GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University)

VISAKHAPATNAM * HYDERABAD * BENGALURU

Accredited by NAAC with A^{++} Grade

GITAM School of Science

CURRICULUM AND SYLLABUS

2 Year Postgraduate Programme
PPHYS01: M.Sc. Electronics

w.e.f. 2024-25 admitted batch

(Updated on July 2024)

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.

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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 Admission Test (GAT) 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 aStudent 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 thediscipline.
v. Practical Proficiency Courses
vi. Laboratory and Project work

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

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

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

4.4 The curriculum of the four semesters M.Sc. program is designed to have a total of 80 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/sheshall 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 ofprescribed 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 is 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) One Mid Term Examination for 30 marks. (ii) One assignment and One presentation (OR) Two assignments. Each 5 Marks (5+5 =10 marks)
		60	Semester end Examination	The End Semester Examination shall be for a maximum of 60 Marks
	Total	100		
2	Practical's	100	Continuous evaluation	80 marks for performance, regularity, record/ and case study. Weightage for each component shall be announced at the beginning of the semester. 20 marks for the test conducted at the end of the Semester by the concerned lab Teacher.
	Total	100		
3	Project Work (IV Semester)	200	Project Evaluation	200 marks for evaluation of the project work dissertation submitted by the candidate. The project work evaluation shall be conducted by internal examiners and project 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 to attend 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 finalletter 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 inTable-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 similar formula is used considering the student's performance in all the courses taken 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 student must have necessarily passedall 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 innot 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 allthe 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 reviewall exceptional cases and give his decision which will be final and binding.

GITAM SCHOOL OF SCIENCE
DEPARTMENT OF PHYSICS

M.Sc. Electronics
(Effective from AD 2024-25)

I Semester				
		No. of courses	**Credits**	**Total credits**
Theory	Program core	4	3	12
	PP_ Lab courses	2	2	4
	Skill enhancement	2	4	4
		Total semester credits		20

I – SEMESTER

S.No.	**Course Code**	**Name of the Course**	**Category**	**Credits**	**Hours per Week**		**Maximum Marks**	
					L/T	**P**	**Sem. End Exam**	**Con. evaluation**
1	SEL 701	Physics of Electronic Materials	PC	3	3	0	60	40
2	SEL 703	Electronic communication	PC	3	3	0	60	40
3	SEL 705	Microprocessors & Microcontrollers	PC	3	3	0	60	40
4	SEL 707	Programming Language C	PC	3	3	0	60	40
5	SSE 701/ SSE 703	Skill Enhancement Course*	SEC	2	0	4	--	100
6	IENT1051	Fundamentals of Entrepreneurship	SEC	2	2	0	--	100
7	SEL 721	Communication Lab	PP	2	0	4	--	100
8	SEL 723	Programming Language C Lab	PP	2	0	4	--	100
Total			---	**20**				

*** Skill Enhancement Course (Choose one of the following)**

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

II Semester				
		No. of courses	**Credits**	**Total credits**
Theory	Program core	4	3	12
	Program elective	1	3	3
	PP_ Lab courses	2	2	4
	Professional communication	1	2	2
		Total semester credits		21

II - SEMESTER

Sl. No.	**Course Code**	**Name of the Course**	**Category**	**Credits**	**Hours per Week**		**Maximum Marks**	
					L/T	**P**	**Sem. End Exam**	**Con. Eval**
1	SEL 702	RADAR Systems and Mobile Communication	PC	3	3	0	60	40
2	SEL 704	Control Systems	PC	3	3	0	60	40
3	SEL 706	Embedded Systems	PC	3	3	0	60	40
4	SEL 708	Scripting Language - Python	PC	3	3	0	60	40
Program Elective (One to Be Chosen)								
5	SEL 742	Antenna Theory and Radio Wave Propagation	PE	3	3	0	60	40
	SEL 744	Opto Electronic Devices	PE	3	3	0	60	40
	SEL 746	Information Theory	PE	3	3	0	60	40
6	SAE 702	Professional communication Skills	AEC	2	0	4	--	100
7	SEL 722	Python Lab	PP	2	0	4	--	100
8	SEL 724	Embedded Systems Lab	PP	2	0	4	--	100
		Total	---	**21**				

III Semester				
		No. of courses	**Credits**	**Total credits**
Theory	Program core	4	3	12
	Program elective	1	3	3
	Open Elective	1	2	2
	PP_ Lab courses	2	2	4
	Comprehensive Viva	1	2	2
		Total semester credits		23

III – SEMESTER

Sl. No.	**Course Code**	**Name of the Course**	**Category**	**Credits**	**Hours per Week**		**Maximum Marks**	
					L/T	**P**	**Sem. End Exam**	**Con. Eval**
1	SEL 801	VLSI and VHDL	PC	3	3	0	60	40
2	SEL 803	Data Communications	PC	3	3	0	60	40
3	SEL 805	Electronic Measurements andInstrumentation	PC	3	3	0	60	40
4	SEL 807	Digital Signal Processing	PC	3	3	0	60	40
Program Elective (One to Be Chosen)								
5	SEL 841	Business Process	PE	3	3	0	60	40
	SEL 843	Switching Theory andLogic Design	PE	3	3	0	60	40
	SEL 845	Digital Image Processing	PE	3	3	0	60	40
	SEL 847	Neural Networks	PE	3	3	0	60	40
	SEL 849	Robotics	PE	3	3	0	60	40
	SEL 851	Application of Machine Learning methods in Air Quality studies	PE	3	3	0	60	40
Open Elective (One to be Chosen)								
6	SOE 861	Fundamentals of Electronics	OE	2	2	0	60	40
	SOE 863	Bio-medical Instrumentation	OE	2	2	0	60	40
7	SEL 821	VHDL Lab	PP	2	0	4	--	100
8	SEL 823	DSP Lab	PP	2	0	4	--	100
9	SEL 891	Comprehensive Viva	PP	2	0	0	--	50
		Total	---	**21**				

IV Semester				
		No. of courses	**Credits**	**Total credits**
Theory	Program Core	1	3	3
	Program elective	1	3	3
	PP_ Lab courses	1	2	2
	Project work	1	8	8
		Total semester credits		16

IV – SEMESTER

Sl. No.	**Course Code**	**Name of the Course**	**Category**	**Credits**	**Hours per Week**		**Maximum Marks**	
					L/T	**P**	**Sem. End Exam**	**Con. Eval**
1	SEL 802	Internet of Things (IoT) and Applications	PC	3	3	0	60	40
Program Elective (One to Be Chosen)								
2	SEL 842	Advanced Embedded Systems	PE	3	3	0	60	40
	SEL 844	Advanced Networking	PE	3	3	0	60	40
	SEL 846	Sensors and Transducers	PE	3	3	0	60	40
	SEL 848	Non-Destructive Testing of Materials	PE					
3	SEL 822	Internet of Things (IoT) Lab	PP	2	0	4	--	100
4	SEL 892	Project work	PP	8	0	0	--	200
		Total	---	**16**				

M.Sc. ELECTRONICS

I-SEMESTER

SEL 701 PHYSICS OF ELECTRONIC MATERIALS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT-I Fundamentals of Materials 9 hrs.

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 9 hrs.

Metal-semiconductors, 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 **9 hrs.**

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 **9 hrs.**

BJT fabrication, transistor action, minority carrier distributions, and terminal currents, Switching, Drift in 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 **9 hrs.**

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

Textbooks:

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.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

I - SEMESTER

SEL 703 ELECTRONIC COMMUNICATION

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT-I Amplitude Modulation 9 hrs.

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 9 hrs.

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 9 hrs.

Digital line wave forms: Symbols, Bits and Bauds, Functional notation for pulses, Line codes and waveforms, Unipolar NRZ, RZ, Polar line codes, M- array encoding, ISI and Pulse

shaping, HDB 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 9 hrs.

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 9 hrs.

Introduction, Historical background, 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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3				1	1	1	3	3	2
CO2	3	3				1	1	1	3	3	2
CO3	3	3				1	1	1	3	3	2
CO4	3	3				1	1	1	3	3	2
CO5	3	3				1	1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

I-SEMESTER

SEL 705 MICROPROCESSORS & MICROCONTROLLERS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT-I Microprocessors 9 hrs.

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 9 hrs.

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

UNIT-III Microcontrollers 9 hrs.

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 microcontrollers
2. Understand the data simple ALP using controller
3. Knowledge on different types of controllers

UNIT-IV Microcontroller Interfacing Essentials 9 hrs.

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 9 hrs.

Applications of 8051 Microcontrollers: Displays-7 segment and LCD, Multiple Interrupt Invoking, Interfacing of serial memories- I2C, 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

Textbooks

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,

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	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

I-SEMESTER

SEL 707 PROGRAMMING LANGUAGE C

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT-I Introduction to C Language 9 hrs.

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 9 hrs.

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 **9 hrs.**

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 pointers and arrays

UNIT-IV Searching and Sorting Techniques **9 hrs.**

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 manipulation in C language
2. Implement programs using quicksort
3. Knowledge on queues in C

UNIT-V Trees and Graphs **9 hrs.**

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

Textbooks

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.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	1	1	3	3	3	1	3	3	1	1	2
CO2	1	1	3	3	3	1	3	3	1	1	2
CO3	1	1	3	3	3	1	3	3	1	1	2
CO4	1	1	3	3	3	1	3	3	1	1	2
CO5	1	1	3	3	3	1	3	3	1	1	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

I-SEMESTER

SEL 721 COMMUNICATION LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4

Credits: 2 Sessionals: 100 Marks

Objective: To get a handful of experience in 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 Dmin 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 different second order filters.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	1	1	3	3	3	1	3	3	3	2	1
CO2	1	1	3	3	3	1	3	3	3	2	1
CO3	1	1	3	3	3	1	3	3	3	2	1
CO4	1	1	3	3	3	1	3	3	3	2	1
CO5	1	1	3	3	3	1	3	3	3	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

I - SEMESTER

SEL 723 PROGRAMMING LANGUAGE C LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4

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 100and 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 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.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	1	1	3	3	3	1	3	3	3	2	1
CO2	1	1	3	3	3	1	3	3	3	2	1
CO3	1	1	3	3	3	1	3	3	3	2	1
CO4	1	1	3	3	3	1	3	3	3	2	1
CO5	1	1	3	3	3	1	3	3	3	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS
I – SEMESTER
SKILL ENHANCEMENT COURSE

SSE 701: BASIC COMPUTER CONCEPTS

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4
Credits: 2 Continuous Evaluation: 100 Marks

Preamble: The course gives an understanding about the characteristics and classification of computers, various components of computer along with different operating systems that are available. It gives hands-on training on the packages MS-Word, MS-Power Point, and MS-Excel. The course also comprehends AI tools.

Objectives:

- To introduce components of digital computers and their working along with the outline of Operating Systems.
- To give hands-on training on MS-Word, Power Point and Excel features.

Basics of Computers

Definition of a Computer - Characteristics and Applications of Computers Block Diagram of a Digital Computer – Classification of Computers based on size and working –Central Processing Unit – I/O Devices, Primary, Auxiliary and Cache Memory – Memory Devices. Software, Hardware, Firmware and People ware

Types of Operating System

Functions of an Operating System – MS-DOS –MS Windows, UNIX.

MS-Word

Features of MS-Word – MS-Word Window Components – Creating, Editing, formatting, and Printing of Documents – Headers and Footers – Insert/Draw Tables, Table Auto format – Page Borders and Shading – Inserting Symbols, Shapes, Word Art, Page Numbers, Equations – Spelling and Grammar – Thesaurus – Mail Merge.

MS-PowerPoint

Features of PowerPoint – Creating a Blank Presentation - Creating a Presentation using a Template - Inserting and Deleting Slides in a Presentation – Adding Clip Art/Pictures - Inserting Other Objects, Audio, Video- Resizing and Scaling of an Object –Slide Transition – Custom Animation.

MS-Excel

Overview of Excel features – Creating a new worksheet, selecting cells, Entering, and editing Text, Numbers, Formulae, referencing cells – Inserting Rows/Columns –Changing column widths and row heights, auto format, changing font sizes, colors, shading.

Reference Books:

1. Fundamentals of Computers, V.Raja Raman, PHI Learning Pvt. Ltd, 2010.
2. Microsoft Office 2010 Bible, John Walkenbach, Herb Tyson,
3. Michael R. Groh and Faithe Wempen, Wiley Publications, 2010.

Course Outcomes

1. Able to understand fundamental hardware components that make up a computer's hardware and the role of each of these components
2. Understand the difference between an operating system and an application program, and what each is used for in a computer.
3. Acquire knowledge about AI tools.
4. Create a document in Microsoft Word with formatting that complies with the APA guidelines.
5. Write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
6. Create a presentation in Microsoft PowerPoint that is interactive and legible content

M.Sc. ELECTRONICS

I – SEMESTER

SKILL ENHANCEMENT COURSE

SSE 703: INFORMATION TECHNOLOGY TOOLS

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4 Continuous Evaluation: 100 Marks

Credits: 2

Preamble: The course enables the student to understand networking concepts related to the Internet and introduce social Networking sites and the working of email. It gives orientation of Block Chain technology. It gives hands-on training in SPSS, R Programming, and creation of simple HTML documents.

Objective:

- To enable the student to understand networking concepts related to the Internet and introduce the social Networking sites and working of email.
- To give orientation of Block Chain technology.
- To give hands on training in SPSS, R Programming, and creation of simple HTML documents

Introduction to Internet

Networking Concepts, Data Communication –Types of Networking, Internet, and its Services, Internet Addressing –Internet Applications–Computer Viruses and its types –Browser –Types of Browsers.

Internet applications

Using Internet Explorer, Standard Internet Explorer Buttons, entering a Web Site Address, Searching the Internet– Introduction to Social Networking: twitter, Tumblr, LinkedIn, Facebook, Flickr, skype, yahoo!, google+, YouTube, WhatsApp, etc

E-mail

Definition of E-mail, Advantages and Disadvantages, User Ids, Passwords, Email Addresses, Domain Names, Mailers, Message Components, Message Composition, Mail Management,

Email Inner Workings.

WWW-Web Applications, Web Terminologies, Web Browsers, URL–Components of URL, Searching WWW –Search Engines and Examples.

Block Chain technology

What is Block Chain, Blockchain Architecture, How Block chain Transaction Works? Why do we need Blockchain? Block chain versions, Block chain Variants, Block chain Use Cases, Important Real-Life Use Cases of Block chain Bitcoin cryptocurrency: Most Popular Application of Block chain, Block chain vs. Shared Database, Myths about Block chain, Limitations of Block chain technology.

SPSS

SPSS Commands Descriptive Statistics, Hypothesis Testing, Test of Difference, Analysis of Variance- One Way ANOVA, Non-Parametric Tests, Correlation Analysis, Regression Analysis.

R Programming: Becoming familiar with R, Working with Objects, Introduction to Graphical Analysis.

HTML

WEB Terminology, Structure of HTML Document, HTML – Head and Body tags, Semantic tags- HR- Heading, Font, Image & Anchor tags, Different Types of Lists using Tags, Table Tags, Image Formats – Creation of Simple HTML Documents.

Reference Books:

- In-line/On-line: Fundamentals of the Internet and the World Wide Web by Raymond Greenlaw and Ellen Hepp, 2nd Edition, TMH.
- Microsoft Office 2010 Bible by John Walkenbach, Herb Tyson, Michael R. Groh, and Faithe Wempen, Wiley Publications.

Course Outcomes:

- Enable to understand the basic networking concepts, types of networks, Internet Explorer, and www.
- Outline the Block chain architecture, Bitcoin Crypto currency, and Limitations of Block Chain.
- Choose different statistical tests to be performed on the data sets.
- Demonstrate the R programming with simple graphs.
- To make use of commands to structure HTML document

M.Sc. ELECTRONICS

I - SEMESTER

Course Code: IENT1051	**Course Title**: Fundamentals of Entrepreneurship						
Semester:	**Course Type: Core**	**L**	**T**	**P**	**S**	**J**	**C**
		2					**2**
Home Programme(s): UG and PG Courses							
Course Leader:							

Introduction

Entrepreneurship is a vital life skill that fosters curiosity, creativity, and a focus on seizing opportunities. By embracing entrepreneurship, individuals can achieve professional independence, tackle complex challenges with innovative solutions, and take calculated risks. This course, "Introduction to Entrepreneurship," is designed to provide students with essential knowledge and practical skills for their entrepreneurial journey. Contrary to popular belief, entrepreneurship can indeed be learned, and this course dispels those myths. It offers a comprehensive understanding of the entire entrepreneurial process, from generating ideas to launching a minimum viable product (MVP). Through a combination of theory and hands-on activities, students will explore various aspects of entrepreneurship, such as identifying opportunities, discovering customers, designing solutions, and employing lean startup methods. To succeed, students must demonstrate self-direction and a genuine enthusiasm for learning, whether independently or in collaboration with peers.

Learning Objectives

S. No.	Learning Objective
1	Understand the fundamental concepts and processes of entrepreneurship.
2	Identify and evaluate business opportunities.
3	Know the techniques for effective problem-solving.
4	Recognize the customer discovery and market sizing.
5	Effectively communicate your Venture Idea

Course outline and indicative content

Unit I: Entrepreneurial Process and Mindset **L-6**

Introduction to Entrepreneurship, Pilot Your Purpose, Innovation, Risk-Taking and Value Creation, Myths around Entrepreneurship, Distinct Types of Entrepreneurship, Entrepreneurial vs. Managerial Mindset.

Unit II: Problem Identification and Ideation **L-6**

Entrepreneurship Opportunity identification, Market and Need Analysis, Problem Discovery, Problem Statement Canvas, Evaluating and Selecting Ideas

Unit III: Customer Discovery **L-6**

Users and Buyers, Target Group and Persona, Customer Research Methods (People Shadowing, laddering etc.), Use Cases, Market Sizing, Customer Value Proposition

Unit IV: Solution Design **L-6**

Principles of Effective Solution Design, Prototyping Methods and Tools, Building and Testing Prototypes, Gathering Feedback on Prototypes, Iterating and Refining Solutions, Building Minimum Viable solution.

Unit V: Crafting your Venture Narrative **L-6**

Can you make money? Tell your venture story

Course Outcomes

On successful completion of this course, students will be able to:

S. No.	Learning Outcome	Assessment
1	To discover emotional competencies needed for entrepreneurial career	A1
2	Effectively utilize frameworks like the Problem Statement Canvas and Business Model Canvas for business planning and development.	A3
3	Implement customer research methods such as shadowing and laddering to gather insightful data.	A2
4	Build and refine a minimum viable product (MVP) based on real customer feedback.	A3
5	Present a process pitch that integrates learnings across all units to propose a viable entrepreneurial venture.	A4

Assessment Methods

Task	Task type	Task mode	Weightage (%)
A1	**Class Participation and Activities**: Engagement in class discussions, group activities, and case studies throughout the course.	Individual	20
A2	**Problem Statement and Ideation Report**: A detailed report identifying a market problem, supported by a Problem Statement Canvas.	Group	20
A3	**Customer Discovery Assignment**: A comprehensive analysis of target customers, including persona creation and market sizing.	Group	20
A4	**Process Pitch**: Share your learning from the course	Group	40

**as per grouping made by the course facilitator (no deviation permitted)*

Evaluation pattern

A1: Classroom Participation and Engagement

a) Class Participation – 5 Marks.
b) Group discussions- 5 Marks,
c) Group Activity – 5 Mark
d) Case Study discussion- 5 Marks.

A2: Problem Statement and Ideation.

a) Problem Identification - 5 Marks.
b) Drawings / Prototype Product or Service-5 Marks
c) Discussion on Market Survey-5 Marks
d) Problem Statement Canvas-5 Marks.

A3: Customer Discovery Assignment

a) Analysis on Target Customers - 10 Marks.
b) Report on Market Size - 10 Marks

A4: Process Pitch

a) Presentation from Problem Identification to Launching a Product or Service - 40 Marks.

Learning and Teaching Activities

In classrooms

Reflection videos, Case Discussions, Simulations

Outside classrooms

Field Visits

Teaching and Learning Resources

"Entrepreneurship: Theory, Process, and Practice" by Donald F. Kuratko

Other Books

- The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries
- Blank, S. and Dorf, B. (2012) The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. BookBaby, Pennsauken.
- Osterwalder, A., & Pigneur, Y. (2010) Business Model Generation: A Handbook for Visionaries, Game Changers, And Challengers Wiley.
- Neck, Heidi & Greene, Patricia & Brush, Candida. (2014). Teaching entrepreneurship: A practice-based approach. 10.4337/9781782540564.

Documentaries

- Bloomberg Game Changers (e.g. Zuckerberg, Brin & Page; Jobs, Musk, etc.) - YouTube
- Elon Musk: The future we're building and boring | TED – YouTube
- Inspirational series about the entrepreneurial path of 5 of the most admired business entrepreneurs: Cornelius Vanderbilt (Railroads), John D. Rockefeller (Oil),

Andrew Carnegie (Steel), J.P. Morgan (Banking) and H. Ford (Automobile).

- 6 Tips on Being a Successful Entrepreneur | John Mullins | TED - YouTube

Learning articulation (LO – PO mapping and SDG mapping)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	1	3	3	2	2	2	3	2	2	1	2
CO2	2	3	3	2	2	2	3	2	2	1	3	3	2	1	2
CO3	1	3	3	3	2	3	3	2	3	2	3	3	2	1	2
CO4	2	2	3	3	3	3	3	1	3	1	3	2	2	1	2
CO5	2	3	3	2	2	2	3	1	2	1	3	3	2	1	2

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

M.Sc. ELECTRONICS

II - SEMESTER

SEL 702 RADAR SYSTEMS and MOBILE COMMUNICATION

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT-I Introduction to RADAR **9 hrs.**

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 Fundamentals of Radar: Tracking, Signal Detection, Clutter, and Measurements **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

Co-channel interference, Real time co-channel interference measurement, Design of omni-directional and Directional Antenna systems, lowering the Antenna height. Frequency Management and 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 **9 hrs.**

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 4G

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 Systems Design
4. Understand the different interferences and antenna systems
5. Gain knowledge on different wireless communication systems.

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II - SEMESTER

SEL 704 CONTROL SYSTEMS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 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 9 hrs.

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 9 hrs.

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 9 hrs.

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 9 hrs.

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 Nyquist criteria

UNIT-V Analysis and Design of Control Systems 9 hrs.

Introduction, Frequency domain specifications, Bode Diagrams, 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

Textbooks

1. Modern Control Engineering - Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th Edition, 2009
2. Automatic Control Systems - Benjamin C.Kuo Wiley Publisher, 9 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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II - SEMESTER

SEL 706 EMBEDDED SYSTEMS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT-I Introduction to Embedded Systems 9 hrs.

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 9 hrs.

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 9 hrs.

Architecture of the Kernel, Task and Task scheduler, Interrupt Service Routines, Management function calls of Semaphores, Mutex, Mailboxes, 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 registers
3. Knowledge on real-time operating systems

UNIT-IV Basic Design using Real Time Operating Systems 9 hrs.

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 9 hrs.

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II - SEMESTER

SEL 708: SCRIPTING LANGUAGE – PYTHON

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT I Introduction to Python 9 hrs.

Data types, operators, Expressions. Control statement, Standard I/O Operations. **Sequence:** Lists, Tuples, Sets, Dictionaries

Learning outcomes:

1. Learning of Data types and operators
2. Learning of Control statement, Standard I/O Operations
3. Learning of Sequence data types in python

UNIT II Strings and Regular expressions 9 hrs.

String operations, Built-in string methods and functions, comparing strings, Functions in regular expression. **Functions:** Declaration and Definition, Function Calling, more on defining functions, Doc Strings, Built-in functions

Learning outcomes:

1. Understand strings and string methods.
2. Introduction to Declaration and Definition of functions
3. Understand Doc Strings

UNIT III Files and Exception Handling 9 hrs.

Files: Handling text files, images, and excel files. **Exception Handling:** Introduction, Handling exceptions, multiple except blocks and multiple exceptions, finally block.

Learning outcomes:

1. Understand how to handle text files, images and excel files.
2. Understanding the handling of exceptions
3. Lear about handling multiple exceptions.

UNIT IV Introduction to object-oriented programming 9 hrs.

Classes and objects in Python. Data 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

UNIT V Python modules for data analysis and Plotting **9 hrs.**

NumPy: matrix operations, SciPy for constants, built-in functions, Numerical methods using python(SciPy). Pandas for basic statistical operations, Plotting with Pandas. Matplotlib for basic 2D plotting, subplots and overlays.

Learning outcomes:

1.Understand about Pandas

2.Learn the basics of the Matplotlib plotting package

3.Understand the usage of SciPy

Textbooks

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

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.
4. Python documentation: https://www.python.org/doc/

Course Outcomes

1. Understand different data types in python.
2. Get the basic understanding of strings and functions used in python programming.
3. Gain the knowledge on Exception Handling, handling text, image and excel files.
4. Obtain knowledge on data structures, linked lists and binary trees in Python.
5. Understand different python modules for data analysis and plotting.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	1	1	3	3	3	1	3	3	1	1	2
CO2	1	1	3	3	3	1	3	3	1	1	2
CO3	1	1	3	3	3	1	3	3	1	1	2
CO4	1	1	3	3	3	1	3	3	1	1	2
CO5	1	1	3	3	3	1	3	3	1	1	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II-SEMESTER

SEL 742 ANTENNA THEORY AND RADIO WAVE PROPAGATION

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT I Antenna Basics **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

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, Babinets 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 **9 hrs.**

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO2	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO3	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO4	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO5	**3**	**3**					**1**	**1**	**3**	**3**	**2**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II-SEMESTER

SEL 744 OPTO ELECTRONIC DEVICES

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

Objective: To understand communication theory using optical fibers

UNIT I Overview of Optical fiber Communication **9 hrs.**

Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, Optical fiber waveguides, Ray theory, single mode and multimode fibers, cutoff wavelength, 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 **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

Analog links: Introduction, overview of analog links, CNR, Multichannel transmission techniques, 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 **9 hrs.**

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO2	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO3	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO4	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO5	**3**	**3**					**1**	**1**	**3**	**3**	**2**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II-SEMESTER

SEL 746 INFORMATION THEORY

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT I Information Theory **9 hrs.**

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 **9 hrs.**

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm, Audio: Perceptual coding, 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 **9 hrs.**

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO2	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO3	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO4	**3**	**3**					**1**	**1**	**3**	**3**	**2**
CO5	**3**	**3**					**1**	**1**	**3**	**3**	**2**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. Electronics

II – SEMESTER

SAE 702 PROFESSIONAL COMMUNICATION SKILLS

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4

Credits: 2 Continuous Evaluation: 100 Marks

Objective:

To enable students to

1. acquaint themselves with basic English grammar.
2. acquire presentation skills.
3. develop formal writing skills.
4. develop creative writing skills.
5. keep themselves abreast with employment-readiness skills.

UNIT-I Back to Basics:

Tenses, Concord – Subject Verb Agreement, Correction of Sentences-Error Analysis, Vocabulary building

UNIT -II Oral Presentation

What is a Presentation? Types of Presentations, Technical Presentation – Paper Presentation Effective Public Speaking, Video Conferencing,

UNIT- III Documentation

Letter –Writing, E-mail Writing & Business Correspondence, Project Proposals, Report Writing, Memos, Agenda, Minutes, Circulars, Notices, Note Making

UNIT- IV Creative Writing

Paragraph Writing, Essay writing, Dialogue Writing, Précis Writing, Expansion of Hints, Story Writing

UNIT V Placement Orientation

Resume preparation, group discussion – leadership skills, analytical skills, interviews –Types of Interviews, Preparation for the Interview, Interview Process

Textbooks:

1. Essentials of Business Communication by Rajendra Pal and J S Kalahari, Sultan Chand & Sons, New Delhi.
2. Advanced Communication Skills by V. Prasad, Atma Ram Publications, New Delhi.
3. Effective Communication by Ashraf Rizvi, McGraw Hill Education; 1 edition (27 June 2005)
4. Interviews and Group Discussions How to face them, T.S.Jain, Gupta, First Edition, New Delhi.
5. High School English Grammar and Composition, PCWeek & Martin, N.D.V.Prasada Rao (Editor), S.Chand, 1995.

M.Sc. ELECTRONICS

II-SEMESTER

SEL 722 PYTHON LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4
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 programs on linked lists and binary search.
4. Practical experience on timer and counter applications
5. Practical experience on implementing voltmeter.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

II - SEMESTER

SEL 724 EMBEDDED SYSTEMS LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4
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 an 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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III - SEMESTER

SEL 801 VLSI and VHDL

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks
Credits: 3 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 9 hrs.

Introduction to IC Technology; 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 9 hrs.

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. Scaling of MOS Circuits: Scaling Models and Scaling Factors; Limitations of Scaling

Learning outcomes:

1. Understand MOS technology

2. Understand Loads in VLSI

3. Understand the Scaling of MOS Circuits

UNIT III Subsystem Design and Layout **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

VHDL Models and Simulation of Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc. Sequential Circuit Design: 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 Circuit Design
3. Understand the microcomputer system using VHDL

Course Outcomes:

1. Gain 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

Textbooks

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 & Modelling with VHDL & Synthesis – KC.Chang; IEEE Computer Society Press,1997
5. CMOS VLSI Design- Circuits and System Perspective - Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson Education, 4th Edition, 2011

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	2	2	3	2	2	3	3	3	2	2	1
CO2	2	2	3	2	2	3	3	3	2	2	1
CO3	2	2	3	2	2	3	3	3	2	2	1
CO4	2	2	3	2	2	3	3	3	2	2	1
CO5	2	2	3	2	2	3	3	3	2	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SEL 803 DATA COMMUNICATIONS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks
Credits: 3 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 9 hrs.

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

Learning outcomes:

1. Introduction to Communications model
2. Understand Internet based Applications
3. Understand the Concepts and Terminology

UNIT II Transmission Media 9 hrs.

Guided Transmission Media, Wireless Transmission, Signal Encoding Techniques :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 9 hrs.

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 9 hrs.

Routing in Packet-Switching Networks, Least-Cost Algorithms Congestion Control in Data Networks: Effects of Congestion, Congestion Control, Traffic Management, 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 Traffic Management
3. Understand the High-Speed LANs

UNIT V Wireless LANs 9 hrs.

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SEL 805 ELECTRONIC MEASUREMENTS and INSTRUMENTATION

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks
Credits: 3 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 9 hrs.

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, Digital storage 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 9 hrs.

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 9 hrs.

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 9 hrs.

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-Medical Instruments: ECG, EEG, EMG, Electronic Pacemaker.

Learning outcomes:

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

UNIT V Medical Imaging Systems 9 hrs.

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. Able to understand data Acquisition Systems
4. To understand the construction of medical systems and bio signals
5. Will be able to understand medical imaging systems like CT, NMR

Textbooks

1.Electrical and Electronic Measurements and Instrumentation - Sawhney, Dhanpat Rai Publications., 3rd Edition, 2005

2. Handbook 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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III -SEMESTER

SEL 807 DIGITAL SIGNAL PROCESSING

L	T	P	S	J	C
3	0	0	0	0	3

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

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

UNIT I Classification of Signals and Systems 9 hrs.

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 9 hrs.

Definition, Region of Convergence (ROC), Laplace Transforms 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 9 hrs.

Introduction, Difference Equation and its Relationship with System Function, Impulse Response and Frequency Response, Discrete and Fast Fourier Transforms - Introduction, Discrete Convolution, Discrete-Time Fourier Transform (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 convolution

UNIT IV Finite Impulse Response (FIR) Filters

Introduction, Frequency Response of Linear Phase FIR Filters, 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, Basic Structures 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 of Sinusoidal 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

Textbooks

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
5. Bernard Gold, Prentice Hall, 1st Edition, 1975

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III - SEMESTER

SEL 841 BUSINESS PROCESS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3
Credits: 3

End Examination: 60 Marks
Sessionals: 40 Marks

Objective:

UNIT I 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 II 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 III Production Planning and Control

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

Learning outcomes:

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

UNIT IV 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 V 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

Textbooks

1.Stephen P. Robbins, Fundamentals of Management Essential Concepts and Application, 6th Edition, Pearson, 2011.
2.Fred Luthans, "Organizational behaviour", Tata McGraw Hill Publishing Co., New Delhi.
3.P. Subba Rao, "Management and Organizational Behaviour", 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

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks
Credits: 3 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, switching functions, 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 (PLDs)

Programmable Logic Devices, Threshold Logic Basic PLD‟s-ROM, PROM,PLA,PLD Realization of Switching functions using PLD‟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.Learn 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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
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CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SEL 845 DIGITAL IMAGE PROCESSING

L	T	P	S	J	C
3	0	0	0	0	3

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

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

UNIT I Fundamentals of Image Processing 9 hrs.

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 9 hrs.

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) 9 hrs.

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 9 hrs.

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 9 hrs.

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	2	2	3	2	2	3	3	3	2	2	1
CO2	2	2	3	2	2	3	3	3	2	2	1
CO3	2	2	3	2	2	3	3	3	2	2	1
CO4	2	2	3	2	2	3	3	3	2	2	1
CO5	2	2	3	2	2	3	3	3	2	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SEL 847 NEURAL NETWORKS

L	T	P	S	J	C
3	0	0	0	0	3

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

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

UNIT I **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

Applications of neural networks, Handwritten 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.

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	2	2	3	2	2	3	3	3	2	2	1
CO2	2	2	3	2	2	3	3	3	2	2	1
CO3	2	2	3	2	2	3	3	3	2	2	1
CO4	2	2	3	2	2	3	3	3	2	2	1
CO5	2	2	3	2	2	3	3	3	2	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SEL 849 ROBOTICS

L	T	P	S	J	C
3	0	0	0	0	3

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

Objective: To understand the concepts of mechanical electronics.

UNIT I Introduction 9 hrs.

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 of robot

Learning outcomes:

1.Understanding Automation and Robotics

2.Understand Classification of Robots

3.Understand about the Components of Robot System

UNIT II Dynamics & Kinematics 9 hrs.

Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution and Inertia, Tension, Newton's equation, Euler equations, Dynamic Modelling 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 9 hrs.

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 9 hrs.

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 9 hrs.

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 analysing of obtained images

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
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CO4	2	2	3	2	2	3	3	3	2	2	1
CO5	2	2	3	2	2	3	3	3	2	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SEL 851 APPLICATION OF MACHINE LEARNING METHODS IN AIR QUALITY STUDIES

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3
Credits: 3

End Examination: 60 Marks
Sessionals: 40 Marks

Objective: Promote solving issues in Atmospheric sciences

UNIT I Introduction to Atmospheric Sciences 6 hours

Introduction, structure and composition, Earth's radiation budget, elementary concepts of weather and climate; changes and challenges; wind circulations and monsoons; particulate matter and greenhouse gases; general circulation, Atmospheric pollution. Historical progress of understanding, atmospheric parameters.

UNIT II Open data sources and types 8 hours

Satellite data: Aerosols characteristic parameters with MODIS, TOMS, CALIPSO, MISR. MODIS, CloudSat, Hysplit wind parameters and trajectories. Surface pollutants with MERRA2. Surface data: openAQ, meteorological data such as temperature, pressure, wind speed, rainfall.

UNIT III Time series data / Geo-spatial data in Python 8 hours

Features of time series data, Handling time series data in Python, Geo-spatial files: sources, plotting in Python. Pre-processing the data in Python.

UNIT IV Introduction to Machine learning tools 12 hours

Introduction, ANN, BPNN, Recurrent Neural Network, long short-term memory (LSTM), Random Forest method using Tensor Flow- keras/ scikitlearn. (Not Mathematics)

UNIT V Scope of Machine Learning in Atmospheric sciences 11 hours

Machine Learning methods in prediction, classification, and other problems. Contemporary usage. Importance of Domain knowledge, Refinement of Machine learning methods, Future scope.

Course outcomes

After completing this course, student will be able to

1.Use open-sourced (satellite data or other) atmospheric data of their interest.

2.Understand the basics of elements of Earth's atmosphere and related issues.

3.Handle the geo-spatial data

4.Hands on practice on application of machine learning methods

5. Apply machine learning models for time series data in python.

References:

1.tensorflow keras documentation: https://www.tensorflow.org/api_docs/python/tf/keras

2.GeoPandas: https://geopandas.org/docs.html

3.Scikitlearn: https://scikit-learn.org/stable/

4.Matplotlib documentation: https://matplotlib.org/stable/contents.html

5.C.N. Hewitt Andrea V. Jackson, Editors. Handbook of Atmospheric Science: principles and Applications. Blackwell Publishing

6.McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly Media, Inc.".

7. Swaroop, C. H. (2003). A Byte of Python. Python Tutorial.

8. Michael Bowels, Machine Learning in python: Essential Techniques for predictive analysis, John Wiley & Sons, Inc.

9.Manohar Swamynathan, Mastering Machine learning with Python in Six Steps. A press

Lab Experiments:

1. Accessing data sets (satellite/ in-situ) from various sources
2. Geospatial mapping using Geo-Pandas
3. Handling Time Series Data
4. Tensor-flow tools
5. Data pre-processing
6. Run ANN model, upload data and to make predictions
7. Run BPNN model, upload data and to make predictions
8. Run the code, upload data to make predictions with RNN
9. Run the code, upload data to make predictions with LSTM
10. Run the code, upload data to make predictions with Random Forest

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
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CO2	1	3	3	3	3	1	3	3	1	1	2
CO3	1	3	3	3	3	1	3	3	1	1	2
CO4	1	3	3	3	3	1	3	3	1	1	2
CO5	1	3	3	3	3	1	3	3	1	1	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-EMESTER

SOE 861 FUNDAMENTALS OF ELECTRONICS

L	T	P	S	J	C
2	0	0	0	0	2

Hours per week: 2
Credits: 2

End Examination: 60 Marks
Sessionals: 40 Marks

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

UNIT I BJT and FET Devices **9 hrs.**

Bipolar Junction Transistor: Configurations, Characteristics, Biasing, Frequency response and Applications 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 **9 hrs.**

Op-amp basics, parameters, Differential and Common mode operation, virtual ground, Practical op-amp circuits, Integrator, Differentiator and Summing amplifier ,Op-amp Applications- Constant gain 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 **9 hrs.**

Rectifiers- Half wave, Full wave and Bridge rectifiers, Filter considerations, Zener diode voltage regulator, 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 rectifiers

2. Knowledge on applications rectifiers

3. Understand about the logarithmic amps

UNIT IV Combinatorial Logic Circuits **9 hrs.**

Simplification of Boolean expressions: Algebraic method, Karnaugh map method, EX- OR, EX-NOR gates, Encoder and Decoder, Multiplexer and De-multiplexer, Digital Arithmetic Operations and Circuits: Binary addition, Subtraction, Multiplication and Division, Design of Adders, Subtractors and 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 **9 hrs.**

Flip-Flops: NAND latch, NOR latch, R-S, J-K, T-flip-flops, D-Latch. Counters: Asynchronous(ripple) counter, Counters with MOD number<2n, 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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III-SEMESTER

SOE 863 BIOMEDICAL INSTRUMENTATION

L	T	P	S	J	C
2	0	0	0	0	2

Hours per week: 2 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 9 hrs.

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 9 hrs.

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 9 hrs.

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 9 hrs.

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 9 hrs.

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.

Textbooks

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.Handbook 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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III - SEMESTER

SEL 821 VHDL LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4

Credits: 2 Sessionals: 100 Marks

Objective:

VHDL Lab

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 simulate combinational circuits using Verilog HDL
2. Simulate sequential circuits using Verilog HDL
3. Mastery attained in 32-bit ALU design, comprehending architecture and operation.
4. Proficiency demonstrated in 4-bit binary to Grey code conversion.
5. Skills acquired in designing 4-bit ring counters for digital circuits.

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III - SEMESTER

SEL 823 DSP LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4

Credits: 2 Sessionals: 100 Marks

DSP Lab

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)

Course Outcomes

1. Mastering digital convolution and correlation techniques.
2. Proficiency in difference equations and analog/digital Fourier transforms.
3. To analyze FIR filters using MATLAB
4. To analyze IIR filters using MATLAB
5. To perform convolution techniques using DSP

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**2**	**1**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

III - SEMESTER

SEL 891 COMPREHENSIVE VIVA

Credits: 2 Continuous Evaluation: 50 Marks

M.Sc. ELECTRONICS

IV - SEMESTER

SEL 802 INTERNET of THINGS (IoT) AND APPLICATIONS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week:3 End Examination: 60Marks
Credits:3 Sessional: 40Marks

Objective: To seamlessly integrate IoT technology into human life, enhancing daily experiences and overall well-being

UNIT I Introduction to IoT and communication Technologies 9 hrs.

Introduction: History of IoT, major components of IoT devices, Applications

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

Learning outcomes

1. To know the concepts in IoT
2. Learn various communication technologies.

UNIT II Hardware : Sensors and Actuators 9 hrs.

Accelerometer sensor, Chemical sensor, Humidity sensor, Level sensor, Motion senor, Optical sensor, Pressure sensor, Proximity sensor, Temperature sensor, Touch sensor, Digital sensors, Digital accelerometers, Digital temperature sensor, Characteristics of sensors: Static characteristics, Dynamic characteristics

Types of actuators, Hydraulics actuators, Pneumatic actuators, Electrical actuators, Thermal/magnetic actuators, Mechanical actuators, Relay actuators

Learning outcomes

1. To know about various sensors used for IoT applications.
2. To know about various actuators used for IoT applications.

UNIT III Embedded Platforms for IoT 9 hrs.

Embedded systems in IoT, Challenges of IoT embedded software, Embedded computing examples, IoT-supported hardware platforms: Arms cortex, Intel Galileo, Beagle Bone, Raspberry Pi, Netduino, Arduino

Learning Outcomes:

1. Grasp IoT embedded systems and software challenges.
2. Evaluate IoT hardware platforms for embedded computing.

UNIT IV Introduction to Raspberry Pi 9 hrs.

Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface.

Communication with devices through the pins of the Raspberry Pi, RPi.GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface.

Learning Outcomes

1. Interface hardware and operate Raspberry Pi remotely.
2. Communicate with devices via pins using Python and access GPIO through Tkinter GUI.

UNIT V Raspberry Pi: Setup, configuration, and operating system essentials 9 hrs.

Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS, Basics of Linux and its use, main features including navigating the file system and managing processes, text-based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution.

Learning Outcomes

1. Efficient setup and configuration of Raspberry Pi B+ for IoT.
2. Understanding OS impact and proficient OS booting and management.

Course Outcomes

1. Understanding IoT history, components, and applications.
2. Familiarity with IoT sensors and actuators.
3. Recognizing the role of embedded systems in IoT and IoT hardware platforms.
4. Proficiency in interfacing hardware with Raspberry Pi and remote operation.
5. Mastery in setting up, configuring, and operating Raspberry Pi for IoT.

Textbooks:

1. Fundamentals of IoT: Get familiar with the building blocks of IoT Rajan Gupta, Supriya Madan, BPB Publications, ISBN: 9789355518644 ,2023.
2. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional
3. The official raspberry Pi Projects Book https://www.raspberrypi.org/magpi-issues/Projects_Book_v1.pdf

Reference books:

1. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons
2. Alex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, John Wiley & Sons
3. Michael Margolis, “Arduino Cookbook”, First Edition, March 2011, O'Reilly Media, Inc

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	1	1	3	3	3	1	3	3	1	1	2
CO2	1	1	3	3	3	1	3	3	1	1	2
CO3	1	1	3	3	3	1	3	3	1	1	2
CO4	1	1	3	3	3	1	3	3	1	1	2
CO5	1	1	3	3	3	1	3	3	1	1	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

IV-SEMESTER

SEL 842 ADVANCED EMBEDDED SYSTEMS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

Objective: Learn and try to implement embedded based system design

UNIT I Introduction to Embedded Hardware and Software **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

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

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 **9 hrs.**

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 **9 hrs.**

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

Textbooks

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 Hall Publication
5. Daniel W Lewis, “Fundamentals of Embedded Software: Where C and Assembly meet”, 1st Edition, Prentice Hall

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO2	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO3	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO4	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
CO5	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**1**	**2**
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

IV-SEMESTER

SEL 844 ADVANCED NETWORKING

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

Objective: To study and implement the advanced concepts in Networking

UNIT I Network as a Platform, Architecture of the Internet **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

Data Link Layer: Accessing the Media, MAC Techniques: Placing Data on 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 **9 hrs.**

Overview of Ethernet, Ethernet: Communication through the LAN, Ethernet Frame, Ethernet MAC, Ethernet Physical Layer, Hubs and Switches-Legacy Ethernet: Using Hubs, 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 **9 hrs.**

LANs: Making the Physical Connection, Device Interconnections, Developing an Addressing Scheme, Calculating the Subnets, Device Interconnections. Configuring and Testing the Network- Configuring Cisco Devices: IOS Basics, applying a Basic Configuration Using Cisco IOS, Verifying Connectivity

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

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

IV-SEMESTER

SEL 846 SENSORS AND TRANSDUCERS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

Objective: To learn the working principles of various Sensors

UNIT I Chemical Sensors **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

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 **9 hrs.**

Gyroscope laser and fiber 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

Textbooks

1. Sensors Handbook – Sabaree Soloman, 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
4. Guided Weapon Control Systems - P. Garnell, Pergamon Press,1980

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

IV-SEMESTER

SEL 848 NON-DESTRUCTIVE TESTING OF MATERIALS

L	T	P	S	J	C
3	0	0	0	0	3

Hours per week: 3 End Examination: 60 Marks

Credits: 3 Sessionals: 40 Marks

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

UNIT I Structure of Metals and Defects **9 hrs.**

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 **9 hrs.**

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) **9 hrs.**

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) **9 hrs.**

Principle of wave propagation, Reflection, Refraction Diffraction, mode conversion and attenuation, Ultrasonic transducers, Ultrasonic Equipment, A,B,C-Scan Presentation, Test indication 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) **9 hrs.**

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 Electromagnetic NDT method line Eddy Current
4. Gain the knowledge in ultrasonic NDT method
5. Gain the knowledge in radiographic NDT method

Textbooks

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

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	3	3					1	1	3	3	2
CO2	3	3					1	1	3	3	2
CO3	3	3					1	1	3	3	2
CO4	3	3					1	1	3	3	2
CO5	3	3					1	1	3	3	2
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

IV-SEMESTER

SEL 822 INTERNET OF THINGS (IoT) LAB

L	T	P	S	J	C
0	0	4	0	0	2

Hours per week: 4

Credits: 2 Sessionals: 100Marks

Objective: To expertise with IoT-Sensor interfacing

List of Experiments

1. Controlling of LED
2. Displaying 0-F Hexadecimal Numbers on Seven segment
3. Distance Measurement using ultrasonic sensor
4. DC Motor Control
5. Stepper Motor Control
6. Water Level Measurement
7. Smart Home Automation
8. Room Temperature Measurement
9. Human Detection using PIR Sensor
10. Keypad Interface to detect the keys

Course outcomes

1. Practical knowledge on Displays
2. Practical knowledge on motor control
3. Practical knowledge on Ultrasonic and PIR sensors
4. Practical knowledge on smart home automation
5. Practical knowledge on sensor interface

	PO 1	PO 2	PO3	PO 4	PO 5	PO6	PSO 1	PSO 2	PSO3	PSO4	PSO5
CO1	1	1	3	3	3	1	3	3	3	2	1
CO2	1	1	3	3	3	1	3	3	3	2	1
CO3	1	1	3	3	3	1	3	3	3	2	1
CO4	1	1	3	3	3	1	3	3	3	2	1
CO5	1	1	3	3	3	1	3	3	3	2	1
Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation											

M.Sc. ELECTRONICS

IV-SEMESTER

SEL 892 PROJECT WORK

Credits:8 Continuous Evaluation: 200 Marks

GITAM School of Science

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Visakhapatnam | Hyderabad | Bengaluru