GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

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

VISAKHAPATNAM ∗HYDERABAD ∗BENGALURU

Accredited by NAAC with 'A+' Grade

REGULATIONS & SYLLABUS

Master of Science

In

Electronic Science

(w.e.f 2017-18 admitted batch)

Website: www.gitam.edu

M.Sc. ELECTRONIC SCIENCE
REGULATIONS
(W.e.f. 2015-16 Admitted Batch)

1. ADMISSION

1.1 Admission into M.Sc. in Electronic Science program of GITAM University is governed by GITAM University admission regulations.

2. ELIGIBILITY CRITERIA

2.1 A pass in B.Sc. with Electronics/Physics, Mathematics and any other Subject and with a minimum aggregate of 50% marks in degree or any other equivalent examination approved by GITAM University.

2.2 Admission into Electronic Science will be based on an All India GITAM Science Admission Test (GSAT) conducted by GITAM 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 2015-16 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 give general exposure to a Student in communication and subject related area.

ii) Core Courses (compulsory)

iii) Discipline centric electives which

a) Are supportive to the discipline

b) Give expanded scope of the subject

c) Give inter disciplinary exposure

d) Nurture the student skills

iv) Open electives are of general nature either related or unrelated to the discipline.

v) Practical Proficiency Courses Laboratory and Project work

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

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

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

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

5. MEDIUM OF INSTRUCTION

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

6. REGISTRATION

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

7. ATTENDANCE REQUIREMENTS

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

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

8. EVALUATION

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

8.2 A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the

candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

8.3 Practical/Viva voce/Seminar etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 2.

Table 2: Assessment Procedure

S. No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous evaluation	(i) Two mid semester examinations shall be conducted for 15 marks each. (ii) 5 marks are allocated for quiz. (iii) 5marks are allocated for assignments.
		60	Semester-end examination	The semester-end examination Shall be for a maximum of 60 marks.
	Total	100		
2	Practicals	40	Continuous evaluation	Forty (40) marks for continuous evaluation is distributed among the components: regularity, preparation for the practical, performance, submission of records and oral presentations in the laboratory. Weightage for each component shall be announced at the beginning of the Semester.
		60	Continuous evaluation	Sixty (60) marks for two tests of 30 marks each (one at the mid-term and the other towards the end of the Semester) conducted by the concerned lab Teacher and another faculty member of the department who is not connected to the lab, as appointed by the HoD.
	Total	100		
3	Project work (IV semester)	200	Project evaluation	(i) 150 marks for evaluation of the project work dissertation submitted by the candidate. (ii) 50 marks are allocated for the project Viva-Voce. (iii) The project work evaluation and the Viva-Voce shall be conducted by one external examiner outside the University and the internal project work supervisor.

9. 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 final letter grade will be awarded at the end of the trimester/semester in each course. The letter grades and the corresponding grade points are as given in Table 3.

Table 3: 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 to 79
4	B+ (Good)	7	60 to 69
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/trimester.

13. GRADE POINT AVERAGE

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

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

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 4.

Table 4: 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 passed all the courses of every semester in first attempt.

14. ELIGIBILITY FOR AWARD OF THE M.Sc. DEGREE

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

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

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

a) Registered and successfully completed all the courses and projects.

b) Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.

c) Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and

d) No disciplinary action is pending against him / her.

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

15. Discretionary Power

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

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

M.Sc. Electronic Science
Scheme of Instruction and Syllabus

FIRST SEMESTER

Course Code	Name of the Course	Category	Credits	L/W	Continuous Evaluation	Semester End Examination	Total Marks
SEL 701	Linear and Digital Electronics	PC	4	4	40	60	100
SEL 703	Electronic Communication	PC	4	4	40	60	100
SEL 705	Control Systems	PC	4	4	40	60	100
SEL 707	Programming Language C and Data Structures	PC	4	4	40	60	100
LABS							
SEL 721	Analog and Digital Electronics Lab	PP	2	6	100		100
SEL 723	Programming C Language and Data Structures Lab	PP	2	6	100		100
Total			**20**	**28**	**360**	**240**	**600**

Note: L/W = Lectures per Week

SECOND SEMESTER

Course Code	Name of the Course	Category	Credits	L/W	CIA	SEE	Total Marks
SEL 702	Microwave and Mobile Communication	PC	4	4	40	60	100
SEL 704	Microprocessors & Microcontrollers	PC	4	4	40	60	100
SEL 706	Electronic Measurements and Instrumentation *(Common with M.Sc. Physics)*	PC	4	4	40	60	100
Programme Elective- 1 (ONE TO BE CHOSEN)							
SEL 742	Radar Systems and Satellite Communication	PE	4	4	40	60	100
SEL 744	Antenna Theory and Radio Wave Propagation	PE					
SEL 746	Opto Electronic Devices	PE					
SEL 748	Information Theory	PE					
SEL 750	Remote sensing	PE					
***Open Elective**		OE	3	3	40	60	100
LABS							
SEL 722	Communication Lab	PP	2	6	100		100
SEL 724	Microprocessor and Microcontroller Lab	PP	2	6	100		100
Total			**23**	**31**	**400**	**300**	**700**

Note: L/W = Lectures per Week.

* **Open Elective** - Student can choose one open elective from the list of open electives offered by GITAM UNIVERSITY

THIRD SEMESTER

Course Code	Name of the Course	Category	Credits	L/W	Continuous Evaluation	Semester End Examination	Total Marks
SEL 801	Embedded Systems	PC	4	4	40	60	100
SEL 803	Networking	PC	4	4	40	60	100
SEL 805	Digital Signal Processing	PC	4	4	40	60	100
Programme Elective (ONE TO BE CHOSEN)							
SEL 841	Switching Theory and Logic Design	PE	4	4	40	60	100
SEL 843	Industrial Electronics	PE					
SEL 845	Digital Image Processing	PE					
SEL 847	Neural Networks	PE					
SEL 849	Robotics	PE					
***Open Elective**		OE	3	3	40	60	100
LABS							
SEL 821	Embedded Systems Lab	PP	2	6	100		100
SEL 823	Networking Lab	PP	2	6	100		100
SEL 825	Comprehensive viva	PP	2	-	--	50	50
Total			**25**	**31**	**400**	**350**	**750**

Note: L/W = Lectures per Week.

* **Open Elective** - Student can choose one open elective from the list of open electives offered by GITAM UNIVERSITY

FOURTH SEMESTER

Course Code	Name of the Course	Category	Credits	L/W	Continuous Evaluation	Semester End Examination	Total Marks
SEL 802	VLSI &VHDL	PC	4	4	40	60	100
Program Elective (ONE TO BE CHOSEN)							
SEL 850	Advanced Embedded Systems	PE	4	4	40	60	100
SEL 852	Advanced Networking						
SEL 854	Sensors						
SEL 856	Non Destructive Testing of Materials						
LABS							
SEL 890	DSP &VHDL Lab	PP	2	6	100	---	100
SEL 892	Project work	PP	8	24	----	200	200
Total			**18**	**38**	**180**	**320**	**500**

Note: L/W = Lectures per Week.

Open Electives offered by the Department

(Eligible to all programs other than Electronics and Physics)

Course Code	Name of the Course	Category	Credits	L/W	Continuous Evaluation	Semester End Examination	Total Marks
OPEN ELECTIVE - SECOND SEMESTER							
SOE 752	Fundamentals of Electronics	OE	3	3	40	60	100
OPEN ELECTIVE - THIRD SEMESTER							
SOE 861	Biomedical Instrumentation	OE	3	3	40	60	100

M.Sc. ELECTRONIC SCIENCE I-SEMESTER
SEL 701 LINEAR AND DIGITAL ELECTRONICS

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

UNIT-I
BJT and FET Devices

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.

UNIT-II
Operational Amplifiers

Op-amp basics, parameters, Differential and Common mode operation, virtual ground, P**ractical 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, Schmitt trigger,.

UNIT-III
Power Supplies

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, VCO (IC 566), PLL (IC 565).

UNIT-IV
Combinatorial Logic Circuits

Simplification of Boolean expressions*:** Algebraic method, Karnaugh map method, EX-OR, EX-NOR gates, Encoders and Decoders, Multiplexers and Demultiplexers, ***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 and checker, Code converters, Seven segment decoder /driver display, ALU design.

UNIT-V
Sequential Logic Circuits

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

Books:

1. Electronic Devices and Circuit Theory by R. Boylestad and L. Nashelsky- 11th Edition –Pearson,2008
2. Digital Systems principals and applications by Ronald J Tocci, 10th Edition –Pearson, 2003
3. Digital Design by Morris Mano- 4thEdition- Pearson, 2006
4. Op-Amp Applications by Ramakanth Gaykward, 4th Edition, PHI, 2000
5. Linear IC Applications by D. Roy Chowdhary, New Age International, 2nd Edition, 2004

M.Sc. ELECTRONIC SCIENCE I-SEMESTER
SEL 703: ELECTRONIC COMMUNICATION

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

UNIT-I
Amplitude Modulation

Sinusoidal A.M: Introduction, Modulation Index, Frequency Spectrum, Average Power. BJT Collector 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.

UNIT-II
Angle Modulation

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

UNIT-III
Pulse Communication

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, HDBn Signaling, ***Pulse Modulations***- Generation and Detection of PAM, TDM, PWM, and PPM.

UNIT-IV
Sampling and Pulse Code Modulation

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

UNIT-V
Fiber Optic Communication

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

Books:

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

M.Sc. ELECTRONIC SCIENCE I-SEMESTER
SEL 705 CONTROL SYSTEMS

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

UNIT-I
Fundamental of Control Systems

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

UNIT-II
Mathematical Modeling of Systems

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

UNIT-III
Time Response Analysis

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

UNIT-IV
Stability Analysis of Systems

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

UNIT-V
Analysis and Design of Control Systems

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, Lag, Lead, Lead-Lag Controllers design.

Books:

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

M.Sc. ELECTRONIC SCIENCE I-SEMESTER
SEL 707: Programming Language C and Data Structures

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

Unit-I

Introduction to the C language

First program in C, Inputting the data, Control statement, Iteration loop, *do…while* loop, *switch* statement, . printf, scanf ***C – Operators*:** Arithmetic operator, Relational operator, Logical operator, Ternary operator, Increment operator, Comma operator, Bitwise operator, Operator precedence.

Unit-II

Control Structures

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

Unit-III

Functions and Pointers

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

Unit-IV

Searching and Sorting Techniques

Arrays, array applications, Manipulations on the list using an array, Bubble sort, Binary search, Merging of two sorted lists, Merge sort, Quick sort. *Stacks, Queues:* stack and queues, its applications Circular queues

Unit-V

Trees and Graphs

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

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

M.Sc. ELECTRONIC SCIENCE I-SEMESTER
SEL 721 ANALOG AND DIGITAL ELECTRONICS LAB

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

Any 6+6 from the following lists :

Analog Experiments
Any 6 from the Following List

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

Digital Experiments
Any 6 from the Following List

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

M.Sc. ELECTRONIC SCIENCE I - SEMESTER

SEL 723:Programming C Language and Data Structures LAB

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

Any 12 from the Following List

1. Arranging words in alphabetical order
2. Finding of largest and smallest from a set of numbers
3. Multiplication of two square matrices
4. Write functions for (i) reverse the string (ii) converting integer into string
5. Write functions for (i) string copy (ii) string compare (iii) Replace a sub-string with another string
6. Program to sort a series of elements.
7. Program to exchange elements of two arrays using pointers.
8. Write a C program to find the number of and sum of all integers greater than 100 and less than 200 that are divisible by a given integer *x*.
9. Given a number, write a C program using *while* loop to reverse the digits of the number. For e.g. the number 12345 should be printed as 54321.
10. Write a C program to read *n* numbers into an array, and compute the mean, variance and standard deviation of these numbers.
11. Write a C program using recursive calls to evaluate f(x) = x – x3/3! + x5/5! - x7/7! + …
12. Write a C program to read in an array of names and to sort them in alphabetical order.
13. 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.
14. 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.
15. Write a C program to implement a queue in which insertions, deletions and display can be performed.

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 702 MICROWAVE AND MOBILE COMMUNICATION

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

UNIT-I
Microwave wave line of sight propagation

Free space transmission equation, Atmospheric effects and Terrain effects on Free Space transmission, Fresnel zone clearance, Ground reflections, Statistical properties of fades. **Intermodulation Noise:** Sources of Intermodulation noise, Methods of testing IM noise, noise due to feeder mismatch, Multiple reflections in long feeders, Inter-channel interference.

UNIT-II
Repeater Design Considerations

Active Repeaters, Branching filter network, Passive Repeaters- Antenna-reflector configuration, Passive Repeaters Systems. **Troposcatter communication:** Physical properties of tropo-sphere, short term, long term and combined fading. Path geometry, Effective earth radius, calculation of angular distance and diversity techniques in Tropo-scatter communication systems- Diversity systems combining techniques

UNIT-III
Introduction to Cellular Mobile Systems

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

UNIT-IV
Co-channel Interference Reduction

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

UNIT-V
Cellular Wireless Communication Systems

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

Books:

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

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 704 MICROPROCESSORS & MICROCONTROLLERS

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

Microprocessors

UNIT-I

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

UNIT-II

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

Microcontrollers

UNIT-III

Comparison of Microprocessors and Microcontrollers, Evolution of Microcontrollers,architecture of 8051,registers,ports,Interrupt Structure, Timer/counters, Addressing modes, Instruction set of 8051. **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

UNIT-IV

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

UNIT-V

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

Books:

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

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 706 - ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Common with M.Sc. Physics)

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

UNIT-I
Fundamental Measurements

Accuracy, Precision, Types of errors, Standards of measurements, ***Electronic Instruments:*** RMS, FET voltmeters, Electronic multimeter, 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.

UNIT-II
Instruments for Generation and Analysis of waveforms

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

UNIT-III
Data Acquisition Systems

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

UNIT-IV
Bio-Medical Instrumentation

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

UNIT-V
Medical Imaging Systems

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

Books:

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

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 742 RADAR SYSTEMS AND SATELLITE COMMUNICATION

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

UNIT-I

Simple RADAR, Overview of frequencies, Radar Equation, Accuracy and Resolution, Integration time and the Doppler shift, Surveillance radar, Antenna beam-width consideration, Pulse repetition frequency, unambiguous range and velocity, Pulse length and sampling, Radar cross section, Clutter noise, Tracking Radar, Sequential lobbing, Conical scanning.

UNIT-II

Signal and Data Processing, Properties of clutter, Moving Target Indicator, Processing Share holding, Plot extraction, Tract Association, Initiation and Tracking, Radar Antenna, Antenna parameters, Antenna Radiation Pattern and aperture distribution, Parabolic reflector, Cosecant squared antenna pattern, Effect of errors on radiation pattern, Stabilization of antennas

Satellite Communication

UNIT-III

Satellite System, Historical development of satellites, communication satellite systems, communication satellites, orbiting satellites, satellite frequency bands, satellite multiple access formats, Satellite orbits and inclination, Look angles, orbital perturbations, Space craft and its subsystems, altitude and orbit control system

UNIT-IV

Telemetry, Tracking and Command, Power system, Transponder, Reliability and space qualification, launch vehicles, Multiple Access Techniques, Time division multiple access, Frequency division multiple access, Code division multiple access, Space domain multiple access

UNIT-V

Earth Station technology, Subsystem of an earth station, Transmitter, Receiver Tracking and pointing, Small earth station, different types of earth stations, Frequency coordination, Basic principles of special communication satellites, VSAT, GPS, RADARSAT, INTELSAT

Books:

1. Introduction to Radar Systems by MI Skolnik , 3rd Edition, 2001
2. Satellite Communication by Robert M. Gagliardi, 2nd Edition , 2006
3. Understanding Radar Systems by Simon Kingsley and Shaun Quegan, Mc Graw hill , 1999
4. Satellite Communication by Manojit Mitra, PHI, 1st Edition, 2005

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 744 ANTENNA THEORY AND RADIO WAVE PROPAGATION

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

UNIT-I
Antenna Basics

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

UNIT-II
Point Sources and Arrays

Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources, non-isotropic but similar 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 n isotropic point sources of equal amplitude and spacing.

UNIT-III
Electric dipoles and thin linear antennas

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

UNIT-IV
Loop, Slot, Patch and Horn Antenna

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

UNIT-V
Radio Wave Propagation

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

Books:

1. Antennas by 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. Antenna Theory Analysis and Design by C A Balanis, 3rd Edition, John Wiley, 2005.
4. Antennas and Propagation for Wireless Communication Systems by Sineon R Saunders, John Wiley, 2nd Edition, 2007.
5. Antennas and Wave Propagation by G S N Raju, Pearson Education, 3rd Edition, 2009

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

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

UNIT-I
Overview of Optical fiber Communication

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

UNIT-II
Transmission Characteristics of Optical fibers

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

UNIT-III
Fiber Couplers and Connectors

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

UNIT-IV
Analog and Digital links

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.

UNIT-V
WDM Concepts and Components

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

Books:

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

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 748 INFORMATION THEORY

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

UNIT-I
Information Theory

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

UNIT-II
Source coding: Text, Audio and Speech

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

UNIT-III
Source coding: Image and Video

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

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

UNIT-V
Error control coding: Convolution Codes

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

Books:

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

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 750 REMOTE SENSING

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

UNIT-I
Physics of Remote Sensing

Introduction of Remote Sensing - Electro Magnetic Spectrum, Physics of Remote Sensing-Effects of Atmosphere- Scattering, Different types, Absorption-Atmospheric window- Energy interaction with surface features, Spectral reflectance of vegetation, soil, and water, atmospheric influence on spectral response patterns- multi concept in Remote sensing.

UNIT-II
Data Acquisition

Types of Platforms, different types of aircrafts-Manned and Unmanned spacecrafts, sun synchronous and geo synchronous satellites, Types and characteristics of different platforms, LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD etc – Photographic products, B/W, colour, IR film and their characteristics, resolving power of lens and film - Opto mechanical electro optical sensors, across track and along track scanners, multi spectral scanners and thermal scanners, geometric characteristics of scanner imagery - calibration of thermal scanners.

UNIT-III
Scattering System

Microwave scatterometry, types of RADAR, SLAR, resolution - range and azimuth, real aperture and synthetic aperture RADAR, Characteristics of Microwave imagestopographic effect - different types of Remote Sensing platforms,airborne and space borne sensors, ERS, JERS, RADARSAT, RISAT - Scatterometer, Altimeter-LiDAR remote sensing, principles, applications.

UNIT-IV
Thermal And Hyper Spectral Remote Sensing

Sensors characteristics - principle of spectroscopy - imaging spectroscopy – field conditions, compound spectral curve, Spectral library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing, thermal sensors, principles, thermal data processing, applications.

UNIT-V
Data Analysis

Resolution, Spatial, Spectral, Radiometric and temporal resolution- signal to noise ratio- data products and their characteristics - visual and digital interpretation, Basic principles of data processing, Radiometric correction, Image enhancement, Image classification, Principles of LiDAR, Aerial Laser Terrain Mapping.

Books:

1. Remote Sensing and Image interpretation by Lilles and T.M., and Kiefer, R.W., 6th Edition, John Wiley & Sons, 2000
2. Introductory Digital Image Processing: A Remote Sensing Perspective by John R. Jensen, 2nd Edition, 1996
3. Remote Sensing Digital Image Analysis by John A.Richards, Springer,Verlag, 5th Edition, 1999

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 722 COMMUNICATION LAB

Hours per week: 6 | End Examination: 60 Marks
Credits: 2 | Sessionals: 40 Marks

Communication Lab (Any 9 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 3 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

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SEL 724 MICROPROCESSOR AND MICROCONTROLLER LAB

Hours per week: 6 End Examination: 60 Marks
Credits: 2 Sessionals: 40 Marks

8086 programming (Any 6 from the following)

1. Addition / Subtraction of 32-bit integers
2. Hexadecimal to ASCII and vice versa
3. Search for character sequence in a String
4. Addition of an array of integers
5. Bubble sorting of an array of integers
6. Counting no. of 1"s in a word using shift and rotate instructions
7. Packed and unpacked BCD Arithmetic
8. Counting positive values, zeros and negative values in an array of integer
9. 64 bit Addition

8086 Interfacing (Any 6 from the following)

1. Interfacing of 8255 I/O Programming.
2. Interfacing of 8253 programmable Interval Timer
3. Interfacing of Stepper Motor
4. Interfacing of Seven Segment Display
5. Interfacing of 8279 Programmable Keyboard
6. Interface of A/D converter
7. Interface of D/A converter
8. Traffic Controller interface
9. Square wave generator

8051 Microcontroller (Any 6 from the following)

1. Addition, Subtraction (8-bit and multi Bytes)
2. Multiplication, Division of 8-bit and 16-bit.
3. Temperature measurement
4. Ascending and Descending order and Alphabetical order.
5. Real Time Clock.
6. LED Interface.
7. Interfacing A/D converter
8. Interfacing D/A Converter
9. Interfacing Logic controller
10. Interfacing Traffic Controller
11. Interfacing of Keyboard

Interfacing of Seven Segment Display

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 801 EMBEDDED SYSTEMS

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

UNIT-I
Introduction to Embedded Systems

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

UNIT-II
ARM Microcontrollers

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

UNIT-III
Introduction to Real Time Operating Systems

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

UNIT-IV
Basic Design using Real Time Operating Systems

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

UNIT-V
Embedded C and Linux

Introduction to KEIL, Compilation steps, Header files in KEIL, Writing programs in Embedded C, Debugging Techniques. **Programming in Linux-** Overview of Unix/Linux, Feature of Linux, Linux Commands, File manipulation Commands, Editor, Directory Commands, Input/ Output redirection, file protection, Process Commands, System Programming.

Books:

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 803 NETWORKING

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

UNIT-I

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

UNIT-II

Transmission Media: 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.

UNIT-III

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

UNIT-IV

Routing in Switched Networks: 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.

UNIT-V

Wireless LANs: 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.

Books:

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 805 DIGITAL SIGNAL PROCESSING

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

UNIT-I

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

UNIT-II

Laplace Transform to System Analysis- Definition, Region of Convergence (ROC), Laplace Transforms of Functions, Convolution Integral, Partial Fraction Expansions, Network Transfer Function, Laplace Transform of Periodic Functions, Application of Laplace Transform. *z*-Transform- Introduction, Properties of *z*-transform, Inverse *z*-transform

UNIT-III

Linear Time Invariant Systems- 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.

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.

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

Books:

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 841 SWITCHING THEORY AND LOGIC DESIGN

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

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

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

UNIT-III

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, Multigate Synthesis.

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.

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.

Books:

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 843: INDUSTRIAL ELECTRONICS

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

UNIT-I
Characteristics of Devices

PNPN Diode, Schottky Diode, Silicon Carbide Diodes, Freewheeling diodes, SCR Triggering, Series and Parallel connection of SCRs, DIAC, TRIAC, UJT, Power Diodes, Control Characteristics of Power devices. **Controlled Rectifier:** Single-phase Half wave and Full wave Converters, Three phase Rectifiers- Bridge rectifiers- Half controlled and Fully controlled.

UNIT-II
Inverter, Chopper and Cycloconverter

Voltage driven, Current driven, Bridge, Parallel, Control of output voltage- PWM Schemes, Harmonic reduction, Types of Choppers, step-up and step-down Cycloconverter. ***Motor Control:*** D.C. and A.C. Motor control reversible drives, closed loop control, commutator less D.C. Motor control. **3-phase AC motor control-** Speed control of Induction Motor using Inverter.

UNIT-III
Switched Mode Power Supplies

Basic principle, step-up and step-down circuits, Integrated circuits for Switched Mode regulators, Induction Heating, Effect of frequencies and Power requirements, Dielectric heating and Applications. BJT switching characteristics and limits, Power MOSFETS-Steady state and switching characteristics, IGBT series and parallel operation

UNIT-IV
Programmable Logic controllers (PLC's) - Ladder Diagram

Fundamentals, symbol, PLC configurations, Block diagram, Fundamentals, PLC programming, Physical components vs. Program components, Discrete Position Sensors, Encoders, Transducers and Advanced Sensors, **Switches** - AC switches, switches for BUS Transfer, Solid State Relays. Gate Drive Circuits-MOSFET and BJT base drive, Isolated Gate and Base drives.

UNIT-V
Microwave Semiconductor Devices

Tunnel diode, Gunn diode, IMPATT and TRAPATT diodes, Varactor diode, PIN diode **Microwave oscillators**: High frequency limitations of conventional tubes, Two cavity and Multi-cavity Klystron, Reflex Klystron, Traveling wave tube, Magnetron oscillator, Forward wave crossed field amplifier and Backward wave crossed field amplifier.

Books:

1. Power Electronics by P.C.Sen, Tata McGraw Hill Publishing Co., Ltd.,2008
2. Power Electronics and Control by S.K.Dutta, Prentice Hall of India Pvt. Ltd.1986
3. Power Electronics: Circuits, Devices and Applications by Rashid, 3rd Edition,2004
4. Industrial and Power Electronics by G.K. Mithal.
5. Microwave Devices and Circuits by Samuel Y. Liao, Pearson, 2nd Edition, 1997
6. Power Electronics, Converters, Applications and Design by Net Mohan, Tore M. Undeland and William P. Robins, 3rd Edition, John Wiley and Sons, 2006
7. Power Electronics by M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition, 2008
8. Power Electronics: Principles and Applications by J.M. Jacob, Thomson, Vikas Publications.

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 845 DIGITAL IMAGE PROCESSING

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

UNIT-I
Fundamentals of Image Processing

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

UNIT -II
Image Transforms

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

UNIT -III
Image Enhancement (By FREQUENCY Domain Methods)

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

UNIT -IV
Image Compression

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

UNIT -V
Image Segmentation

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

Books:

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

M.Sc. ELECTRONIC SCIENCE -III-SEMESTER
SEL 847 NEURAL NETWORKS

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

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

Books:

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 849 ROBOTICS

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

UNIT-I
Introduction

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

UNIT-II
Dynamics & Kinematics

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

UNIT-III
End Effectors and Actuators

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

UNIT-IV
Motion Planning and Controllers

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

UNIT-V
Robot Vision

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

Books:

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 821 EMBEDDED SYSTEMS LAB

Hours per week: 6 End Examination: 60 Marks
Credits: 2 Sessionals: 40 Marks

Any 12 from the following

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

M.Sc. ELECTRONIC SCIENCE III-SEMESTER
SEL 823 NETWORKING LAB

Hours per week: 6 | End Examination: 60 Marks
Credits: 2 | Sessionals: 40 Marks

The Experiments will be conducted based on methodology adopted for the certification of the following courses

1. CCNA = Cisco Certified Network Administrator
2. MCSE = Microsoft Certified Systems Engineer
3. MCSD = Microsoft Certified Solution Developer
4. MCSA = Microsoft Certified Systems Administrator
5. MCP = Microsoft Certified Professional
6. MCDBA = Microsoft Certified Database Administrator
7. MCDST = Microsoft Certified Desktop Support Technician
8. MCTS = Microsoft Certified Technology Specialist

M.Sc. ELECTRONIC SCIENCE IV-SEMESTER
SEL 802 VLSI DESIGN & VHDL

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

UNIT-I

Review of Microelectronics and Introduction to MOS Technology: 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.

UNIT-II

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

UNIT-III

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

UNIT-IV

VHDL: Hardware Description Languages, Introduction to VHDL, Data objects, Classes and data types, 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

UNIT-V

Combinational Circuit Design: 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.

Books:

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

M.Sc. ELECTRONIC SCIENCE IV-SEMESTER
SEL 850: ADVANCED EMBEDDED SYSTEMS

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

UNIT-I

Introduction to Embedded Hardware and Software

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

UNIT-II

Memory and Interfacing

Memory: Memory write ability and storage performance, Memory types, composing memory, Advance RAM interfacing communication basic, Microprocessor interfacing I/O addressing, Arbitration multilevel bus architecture, Serial protocol, Parallel protocols, Wireless protocols

UNIT-III

Embedded Linux:

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

Unit-IV

Kernel Architecture –

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

Unit-V

Embedded LINUX on ARM:

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

Books:

1. An Embedded Software Primer by David. E. Simon, Pearson Education, 1st Edition, 2004
2 E Embedded Systems Design: A Unified Hardware/ Software Introduction by Frank Vahid and Tony Givargis, John & Wiley Publications, 2nd Edition, 2002

3. Karim Yaghmour, “Building Embedded Linux Systems”, O'Reilly Publications, 2nd Edition,

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

M.Sc. ELECTRONIC SCIENCE IV-SEMESTER
SEL 852: ADVANCED NETWORKING

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

UNIT-I

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

UNIT-II

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

UNIT-III

OSI Data Link Layer- 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

UNIT-IV

Ethernet- 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).

UNIT-V

Planning and Cabling Networks- 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

Books:

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

M.Sc. ELECTRONIC SCIENCE IV-SEMESTER
SEL 854: SENSORS

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

UNIT-I
Chemical Sensors

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

UNIT-II
Optical Sensors

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

UNIT-III
Biomedical Sensors

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

UNIT-IV
Aerospace Sensor

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

UNIT-V
Advanced Sensor Design

Sensor design a 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

Books:

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

M.Sc. ELECTRONIC SCIENCE IV-SEMESTER

SEL 854: Non-Destructive Testing and Evaluation of Materials

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

Unit –I: Structure of Metals and Defects

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

Unit – II: Introduction to NDT and Surface Methods

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

Unit – III: Eddy Current Testing (ECT)

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

Unit – IV: Ultrasonic Testing (UT)

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

Unit – V: Radiography Testing (RT)

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

Text Books:

William D. Callister, Materials Science and Engineering An Introduction, 7th Edition, John Wiley & Sons, Inc.
C. Hellier, Handbook of Non-Destructive Evaluation, McGraw-Hill Professional, 1st edition (2001).
Jayamangal Prasad, C. G. Krishnadas Nair, Non-Destructive Test And Evaluation Of Materials, 2nd Edition, Tata Mcgraw-hill.
P.J. Shull, Nondestructive Evaluation - Theory, Techniques, and Applications, Marcell Decker Inc., NY 2002.

References:

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

M.Sc. ELECTRONIC SCIENCE IV-SEMESTER
SEL 890 DSP / VHDL LAB

Hours per week: 6 End Examination: 60 Marks
Credits: 2 Sessionals: 40 Marks

DSP Lab (Any 6 from the following)

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

VHDL Lab (Any 6 from the following)

1. Realization of Basic Logic Gates using VHDL
2. R-S, D and J-K Flip- Flops
4. 8-to-1 Multiplexer and 1-to-4 De-Multiplexer
5. 4-Bit Full Adder/ Subtractor
6. 4-Bit Comparator
7. 8-to-3 Encoder and 3-to-8 Decoder
8. 32-Bit ALU Design
9. 4-Bit Binary to Grey Code Converter
10. 4-Bit Ring Counter
11. 4-Bit Up-Down Counter
12. 4-Bit Shift Register

M.Sc. ELECTRONIC SCIENCE II-SEMESTER
SOE 752 FUNDAMENTALS OF ELECTRONICS

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

UNIT-I
BJT and FET Devices
Bipolar Junction Transistor*:** Configurations, Characteristics, Applications of BJT. ***Field Effect Transistor*:** Construction, Characteristics, Applications of FET.Feedback concepts:*** Introduction, Practical feedback circuits, Oscillator operation

UNIT-II
Operational Amplifiers
Op-amp basics,Parameters, P**ractical op-amp circuits**, Integrator, Differentiator and Summing amplifier, ***Op-amp Applications***, Voltage to Current and Current to Voltage Converters, Instrumentation Amplifier, Active Filter Design, Logarithmic and Anti Logarithmic Amplifiers,

UNIT-III
Power Supplies
Rectifiers- Half wave, Full wave and Bridge rectifiers, Zener diode voltage regulator,), IC voltage regulators-78XX and 79XX, Variable Power supply Design, ***Linear ICs:*** IC 555 (Timer) and its **applications**: Astable ,nd Monostable PLL (IC 565).

UNIT-IV
Combinatorial Logic Circuits
Simplification of Boolean expressions*:** Algebraic method, Karnaugh map method, Encoders and Decoders, Multiplexers and Demultiplexers, ***Arithmetic Circuits: Binary addition, Subtraction, Multiplication, Parallel binary adder, ***Applications of Boolean Algebra:*** Magnitude comparator, Parity generator and checker, Seven segment decoder /driver display, ALU design.

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

Books:

1. Electronic Devices and Circuit Theory by R. Boylestad and L. Nashelsky- 11th Edition – Pearson,2008
2. Digital Systems principals and applications by Ronald J Tocci, 10th Edition –Pearson, 2003
3. Digital Design by Morris Mano- 4thEdition- Pearson, 2006
4. Op-Amp Applications by Ramakanth Gaykward, 4th Edition, PHI, 2000
5. Linear IC Applications by D. Roy Chowdhary, New Age International, 2nd Edition, 2004

M.Sc. ELECTRONIC SCIENCE III-SEMESTER

SOE 861 BIOMEDICAL INSTRUMENTATION

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

UNIT-I

Biomedical signals & Physiological transducers

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

UNIT-II

Recording Systems

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

UNIT-III

Patient Monitoring systems & Audiometers

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

UNIT-IV

Modern Imaging systems

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

UNIT-V

Patient Safety & Computer Applications in Biomedical Field

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

Books:

1. Electronics in Medicine & Biomedical Instrumentation by Nandini K.Jog, 2ndEdition, 2013
2. Textbook of Biomedical Instrumentation by K.N.Scott & A.K.Mathur
3. Biomedical Engineering by S .N.Sarbadhikari
4. Hand book of Biomedical Instrumentation by R.S.Khandpur , TMH, 2nd Edition, 2002
5. Biomedical Instruments : Theory and Design by Walter Welko- Witiz and Sid Doutsch
6. Biomedical Instrumentation & Measurements by Lesile Cromwell, Fred J.Weibell &Erich A. Pfeiffer, PHI