student Centered Learning
- Cafeteria Approach
- Inter-disciplinary Learning

Learning goals/ objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

4. STRUCTURE OF THE PROGRAM

4.1 The program consists of

i. Foundation Courses (compulsory) which gives general exposure to a Student in communication and subject related area.
ii. Core Courses (compulsory)
iii. Discipline centric electives which
    a. Are supportive to the discipline
    b. Gives expanded scope of the subject
    c. Gives inter disciplinary exposure
    d. Nurture the student skills
iv. Open electives are of general nature either related or unrelated to the discipline.
v. Practical Proficiency Courses
vi. Laboratory and Project work

4.2 Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.

4.3 In general, credits are assigned to the courses based on the following contact hours per week per semester.

- One credit for each Lecture / Tutorial hour per week.
- One credit for two hours of Practicals per week.
- Two credits for three (or more) hours of Practicals per week.
- Eight credits for project

4.4 The curriculum of the four semesters M.Sc. program is designed to have a total of 87 credits for the award of M.Sc. degree.

5. MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be in English.

6. REGISTRATION

Every student has to register himself/herself for each semester individually at the time specified by the Institute / University.

7. ATTENDANCE REQUIREMENTS

7.1 Student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she shall not be allowed to register for subsequent semester of study. He/she has to repeat the semester along with his / her juniors.

7.2 However, the Vice Chancellor on the recommendation of the Principal / Director of the Institute/School may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine grounds and on payment of prescribed fee.

8. EVALUATION

8.1 The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40marks) and Semester-End Examination (60 marks).

8.2 A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

8.3 Practical/Viva-voce/Seminar etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished

below in Table-1.

Table-1: Assessment Procedure

S.No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous Evaluation	(i) Out of three, best of two Mid Semester Examinations Shall be considered for 15 marks each. (ii) 5 Marks Allotted for Quiz (iii) 5 Marks allotted for Assignments
		60	Semester End Examination	The End Semester Examination shall be for a maximum of 60 Marks
	Total	100		
2	Practical's	40	Continuous Evaluation	40 Marks for Continuous Evaluation is distributed among the components as regularity, preparation for practical, performance, submission of records and oral presentations in laboratory. Weightage shall be announced at the beginning of Semester
		60	Semester End Examination	60 Marks for practical exam conducted by the concerned lab teacher and another faculty member of department who is not connected to laboratory as appointed by the HoD
	Total	100		
3	Project Work (IV Semester)	200	Project Evaluation	(i) 150 marks for evaluation of project work dissertation submitted by the candidate (ii) 50 marks are allotted for project viva-voce. The project work evaluation shall be conducted by one External Examiner outside the university and Internal project work supervisor

REAPPEARANCE

9.1 A student who has secured 'F'grade in a Theory course shall have to reappear at the subsequent semester end examinations held for that course.

9.1.1 A student who has secured 'F'grade in a Practical course shall have toattend Special Instruction Classes held during summer.

9.1.2 A student who has secured 'F' grade in Project work / Industrial Training etc., shall have to improve his/her report and reappear for viva – voce at the time of Special Examination to be conducted in the summer vacation.

10. SPECIAL EXAMINATION

A student who has completed his/her period of study and still has 'F'grade in a maximum of three Theory courses is eligible to appear for Special Examination normally held during summer vacation.

11. BETTERMENT OF GRADES

A student who has secured only a Pass or Second class and desires to improve his/her class can appear for Betterment Examinations only in Theory courses of any semester of his/her choice, conducted in summer vacation along with the Special Examinations.Betterment of Grades is permitted 'only once' immediately after completion of the program of study.

12. GRADING SYSTEM

12.1 Based on the student performance during a given semester/trimester, a final letter grade will be awarded at the end of the trimester/semester in each course. The letter grades and the corresponding grade points are as given in Table-2.

Table-2: Grades & Grade Points

S.No	Grade	Grade points	Absolute Marks
1	O (Outstanding)	10	90 and Above
2	A^+(Excellent)	9	80 to 89
3	A (Very Good)	8	70 to79
4	B^+(Good)	7	60 to69
5	B(Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab.(Absent)	0	

12.2 A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course, subject to securing a GPA of 5 for a Pass in the semester.

13. GRADE POINT AVERAGE

13.1 A Grade Point Average (GPA) for the semester/trimester will be calculated according to the formula:

$$GPA = \frac{\sum[C \times G]}{\sum C}$$

Where

C = number of credits for the course,

G = grade points obtained by the student in the course.

13.2 To arrive at Cumulative Grade Point Average (CGPA), a similarformula is used considering the student's performance in all the coursestaken in all the semesters up to the particular point of time.

13.3 CGPA required for classification of class after the successful completion of the program is shown in Table-3.

Table-3: CGPA required for award of Class

Class	**CGPA Required**
First Class with Distinction	≥8.0*
First Class	≥6.5
Second Class	≥5.5
Pass Class	≥5.0

* In addition to the required CGPA of 8.0 or more the studentmust have necessarily passed all the courses of every semester in first attempt.

14. ELIGIBILITY FOR AWARD OF THE M.Sc DEGREE

14.1. Duration of the program: A student is ordinarily expected to complete M.Sc program in four semesters of two years. However, a student may complete the program in not more than four years including study period.

14.2. However, the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

14.3. A student shall be eligible for award of the M.Sc Degree if he / she fulfills all the following conditions.

a) Registered and successfully completed all the courses and projects.
b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.
c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc.
d) No disciplinary action is pending against him / her.

14.4 The degree shall be awarded after approval by the Academic Council

15. Discretionary Power

Notwithstanding anything contained in the above sections, the Vice Chancellor may review all exceptional cases and give his decision which will be final and binding.

Department of Electronics and Physics
GITAM Institute of Science
GITAM (Deemed to beUniversity)
(Estd u/s 3 of UGC Act 1956)

M.Sc Electronics
Scheme of Instruction and Syllabus

I – SEMESTER

Sl. No.	Course Code	Name of the Course	Category	Credits	Scheme of Instruction			Scheme of Examination		
					Hours per Week		Total	Duration in Hrs.	Maximum Marks	
					L/T	P			Sem. End Exam	Con. Eval
1	SEL 701	Physics of Electronic Materials	PC	4	4	0	4	3	60	40
2	SEL 703	Electronic Communication	PC	4	4	0	4	3	60	40
3	SEL 705	Microprocessors & Microcontrollers	PC	4	4	0	4	3	60	40
4	SEL 707	Programming Language C	PC	4	4	0	4	3	60	40
5	SSE 701/ SSE 703	Skill Enhancement Course*	SEC	2	0	3	3	3	--	100
6	VDC111	Venture Discovery	SEC	2	2	0	2	2	--	100
7	SEL 721	Analog and Digital Electronics Lab	PP	3	0	6	6	3	--	100
8	SEL 723	Programming Language C Lab	PP	3	0	6	6	3	--	100
Total			---	26	16	15	31	--	240	560

*** SkillEnhancement Course (Choose one of the following)**

1. SSE 701: Basic Computer Concepts
2. SSE 703: Information Technology Tools

II - SEMESTER

Sl. No.	Course Code	Name of the Course	Category	Credits	Scheme of Instruction			Scheme of Examination		
					Hours per Week		Total	Duration in Hrs.	Maximum Marks	
					L/T	P			Sem. End Exam	Con. Eval
1	SEL 702	RADAR Systems and Mobile Communication	PC	4	4	0	4	3	60	40
2	SEL 704	Control Systems	PC	4	4	0	4	3	60	40
3	SEL 706	Embedded Systems	PC	4	4	0	4	3	60	40
Generic Elective – 1 (One To Be Chosen)										
4	SEL 742	Digital Signal Processing	GE	4	4	0	4	3	60	40
	SEL 744	Antenna Theory and Radio Wave Propagation	GE	4	4	0	4	3	60	40
	SEL 746	Opto Electronic Devices	GE	4	4	0	4	3	60	40
	SEL 748	Information Theory	GE	4	4	0	4	3	60	40
	SEL 750	Electronic Measurements and Instrumentation	GE	4	4	0	4	3	60	40
5	SAE 702	Professional Communication Skills	AEC	2	0	3	3	3	--	100
6	SEL 722	Communication Lab	PP	3	0	6	6	3	--	100
7	SEL 724	Embedded Systems Lab	PP	3	0	6	6	3	--	100
Total			---	24	16	15	31	--	240	460

III - SEMESTER

Sl. No.	Course Code	Name of the Course	Category	Credits	Scheme of Instruction			Scheme of Examination		
					Hours per Week		Total	Duration in Hrs.	Maximum Marks	
					L/T	P			Sem. End Exam	Con. Eval
1	SEL 801	VLSI and VHDL	PC	4	4	0	4	3	60	40
2	SEL 803	Data Communications	PC	4	4	0	4	3	60	40
3	SEL 805	Scripting Language - Python	PC	4	4	0	4	3	60	40
Generic Elective – 1 (One To Be Chosen)										
4	SEL 841	Business Process	GE	4	4	0	4	3	60	40
	SEL 843	Switching Theory and Logic Design	GE	4	4	0	4	3	60	40
	SEL 845	Digital Image Processing	GE	4	4	0	4	3	60	40
	SEL 847	Neural Networks	GE	4	4	0	4	3	60	40
	SEL 849	Robotics	GE	4	4	0	4	3	60	40
Open Elective (One To Be Chosen)										
5	SOE 861	Fundamentals of Electronics	OE	2	3	0	3	3	60	40
	SOE 862	Bio-medical Instrumentation	OE	2	3	0	3	3	60	40
6	SEL 821	DSP and VHDL Lab	PP	3	0	6	6	3	--	100
7	SEL 823	Python Lab	PP	3	0	6	6	3	--	100
8	SEL 825	Comprehensive Viva	PP	2	0	0	0	0	--	50
Total			---	26	19	16	35	--	300	450

IV- SEMESTER

Sl. No.	Course Code	Name of the Course	Category	Credits	Scheme of Instruction			Scheme of Examination		
					Hours per Week		Total	Duration in Hrs.	Maximum Marks	
					L/T	P			Sem. End Exam	Con. Eval
1	SEL 802	Internet Of Things (IOT) and Applications	PC	4	4	0	4	3	60	40
Generic Elective -2 (One to be Chosen)										
2	SEL 842	Advanced Embedded Systems	GE	4	4	0	4	3	60	40
	SEL 844	Advanced Networking	GE	4	4	0	4	3	60	40
	SEL 846	Sensors and Transducers	GE	4	4	0	4	3	60	40
	SEL 848	Non-Destructive Testing of Materials	GE	4	4	0	4	3	60	40
3	SEL 822	Internet of Things (IoT) Lab	PP	3	0	6	6	3	--	100
4	SEL 892	Project work	PP	8	0	0	0	3	--	200
Total			--	19	8	8	16	--	120	380

M.ScELECTRONICS
I-SEMESTER
SEL 701 PHYSICS OF ELECTRONICMATERIALS

Hours pe r week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: to know about the basic materials science and semiconductor physics

UNIT-I

Fundamentals of Materials: Crystal structures, classification of crystals, lattices, reciprocal lattice, Amorphous materials, Electronic structure and related properties, Bloch theorem, phonons, Free electron theory, binding and various band structures, thermal conductivity due to electrons and phonons.

Learning outcomes:

1. Understand the structure and physics of materials used in electronics
2. Understand the free electron theory
3. gain the knowledge on the thermal conductivity

UNIT-II

Semiconductors: Metal-semiconductor, Direct and Indirect semiconductors, Variation of energy bands, charge carriers in semiconductors, effective mass, Intrinsic and Extrinsic materials, Diffusion and drift, diffusion and recombination. The Fermi level and Fermi dirac distribution, electron and hole in quantum well, Temperature dependency of carrier concentration, conductivity and mobility, effects of temperature and doping on mobility, high field effects, the hall effects.

Learning outcomes:

1. Gain the knowledge on the semiconductor band gap theory
2. Understand the different semiconductors
3. Understand the electron and hole mobility

UNIT-III

Dielectric and Magnetic Materials: Dielectric properties, Electronic polarizability, dielectric constant- static and frequency dependence, damped oscillation, Piezoelectric properties, polymers and their properties. Magnetic and Electro-optical properties, para and dia magnetism, Fero and Ferri magnetism and ferrites, anti-ferromagnetism, domains and domain walls, coercive force, hysteresis.

Learning outcomes:

1. Gain the knowledge on the Dielectric properties
2. Understand the magnetic and electromagnetic properties of materials
3. Knowledge on different magnetic materials and structures

UNIT-IV

Bipolar Transistors: BJT fabrication, transistor action, minority carrier distributions, and terminal currents, Switching, Driftin base region, Base narrowing, Avalanche breakdown, injection level-thermal effects, Base resistance and Emitter crowding, h-parameters and analysis of transistor amplifier using h-parameter.

Learning outcomes:

1. Gain the knowledge on BJT Basics
2. Understand the switching and normal characteristics of BJT
3. Gain the Knowledge on different h-parameters

UNIT- V

Field Effect Transistors: Junction FET-metal semiconductor FET, GaAs MESFET, metal

insulator semiconductor FET, High electron mobility transistor, threshold voltage. MOSFET-basic operations, constructions, and characteristics, ideal MOS capacitor, Control of threshold voltage

Learning outcomes:

1. Gain the knowledge on FET Basics
2. Understand the different types of FETs
3. Gain the Knowledge on MOS capacitors and switching operation of FET

Course Outcomes

1. Gain the knowledge on crystal structures and their classifications
2. To gain the knowledge on semiconductor materials
3. Understanding of dielectric materials and magnetic material properties
4. Understand the basic physics in BJT functionality
5. Gain the basic knowledge on Field effect transistors and their functionality

Text books:

1. A First Course In Material Science - Raghvan, McGraw Hill Pub.
2. Solid State Physics - S.O.Pillai,New Age Publication.
3. Electrical Engineering Materials - A.J. Dekker,PHI Pub.
4. Electronic Components and Materials - Grover and Jamwal, Dhanpat Rai and Co.
5. The Science and Engineeringof materials - Donald R.Askel andChapman & Hall Pub.
6. Solid State Electronic Devices - Ben G Streetman, PHI Pub.
7. Semiconductor Devices-Physics and Technology - S M Sze, John Wiley Pub
8. Semiconductor Physics and Devices –Basic Principles - Donald A Neamen, TMH Pub.

M.Sc ELECTRONICS
I - SEMESTER
SEL 703ELECTRONIC COMMUNICATION

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: To understand the basic communication methods and their applications.

UNIT-I
Amplitude Modulation

Sinusoidal A.M: Introduction, Modulation Index, Frequency Spectrum, Average Power. BJTCollector modulator, A.M Broadcast Transmitter and Super heterodyne receiver, Output S/N ratio, DSBSC modulation, balanced modulators- single and diode ring, QAM, VSB, ***SSB modulation:*** SSB generation and reception. ISB, FDM, Output S/N ratio in SSB.

Learning outcomes:
1. Gain the knowledge on AM
2. Understand the different types Modulations
3. Gain the Knowledge on advantages of modulations

UNIT-II
Angle Modulation

Sinusoidal F.M: Introduction, Modulation Index, Frequency spectrum, Average Power,Deviation ratio, Phase Modulation, Equivalence between PM and FM, ***Modulator Circuits***- Varactor diode, JFET. ***FM Transmission***- Direct and Indirect methods, ***FM Detection***- Slope detector, balanced double tuned detector, Foster-Seeley discriminator and PLL detector, Amplitude limiter, Pre-emphasis and De-emphasis, FM broadcast receiver, Differences between wideband and narrowband FM, Noise in FM.

Learning outcomes:
1. Gain the knowledge on FM
2. Understand the FM transmission
3. Gain the Knowledge on emphasis methods

UNIT-III
Pulse Communication

Digital line wave forms: Symbols, Bits and Bauds, Functional notation for pulses, Line codesand waveforms, Unipolar NRZ, RZ, Polar line codes, M- array encoding, ISI and Pulse shaping, HDBn Signaling, ***Pulse Modulations***- Generation and Detection of PAM, TDM, PWM, and PPM.

Learning outcomes:
1. Understand the Digital Signals
2. Understand different types of Digital Signals
3. To know pulse communication methods

UNIT-IV
Sampling and Pulse Code Modulation

Sampling Theorem, Signal Reconstruction, Pulse Code Modulation (PCM) Quantization, Non-uniform Quantization, T1 carrier system, Differential PCM, Delta modulation, Adaptive Delta modulation, Comparison with PCM, ***Digital carrier systems:*** ASK, FSK, PSK, DPSK, QPSK, Digital multiplexing, Eye patterns.

Learning outcomes:

1. Understand the brief PCM
2. Understand the working of digital carrier systems
3. Know about digital carrier systems

UNIT-V

Fiber Optic Communication

Introduction, Historical back ground, Advantages and Applications of optical fiber communication, Nature of light, Basic optical laws and definitions, fiber modes and configurations, scattering, bending, core and cladding losses, Optical Sources and Detectors, ***Optical Receivers***-Receiver operation, Analog and Digital receivers, Wavelength Division Multiplexing, Fiber connectors, Measurement of attenuation and dispersion.

Learning outcomes:

1. Understand the historical background on OFC
2. Advantages OFC communication
3. understood various Optical Sources and sensors

Course Outcomes

1. To understand basics of AM and multiplexing in AM
2. To learn the advantages of FM over AM
3. To understand various Digital line waveforms
4. To understand the working of digital carrier systems
5. To learn the advantages OFC communication

Text Books

1. Electronic Communications-Dennis Roddy and John Collins - Prentice Hall, 4th Edition,1995
2. Modern Digital and Analog Communication System - B.P.Lathi-Oxford University Press-3rd Edition,2009
3. Optical Fiber Communication - Gerd Keiser- Tata Mcgraw Hill-4th Edition, 2010
4. Principles of Communication System - H.Taub and D.Schilling, Tata Mcgraw Hill, 2nd Edition,2008
5. Fiber Optics Communication Systems - Agrawal GP, Publisher: JW, 4th Edition , 2010

M.Sc ELECTRONICS
I-SEMESTER
SEL 705 MICROPROCESSORS & MICROCONTROLLERS

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: The student will be able to know the functionality and programming of the micro Processors/micro controllers.

UNIT-I

Microprocessors

Architecture of 8086, Instruction set of 8086- Data Transfer-Arithmetic, Branch-Loop - Flag Manipulation-Logical, shift and rotate- Stack and I/O instructions. Interrupts and Interrupt Applications, Assembly language Programming: Multiplication, division, greatest and smallest numbers in an array, arranging in ascending and descending order, Architectures of 80286 and Pentium processor

Learning outcomes:

1. To develop programs in assembly language and 8086
2. understand the instruction set
3. Able to write simple programs in 8086

UNIT-II

Interfacing of memory and I/O devices, I/O mapped I/O, Memory mapped I/O, Data Transfer: Parallel programmed data transfer, Interfacing devices: 8255- I/O Ports and Programming, 8251- Serial communication interface, 8253- Programmable interval timer, 8257- DMA controller, 8259 - Interrupt controller, 8279 -Key board display controller**.**

Learning outcomes:

1. Understand the memory mapping
2. Understand the data transfer using 8255
3. Knowledge on interrupts

Microcontrollers

UNIT-III

Comparison of Microprocessors and Microcontrollers, Evolution of Microcontrollers, architecture of 8051, registers, ports, Interrupt Structure, Timer/counters, addressing modes, Instruction set of8051. **ALP-** Multiplication, Division, Greatest and Smallest numbers in an Array, Arranging in Ascending and Descending order, Delay and Subroutines, Calculation of Time delay, Architecture of AVR microcontroller, Registers and Ports

Learning outcomes:

1. To develop programs using 8051 microcontroller
2. Understand the data simple ALP using controller
3. Knowledge on different types of controllers

UNIT-IV

Interfacing of Memories, Interfacing of Unidirectional & Bi-directional Buffers, Latches, Decoders, Interfacing of DAC and ADC with Microcontroller, Serial memories, RS- 232/485 communication interface, CAN, Zigbee

Learning outcomes:

1. To know the interfacing concepts using data converters
2. Understand the ADC and DAC
3. Knowledge on buffers and latches in microcontroller

UNIT-V

Applications of 8051 Microcontrollers: Displays-7 segment and LCD, Multiple Interrupt Invoking, Interfacing of serial memories- I^2C, SPI, Measurement of Frequency, Temperature measurement and controlling, Stepper motor interfacing, Keyboard interface, Relays

Learning outcomes:

1. Gain the knowledge on applications of microcontroller
2. Know the measurement of sensor outputs
3. Knowledge on compound interfacing

Course Outcomes

1. To understand the architecture of 8086 microprocessor
2. To know the difference between serial and parallel communications
3. Understand the architecture and develop programs using 8051 microcontroller
4. To know the applications using microcontroller
5. To interface buffers and latches using microcontroller

Text Books

1. Microprocessor and Interfacing - Douglas V. Hall (McGraw-Hill), 2nd Edition, 1992
2. The 8051 Microcontroller Architecture, Programming & Applications - Kenneth J. Ayala, Penram International Publishing (India) - 3rd Edition, 2004
3. The 8051 Microcontroller and Embedded Systems - Muhammad Ali Mazidi, Pearson Education - 2nd Edition, 2007
4. Advanced Microprocessors and Peripherals - A K Ray, Tata Mc Graw Hill, 2nd Edition, 2006

M.Sc. ELECTRONICS
I-SEMESTER
SEL 707 Programming Language C

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: To introduce basic structure of C programming language for solving of numerical methods.

UNIT-I
Introduction to C Language
Structure of the C program, Data types, Input and output functions: printf, scanf; ***C – Operators*:** Arithmetic operator, Relational operator, Logical operator, Ternary operator, Increment operator, Comma operator, Bitwise operator, Operator precedence, example programs

Learning outcomes:
1. Gain the knowledge basic concepts of C language
2. Know the describe the operators of C language
3. Knowledge on different operators in C

UNIT-II
Control Structures
Control structures, *if* statement, Scope of an *if* clause, *if…else* statement, *if…else…if* statement, *switch* statement, *while* loop, *do…while* loop, *for* loop, *for*loop with a comma operator, *break* statement, *continue* statement, Arrays and Strings : Accessing Array Elements – Initializing Of Array – Multidimensional Arrays – Strings – Arrays of Strings – String functions – Storage classes

Learning outcomes:
1. Gain the knowledge basic loops and statements in C
2. Understand the structures of C language
3. Knowledge on strings and arrays

UNIT-III
Functions and Pointers
Functions, concept of (system) stack, function call, Parameter passing, Call by reference, Calling function, Recursion**,** Pointers: - Address Operator – Pointer Variables –Dereferencing Pointers – Pointers To Pointers – Pointers and Arrays – Array Of Pointers

Learning outcomes:
1. Gain the knowledge on functions in C language
2. Implement programs using pointers
3. Knowledge on poiners and arrays

UNIT-IV
Searching and Sorting Techniques
Arrays, array applications, Manipulations on the list using an array, Bubble sort, Binary search, merging of two sorted lists, Merge sort, Quick sort. *Stacks, Queues:* stack and queues, its applications Circular queues

Learning outcomes:

1. Gain the knowledge on Arrays manupation in C language
2. Implement programs using quicksort
3. Knowledge on queues in C

UNIT-V

Trees and Graphs

Concept of trees, Binary trees, Binary tree traversal, Binary search tree, Counting the number of nodes in a binary search tree, Searching for a target key in a binary search tree, deletion of a node from a binary search tree.

Learning outcomes:

1. Gain the knowledge on binary trees concepts
2. Implement develop programs using binary search algorithms
3. Knowledge on binary search tree

Course Outcomes

1. To know the basic structure and operators in C language
2. To understand the control structures and arrays in C language
3. To understand the functions in C language
4. To implement programs using arrays, stacks and queues
5. To understand the concepts of binary trees

Text Books

1. C & Data Structures - P.S. Deshpande and O.G. Kakde, Dreamtech Press, 2005.
2. C Programming and Data Structures, 3rd Edition-E. Balagurusamy, Tata McGraw Hill, 2007.
3. Mastering C - K R Venugopal, S R Prasad- Tata Mcgraw Hill- 1st Edition
4. Data Structures – A Pseudocode Approach with C, 2nd Edition, Richard F. Gilberg and Behrouz A. Forouzan, Thomson Course Technology, 2005.

M.Sc ELECTRONICS
I-SEMESTER
SEL 721 ANALOG and DIGITAL ELECTRONICS LAB

Hours per week: 6
Credits: 2 Sessionals: 100 Marks

Analog Experiments
Any 6 from the Following List

1. Active Band pass filter (IC 741)
2. Monostable multi vibrator (IC 555)
3. Astable multivibrator (IC 555)
4. Voltage controlled oscillator (IC 555)
5. Wein bridge oscillator (IC 741)
6. Voltage regulator (IC 723)
7. Op-amp characteristics (IC 741)
8. Op-amp as Differentiator (IC 741)
9. Op-amp as Integrator (IC 741)
10. Saw tooth wave generator (IC 555)
11. Colpitt‟s oscillator (BF 194/ IC 741)
12. Twin T filter (IC 741)
13. Phase shift oscillator (IC 741)
14. Logarithmic amplifier (IC 741)
15. Triangular wave generator (IC 741)
16. Crystal oscillator (BC 548)
17. Tuned amplifier (BF 194)
18. SCR characteristics
19. Hartley oscillator (IC 741)
20. Clipping and Clamping circuits

Digital Experiments
Any 6 from the Following List

1. Implementation of logic gates
2. Study of Adder and Subtractor (IC 7483)
3. Binary to Gray code converter (IC 7486)
4. BCD to Excess-3 code converter (7486)
5. Design of Flip-Flops with basic gates
6. (IC 7486)
7. Encoder and Decoder (IC 74138, 74148)
8. Multiplexer and Demultiplexer
9. (IC 74151, 74154)
10. UP- Down counter (IC 74192,74193)
11. D to A converter (IC 7490, 741)
12. 4-bit counter using Flip-Flpos (IC 7490)
13. 4-bit shift register (IC 7476, 7400)
14. 4-bit magnitude comparator (IC 7485)
15. Parity generator (IC 7486, 7404)
16. Study of ALU (IC 74181)
17. Appliance Timer
18. Frequency counter

Course Outcomes

1. Practical understanding of operation of filters using IC741.
2. Practical understanding of operation of oscillators.
3. Practical understanding of operation of integrators and differentiators
4. Practical knowledge on combinational circuits and code converters
5. Practical knowledge on sequential circuits, regesters, counters and multiplexers

M.Sc ELECTRONICS I - SEMESTER
SEL 723 Programming Language- C LAB

Hours per week: 6
Credits: 2 Sessionals: 100 Marks

Any 12 from the Following List

1. Arranging words in alphabetical order
2. Finding of largest and smallest from a set of numbers
3. Multiplication of two square matrices
4. Write functions for (i) reverse the string (ii) converting integer into string
5. Write functions for (i) string copy (ii) string compare (iii) Replace a sub-string with another string
6. Program to sort a series of elements.
7. Program to exchange elements of two arrays using pointers.
8. Write a C program to find the number of and sum of all integers greater than 100 and less than 200 that are divisible by a given integer *x*.
9. Given a number, write a C program using *while* loop to reverse the digits of the number. For e.g. the number 12345 should be printed as 54321.
10. Write a C program to read *n* numbers into an array, and compute the mean, variance and standard deviation of these numbers.
11. Write a C program to read in an array of names and to sort them in alphabetical order.
12. Write a C program to sort a sequence of *n* integers using Quick sort technique and then search for a key in the sorted array using Binary search technique.
13. Write an interactive C program to create a linear linked list of customer names and their telephone numbers. The program should be menu-driven and include features for adding a new customer, deleting an existing customer and for displaying the list of all customers.
14. Write a C program to implement a queue in which insertions, deletions and display

can be performed.

Course Outcomes:

1. Knowledge in Writing and execution of sorting the strings and numbers
2. Knowledge in application of different operations on Matrices
3. Knowledge in writing the programs using arrays
4. Knowledge in writing the programs using binary search algorithms
5. Knowledge in writing the programs using queues and linked lists

M.Sc ELECTRONICS I - SEMESTER
VDC111: Venture Discovery

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Course Description:

India as part of its "Make in India" initiative has been focusing on creating incubation centers within educational institutions, with an aim to generate successful start-ups. These start-ups will become employment creators than employment seekers, which is the need of the hour for our country. This common course (university core) for all the disciplines is a foundation on venture development. It is an experiential course that starts with students discovering their deeper self in terms of how they might contribute to society by creating exciting new products and services that can become the basis of real businesses. The students learn about the emerging areas of knowledge that are the foundations of any successful company. They will learn how to develop insight into the problems and desires of different types of target customers, and from this, to identify the design drivers for a specific innovation. Students will learn specific design methods for new products and services. The students will learn that as important as the product or service itself, is a strategy for monetizing the innovation – for generating revenue, structuring the operating costs, and creating the operating profit needed to support the business, hire new employees, and expand forward. This course is aimed to be the beginning of what might be the most important journey of personal and career discovery so far in a student's life, one with lasting impact. This is not just a course, but potentially, an important milestone in life that a student remembers warmly in the years to come.

Course Objectives

Students have the opportunity to:
1. Discover who they are – Values, Skills, and Contribution to Society
2. Understand how creativity works and permeates the innovation process
3. Learn the basic processes and frameworks for successful innovation.
4. Gain experience in actually going through the innovation process.
5. Conduct field research to test or validate innovation concepts with target customers.
6. Understand innovation outcomes: issues around business models, financing for start-ups, intellectual property, technology licensing, corporate ventures, and product line or service extensions.

Unit 1: PERSONAL DISCOVERY **No of Hours: 4**

Personal Values, Excite & Excel, Build a Team, Define Purpose, Mission Statement

Learning Outcomes

After completion of this unit, the student will be able to

- Identify one's core values, personal strengths and weaknesses and how he/she can contribute to the society L4
- Build a team based on common values and varying abilities of teammates L6
- Define Vision and Mission statements for a prospective venture L6

Pedagogy tools:

Report , Lecture , Practical

Unit 2: IDEATION **No of Hours: 10**

Ideation & Impact, User Insights - Frameworks, Customer Interviews, Interpreting Results

Learning Outcomes

After completion of this unit, the student will be able to

- Identify a problem/idea to work on by brainstorming with teammates L4
- Formulate a questionnaire and obtain insights into Customer thought process through Observation and Interviews L6

- Reshape the idea based on customer responses L5

Pedagogy tools:

Self-reading , Video , Report , Lecture , Case study

Unit 3: SOLUTION DISCOVERY **No of Hours: 8**

Concept Design, Competitive Analysis, Product Line Strategy, Prototyping Solutions, Reality Check

Learning Outcomes

After completion of this unit, the student will be able to

- Prepare a Customer Value Proposition to explain the value of their product to the customer L6
- Compare their product with existing products through a competitive matrix L5
- Express a potential solution through Prototyping L6

Pedagogy tools:

Self-reading , Video , Report , Lecture , Practical , Case study

Unit 4: BUSINESS MODEL DISCOVERY **No of Hours : 4**

Understand the Industry, Types of Business Model, Define Revenue Models, Define Operating Models, Define Customer Journey, Validate Business Model

Learning Outcomes

After completion of this unit, the student will be able to

- Identify the trends in their chosen industry L2
- Explore marketing and distribution channels for their product L2
- Calculate revenues and operating expenses for their product L3

Pedagogy tools:

Self-reading , Report , Lecture , Case study

Unit 5: DISCOVERY INTEGRATION **No of Hours : 4**

Define Company Impact, Create Value, Tell Your Story

Learning Outcomes

After completion of this unit, the student will be able to

- Understand how to balance societal and economic impact of their venture L1
- Implement a framework for making profit L6
- Make a pitch to present their case for actually starting a company L6

Pedagogy tools:

Self-reading , Video , Report , Lecture

Texbook(s)

Meyer and Lee,'Personal Discovery through Entrepreneurship, The Institute for Enterprise Growth, LLC. Boston, MA., USA',1,The Institute for Enterprise Growth, LLC,Boston (MA), USA,2020,NIL,Prepared as per Syllabus

Additional Reading(s)

Adi Ignatius (Editor-in-Chief),'Harvard Business Review',All,Harvard Business Publishing,Brighton, Massachusetts,2021,https://hbr.org/,Based on the Case Study

Course Outcomes(COs)

On completion of the course, the student would be able to:

1. Identify ones values, strengths and weaknesses and their will to contribute to the society
2. Formulate an idea and validate it with customers
3. Demonstrate prototyping and analyze the competition for the product
4. Create business models for revenue generation and sustainability of their business
5. Come up with a pitch that can used as the basis for actually starting a company based on an impactful innovation and societal impact

M.Sc ELECTRONICS
II - SEMESTER
SEL 702 RADAR SYSTEMS and MOBILE COMMUNICATION

Hours per week: 4 — End Examination: 60 Marks
Credits: 4 — Sessionals: 40 Marks

Objective: To understand basic principles of different types of radar systems and mobile communications

UNIT-I

Introduction to RADAR: Basic RADAR, simple Radar Equation, block diagram, Radar frequencies, Applications. **Radar equation**- detection of signals in noise, false alarm, Radar cross section of targets, Pulse repetition frequency. **MTI and Pulse Doppler Radar** Introduction, delay-line cancelers, Doppler filter banks, MTI block diagram, Pulse Doppler Radar.

Learning outcomes:

1. Gain the knowledge on Basics of RADAR
2. Derivation of RADAR equations
3. Knowledge on different RADARS

UNIT-II

Tracking Radar- Tracking with Radar, mono-pulse tracking, Conical scanning and sequential lobbing, limitations to tracking accuracy, **Detection of Signals in Noise**- Introduction, Matched filter receiver, Detectors. Basic Radar measurements. **Radar Clutter**- Introduction to Radar clutter, surface, land, weather and sea clutters. Detection of targets in clutter.

Learning outcomes:

1. Will be able to know the principles of Signal processing
2. Understand the noise in Signals
3. Knowledge on different clutters I RADAR

UNIT-III

Introduction to Cellular Mobile Systems

Why Cellular Mobile Telephone Systems, A basic cellular system, Performance criteria, Operation of cellular systems, Hexagonal shaped Cells, Planning a cellular system, Analog and Digital cellular systems. **Elements of Cellular Radio SystemsDesign:** Concept of frequency reuse channels, Co-channel interference reduction factor, Hand-offmechanism, Cell splitting.

Learning outcomes:

1. Knowledge on mobile systems
2. Understand the basic cellular structure

3. Knowledge on multiplexing

UNIT-IV

Co-channel Interference Reduction

Co-channel interference, Real time co-channel interference measurement, Design of omni-directional and Directional Antenna systems, lowering the Antenna height. **Frequency Managementand Channel Assignment:** Frequency Management, Frequency, Spectrum utilization, Setup channels,Channel assignment- fixed and non-fixed assignment.

Learning outcomes:

1. Gain the knowledge in channel interference
2. Understand the frequency management
3. Knowledge on channel setup

UNIT-V

Cellular Wireless Communication Systems

First generation: AMPS. **Second generation cellular systems**: **GSM** - Specifications,Architecture and Air Interface, **North American TDMA -** Architecture, TDMA structure, Channels. **2.5 G Systems**: GPRS and EDGE specifications and features, **3G systems**: UMTS and CDMA 2000Standards and Specifications, Introduction to 4G.

Learning outcomes:

1. Gain the knowledge on generation of mobiles
2. Understand the TDMA
3. Knowledge 3G and $G

Course Outcomes

1. To understand the working of basic RADAR, MTI and pulse doppler RADARs
2. To understand various antennas and Tacking RADARS
3. Gain the basic knowledge on Elements of Cellular Radio SystemsDesign
4. Understand the different interferences and antenna systems
5. Gain knowledge on different wireless communication systems.

Text Books

1. Mobile Cellular Telecommunications - William - C Y Lee, Tata McGraw Hill- 2nd Edition,1995
2. Advanced Electronic Communication Systems - Wayne. Tomaasi- Prentice Hall- Gale 2nd Edition, 1994
3. Wireless Digital Communications - Dr. Kamilo Feher- Pearson Education, 1st Edition, 2001
4. Wireless Communication, Principles & Practice - T.S. Rappaport PHI, 2001

M.Sc ELECTRONICS
II - SEMESTER
SEL 704 CONTROL SYSTEMS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: It is aimed to introduce principles and applications of control systems in everyday life and industrial automation

UNIT-I
Fundamental of Control Systems

Control system components, Open Loop and Closed Loop control systems and their differences, Examples of control systems and applications, Feedback control systems, Representation of Control Systems, Block diagrams and transfer function of single and multivariable systems. Signal flow graphs-Basic elements, properties, SFG of feedback control system, gain formula and Applications.

Learning outcomes:
1. Understand Fundamental of Control Systems
2. Understand the Block diagrams and reduction
3. Knowledge SFG reduction

UNIT-II
Mathematical Modeling of Systems

Transfer function and Impulse Response functions. Modeling of state space- Correlation between transfer function and state space, Representation of scalar differential equation Modeling of Mechanical Translational, Rotational and Electrical systems, LRC circuit cascaded elements, field and armature-controlled DC motor

Learning outcomes:
1. Understand how to model a mechanical system
2. Understand the describe the functioning of DC motor
3. Knowledge on modelling electrical systems

UNIT-III
Time Response Analysis

Time response of continuous data systems, typical test signals, Characteristic Equation of Feedback control systems– first and second order systems, Transient response of second order system. Time domain specifications for unit step response. Steady state error-linear continuous data control system. Generalized error coefficient and its evaluation, Correlation between static and dynamic error coefficients

Learning outcomes:
1. Understand the time response of system
2. Understand the evaluate study state response
3. understand the error coefficients

UNIT-IV
Stability Analysis of Systems

The concept of stability, Routh's stability criterion, limitations of Routh's stability and applications to control systems, Root Locus Method-Introduction, Basic properties of root loci, Nyquist stability criterion- fundamentals, Number of encirclements and enclosures, principle of argument, Nyquist path.

Learning outcomes:

1. Understand Stability of Systems
2. Understand the Root locus method
3. Understand the inquest criteria

UNIT-V

Analysis and Design of Control Systems

Introduction, Frequency domain specifications, BodeDiagrams, Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin. Compensation techniques – overview.

Learning outcomes:

1. Understand frequency domain
2. Understand the bode plots
3. Understand the compensation methods

Course Outcomes

1. To understand Fundamental of Control Systems
2. To know how to model a system
3. To know the time response of a systems
4. To understand Stability Analysis of Systems
5. To learn compensation techniques used in control systems

Text Books

1. Modern Control Engineering - Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th Edition,2009
2. Automatic Control Systems - Benjamin C.Kuo Wiley Publisher, 9th Edition, 2009.
3. Control Systems Engineering - NISE 7th Edition, John Willey,2005
4. Control Systems Engineering - I.J.Nagrath and M. Gopal, New Age Intl., 2008
5. Control Systems - N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998

M.Sc ELECTRONICS
II - SEMESTER
SEL 706 EMBEDDED SYSTEMS

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: To introduce concept of embedded systems and their applications in the industries

UNIT-I

Introduction to Embedded Systems

Introduction, Application areas, Categories of Embedded Systems, Overview of Embedded system architecture, Specialties of Embedded systems, Recent trends, Hardware architecture, Software architecture, Application software, Communication software, Process of generating executable images, Core Platform Development, Development tools, Communication Interfaces

Learning outcomes:

1. Understand concepts in embedded systems
2. Understand the recent trends
3. Knowledge on application software

UNIT-II

ARM Microcontrollers

Introduction to 32- bit Microcontrollers, ARM7TDMI and ARM9TDMI pipelines, Registers, Modes, Exception handling, Instruction sets. Thumb instruction set, Jazelle, ARM Processor Core, JTAG, Working with Audio codec, JPEG Encoder, MP3 Decoder, File Transfer Between Two Embedded Reference Boards, Interfacing of IRDA card

Learning outcomes:

1. Understand different processors
2. Understand the instruction set
3. Gain the Knowledge on encoders and decoders

UNIT-III

Introduction to Real Time Operating Systems

Architecture of the Kernel, Task and Task scheduler, Interrupt Service Routines, Management function calls of Semaphores, Mutex, Mail boxes, Message queues, Event Registers, Pipes, Signals, Timers, Memory Management, Priority Inversion Problem. Embedded Operating Systems, Real Time Operating Systems and Handheld operating systems

Learning outcomes:

1. Understand he architecture kernal
2. Understand the event egisters
3. Knowledge on real-time operating systems

UNIT-IV

Basic Design using Real Time Operating Systems

Overview, Principles, an Example, Encapsulating Semaphores and Queues, Hard Real Time Scheduling consideration, Saving Memory Space, Saving Power. ***RFID systems:*** RFID systems, Tags, and Readers, Application development using RFID.

Learning outcomes:

1. Understand the queues
2. Understand the saving and memory space
3. Knowledge on RFID

UNIT-V

Embedded C and Linux

Introduction to KEIL, Compilation steps, Header files in KEIL, writing programs in

Embedded C, Debugging Techniques. **Programming in Linux-** Overview of Unix/Linux, Feature of Linux, Linux Commands, File manipulation Commands, Editor, Directory Commands, Input/ Output redirection, file protection, Process Commands, System Programming.

Learning outcomes:

1. Understand the KEIL
2. Understand the Linux
3. Knowledge on process commands

Course Outcomes

1. To understand the hardware and software architectures
2. To know the architecture of ARM processor
3. To understand the internal architecture of RTOS
4. To develop an application using RTOS
5. To implement programs using KEIL compiler and programming in Linux

Text Books

1. Embedded/ Real-Time Systems: Concepts, Design & Programming, Black Book - K. V. K Prasad, Dreamtech Press, 1st Edition, 2003
2. An Embedded Software - Primer B. David A. Simon. Pearson Education, 1st Edition, 2004
3. Embedded Microcomputer Systems - Jonathan W. Valvano, 3rd Edition, 2011

M.Sc ELECTRONICS
II -SEMESTER
SEL 742 DIGITAL SIGNAL PROCESSING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: To get basic knowledge on processing analog and discrete signals using different methods.

UNIT-I

Classification of Signals and Systems

Introduction, Classification of Signals, and Systems,Manipulations of Discrete-time Signals, Representations of Systems. Fourier Analysis- Trigonometric Fourier series, Complex or Exponential form of Fourier series, Parseval's Identity for Fourier series, Power Spectrum of a Periodic Function, Fourier Transform, Properties of Fourier Transform, Fourier Transform of some signals.

Learning outcomes:

1. Understand introduce various classification of signals
2. Understand the FFT transform
3. Knowledge on power spectrum

UNIT-II

Laplace Transform to System Analysis

Definition, Region of Convergence (ROC), LaplaceTransforms of Functions, Convolution Integral, Partial Fraction Expansions, Network Transfer Function, Laplace Transform of Periodic Functions, and application of Laplace Transform. *z*-Transform- Introduction, Properties of *z*-transform, Inverse *z*-transform

Learning outcomes:

1. Understand ROC
2. Understand the Laplace transform
3. gain the Knowledge on Z-Transform

UNIT-III

Linear Time Invariant Systems

Introduction, DifferenceEquation and its Relationship with System Function, Impulse Response and Frequency Response, Discrete and Fast Fourier Transforms - Introduction, Discrete Convolution, Discrete-Time FourierTransform (DTFT), Fast Fourier Transform (FFT), Decimation in Time and Decimation in Frequency algorithms, Computing an Inverse DFT, Fast Convolution.

Learning outcomes:

1. Understand FFT computations
2. Understand the DIT and DIF FFTs
3. gain the Knowledge convelution

UNIT-IV

Finite Impulse Response (FIR) Filters

Introduction, Frequency Response of Linear Phase FIRFilters, Design Techniques for FIR Filters Infinite Impulse Response (IIR) Filters- Introduction, IIR Filter Design by Approximation of Derivatives, Impulse Invariant Method, Bilinear Transformation Realization of Digital Linear Systems- Block Diagram and the Signal-flow Graph realization, BasicStructures for IIR Systems, Basic Structures for FIR Systems.

Learning outcomes:

1. Understand responses of FIR and IIR filters

2. Understand the draw signal flow graphs
3. Knowledge on IIR and FIR systems

UNIT-V

Applications of Signal Processing

Introduction, Voice Signal Processing, Spectral analysis ofSinusoidal signals, Spectral analysis of Non Stationary signals, and Spectral analysis of Random signals, **Applications to Radar** - Digital Matched Filters for Radar signals, Doppler Processing to MTI Radars, Applications to Image Processing

Learning outcomes:

1. Understand Signal processing in RADARs
2. Understand Applications of Signal Processing
3. Knowledge on MTI radars

Course Outcomes

1. To introduce various classification of signals
2. To introduce laplace transform for signal processing
3. To know the differences between DIT and DIF FFTs
4. To find the impulse responses of FIR and IIR filters
5. To understand Applications of Signal Processing

Text Books

1. Digital Signal Processing - Alan V. Oppenheim and Ronal W. Schafer, PHI, 1st Edition, 1999
2. Digital Signal Processing - S. Salivahanan, A. Vallavaraj and C. Gnanapriya, Mcgraw - Hill, 2nd Edition, 2011
3. Digital signal processing - Sanjit K. Mitra, TMH edition, 4th Edition, 2011
4. Theory and Application of Digital Signal Processing by Lawrence R. Rabiner and Bernard Gold, Prentice Hall, 1st Edition, 1975

M.ScELECTRONICS
II-SEMESTER
SEL 744 ANTENNA THEORY and RADIO WAVE PROPAGATION

Hours per week: 4 — End Examination: 60 Marks
Credits: 4 — Sessionals: 40 Marks

Objective: To introduce basic theory and operation of various antennas for the propagation of radio waves.

UNIT-I

Antenna Basics

Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

Learning outcomes:

1. Understand the antennas basics
2. Understand radiation
3. Know the Characteristics of antennas

UNIT-II

Point Sources and Arrays

Introduction, point sources, power patterns, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources, principles of pattern multiplication, examples of pattern synthesis by pattern multiplication, non-isotropic point sources, broad side array with non-unipolar amplitude distribution, broad side versus end fire array, direction of maxima fire arrays of an isotropic point sources

Learning outcomes:

1. Understand the point sources
2. Understand field patterns
3. Understand the arrays

UNIT-III

Electric dipoles and thin linear antennas

Introduction, short electric dipole, fields of a short dipole, radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas.

Learning outcomes:

1. Understand the dipole
2. Understand lambda/2 Antenna
3. Understand the folded dipole antennas

UNIT-IV

Loop, Slot, Patch and Horn Antenna

Introduction, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Balinets principle and complementary antennas, impedance of complementary and slot antennas, patch antennas, horn antennas, rectangular horn antennas. **Antenna Types:** Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna.

Learning outcomes:

1. Understand the comparison of far fields
2. Understand radiation resistance
3. Understand the Antenna Types

UNIT-V

Radio Wave Propagation

Introduction, Ground wave propagation, free space propagation, surface wave, diffraction, troposphere wave propagation, Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field.

Learning outcomes:

1. Understand the Ground wave propagation
2. Understand the Troposcopic scatter
3. Understand the propagation in earth's magnetic field

Course Outcomes:

1. Understand the basic antenna parameters
2. Understand the antenna field patterns and arrays
3. Gain the knowledge on dipole and its field distribution and radiation resistance
4. Understand different types of antennas and their applications
5. Gain the knowledge about the radio wave propagation in different fields

Text Books

1. Antennas - John D. Krauss, 3rd Edition, McGraw Hill International edition, 2006
2. Antennas and Wave Propagation by Harish and Sachidananda: Oxford Press, 1st Edition, 2007
3. Antennas and Propagation for Wireless Communication Systems - Sineon R Saunders, John Wiley, 2nd Edition, 2007.
4. Antennas and Wave Propagation - G S N Raju, Pearson Education, 3rd Edition, 2009

M.Sc ELECTRONICS
II-SEMESTER
SEL 746 OPTO ELECTRONIC DEVICES

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: To understand communication theory using optical fibers

UNIT-I

Overview of Optical fiber Communication

Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, Optical fiber waveguides, Ray theory, single mode and multimode fibers, cutoff wave length, and mode filed diameter. Optical Fibers: fiber materials, Photonic crystal, fiber optic cables.

Learning outcomes:
1. Understand the Historical development
2. Understand the optical fiber communication
3. Knowledge on fiber optic cables

UNIT-II

Transmission Characteristics of Optical fibers

Introduction, Attenuation, Absorption, Scattering losses, Bending loss, Dispersion, Intra-modal dispersion, Inter-modal dispersion, **Optical Sources and Detectors**: Introduction, LED‟s, LASER diodes, Photo detectors, Photo detector noise, Response time, comparison of photo detectors.

Learning outcomes:
1. Understand the Attenuation, Absorption
2. Understand the Optical Sources and Detectors
3. Knowledge on comparison of photo detectors

UNIT-III

Fiber Couplers and Connectors

Introduction, fiber alignment and joint loss, single mode fiber joints, fiber Splices, fiber connectors and fiber couplers. **Optical receiver**: Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, Eye diagrams, Coherent detection, Burst mode receiver operation, Analog receivers

Learning outcomes:
1. Knowledge on losses in OFC
2. Understand the Optical receiver
3. Knowledge on different receivers

UNIT-IV

Analog and Digital Links

Analog links: Introduction, overview of analog links, CNR, Multichannel transmissiontechniques, **Digital links:** Introduction, point–to–point links, System considerations,

link power budget, rise time budget, transmission distance for single mode links, line coding, error correction, modal noise and chirping.

Learning outcomes:

1. Knowledge on links in OFC
2. Understand the digital links
3. Knowledge on budgets of OFC

UNIT-V

WDM Concepts and Components

Operational Principles of WDM, Passive components: 2x2 Fiber Coupler, 2x2 Waveguide coupler, Star couplers, Mach-Zehnder interferometer multiplexers, Tunable sources, Tunable filters. **Optical Amplifiers:** Basic Applications and Types of Optical Amplifiers, Semiconductor Optical Amplifiers, EDFA.

Learning outcomes:

1. Knowledge on fiber couplers
2. Understand the multiplexers
3. Knowledge on Optical Amplifiers

Course Outcomes

1. Gain the basic knowledge on optical fibre communication and background
2. Obtain the knowledge on different transmission characteristics, optical sources and detectors
3. Understand the different losses in optical fibre communications
4. Gain he basic understanding in analog and digital links in OFC
5. To get the basic knowledge in multiplexers and optical amplifiers

Text Books

1. Optical Fiber Communication - Gerd Keiser, 3rd Edition, MGH
2. Optical Fiber Communications - John M. Senior, Pearson Education, 3rd Edition, 2010
3. Fiber Optic Communication - Joseph C Palais, 5th Edition, Pearson Education, 2005

M.Sc ELECTRONICS
II-SEMESTER
SEL 748 INFORMATION THEORY

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: This curse helps the student to understand theory of sending and receiving of information

UNIT-I

Information Theory

Information, Entropy, Information rate, Classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memory less channels, BSC, BEC, Channel capacity, Shannon limit.

Learning outcomes:

1. Knowledge on Classification of codes
2. Understand the conditional entropies
3. Knowledge on channel capacity

UNIT-II

Source coding: Text, Audio and Speech

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm, **Audio:** Perceptualcoding, Masking techniques, Psychoacoustic model, MEG Audio layers I, II, III, Dolby AC3 **Speech:** Channel Vocoder, Linear Predictive Coding

Learning outcomes:

1. Knowledge on Classification of coding
2. Understand the masking techniques
3. Knowledge on Psychoacoustic model

UNIT-III

Source coding: Image and Video

Image and Video Formats, GIF, TIFF, SIF, CIF, QCIF, Image compression: READ, JPEG, Video Compression: Principles, I, B, P frames, Motion estimation, Motion compensation, H.261, MPEG standard

Learning outcomes:

1. Knowledge on Image and Video Formats
2. Understand the Image compression
3. Knowledge on MPEG standard

UNIT-IV

Error Control Coding: Block Codes

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC

Learning outcomes:

1. Knowledge on Hamming weight

2. Understand the Repetition codes
3. Knowledge on Encoder and decoder

UNIT-V

Error control coding: Convolution Codes

Convolution codes, Code tree, Trellis, State diagram- Encoding, Decoding: Sequential search and Viterbi algorithm, Principle of Turbo coding

Learning outcomes:

1. Knowledge on Code tree
2. Understand the Encoding, Decoding
3. Knowledge on Turbo coding

Course Outcomes

1. To explain the concepts of different coding techniques
2. To explain Shanon and Huffman for channel performance improvement against errors.
3. Understand different video and image formats and applications
4. Understand the data compression and source coding techniques.
5. To describe and understand the error control coding

Text Books

1. Information Theory, Coding and Cryptography - R Bose, TMH, 3rd Edition, 2002
2. Multimedia Communications: Applications, Networks, Protocols and Standards - Fred Halsall Pearson Education Asia, 4th Edition, 2001
3. Introduction to Data Compression - K Sayood, Elsevier, 3rd Edition
4. Introduction to Error Control Codes - S Gravano, Oxford University Press ,2001
5. Digital Communication - Amitabha Bhattacharya, TMH, 2006

M.Sc ELECTRONICS
II-SEMESTER
SEL 750ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: to analyze and monitor the control of basic instruments those are used to measure the electrical and biological signals.

UNIT-I
Fundamental Measurements

Accuracy, Precision, Types of errors, Standards of measurements, ***Electronic Instruments:*** RMS, FET voltmeters, Electronic multi-meter, Q meter, LCR meter, Power meter, Measurement of Inductance, Capacitance and Effective resistance at high frequency, ***CRO***- study of various stages in brief, measurement of voltage, current, phase and frequency, Digitalstorage oscilloscope.

Learning outcomes:
1. Knowledge on fundamentals of measurements
2. Understand Q meter, LCR meter
3. To know the operation of CRO

UNIT-II
Instruments for Generation and Analysis of waveforms

Function generator, wave analyzers- Harmonic distortion analyzer, spectrum analyzer and spectrum analysis. ***Recording Instruments:*** X-Y, Strip chart, Magnetic tape recorder ***Transducers:*** Classification of transducers, Strain Gauze, LVDT, Thermocouple, Piezo-electric and photoelectric transducers, Flow measurement transducer.

Learning outcomes:
1. Knowledge on fundamentals of signal generators
2. Understand recorders working
3. Understand the operation of transducers

UNIT-III
Data Acquisition Systems

D/A conversion- Linear weighted and ladder type. A/D conversion- Digital ramp ADC, Successive approximation method, Data loggers, Signal Conditioning of the inputs, Computer based data systems, ***Electronic Indicating instruments***: Seven Segment Display, Fourteen Segment Display, LCD and LED display devices.

Learning outcomes:
1. Knowledge and understand data Acquisition Systems
2. Understand Computer based data systems
3. Understand the LCD/LED Displays

UNIT-IV
Bio-Medical Instrumentation

Basic Medical Instrumentation System, Origin of Bioelectric signals, Recording Electrodes, Electrode-tissue interface, Skin contact impedance, Biosensors, Measurement of Heart rate, Blood pressure measurement, blood flow meter. ***Bio-MedicalInstruments:*** ECG, EEG, EMG,

Electronic Pace maker.

Learning outcomes:

1. Understand bioelectric potentials
2. Understand Skin contact impedance
3. Understand the operation of *:* ECG, EEG

UNIT-V

Medical Imaging Systems

Radiography, X-Ray machine, CT scanner, ***Nuclear Medical Imaging systems****:* Physics of Radio Activity, Radiation Detectors, Gamma Camera, NMR imaging, Ultrasonic Imaging Systems, Angiography and Fluoroscopy

Learning outcomes:

1. Understand NMR and X-Rays
2. Understand medical imaging systems
3. Understand the Angiography and Fluoroscopy

Course Outcomes

1. Deals with fundamentals of measurements in electronic circuits
2. To understand basic recording instruments
3. Aable to understand data Acquisition Systems
4. To understand the construction of medical systems and bio signals
5. Will be able to to understand medical imaging systems like CT, NMR

Text Books

1. Electrical and Electronic Measurements and Instrumentation - Sawhney, Dhanpat Rai Publications., 3rd Edition, 2005
2. Hand Book of Biomedical Instrumentation - Khandpur, Tata Mcgraw Hill, 2nd Edition
3. Medical Instrumentation: Application & Design - John G. Webster, Houghton Miffin & Co., Boston
4. Biomedical Instrumentation - Marvin D. Wirs, Chilton Book Co., London,1973

M.Sc ELECTRONICS
II-SEMESTER
SEL 722 COMMUNICATION LAB

Hours per week: 6
Credits: 2 Sessionals: 100 Marks

Objective: To get handful experience on analog and communication systems.

Communication Lab (Any 10 from the following)

1. Amplitude modulation and detection
2. Frequency modulation and detection
3. P.A.M, P.W.M, and P.P.M generation using I.C 555 and Detection
4. Design of Mixer
5. Phase locked Loop (PLL)

6 Design of Chebyshev second order low pass / high pass filter

7 P.C.M generation and Reception

8 A.S.K, F.S.K and P.S.K generation and Reception

9 Propagation and Bending losses in optical fibers

10 Characteristics of Fiber optic LED and Detector

11 Measurement of speed of light in optical fibers

12 Measurement of Bit Error Rate (BER)

13 Measurement of Numerical Aperture

Microwave Lab (Any 2 from the following)

1. Measurement of signal power
2. Measurement of VSWR
3. Characteristics of Reflex Klystron
4. Electronic Tuning Range
5. Electronic Tuning Sensitivity
6. Double minima Method
7. Measurement of Frequency and Wavelength of Reflex Klystron
8. Plot of Reflex Klystron directly on CRO
9. Measurement of D_{min} for a given Load

Course Outcomes:

1. Practical approach to understand the operation of different modulation methods
2. Understand the Generation of pulse modulation methods using IC 555
3. Practical approach to understand the operation of PLL
4. Understand and calculation of different losses in fiber optic communication
5. Designing of different second order filters.

M.Sc ELECTRONICS
II - SEMESTER
SEL 724 EMBEDDED SYSTEMS LAB

Hours per week: 6

Credits: 2 Sessionals: 100 Marks

Objective: To introduce concept of embedded systems and practical knowledge

Any 12 from the following

1. AC load controlling system by using Relay
2. Temperature display system using LCD and LM35 temperature sensor
3. LDR based Light controlling system
4. Object obstacle identification system using IR transmitter and receiver
5. LEDs Display and moving LEDs controlling system
6. Discrete Switches interface to read inputs
7. Buzzer indication system when an interrupt triggers from Switches
8. Data Acquisition using Embedded System
9. Memory Interfacing
10. Integration of some applications on single board
11. Realization of Boolean expression using ports
12. Generation of different waveforms
13. Serial communication programs
    a. Send a ASCII message to serial port (verify receipt of this message on a computer)
    b. Send characters from computer and verify receipt of echo.

Course Outcomes

1. Able to control the devices and systems
2. Able to program the LEDs Display and moving LEDs controlling system
3. Practical knowledge on memory interfacing
4. Practical knowledge on port controlling and waveform generation
5. Practical experience on serial communication

M.Sc ELECTRONICS
III - SEMESTER
SEL 801 VLSI & VHDL

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: To understand the basics of VLSI design and device simulation by VHDL.

UNIT-I

Review of Microelectronics and Introduction to MOS Technology

Introduction to ICTechnology; The IC Era; MOS and Related VLSI Technology; MOS Transistors; Enhancement and Depletion Mode Transistor Actions, NMOS Fabrication; CMOS Fabrication; Latch-up in CMOS Circuits, CMOS Inverter, BiCMOS Technology. ***MOS and BICMOS Circuit Design Process:*** MOS Layer; Stick Diagrams; Design Rules and Layout; CMOS Rules, Symbolic Diagrams.

Learning outcomes:

1. Understand IC technology
2. Understand VLSI technology
3. Understand the *BICMOS Circuit Design Process*

UNIT-II

Basic Circuit Concepts

Sheet Resistance Concept Applied to MOS Transistors and Inverters;Area Capacitances of Layers; Standard Unit of Capacitance Cg, Inverter Delays; Driving Large Capacitive Loads; Propagation Delays; Wiring Capacitances; Choice of Layers. ***Scalingof MOS Circuits:*** Scaling Models and Scaling Factors; Limitations of Scaling

Learning outcomes:

1. Understand MOS technology
2. Understand Loads in VLSI
3. Understand the *Scalingof MOS Circuits*

UNIT-III

Subsystem Design and Layout

Architectural Issues; Switch Logic; Gate (Restoring) Logic;***Subsystem Design Process:*** Illustration of Design Processes. Design of ALU,Adders. System Timing Considerations, Real World of VLSI Design; Design Styles and Philosophy; Interface with the Fabrication House; CAD Tools for Design and Simulation, Test and Testability

Learning outcomes:

1. Understand Gate (Restoring) Logic
2. Understand Design of ALU,Adders
3. Understand the Fabrication House

UNIT-IV

VHDL

Hardware Description Languages, Introduction to VHDL, Data objects, Classes and datatypes, Operators, Overloading, Logical operators, Entity and Architecture declaration, Introduction to behavioral, dataflow and structural models ***VHDL Statements:*** Assignment statements, sequential Statements and process, Conditional statements, Case statements, Array and Loops, Resolution functions, Concurrent statements, Packages & Libraries

Learning outcomes:

1. Introduction to VHDL
2. Understand Logical operators
3. Understand the Array and Loops

UNIT-V

Combinational Circuit Design

VHDL Models and Simulation of Multiplexers, Encoders,Decoders, Code converters, Comparators, Implementation of Boolean functions etc. ***Sequential CircuitDesign*:**VHDL Models and Simulation of Shift registers, Counters etc. ***Design of Microcomputer*:**Architecture of a simple Microcomputer system, Implementation of a microcomputer system using VHDL. ***Design with CPLDs and FPGAs:*** PLDs, ROM, PLAs, CPLDs and FPGA.

Learning outcomes:

1. Introduction Simulation of Multiplexers
2. Understand *Sequential CircuitDesign*
3. Understand the microcomputer system using VHDL

Course Outcomes:

1. Gain the the knowledge on different logic families applications in circuit design
2. Understand the basic characteristics like sheet resistance capacitance etc and scaling of MOS circuits
3. Understand the subsystem layout and design
4. To get the knowledge on Hardware Description Language
5. Able to model the different combinational and sequential circuits

Text Books

1. Basic VLSI Design - Douglas A. Pucknell and Kamran Eshraghian, 3rd Edition, PHI, 2007
2. A VHDL Primmer - Bhasker; Prentice Hall, 3rd Edition, 1999
3. Digital System Design using VHDL - Charles. H. Roth, PWS, 1st Edition, 1998
4. Digital Design & Modeling with VHDL & Synthesis – KC.Chang; IEEE ComputerSocietyPress,1997
5. CMOS VLSI Design- Circuits and System Perspective - Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson Education, 4th Edition, 2011

M.Sc ELECTRONICS
III-SEMESTER
SEL 803 DATA COMMUNICATIONS

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: To gain the complete knowledge on the different data communications and transmission, data links

UNIT-I

Data Communication, Data Networking and the Internet

Data Communications, Communications model, Data Communications, Networks Protocol, Architecture, TCP/IP, and Internet based Applications: The Need for ProtocolArchitecture; TCP/IP, Protocol Architecture, OSI Model, Data Transmission: Concepts andTerminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

Learning outcomes:

1. Introduction Communications model
2. Understand Internet based Applications
3. Understand the Concepts andTerminology

UNIT-II

Transmission Media

Guided Transmission Media, Wireless Transmission,Signal EncodingTechniques:Digital Data, Digital Signals, Digital Data, Analog Signals, Analog Data, Digital Signals,Analog Data, Analog Signals. Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection; Line Configurations.

Learning outcomes:

1. Introduction Transmission, Signal
2. Understand Analog Data, Digital Signals
3. Understand the Asynchronous and Synchronous Transmission

UNIT-III

Data Link Control Protocols

Flow Control; Error Control, High-Level Data Link Control(HDLC). Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing, Circuit Switching and Packet Switching: Switched Communications Networks, Circuit Switching Networks, and Packet-Switching Principles.

Learning outcomes:

1. Introduction Data Link Control(HDLC)
2. Understand Time-Division Multiplexing
3. Understand the Switched Communications

UNIT-IV

Routing in Switched Networks

Routing in Packet-Switching Networks, Least-Cost AlgorithmsCongestion Control in Data Networks: Effects of Congestion, Congestion Control, TrafficManagement, Congestion Control in Packet-Switching Networks. Local Area Network Overview: Topologies and Transmission Media, LAN Protocol Architecture, Bridges. High Speed LANs: The Emergence of High-Speed LANs, Ethernet.

Learning outcomes:

1. Introduction Packet-Switching Networks
2. Understand TrafficManagement
3. Understand the High Speed LANs

UNIT-V

Wireless LANs

Overview; Wireless LAN Technology, IEEE 802.11 Architecture and Services.Internetwork Protocols: Basic Protocol Functions, Principles of Internetworking; Internet ProtocolOperation,Internet Protocol. Internetwork Operation: Multicasting; Routing Protocols. TransportProtocols: TCP, UDP. Internet Applications: Electronic Mail: SMTP and MIME, Internet DirectoryService: DNS.

Learning outcomes:

1. Understand LAN Technology
2. Understand Principles of Internetworking
3. Understand the Electronic Mail

Course Outcomes

1. To understand Data Communication, Data Networking and the Internet
2. Gain the knowledge on transmission media and different communication techniques
3. Understand different multiplexing techniques used in data communication
4. Understand the basic concepts of networking and protocols
5. Gain the knowledge on wireless LANs internet protocols

Text Books

1. Data and Computer Communications-William Stallings, Pearson Education, 8th Edition,2007
2. Computer Networks - Andrew S. Tanenbaum, Pearson, 3rd Edition, 1996
3. Data Communications and Networking - Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition, 2006

M.Sc. ELECTRONICS
III-SEMESTER
SEL 805 SCRIPTING LANGUAGE - PYTHON

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: to gain the programing skills and application of scripting language Python

Unit-1

Introduction to Scripting languages: Scripts and Programs, Scripting today, Characteristics of Scripting languages, uses of scripting languages, Web Scripting, Universe of Scripting languages.
Introduction to Python: data types, operators, Expressions. Control statement, Standard I/O Operations

Learning outcomes:
1. Introduction to Scripting language
2. Understand Characteristics of Scripting languages
3. Learning of Control statement, Standard I/O Operations

Unit-2

Functions: Declaration and Definition, Function Calling, more on defining functions, Doc Strings, Built-in functions **Sequence:** Lists, Tuples, Sets, Dictionaries

Learning outcomes:
1. Introduction to Declaration and Definition
2. Understand Doc Strings
3. Learning of Sequence in python

Unit-3

Strings and Regular expressions: String operations, Built-in string methods and functions, comparing strings, Functions in regular expression.

Learning outcomes:
1. Introduction Strings
2. Understand string methods
3. Learning of functions

Unit- 4

Exception Handling: Introduction, Handling exceptions, multiple except blocks and multiple exceptions, finally block.

Learning outcomes:
1. Understanding the Handling exceptions
2. Understand blocks
3. Learning of multiple exceptions

Unit-5

Introduction to object-oriented programming: Classes and objects in PythonData

Structures: Abstract datatypes, "Linked" lists: find, insert, and delete, Binary search trees: find, insert, delete, Height-balanced binary search trees

Learning outcomes:

1. Understanding the Classes and objects
2. Understand the Structures
3. Learning of linked lists

Text books

1.Reema Thareja, Python Programming using problem solving approach, First Edition, Oxford higher Education.

Course Outcomes

1. Understand different types of scripting languages and python
2. Get the basic understanding on functions used in python programming
3. Understand of Strings and Regular expressions
4. Gain the knowledge on Exception Handling
5. Obtain the knowledge on data structures, linked lists and binary trees in Python

References

1. Kenneth A. Lambert, Fundamentals of Python
2. James Payne, Beginning Python using Python 2.6 and Python 3
3. Charles Dierach, Introduction to Computer Science using Python

M.Sc ELECTRONICS
III - SEMESTER
SEL 841 BUSINESS PROCESS

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective:

Unit-1

Management: A Brief History of Management, Scientific Management, Administrative Theory, Behavioral Theory, Functions of Management, Functional Areas of Management, Levels in Management, Quality Circles, Total Quality Management

Learning outcomes:
1. Understanding the A Brief History of Management
2. Understand the Administrative Theory
3. Know about the Total Quality Management

Unit-2

Business: Organization, Forms of Business Organizations, Sole Proprietorship, Joint / Partnership, Private and Public Limited. Business Objectives, Business Process, SWOT Analysis, Business Process Reengineering, Sources of Finance and Investment Decisions, New Business Models Viz. Entrepreneurship, Promoting Enterprise, Start-Up, Innovations etc.

Learning outcomes:
1. Understanding the organization
2. Understand the Business Objectives
3. Know about the Start-Up, Innovations

Unit-3

Production Planning and Control: Need, Objectives and functions of Production Planningand Control - Procurement Processes – Inventory.

Learning outcomes:
1. Understanding the Production Planning
2. Understand the functions of Production
3. Know about the Procurement Processes

Unit-4

Management Processes: Techniques for PPC Effectiveness - Line Balancing - Sequencing Models.

Learning outcomes:
1. Understanding the Management Processes
2. Understand the Line Balancing
3. Know about the Sequencing Models

Unit-5

Marketing and Sales Promotion: Types of Marketing, Marketing Mix for Products / Services, Promotional Mix, Sales Promotional Tools / Techniques, Sales Process, Sales Forecasting Techniques, Distribution Channels, Innovations in Marketing.

Learning outcomes:

1. Understanding the Marketing and Sales
2. Understand Promotional Mix
3. Know about the Forecasting Techniques

Course Outcomes

1. Gain the knowledge on functions of management
2. Understand the forms of business organizations and business models
3. Gain the knowledge on Production Planning and Control
4. Understand the management process
5. Obtain the knowledge on Marketing and Sales Promotion

Text books

1. Stephen P. Robbins, Fundamentals of Management Essential Concepts and Application, 6th Edition, Pearson, 2011.
2. Fred Luthans, "Organizational behavior", Tata McGraw Hill Publishing Co., New Delhi.
3. P. Subba Rao, "Management and OrganizationalBehavior", 1st Edition, HPH, Mumbai.
4. Aswathappa K: "Production and Operation Management", Himalaya Publishing House, Mumbai
5. Philip Kotler, "Marketing Management", Millennium Edition, Prentice Hall of India, New Delhi.
7. William. J. Stanton, "Fundamentals of Marketing".

M.Sc ELECTRONICS
III-SEMESTER
SEL 843 SWITCHING THEORY and LOGIC DESIGN

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Objective: To gain the knowledge on the number systems, combinational and sequential circuit design

UNIT-I

Number Systems & Codes

Philosophy of number systems, complement representation of negative numbers-binary arithmetic-binary codes-error detecting & error correcting codes, Boolean Algebra and Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties, switchingfunctions, Canonical and Standard forms

Learning outcomes:

1. Understanding the Philosophy of number systems
2. Understand different codes in number systems
3. Know about the Boolean algebra

UNIT-II

Minimization of Switching Functions

Map method, Prime implicants, don't care combinations, Minimal SOP and POS forms, Combinational Logic Design: Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters

Learning outcomes:

1. Understanding the karnaugh maps
2. Understand different encoders and decoders
3. Designing of Combinational circuits

UNIT-III

Programmable Logic Devices, Threshold Logic

Basic PLD"s-ROM, PROM,PLA,PLD Realization of Switching functions usingPLD"s. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multi-gate Synthesis.

Learning outcomes:

1. Understanding PLDs
2. Understand PLAs
3. Designing of threshold gates

UNIT-IV

Sequential Circuits

Classification of sequential circuits - Synchronous, Asynchronous, Pulse mode, Level mode with examples, Basic flip-flops-Triggering and excitation tables, Steps in synchronous sequential circuit design, Design of modulo-N Ring & Shift counters, Serial binary adder, sequence detector.

Learning outcomes:

1. Understanding sequential circuits
2. Understand flip-flops-Triggering and excitation tables
3. Designing of counters adders

UNIT-V

Algorithmic State Machines

Salient features of the ASM chart, Simple examples, System design using data path and control subsystems, control implementations, examples of weighing machine and Binary multiplier.

Learning outcomes:

1. Understanding ASM charts
2. Understand the design paths
3. Designing of multipliers

Course Outcomes

1. Understand the basic number systems and their inter conversion
2. earn about the different types of boolean functions and their simplification
3. Knowledge on designing of code converters and Multiplexers using combinational circuits
4. Understand the internal structure of memories and programmable logic devices
5. Understand the Algorithmic State Machines, data and control implementations

Text Books

1. Switching & Finite Automata Theory - Zvi Kohavi, TMH, 2nd Edition.
2. Digital Design - Morris Mano, PHI, 3rd Edition, 2006
3. An Engineering Approach to Digital Design - Fletcher, PHI
4. Digital Logic, Application and Design, - John M. Yarbrough, Thomson.
5. Fundamentals of Logic Design - Charles H. Roth, Thomson Publications, 5th Edition, 2004
6. Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006

M.Sc ELECTRONICS
III-SEMESTER
SEL 845 DIGITAL IMAGE PROCESSING

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: To get basic knowledge on processing of digital image signals.

UNIT-I

Fundamentals of Image Processing

Image Acquisition, Image Model, Sampling, Quantization, Relationship between pixels, distance measures, connectivity, Image geometry, Photographic film. Histogram: Definition, Decision of contrast basing on histogram, operations basing on histograms like image stretching, Image sliding, Image classification. Definition and Algorithm of Histogram equalization

Learning outcomes:

1. Understanding Image Model
2. Understand the connectivity, Image geometry
3. Know about the Definition and Algorithm

UNIT -II

Image Transforms

2-D Fast Fourier Transform, Properties, Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, Hotelling transform

Learning outcomes:

1. Understanding 2-D Fast Fourier Transform
2. Understand the Walsh transform
3. Know about the Hotelling transform

UNIT -III

Image Enhancement (By FREQUENCY Domain Methods)

Design of Low pass, High pass, edge enhancement, smoothening filters in Frequency Domain. Butterworth filter, Homomorphic filters in Frequency Domain, Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain

Learning outcomes:

1. Understanding High pass, edge enhancement
2. Understand the Homomorphic filters in Frequency Domain
3. Know about the frequency domain and spatial domain

UNIT -IV

Image Compression

Definition, a brief discussion on, Run length encoding, contour coding, Huffman Course code, Compression due to change in domain, Compression due to quantization, Compression at the time of image transmission, Brief discussion on image compression standards

Learning outcomes:

1. Brief discussion on, Run length encoding
2. Understand the Compression due to change in domain

3. Brief discussion on image compression

UNIT -V

Image Segmentation

Detection of discontinuities, edge linking and boundary detection, thresholding, Region oriented segmentation. **Image Restoration** Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, constrained least squares restoration, Interactive restoration.

Learning outcomes:

1. Understanding Detection of discontinuities
2. Understand the Image Restoration
3. Know about the least mean square filters

Course Outcomes

1. To provide an understanding of the fundamentals of image processing
2. To explain the importance of image transforms in extracting the information in an image.
3. To describe image enhancement techniques in spatial and frequency domain.
4. To introduce the image compression models for better bandwidth utilization,and storage reduction.
5. To explore image segmentation and image restoration techniques

Text Books

1. Digital Image processing - R.C. Gonzalez & R.E. Woods, Addison Wesley, Pearson 2nd Edition, 2002.
2. Fundamentals of Digital Image processing - A. K. Jain, Prentice Hall of India, 1989
3. Digital Image processing using MAT LAB - Rafael C. Gonzalez, Richard E Woods and Steven L, PEA, 2004
4. Digital Image Processing - William K. Pratt, John Wiley, 3rd Edition, 2004

M.Sc. ELECTRONICS
III-SEMESTER
SEL 847 NEURAL NETWORKS

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: This course is designed to analyze neural networks and their application.

UNIT-I

Fundamentals of artificial Neural Networks, Biological neurons and their artificial models, Neural processing, learning and Adaptation, Neural Network Learning Rules, Hebbian,Perceptron, delta, widrow, hoff, correlation, winner, take, all, outstar learning rules.

Learning outcomes:
1. Understanding Fundamentals of artificial Neural
2. Understand the Neural processing
3. understand about the outstar learning rules

UNIT-II

Single Layer Perceptions, Multi player Feed forward Networks, Error back propagation training algorithm, problems with back propagation, Boltzmann training, Cauchy training, Combined back propagation /Cauchy training.

Learning outcomes:
1. Understanding Single Layer Perceptions
2. Understand the Error back propagation
3. Understand about the Boltzmann training

UNIT-III

Hopfield networks, Recurrent and Bi-directional Associative Memories, Counter Propagation Network, Artificial Resonance Theory (ART)

Learning outcomes:
1. Understanding Hopfield networks
2. Understand the Bi-directional Associative
3. Understand about the Artificial Resonance Theory

UNIT-IV

Applications of neural networks, Hand written digit and character recognition, Traveling salesman problem, Neuro controller, inverted pendulum controller.

Learning outcomes:
1. Understanding Applications of neural networks
2. Understand the Traveling salesman problem
3. Understand about the inverted pendulum controller

UNIT-V

Applications of neural networks - Cerebellar model articulation controller, Robot kinematics, Expert systems for Medical Diagnosis.

Learning outcomes:

1. Understanding Cerebellar model articulation
2. Understand the kinematics
3. Understand about the Expert systems for Medical Diagnosis

Course Outcomes:

1. Understand the Biological neurons and their artificial models.
2. Understand the Single Layer and Multilayer precipitations
3. understand the different types of neural network trying methods
4. To understand the applications of neural networks with suitable examples
5. understand Robot kinematics, Expert systems for Medical Diagnosis.

Text Books

1. Introduction to artificial Neural System - S.M. Zurada, Jaico Publishing House,1992
2. Neural Computing, Theory and Practice - Philip D. Wesserman, Van Nostrand Rein Hold, New York, 1st Edition, 1989
3. Neural Networks and Fuzzy Systems - Bart Kosko, Prentice Hall, 1st Edition, 1992

M.Sc. ELECTRONICS
III-SEMESTER
SEL 849 ROBOTICS

Hours per week: 4 | End Examination: 60 Marks
Credits: 4 | Sessionals: 40 Marks

Objective: To understand the concepts of mechanical electronics.

UNIT-I

Introduction

Automation and Robotics, Definition, Basic Structure of Robots, Classification of Robots based on coordinate system, Present trends and future trends in robotics, Overview of robot subsystems. **Components of Robot System:** Manipulator, Controller, Power conversion unit etc., Specifications ofrobot

Learning outcomes:

1. Understanding Automation and Robotics
2. Understand Classification of Robots
3. Understand about the Components of Robot System

UNIT-II

Dynamics & Kinematics

Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution and Inertia, Tension, Newton's equation, Euler equations, Dynamic Modeling of Robotic Manipulators. Homogeneous co-ordinate vector operations, matrix operations, co- ordinate reference frames,

Learning outcomes:

1. Understanding velocity & acceleration of moving frames
2. Understand Tension, Newton's equation
3. Understand about the co-ordinate vector operations

UNIT-III

End Effectors and Actuators

Different types of grippers, vacuum & other methods of gripping, overview of actuators, Internal and External sensors, position, relocking and acceleration sensors, proximity sensors, force sensors, touch slip laser range tinder, camera.

Learning outcomes:

1. Understanding the Different types of grippers
2. Understand the position, relocking and acceleration sensors
3. Understand about the touch slip laser range tinder

UNIT-IV

Motion Planning and Controllers

On-off trajectory, relocking and acceleration profile, Cartesian motion of manipulator, joint interpolated control, Jacobean in terms of D-H matrix, Obstacle avoidance, Basic control system, control loops of robotic system, Fuzzy controllers.

Learning outcomes:

1. Understanding the On-off trajectory
2. Understand the Jacobean in terms of D-H matrix
3. Understand about the Fuzzy controllers

UNIT-V

Robot Vision

Machine Vision system, description, sensing, Digitizing, Image Processing and Analysis and Application of Machine Vision System, Robotic assembly sensors and Intelligent Sensors. Object recognition.

Learning outcomes:

1. Understanding the Machine Vision system
2. Understand the Digitizing
3. Understand about the Object recognition

Course Outcomes

1. Gain the fundamental knowledge in Robotics and basic components
2. Understand the robot dynamics and kinematics
3. Gain the knowledge in different grippers in Robots
4. Understand the basic controls and sensors in robots
5. Understanding the sensing digitizing and analyzing of obtained images

Text Books

1. Fundamentals of Robotics: Analysis and Control - Robert J Schilling, PHI, New Delhi, 1st Edition, 1990
2. Robotic Engineering - Klafter, Thomas, Negin, PHI, New Delhi, 1st Edition, 1989
3. Robotics for Engineers - Yoram Koren, Mc Graw Hill, New York, 1st Edition, 1985
4. Fundamentals of Robotics - T.C. Manjunath, Nandu Publishers, Mumbai
5. Robotics and Control - R. K. Mittal, I. J. Nagrath, TMH, New Delhi, 6th Edition, 2003
6. MEMS and Microsystems Design and Manufacture - HSU, TMH, New Delhi, 1st Edition, 2008

OPEN ELECTIVE
III-SEMESTER
SOE 861 FUNDAMENTALS OF ELECTRONICS

Hours per week: 3 | End Examination: 60 Marks
Credits: 2 | Sessionals: 40 Marks

Objective: To get the knowledge of basic electronic devices and circuits.

UNIT-I
BJT and FET Devices

Bipolar Junction Transistor*:**Configurations, Characteristics, Biasing, Frequencyresponse andApplications of BJT. ***Field Effect Transistor*:** Construction, Characteristics, Biasing and Applications of FET. ***MOSFET: Introduction, Depletion and Enhancement type. ***Feedback concepts:*** Introduction, Practical feedback circuits, Oscillator operation, Types of oscillators.

Learning outcomes:
1. Understanding the BJT operation
2. Understand the FET operation
3. Understand about the oscillators

UNIT-II
Operational Amplifiers

Op-amp basics, parameters, Differential and Common mode operation, virtual ground, P**racticalop-amp circuits**, Integrator, Differentiator and Summing amplifier,***Op-amp Applications***-Constantgain multiplier, Voltage to Current and Current to Voltage Converters, Instrumentation Amplifier, Active Filter Design, Oscillators, Logarithmic and Anti Logarithmic Amplifiers.

Learning outcomes:
1. Understanding the Op-amp basics and characteristics
2. Knowledge on applications of Opamp
3. Understand about the logarithmic amps

UNIT-III
Power Supplies

Rectifiers- Half wave, Full wave and Bridge rectifiers, Filter considerations, Zener diode voltageregulator, Transistor voltage regulation (series and shunt), IC voltage regulators-78XX and 79XX, Variable Power supply Design, ***Linear ICs:*** IC 555 (Timer) and its **applications**: Astable, Monostable, PLL (IC 565).

Learning outcomes:
1. Understanding the retifiers
2. Knowledge on applications rectifiers
3. Understand about the logarithmic amps

UNIT-IV
Combinatorial Logic Circuits

Simplification of Boolean expressions*:**Algebraic method, Karnaugh map method, EX- OR, EX-NOR gates, Encoder and Decoder, Multiplexer and De-multiplexer, ***Digital Arithmetic

Operationsand Circuits: Binary addition, Subtraction, Multiplication and Division, Design of Adders, Subtractorsand Parallel binary adder, ***Applications of Boolean Algebra:*** Magnitude comparator, Parity generator & checker, Code converters, 7-segment decoder /driver display.

Learning outcomes:

1. Understanding the Simplification of Boolean expressions
2. Knowledge on applications logic gates
3. Understand about the code converters

UNIT-V

Sequential Logic Circuits

Flip-Flops: NAND latch, NOR latch, R-S, J-K, T-flip-flops, D-Latch. ***Counters:*** Asynchronous(ripple) counter, Counters with MOD number$<2^n$, Down counter, Synchronous counters, Up-down counter, Ring counter. ***Registers:*** Shift registers, PIPO, SISO, SIPO, PISO.

Learning outcomes:

1. Understanding the flip-flops
2. Knowledge on counters
3. Understand about the registers

Course Outcomes

1. Gain the knowledge on operation of BJT and FETs
2. Understand the concept of Feedback types and oscillators.
3. To get good knowledge on active filters and amplifiers
4. Get the application approach to power supplies using linear ICs
5. Gain the knowledge on basic combinational and sequential circuits

Text Books

1. Electronic Devices and Circuit Theory - R. Boylestad and L. Nashelsky- 11th Edition –Pearson,2008
2. Digital Systems principals and applications - Ronald J Tocci, 10th Edition –Pearson, 2003

3. Digital Design by Morris Mano - 4thEdition, Pearson, 2006
4. Op-Amp Applications - Ramakanth Gaykward, 4th Edition, PHI, 2000
5. Linear IC Applications - D. Roy Chowdhary, New Age International, 2nd Edition, 2004

OPEN ELECTIVE
III-SEMESTER
SOE 863 BIOMEDICAL INSTRUMENTATION

Hours per week: 3 End Examination: 60 Marks
Credits: 2 Sessionals: 40 Marks

Objective: To understand the working functionality and applications of medical instrumentation.

UNIT-I

Biomedical signals & Physiological transducers

Source of biomedical signal, Origin of bioelectric signals, recording electrodes, electrode tissue interface, skin contact impedance, Physiological transducers: Pressure, Temperature, optical fiber sensors

Learning outcomes:

1. Understanding the Biomedical signals
2. Knowledge on Origin of bioelectric signals
3. Understand about the sensors

UNIT-II

Recording Systems

Basic recording system, General considerations for signal conditioners, Preamplifiers, Instrumentation Amplifier, Signal processing techniques. Writing Systems: Direct writing recorder, ink-jet recorder, Digital recorders. Biomedical Recording: ECG, EEG and EMG.

Learning outcomes:

1. Understanding the Basic recording system
2. Knowledge on Preamplifiers
3. Understand about the Digital recorders

UNIT-III

Patient Monitoring systems & Audiometers

Measurement of heart rate, Blood pressure, Respiration rate, Arrhythmia monitor, Methods of monitoring foetal heart rate, Monitoring labor activity, Mechanism of hearing, Measurement of Sound, Basic Audiometer, Blood cell counters, Oximeter, Blood flow meter.

Learning outcomes:

1. Understanding the Measurement of heart rate
2. Knowledge on Measurement of Sound
3. Understand about the Blood cell counters, Oximeter

UNIT-IV

Modern Imaging systems

Basic principle & Block diagram of x-ray machine, Computed Tomography (CT), Magnetic Resonance Imaging System (NMR). Therapeutic Equipment: Cardiac pacemakers, cardiac defibrillators, Hemodialysis machine, Physiotherapy: Microwave Diathermy, Ultrasound therapy.

Learning outcomes:

1. Understanding the x-ray machine
2. Knowledge on Computed Tomography (CT)
3. Understand about the Ultrasound therapy

UNIT-V

Patient Safety & Computer Applications in Biomedical Field

Precaution, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment, PC based medical instruments, computerized critical care units, Planning & designing a computerized critical care unit.

Learning outcomes:

1. Understanding the safety codes for electro medical equipment
2. Knowledge on PC based medical instruments
3. Understand about the computerized critical care unit

Course Outcomes

1. To learn various sensors and the various electrodes used in medical field.
2. To introduce the student, the various sensing and measurement devices of electrical origin
3. To learn the principles and techniques of measuring the parameters of heart
4. To understand the basic concepts of various medical imaging techniques and their applications.
5. To bring out the important and modern methods of imaging techniques.

Text Books

1. Electronics in Medicine & Biomedical Instrumentation - Nandini K. Jog, 2ndEdition, 2013
2. Textbook of Biomedical Instrumentation - K.N.Scott & A. K .Mathur
3. Biomedical Engineering by S .N. Sarbadhikari

4. Hand book of Biomedical Instrumentation - R. S. Khandpur , TMH, 2nd Edition, 2002
5. Biomedical Instruments: Theory and Design - Walter Welko- Witiz and Sid Doutsch
6. Biomedical Instrumentation & Measurements - Lesile Cromwell, Fred J. Weibell &Erich A. Pfeiffer, PHI

M.Sc ELECTRONICS
III - SEMESTER
SEL 821 DSP and VHDL LAB

Hours per week: 6

Credits: 2 Sessionals: 100 Marks

Objective:

DSP Lab (Any 6 from the following)

1. Convolution (Digital)
   - Linear Convolution
   - Circular Convolution
2. Correlation (Digital)
   - Auto Correlation
   - Cross Correlation
3. Difference Equation (Digital)
4. Impulse response of a given system for 2nd order (Analog)
5. Fast Fourier Transform (FFT) (Analog)
6. Discrete Fourier Transform (DFT) (Digital)
7. To Compute Power Density Spectrum of a Sequence (8-Point) using FFT (Analog)
8. Sampling Theorem (Analog)
9. Design of FIR Filters using Windowing Method (Analog and Digital)
10. Kaiser Window (Low Pass/High Pass Filter)
    - Rectangular Window (Low Pass/High Pass Filter)
    - Triangular Window (Low Pass/High Pass Filter)
11. Design of IIR Filters (Analog and Digital)
    - Butterworth (Low Pass/High Pass Filter)
    - Chebyshev (Low Pass/High Pass Filter)
12. Design of FIR Filters (Analog and Digital)

VHDL Lab (Any 6 from the following)

1. Realization of Basic Logic Gates using VHDL
2. R-S, D and J-K Flip- Flops
4. 8-to-1 Multiplexer and 1-to-4 De-Multiplexer
5. 4-Bit Full Adder/ Subtractor
6. 4-Bit Comparator
7. 8-to-3 Encoder and 3-to-8 Decoder
8. 32-Bit ALU Design

9. 4-Bit Binary to Grey Code Converter
10. 4-Bit Ring Counter
11. 4-Bit Up-Down Counter
12. 4-Bit Shift Register

Course Outcomes

1. To analyze FIR filters using MATLAB
2. To analyze IIR filters using MATLAB
3. To perform convolution techniques using DSP
4. To simulate combinational circuits using Verilog HDL
5. simulate sequential circuits using Verilog HDL

M.Sc ELECTRONICS
III-SEMESTER
SEL 823 PYTHON LAB

Hours per week: 6

Credits: 2 Sessionals: 100 Marks

Objective:

List of Experiments

1. Dice game
2. Fruit game
3. Water Level Indicator
4. Distance Measurement
5. Relay
6. Temperature Measurement
7. Linked List
8. Binary Search tree
9. Appliance Timer
10. Counter Applications
11. Implementation of Voltmeter

Course Outcomes

1. Practical understanding and implementation of simple games
2. Practical experience on interfacing of different sensors
3. Able to write the programmes on linked lists and binary search
4. Practical experience on timer and counter applications
5. Practical experience on implementing voltmeter

M.Sc ELECTRONICS
IV - SEMESTER
SEL 802 INTERNET of THINGS (IoT) & APPLICATIONS

Hours perweek:4 | End Examination: 60Marks
Credits:4 | Sessionals: 40Marks

Objective: to integrate IoT technology to human life for better life

Unit-1

Introduction: The basic concepts: Interaction with the Internet, major components of IoT devices- Control units and activators- Sensors- power sources- Communication modules.

Learning outcomes

1. To know the advanced concepts in IoT

2. To know about various sensor used for IoT applications

Unit-2

Communication Technologies: RFID – Bluetooth – ZigBee-Wi-Fi – LoRa (Long Range Low Power) - RF Links- Mobile Internet.

Learning outcomes

1. Learn varius communication technologies
2. Such as RF ID, Bluetooth, etc…

Unit-3

IoT Architecture: IoT architecture: History of IoT, M2M- Machine to Machine, Web of Things, IoT protocols, The Layering concepts, IoT Communication pattern, IoT protocol Architecture, The 6LoWPAN.

Learning outcomes

1. To learn IoT architecture
2. And Iot communication patterns

Unit-4

Software and hardware development tools for IoT: Overview of Raspberry pi, Arduino, Particle Photon & Electron. -; Programming the devices: C programming, Python programming, windows-10 IoT, android app. Connecting the devices to IoT platforms: Cayenne-my devices, IBM Watson, Ubidots.

Learning outcomes

1. Overview of IoT sofeware
2. And connecting devices to IoT platforms

Unit-5

IoT Interfacing and Applications: Interfacing of sensors and actuators: temperature, pressure, humidity, luminous, soil moisture, relays and motors. Applications: Home automation, Industrial automation, Smart lighting, Smart agriculture.

Learning outcomes

1. Learn how to interface various sensors and actuators

2. Study of IoT applications

Course Outcomes

1. To understand the basic concepts of IOT and applications
2. To know and understand the basic architecture of IoT
3. Gain the knowledge on communication technologies like bluetoothWifi
4. Gain the knowledge on software and hardware development tools
5. Gain the knowledge on IoT interfacing and applications

Text books:

1. CharalamposDoukas - **Building Internet of Things with the Arduino** 2012 Createspace Independent publishingplatform.

2. ArshdeepBahga, Vijay Madisetti- **Internet of Things (A Hands-on-Approach)** 2014 by VPI publisher, 1stedition.

3. **Getting started with Raspberry pi**, Matt Richardson & Shawn Wallace, O'Reilly(SPD), 2014, ISBN:9789350239759.

4. Cunopfister**Getting started with the internet of things** O'relly-2015.

M.Sc ELECTRONICS
IV-SEMESTER
SEL 842 ADVANCED EMBEDDED SYSTEMS

Hours perweek:4 End Examination: 60Marks
Credits:4 Sessionals: 40Marks

Objective: Learn and try to implement embedded based system design

UNIT-I

Introduction to Embedded Hardware and Software

Terminology, Gates, Timing diagram, Memory, Microprocessor buses, Direct Memory Access, Interrupts basis, Built interrupts, Shared data problems, Interrupt latency - Embedded system evolution trends. **Operating System**: Initialization, memory model, interrupts and exceptions handling,

Learning outcomes

1. To know the advanced concepts in embedded systems

2. To analyze the timing diagrams of a given circuit

UNIT-II

Memory and Interfacing

Memory: Memory write ability and storage performance, Memory types, composing memory,

Advance RAM interfacing communication basic, Microprocessor interfacing I/O addressing, Arbitration multilevel bus architecture, Serial protocol, Parallel protocols, Wireless protocols

Learning outcomes

1.To understand the memory concepts of embedded systems

2 To describe the protocols

UNIT-III

Embedded Linux

Embedded Linux Environment Host and target, Host/target Development setups, Host/target Debug setups, Embedded Linux Architecture, Boot-configuration,Linux Hardware support and Developmenttool

Learning outcomes

1. To implement the LINUX OS in an embedded system

2 will be able to learn development tools in LINUX

UNIT-IV

Kernel Architecture

Buses & interfacing – I/O – GNU cross-platform development tools,Linux kernel Getting kernel – Kernel configuration – Kernel compilation – Kernel installation,Root file system & boot loader.

Learning outcomes

1. Will be able to learn Kernel architecture

2 Describe the boot loading concepts

UNIT-V

Embedded LINUX on ARM

Embedded Boards Interfacing: ADC/DAC interface and its applications, PWM, RTC, LCD display, Temperature measurement circuit using LM 35, Programming with GPIO,Busses: I2C, CAN, USB, Serial

Learning outcomes

1.Explain the interfacing of different peripherals

2 Interfacing of Communication protocols

Course outcomes

1. To know the advanced concepts in embedded systems
2. To understand the memory concepts of embedded systems
3. To implement the LINUX OS in an embedded system
4. Will be able to understand Kernel architecture
5. Explain the interfacing of different peripherals

Text Books

1. An Embedded Software Primer - David. E. Simon, Pearson Education, 1st Edition,2004
2. EmbeddedSystemsDesign:AUnifiedHardware/SoftwareIntroductionby-FrankVahid and Tony Givargis, John & Wiley Publications, 2nd Edition, 2002
3. Karim Yaghmour, "Building Embedded Linux Systems", O'Reilly Publications, 2ndEdition,
4. Christopher Hallinam, "Embedded Linux Primer", 2nd Edition, Prentice HallPublication,
5. Daniel W Lewis, "Fundamentals of Embedded Software: Where C and Assembly meet", 1st Edition, Prenticehall

M.Sc ELECTRONICS
IV-SEMESTER
SEL 844 ADVANCED NETWORKING

Hours perweek:4 End Examination: 60Marks
Credits:4 Sessionals: 40Marks

Objective: to study and implement the advanced concepts in Networking

UNIT-I

Network as a Platform, Architecture of the Internet

The Network Architecture, Fault-Tolerant Network Architecture, Scalable Network Architecture, **Communicating over the Network**-The Platform for Communications, Protocols, Using Layered Models, Network Addressing. **Application Layer Functionality and Protocols-** Applications: The Interface between the Networks,Application Layer Protocols and Services Examples.

Learning outcomes

1.Explains the architecture of internet

2. To know the Communication models

UNIT-II

OSI Transport Layer

Roles of the Transport Layer, TCP: Communicating with Reliability,UDP: Communicating with Low Overhead. **OSI Network Layer-** IPv4 136, Networks: Dividing Hosts into Groups, Routing: How Data Packets Are Handled, Routing Processes: How Routes Are Learned. Testing the Network Layer

Learning outcomes

1. To understand the concepts of OSI model

2. To understand the principles of network protocols

UNIT-III

OSI Data Link Layer

Data Link Layer: Accessing the Media, MAC Techniques: Placing Dataon the Media, MAC: Addressing and Framing Data. **OSI Physical Layer-** Physical Layer: Communication Signals, Physical Signaling and Encoding: Representing Bits, Physical Media: Connecting Communication

Learning outcomes

1. To understand the internal configurations in data link layer

2.To understand the signal coding in physical layer

UNIT-IV

Ethernet

Overview of Ethernet, Ethernet: Communication through the LAN, Ethernet Frame,Ethernet MAC, Ethernet Physical Layer, **Hubs and Switches**-Legacy Ethernet: UsingHubs, Ethernet: Using Switches, Switches: Selective Forwarding, Address Resolution Protocol (ARP).

Learning outcomes

1.To know the Ethernet technologies

2.To describe the difference between routers and switches

UNIT-V

Planning and Cabling Networks

LANs: Making the Physical Connection, DeviceInterconnections, Developing an Addressing Scheme, Calculating the Subnets, Device Interconnections. **Configuring and Testing the Network-** Configuring Cisco Devices: IOS Basics, Applying a BasicConfiguration Using Cisco IOS, VerifyingConnectivity

Learning outcomes

1.To know the configuration of addresses in a network

2.To understand the applications of CISCO devices

Course Outcomes

1. To know the Communication models
2. To understand the principles of network protocols
3. To understand the signal coding in physical layer
4. To describe the difference between routers and switches
5. To understand the applications of CISCO devices

Text Books

1. Network Fundamentals- CCNA Exploration Companion Guide - Mark A. Dye, Rick, Mc Donald, Antoon W. Rufi. CiscoPress
2. Cisco Certified Network Associate- Study Guide - Todd Lammle, 2nd Edition
3. Data Communications and Networking - Behrouz A Forouzan, Tata McGrawHill

M.Sc ELECTRONICS
IV-SEMESTER
SEL 846 SENSORS

Hours perweek:4 End Examination: 60Marks
Credits:4 Sessionals: 40Marks

Objective: To learn the working principles of various Sensors

UNIT-I

Chemical Sensors

Physical Sensors, Surface Micro Machined Capacitive Pressure sensor, integrated flow sensor, Chemical and Biochemical Sensors, Conductivity sensor, Hydrogen Sensitive MOSFET, Tri-Oxide Sensors, Schottky diode type sensor, Solid Electrolyte, Electrochemical Sensors. Sensor Matrix for Two-Dimensional measurement of concentrations.

Learning outcomes

1. To understand the behavior of chemical sensors

2.To know sensor matrix

UNIT-II

Optical Sensors

Holography, Echolocation and bio-holography, Sensors used in space and environmental applications. Application in meteorology, Natural resources application sensor used in Instrumentation methods.

Learning outcomes

1. To understand the behavior of optical sensors

2. To know their use in instrumentation

UNIT-III

Biomedical Sensors

Biological Sensors in Human Body, Different types of Transducer system, Physiological Monitoring, chemo receptors, Hot and Cold receptors, Sensors for smell, sound, vision, taste.

Learning outcomes

1. To know functioning of Biomedical Sensors

2. to understand smell sensors

UNIT-IV

Aerospace Sensor

Gyroscope laser and fibre optic gyroscopes, Accelerometers. Laser, Aerospace application of laser, Resolvers, Altimeters, Angle of attack sensors,servos.

Learning outcomes

1. To understand aerospace sensors

2. To study about servos

UNIT-V

Advanced Sensor Design

Sensor design, sensor characteristics, Design of signal conditioning devices for sensors. Design of 2 and 4 wire transmitters with 4, 20 Ma output. Pressure Sensor using SiSi bonding, Catheter pressure sensors, TIP pressure sensors, High pressure sensors, Silicon accelerometers

Learning outcomes

1. To know about advanced sensor design

2. To know Silicon accelerometers

Course Outcomes

1. To understand the behavior of chemical sensors
2. Gain the knowledge and To understand the behavior of optical sensors
3. To know functioning of Biomedical Sensors
4. To understand aerospace sensors
5. To know about advanced sensor design

Text Books

1. Sensors Hand Book - SabareeSoloman, McGraw Hill,1998
2. Medical Instrumentation Application and Design - J.G. Webster Houghton MifilinCo.
3. Introduction to Medical Equipment Technology - Carr and Brown, Addison Wesley,1999
4. Optical Fibre Sensors, Volume 1 & 2 - Culshaw B and Dakin J (Eds), Artech House, Norwood,1989
5. Guided Weapon Control Systems - P. Garnell, Pergamon Press,1980

M.Sc ELECTRONICS
IV-SEMESTER
SEL 848 Non-Destructive Testing and Evaluation of Materials

Hours perweek:4 End Examination: 60Marks
Credits:4 Sessionals: 40Marks

Objective: To learn advanced concepts in Non-Destructive Testing and Evaluation of Materials

UNIT –I

Structure of Metals and Defects

Classification of Materials: Metals, Ceramics, Polymers and Composites, Primary and secondary bonding in solids, *Basic Crystal Structures*: FCC, BCC, HCP (structures only).*Imperfections in crystals*: Point Defects, Dislocations, Interfacial Defects, Volume Defects. Failure: Fundamentals of Fracture, Ductile Fracture, Brittle Fracture, Crack Initiation and Propagation, *Different forms of corrosion*:atmospheric corrosion, galvanic corrosion, pitting corrosion, stress corrosion cracking.

Learning outcomes

1. will be able to know the Structure of Metals and Defects in it

2. To find Different forms of corrosions

UNIT – II

Introduction to NDT and Surface Methods

Introduction: What Is NDT, Scope and limitations of NDT,Industrial Applications Of NDT. *Visual Inspection Method*: Basic principle, direct and indirect methods, magnifiers, Microscope, Baroscope. *Liquid Penetrant Method*: Liquid penetrant test basic concepts, Liquid penetrant system, Testing Procedure. *Magnetic Particle Method*: Magnetic materials, magnetization and demagnetization of materials, Magnetic particle test equipment.

Learning outcomes

1. To introduce NDT

2. To know about various surface methods

UNIT – III

Eddy Current Testing (ECT)

Introduction, Technical Overview, Potential of the Method, Magnetic Induction (Self and Mutual), Coil Impedance, Phasor Notation and Impedance, Eddy Current Density and Skin Depth, Impedance Plane Diagrams, EC Probes, Measurement Equipment, applications, advantages, limitations.

Learning outcomes

1. To introduce technical overview of methods

2. To know about measurement equipment

UNIT – IV

Ultrasonic Testing (UT)

Principle of wave propagation, Reflection, Refraction Diffraction, mode conversion and attenuation, Ultrasonic transducers, Ultrasonic Equipment, A,B,C-Scan Presentation, Testindication and inspection, Ultrasonic Testing, Advantages and limitations of Ultrasonic testing.

Learning outcomes

1. to understand the principles of wave propagation

2. to find the Advantages and limitations of Ultrasonic testing

UNIT – V

Radiography Testing (RT)

X-Ray radiography principle, equipment and methodology, Types of industrial radiation sources and Application- Radiographic exposure factors and techniques, Gamma Ray equipment, Radiographic procedure, Radiograph Interpretation, Film Processing methods, Precautions against radiation hazards.

Learning outcomes

1. To learn X-Ray radiography principles

2. To know about Film Processing methods

Course Outcomes

1. Gain the basic knowledge on material structures and different types of defects
2. Gain he knowledge on basic NDT methods like visual and liquid penetrant
3. Gain the basic knowledge on Electromagnetice NDT method line Eddy Current
4. Gain the knowledge in ultrasonic NDT method
5. Gain the knowledge in radiographic NDT method

Text Books

1. William D. Callister, - Materials Science and Engineering An Introduction, 7th Edition, John Wiley & Sons,Inc.
2. C. Hellier - Handbook of Non-Destructive Evaluation, McGraw-Hill Professional, 1st edition (2001).
3. Jayamangal Prasad, C. G. Krishnadas Nair, Non-Destructive Test And Evaluation Of Materials, 2nd Edition, Tata Mcgraw-hill.
4. P.J. Shull, Nondestructive Evaluation - Theory, Techniques, and Applications, Marcell Decker Inc., NY2002.

References

5. Baldev Raj, T. Jayakumar, M. Thavasimuthu, Practical Non-destructive Testing, 2nd edition, Woodhead Publishing,2002,
6. B.P.C. Rao, Practical Eddy Current Testing, Alpha Science International Limited(2006).
7. Ravi Prakash, Non-Destructive Testing Techniques, 1st revised edition, New Age International Publishers, 2010.
8. Elements of Metallurgy and Engineering Alloys , edited by Flake C. Campbell, ASM International,2008

M.Sc ELECTRONICS
IV-SEMESTER
SEL 822 IoT LAB

Hours per week: 6
Credits:2 Sessionals: 100Marks

Objective: To expertise with IoT-Sensor interfacing

List of Experiments

1. Controlling of LED through UBIDOTSCloud
2. Displaying 0-F Hexadecimal Numbers on Seven segment through UBIDOTSCloud
3. Distance Measurement using ultrasonicsensor
4. DC Motor Control though UBIDOTSCloud
5. Stepper Motor Control though UBIDOTSCloud
6. Water LevelMeasurement
7. Smart HomeAutomation
8. Room TemperatureMeasurement
9. Human Detection using PIRSensor
10. Key Pad Interface to detect the keys on Ubidots Cloud

Course outcomes

1. Practical knowledge on UBIDOTS Cloud
2. Practical knowledge on DC motor control through UBIDOTS Cloud
3. Practical knowledge on Speed motor control through UBIDOTS Cloud
4. Practical knowledge on smart home automation
5. Practical knowledge on sensor interface