1. Introduction: -
M.Sc. Electronics is a four-semester course spread over the period of two years. The Department of Electronics Shivaji University, Kolhapur, offers this course on its campus. It is designed to offer in depth knowledge of the subject starting from its basic concepts to the state of art technologies in use today. Students are also provided extensive laboratory training on the course content and the current requirements of industries and R and D. In the final semester every student has to undertake a project, which is based on the specialization, he/she opts for. Four specializations are offered to the students in the areas of communications, Embedded Systems, Power Electronics and VLSI Design.
Special feature of the course is the course Mathematical Techniques offered at Sem-I and Sem –II with the objective of strengthening the mathematical foundations of Electronics of the students. In addition the course caters to the requirements of providing complete exposure to NET/SET syllabus for Electronics farmed by the U.G.C.

2. Advantages of the course: -
The course revised in the year 2006 to be implemented from the academic year June 2006 provides exposure to the students to the technologies in-vogue and trains them to take up projects relevant to the industrial needs, the R& D activities and self –employment opportunities. The student after passing the M.Sc course has many opportunities of employment, self-employment and higher studies.

Employment Opportunities: -
- Electronics and Telecommunication Industries.
- I.T. Industries (India and Abroad).
- Process and Manufacturing Industries.
- Research and Development Laboratories.
- Employment as a teacher and Other Govt. Organizations.

Educational Opportunities: -
- Higher studies in I.I.T, I.ISc, and CERE Pilani. (Ph.D.)
- Research in Shivaji University or any other University. (Ph.D.)
- M.Tech /M.E courses.
- Research abroad.
- Joining Special courses on current technologies at Pune, Banglore, Mumbai, and CEDT.

3. Objectives of the Courses: -
The course is designed with a view to catering to the present day requirements in Industries, R and D fields, Higher studies and Self-employment. Moreover the course structure intends to inculcate strong laboratory skills so that the student can take up independent projects which will help to be an entrepreneur. The students passed out from the revised course will serve as quality human resource to take up the state of art research work of the Department.

4. Title of the Course:
M.Sc. Electronics

5. Eligibility of the Course:

1.1 Any person who has taken the degree of B.Sc. of this University or the degree of any other statutory University recognized as equivalent, and has kept four semester terms in the University as a postgraduate student be admitted to the examinations for the degree of Master of Science in any of these subjects mentioned in R.M. Sc. No.3.

1.2 A student shall be held eligible to the admission to the M.Sc. course provided he/she has passed the B.Sc. examination either with the principal subject or with a subsidiary / interdisciplinary / applied / allied subjects and has passed the entrance examination conducted by the University.

1.3 The students with B.Sc.(General Course) from other University shall be eligible if they qualify through the entrance examination and they score minimum 55% i.e. B+ marks in the subject at the B.Sc. examinations.

6. Fees for the Course

Class	Total Fees, Paying	Total Fees, EBC/PTC / STC/ Maji Saineek / FF	Total Fees, SC/NT/ST / OBC/ SBC	Total Fees, Paying	Total Fees, EBC/PTC / STC/ Maji Saineek / FF	Total Fees, SC/NT/ST / OBC/ SBC
M.Sc. Part I	Rs. 2790/-	Rs. 1610/-	Rs. 650/-	------	------	------
M.Sc. Part II	------	------	------	Rs. 2640/-	Rs. 1460/-	Rs. 500/-

For foreign students tuition fees is Rs. 5000/- per year.

7. Strength of the Students:
The intake capacity is 36 + 10 % of the intake.

8. Admission/Selection procedure:
The admission to the M.Sc. Electronics course is by entrance examination. 50% of the marks scored in the entrance examination and 50% of the marks scored in the final year examination are added to prepare the merit list and admissions are given on the basis of merit and following the University rules of admission. The admission will be by round and the information regarding entrance examination result and the round of admission will be put up on the Shivaji University website www.unishivaji.ac.in.

9. Duration of the Course:

M.Sc. Electronics is a two year, four semester full time course.

10. Period of the Course:

From June to April End as specified in the University Calendar from time to time.

11. Teacher's Qualifications:

As prescribed by UGC from time to time.

12. Credit system implementation

M.Sc. Electronics is a four semester course. Every semester course consists of four theory courses and two laboratory courses each carrying weitage of 100 marks (4 credits). However, in the final semester, there will be one project in lieu of one practical. In order to qualify for two-year masters degree a student must acquire minimum of 40 credits (10 credits each semester) which are distributed as given below.

i. 20 credits in compulsory courses
ii. 7 credits in elective courses
iii. 13 credits in practical courses including project

The candidates securing grade point less than 4 (b grade) shall be declared to have failed in that subject. Under such circumstances his SGPA, CGPA and FGPA will not be calculated.

Credit as defined is the workload of a student in

1. Lectures
2. Practicals
3. Seminars
4. Private work in the library/home
5. Examination
6. Other assessment activities

The credit system permits students to

- learn at their own pace
- choose electives from a wide range of elective courses offered by the University departments
- undergo additional courses and acquire more than the required number of credits
- adopt an inter-disciplinary approach in learning
- make best use of the expertise of available faculty

How much time a student gives for the examination per semester?

1) 4 Theory papers per semester each of 3 hours duration. Time required is 12 hours
2) Two practical papers with 2 experiments per paper. Total 4 practicals each of 3 hours duration. Time is required 12 hours.

Total time for a semester examination is 12 + 12 = 24 hours.

Time required for the other activities.

- Seminars – as per the requirement of the course
- Discussions
- Library – Book issue, Journal reference, Internet access. Reading magazines and relevant information
- Private work – Project material, Books purchase, Xerox, availing outside facilities etc
- Home – Study, Notes preparation, Computations etc.

Types of credits

1) Credit by examination – Tests (theory and Practicals), Seminars
2) Credit by non examination –Proficiency in state National and International sports achievements, Social service (NSS), Military services (NCC), Colloquium & debate, Cultural programs etc

Credits by lectures and practicals

- 1 credit is equivalent to 15 contact hours
- Total instructional days as per the UGC norms are 180
- For the M.Sc course there are 4 theory papers with 4 hours teaching per week
  Therefore the instructional days for theory papers in a semester are 4 X 15(weeks) = 60 days.
- There are 4 practicals (with one project) each of 3 hrs duration for the two practical papers.
- The total practical workload is of 12 hours. Thus the instructional days for the practical course of 4 practicals are 2(practical papers) x 15 = 30 days.
- The time for which a student is busy in a semester is 60(theory) + 30(practical) = 90 days.
- With 4 credits per subjects there will be 4 x 4 = 16 credits for the theory papers and 4 x 2 = 8 credits for the practicals. Every practical (project) of 50 marks carries 2 credits.
- Number of credits for the M.Sc course per semester will be 16+8 = 24.Total number of credits for the entire M.Sc course will be 4 x 24 = 96.
  At M.Sc. I and II the students are taking two courses in Mathematical Techniques. For which there shall be 2 credits at sem-I and 2 credits at sem-2. These 4 credits at M.Sc. I will be awarded on the basis of unit-wise tests conducted internally by the department for these two papers.
  Total = 96 + 4 = 100.

- Total credits for the M.Phil course – 24
  Theory –12
  Seminar – 2
  Dissertation –8
  Viva-voce – 2

The implementation of the credit system:

- Under the credit system every semester duration will be of at least 15 weeks.
- The examination must be scheduled in one month's time.
- The students must get at least 3 weeks time for the examination preparations.
- Every theory paper syllabus should consist of 4 units (sub units allowed) each carrying 1 credit.
- In order to have uniformity in the credit transfer internal examination in all the P.G.departments shall have equal weightage 80 external +20 internal.

Theory paper	Contact hours	credits
Unit –I (sub units if any)	15	1
Unit –II (sub units if any)	15	1
Unit –IIII (sub units if any)	15	1
Unit –IV (sub units if any)	15	1

- The practical course credit distribution

Practical paper	practical	contact hours	credits	no of practicals
I (Unit –I)	1	3	2	6
I (Unit –I)	2	3	2	6
II (Unit –I)	3	3	2	6
II (Unit –I)	4	3	2	6

- A project of 100 marks will carry 4 credits. Where a project of 100 marks is offered to the student, the student will have to perform 1 project and 1 practical paper (two practicals) for that semester. Time for the explanation for the practical course (contact hours) will be one week (12 hrs).
- This makes the practical workload of a student equal to 30 days in a semester.

Grades, grade point and average grade points calculations

Table showing the grades, grade points and marks scored by a student

Grades	**Grade points**	**marks out of 100**
A+	9	91 to 100
A	8	81 to 90
A-	7	71 to 80
B+	6	61 to 70
B	5	51 to 60
B-	4	41 to 50
C+	3	31 to 40
C	2	21 to 30
C-	1	11 to 20
F	0	0 to 10

Seminar Grade Point Average(SGPA) :-It is a semester index grade of a student.

1. SGPA = $(g_1 x c_1)+ (g_2 x c_2)+\text{----- }+(g_6 x c_6)$/ Total credits offered by the student in a semester.

2. Cumulative Grade Point Average (CGPA) :- It is a cumulative index grade point average of a student
   CGPA = $(g_1xc_1)+ (g_2xc_2)+----- +(g_6xc_6)$/ Total number of credits offered by a student upto and including the semester for which the cumulative average is required.
3. Final Grade Point Average (FGPA):- It is a final index of a student in the course
   FGPA = $(n / \sum ci \times gi) /(n/ cl)$
   Where c_i – credit of the course (paper)(4)
   g_i – grade pints secured (see the table for conversion)
   n - number of courses(number of papers offered)
   cl – Total number of credits for the entire M.Sc course (96)

Illustration with an hypothetical case

For M.Sc I.(or II/II/IV)

1. Papers	I	II	III	IV	Practicals	I	II	III	IV
2. Credits	4	4	4	4		2	2	2	2 = 24
3. Grade points obtained	7	6	8	6		7		7	= 41
4. $\sum$ ci x gi	28	24	32	32		28		28	= 164

5. $\sum$ ci x gi / cl = 164 /24 = 6.83
6. Overall grade = 6.83

The cumulative grade point average is the sum of SGPA of a student in every semester.
Suppose it is 164 (6.83) for Sem-I, 170 (7.08) for Sem-II, 168(7.0) for Sem-III and 176(7.33) for Sem-IV

The cumulative average for Sem –I and Sem-II will be = 334/48 = 6.958 = 6.96
Final Grade Point Average for all the semesters = 678 /96 = 7.0265 =7.03

Rules for opting for the credits

1. A student from the same department only will be eligible for opting for the specialization of his choice.
2. It will be mandatory for a student admitted for a specialization to opt for the papers related to that specialization. Other papers cannot be offered as credits in lieu of these papers.
3. Admission to the students from the other departments for the credits will be restricted to the core papers or practicals only. Papers or practicals from the specialization cannot be offered as credits to the students from the other departments.
4. A student from the other department will be offered credits of his choice in multiples of 4. A theory paper or the practical course can be offered as the credit. However number of such admissions will depend upon the seats available, classroom seating capacity and the laboratory facilities.

5. Core Courses
   Core courses are those, knowledge of which is deemed essential for students registered for a particular Master's programme. As such all core courses shall be mandatory and a student must pass in all the core courses prescribed for the programme. Core courses shall be spread over all the four semesters.

6. Elective/specialization Courses
   Elective courses are intended to:
   - Allow students to specialize in one or more branches of the broad subject area; or
   - Acquire knowledge and skills in a related area that may have applications in the broad subject area; or
   - bridge any gap in the curriculum and enable acquisition of essential skills (e.g. statistical, computational, language, communication skills, etc); or
   - Help pursue an area of interest to the student

7. Any student can have credits from the Management course.

8. Attendance: As per the university rule the attendance of the student must be at least 75 %. For attendance in the classroom or laboratory student will have to sign the attendance sheet. Merely 'P' for present or 'A' for absent will not be considered valid.

9. A teacher offering the course will be responsible for maintaining the attendance and the performance sheets of all the students offering that course. The attendance sheet will have to be deposited to the department office by every teacher bearing his signature at the end of every semester.

Horizontal mobility for the students of electronics department

Semester I

ELE 11 TV and Video Engineering (*)
ELE 12 Microwave Technology – I (*)
ELE 13 Power Electronics – I (**)/(***)
ELE 14 Advanced Digital System Design using VHDL (***)

Semester II

ELE 21 Control Theory (**)
ELE 22 Microwave Technology – II (*)
ELE 23 Power Electronics – II (**)/(***)
ELE 24 Interfacing and modern architectures (PIC and AVR) (**)/(***)/(****)

(*) – Compulsory for Communication Specialization
(**) – Compulsory for Power Electronics Specialization
(***) – Compulsory for VLSI Specialization
(****) – Compulsory for Embedded Systems Specialization

- The compulsory indicates that the students from the concerned specializations will have to opt these papers and the other papers are available to them for credit transfer from the other departments. The maximum credit transfer however will be limited to one subject per semester.
- There won't be any credit transfer for Sem-III and Sem-IV.

Nature of the internal examination:-

- For every theory paper there will be two internal examination(s) carrying 20 marks each. The average of the marks scored in these two examinations will be taken for the final score out of 20.
- The nature of this examination will be as follows.
  - There will be two questions asked in the internal examination.
  - Q1 will carry 8 marks and it will be objective type (Part- A multiple choice and part B true or false)
  - Q2 will carry 12 marks and it will be short answer type (any 3 out of 5 each carrying 4 marks)
  - No student will be allowed to take reexamination if he/she remains absent unless the reason is genuine.
  - The decision regarding such cases will be taken in a department committee meeting.
  - The result of the internal assessment will be declared after one week from the date of examination. The student will be shown the answer papers by the concerned teachers.

The assessment of the practicals (examination): -

1) Every practical a student performs day to day in the laboratory shall be of three hours durations. A student will have to write his journal sheet for the experiment that he has performed in the laboratory on the very day and get the same checked from the teacher concerned before leaving the laboratory.
2) The experiments distribution semester-wise shall be as follows:
   - There will be at least 24 experiments for every semester up to third semester. For the third semester the 24 experiments shall be equally shared by the number of specializations. Out of 24 experiments internal examinations will be carried out on set of minimum 12 experiments each.
   - In the fourth semester there shall be one project and at least 12 experiments. These 12 experiments shall be specialization based and separate for every specialization. A student will have to perform 12 experiments compulsorily during the fourth semester, without which he will not be examined for the practical examination.
   - If a student performs less than 12 experiments in sem-4 or less than 24 experiments in sem-1/2/3 his credits will be proportionately decreased.
   - Marks for the practicals for every semester shall be 200.

   There will be no external examination for the practicals and the project work. These examinations will be internally conducted. In every semester there will be two practical examinations each carrying 100 marks. For 100 marks examination a student will have to perform two experiments. The

examination will be conducted set-wise i.e. at the end of every set of 12 experiments there will be one practical examination. Every set will have 50% component on programming practices and student will have to perform one experiment on it in every internal examination. The distribution of marks for the practicals will be as follows:

i) Experimental skill (10 marks)
ii) Knowledge of the equipments/ software (10 marks)
iii) Oral
(15 marks)
iv) Program writing without syntax error / observations and tabulations. (15 marks)

Total: 50 marks

i) Experimental skill

Whether a student is able to perform the experiment independently and properly. Experimental set up is known to him or not.

ii) Knowledge of the equipments/ software

Whether a student is aware of the equipments or the software required for his experiment. Is he able to handle/work with these equipments/software independently.

iii) Oral

The oral related to the experiment and oral related to the entire set of the expaeriments (comprehensive).

iv) Program writing without syntax error / observations and tabulations
Results graphical/display/calculations.
Procedure of the experiment and conclusions.
Fraction marks are allowed for each head. However rounding-off should be done at the final stage and for the individual experiment.

3. A student will write the oral questions asked to him at the time of internal examination on the answer-sheet with their answers. Almost same number of questions be asked for every experiment.

4. For the assessment of the project specialization wise panel of expert will be appointed. The panel of expert will be as follows.
   i) Project guide
   ii) One expert from the industry or from outside in the subject
   iii) 2 teachers from the department.
   The distribution of the project marks shall be as follows.
   i) Project presentation (20%)
   ii) Demonstration of the project (30%)
   iii) Orals (30%)
   iv) Report (20%)

5. The total number of experiments to be performed by the student during his four semesters shall be as detailed below.

Semester	no of experiments
I	24
II	24
III	24
IV	12 (per specialization)

There will be one project at the fourth semesters.

6. There should justification, for failing a student and also for giving him above 75 % of marks.
7. The workload of a teacher will be as per the UGC norms as far as the theory and practicals are concerned. A contributory teacher will not be allowed to do the practical examination work.

13. Nature of the Question Paper:

The model question paper is as follows:

TITLE OF THE PAPER

Paper- X Marks: 100
Time- 3 Hrs. Day and Date

Instructions:
1. Q.1 and Q.2 are compulsory
2. Attempt any three questions out of Q.3 to Q.7.
3. All questions carry equal marks.

Q.1 – Objective type.
Q.2. Short Answer
Q.3 to Q.7 a) Long Answer
b) Note / Short Answer
c) Problem / Short Answer

OR
a) Long Answer
b) Long Answer

Minimum 20% numerical problems will be included wherever possible.

M.Sc. ELECTRONICS COURSE

The course numbering is of the type '*ELE XY Title'*
ELE stands for Electronics
X stands for semester
Y stands for paper number
Title stands for title of the paper

Structure and titles of the semester courses

Semester-I
ELE.11 T.V and Video Engineering
ELE.12 Microwave Technology – I
ELE.13 Power Electronics – I
ELE.14 Advanced Digital System Design using VHDL
ELE.15 Mathematical techniques - I (Non credit course)
ELE 16 Practicals
ELE.17 Practicals

Semester-II
ELE.21 Control Theory
ELE22 Microwave Technology–II
ELE.23 Power Electronics - II
ELE24 Interfacing and modern Architectures (PIC & AVR)
ELE.25 Mathematical techniques – II (Non credit course)
ELE.26 Practicals
ELE.27 Practicals

Semester-III
ELE.31 Electronic Circuit and System Design
ELE.32 Computer Organization
ELE.33 Elective -I
ELE.34 Elective -II
ELE.35 Practicals
ELE.36 Practicals

Semester IV
ELE41 Operating Systems and Computer Networking
ELE42 Digital Signal Processing
ELE43 Elective-III
ELE44 Elective-IV
ELE45 Practicals
ELE46 Project

The mathematical technique course is offered at only M.Sc.-I. Its main objective is to strengthen the mathematical foundations of Electronics. Two lectures per week will

be devoted for this course. The marks obtained by a student in this paper will not be added to his final total. The examination for this course will be conducted by the concerned teachers unitwise at the end of every unit. There will be no university examination for this course. However every student will have to pass in this paper in order to be eligible for getting the M.Sc degree. This paper will carry two credits each in semester I and II.

ELECTIVES FOR SPECIALIZATION

Semester –III Electives I and II	Semester –IV Electives III and IV
COMMUNICATIONS	
ELE33(C): Digital Communication	ELE43(C): Optical Fiber Communication
ELE34(C): Satellite Communication	ELE:44(C) Cellular Mobile Communication
EMBEDDED SYSTEMS	
ELE33(E): Microcontroller Based Systems & ARM architecture	ELE43(E): ARM Programming and Embedded Communication Protocols
ELE34(E): Fuzzy Logic and Neural network	ELE:44(E) Embedded C and RTOS.
POWER ELECTRONICS	
ELE33(P) Microcontroller based systems	ELE 43(P) Industrial Automation
ELE34(P) Power Electronic Circuit Design	ELE44(P) Advanced Drives and Controls
VLSI DESIGN	
ELE33(V) VLSI Device Modeling and Technology	ELE43(V) Introduction to Microelectromechanical systems
ELE34(V) Mixed Signal ASIC Design	ELE44(V) Computer Aids for VLSI Design

ELE - 11 : TELEVISION AND VIDEO ENGNIERRING

Unit 1: (15)
Colour Television:

Colour fundamentals, Chromaticity diagram, compatibility, Colour T.V camera, Colour picture tubes, Luminance and Colour-difference signals, NTSC, PAL and SECAM systems (Encoders and Decoders)

Unit 2: (15)
Study of representative colour TV receiver (part-I): BEL colour receiver, CTS –86.

Introduction, Video IF subsystem, IF preamplifier and SAW filter, Chroma processing, Video amplifier and picture tube biasing, Horizontal and vertical; subsystem, Horizontal output section, Vertical output section,

Unit 3: (15)
Study of representative colour TV receiver (part-II):Sound IF and audio output section, Power supply section (ref. Book, No.3).

TV set and alignment instruments :
Sweep generator, Wobbuloscope and applications, video pattern generator, Test charts.

Unit 4: (15)
Related Developments

1. Closed circuit TV	2. Video recording and CD recording
3. Cable televisions and Web com	4. Satellite TV
5. Digital and High definition TV	6. Video text service
7. Remote control	8. Picture in picture system
9. Flat panel and wall-screen TV	10. Projection TV

Reference and text Books:
1. Television Engineering – A.M. Dhake, THM
2. Television and Video Engineering – A. M. Dhake, TMH
3. Colour television, theory and practice, S. P. Bali, TMH.
4. Monochrome and colour television – R. R. Gulathi, Wiley Eastern.
5. Basic television – A.K. Maini, CBS Publication.
6. Basic television and video systems- B. Grob, MGH.
7. Television Electronics – Kiver, Kaufman, Golgotia Publication.

ELE –12 MICROWAVE TECHNOLOGY – I

Unit 1 : Transmission lines :

Distributed constants of a line, A-C steady state solution for uniform line, Variation of Zo, a and b with frequency, various exponential forms of A-C steady state solution, solution in terms of Eg, Zg and ZR, hyperbolic form of the solution, interference and standing wave patterns, insertion ratio and insertion loss, half-wavelength and quarter wavelength lines, short sections as circuit elements, measurements of standing waves, impedance matching. coaxial connectors, smith chart.

Unit 2: Electromagnetic Waves:

Maxwell's equations, wave equations, uniform plane waves, conductors and dielectrics, polarization, reflection and refraction of plane waves, Poyntiing theorem

Waveguides and cavity resonators :

Solution of wave equations in rectangular and circular guides, TE and TM modes, power loss and power transmission in rectangular waveguide, excitation of modes, impedance matching, field components of rectangular and cylindrical resonators, expression for Q.

Unit 3: Passive Microwave devices:

Terminations, Attenuators, Phase changers, directional couplers, Hybrid Junctions, Faraday rotation, Gyrator, Isolator, circulator, S parameters.

Unit 4: Microwave Linear-Beam (O type) and Crossed-Field tubes (M type)

Limitations of conventional tubes at microwave frequencies, Klystron, Multicavity Klystron Amplifiers, Reflex Klystrons, Helix Travelling-wave tubes, magnetron Oscillators.

Microwave solid state devices

Tunnel diode, GaAs diode, LSA diode, InP diode, CdTe diode, Read diode, IMPATT diode, TRAPATT diode and BARITT diode.

Reference Books :

1. Transmission lines and Networks – Walter C. Johnson, McGraw Hill Book Company, New Delhi
2. Networks Lines and Fields – John D. Ryder.
3. Microwave Engineering: Passive Circuits - Peter A. Razi, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Electronic and Radio Engineering – F. E. Terman, McGraw Hill Book Company, New York.
5. Electromagnetic waves and Radiating Systems- E. C. Jordan, PHI.
6. Microwave Devices and Circuits – S. Y. Liao, PHI.
7. Waveguides – H.R.L. Lamont,, Methuen and Company Limited, London.
8. Foundations for Microwave Engineering – Robert E. Collin, McGraw Hill Book Company, New Delhi.
9. Microwave Engineering – Annapurna Das, TMH, New Delhi.

ELE - 13: POWER ELECTRONICS –I

1. Fundamental of Power Electronics:-
Important rules for finding Fourier Series. Expression for Voltage, Current and Power factor. Laplace Transform, Inverse Laplace Transform. Performance parameter of Rectifiers. Introduction to Discrete Fourier transform.

2. Basic of Electrical machines:-
D.C. motors, Types of D.C. motors, torque speed characteristics. Induction motors, Types of Induction motors. Synchronous machines and stepper motors.

3. Convertes:-
Single phase and three phase converters, Series converters, Dual converters. Effect of source and leakage inductance on the performance, Power factor improvement. Single phase dual converter, three phase dual converter, three phase AC voltage controllers

4. Pspice and power circuit simulation:
(a) introduction to Pspice and its use in circuit simulation
(b) Basic power circuit simulation using Pspice.

Reference Books.:-

1. Power Electronics P.C. Sen
2. Power Electronics R.M. Jalnekar & N.B. Pasalkar
3. Thyristor power Controllers. C.K Dubey, S. R. Doradla, A. Joshi & R.M. Sinha
4. Power Electronics – By M. Rashid
5. Power Semiconductor drives-S. B. Dewan, G.R. Sleman, A. Strauphan(WileyInt. Pub.-John Wiley Sons.)
6. Power Electronics –J. S. Katre Technover Publication

ELE – 14 : Advanced Digital Systems Design with VHDL
(15 teaching hours per unit / total teaching hours 60)

Unit-1 : Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to VHDL, data objects, classes and data types,
Operators, Overloading, logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioral, dataflow and structural models.

Unit-2 : VHDL Statements : Assignment statements, sequential statements and process,
conditional statements, case statement Array and loops, resolution functions, Packages and
Libraries, concurrent statements. Subprograms: Application of Functions and Procedures, Structural Modelling, component declaration, structural layout and generics.

Unit-3 : Sequential and Combinational Circuit Design: VHDL Models and Simulation of combinational
circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc. Sequential Circuits Design : VHDL Models and Simulation of Sequential Circuits Shift Registers, Counters etc.

Unit -4 : Prototyping and case studies:
Design with CPLDs and FPGAs : Programmable logic devices : ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design implementation using CPLDs and FPGAs
Design of Microcomputer: Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer
system using VHDL

Reference Books:

1. Digital System Design using VHDL: Charles. H.Roth ; PWS (1998).
2. VHDL-Analysis & Modelling of Digital Systems: Navabi Z; McGraw Hill.
3. VHDL by Douglas L. Perry, Mc Graw Hill Publications
4. VHDL: Analysis and Modeling of Digital Systems by Zainalabedin Navabi, McGraw-Hill
5. Logic and Computer Design Fundamentals, 2/E, M. Morris Mano
6. Digital Electronics Laboratory Experiments Using the Xilinx XC95108 CPLD with Xilinx Foundation: Design

ELE –15: Mathematical techniques - I (Non credit course)

Unit 1 – Functions, Limits and Continuity:
Real functions and their graph, concept of limit of function, concept of continuous function.

Unit 2 – Differentiation:
Derivative at a point, interpretation of a Derivative at a point, derivative of a function. Differentiability, product rule, quotient rule, derivative of implicit and logarithmic function.

Unit 3 – Integration:
Infinite integrals, geometrical interpretation, properties of indefinite integrals. Integration by parts, Partial fraction, substitution.

Unit 4 – Fourier Series:
Definition of Fourier Series, calculation of coefficients in easy cases, elementary proportion, Fourier series exponential term, Fourier analysis of half, full wave rectifiers, sweep circuits.

Unit 5 – Laplace Transform:
Laplace Transform and its existence, Laplace Transform of standard functions, properties of Laplace Transform, Laplace Transform of periodic functions, Laplace Transform of some special functions, inverse Laplace Transform, circuit analysis using Laplace Transform (R, RC, LC, RLC circuits).

Books:

1. Numerical Mathematical Analysis, J.B. Scarborough, Oxford and IBM Publishing Company (1979)

ELE 21 : CONTROL THEORY

Total Teaching Hours:60 (15per Unit)

Unit 1: Introduction, terminology and Feedback characteristics of control system definitions, closed and open loop systems, Transfer functions, block diagrams, signal flow graphs.
Feedback systems, reduction of parameter variation using feedback, control of system dynamics, control of the effects of disturbance signals using feedback, regenerative feedback.

Unit 2: Time domain analysis and Root Locus Techniques:
Standard test signals, time domain performance of control systems, transient response of the first, the second and the higher order systems, stability, steady state errors, effect of adding zero to the system, design specification of second order system, Routh stability criterion.
Root locus techniques: The root locus concept, construction of root locus and analysis of control system, transportation lag.

Unit 3 : Frequency domain analysis and Basic control actions:
Correlation between time and frequency response, Polar plots, Bode plots, all pass and minimum phase systems, experimental determination of transfer function, log magnitude versus phase plots, Nyquist stability criterion, Assessment of sensitivity analysis in frequency domain.

Unit 4 Basic actions and industrial control:
Proportional, derivative and integral controllers, combined controllers, Effect of integral and derivative control on system, performance, PID controller.

Reference Books :

1. Control system Engineering – J.J. Nagrath, M. Gopal, 2nd Edition, Wiley Eastern Ltd.
2. Modern Control Engineering – K. Ogata, Prentice Hall of India.
3. Automatic control systems- B.C. Kuo, Prentice Hall of India.

ELE 22 : MICROWAVE TECHNOLOGY –II

Unit 1: Microwave Measurements :

Detection of microwave power, Measurement of microwave power-bridge circuit, thermistor parameters, waveguide thermistor mounts, barreters, theory of operation of Barreters, direct reading barretter bridges, Measurement of wavelength – single line cavity coupling system, transmission through two-line cavity coupling system, Frequency pulling by reactive load, Transmission cavity wavemeter, reaction wavemeter, measurement of VSWR, measurement of attenuation.

Unit 2: Strip Lines :

Microstrip lines, parallel strip lines, coplanar strip lines, shielded strip lines.

Microwave integrated circuits:

Technology of MMICs - Materials, processes involved in fabrication of MMICs, epitaxial growth of semiconductor layer, growth of dielectric layers, diffusion, ion implantation

Technology of hybrid MICs - dielectric substrates, thick film technology and Materials, thin film technology and materials, methods of testing, encapsulation, mounting of active devices, , Lumped Elements for MICs - Design of lumped elements, fabrication of lumped elements, circuits using lumped elements, comparison with distributed circuits

Unit 3: Microwave Antennas:

Classification of microwave antennas, general characteristics of microwave antennas, E plane and H plane sectoral horns, Pyramidal horn, methods of analyzing reflector operation, design of paraboloid of revolution by aperture method, exciters for paraboloids of revolution, Cassegrain Reflectors.

Unit 4: Radar and Radio Aids to Navigation:

Radar equation, Radar receiver, Radar transmitter, Pulse radar, Duplexer, Doppler Effect, CW Radar, FMCW Radar, MTI radar, conical-scan tracking radar, Loran, Radio Range, Aircraft landing systems, Radio Direction Finding.

Reference Books:

1. Microwave Devices and Circuits – S. Y. Liao, Prentice Hall of India.
2. Microwave Integrated Circuits – (Ed.) K.C. Gupta and Amerjit Singh
3. Microwave antennas- A.Z. Fradin
4. Techniques of Microwave Measurement, Vol. 1 Ed. Carol G. Montgomery
5. Microwave Measurement – E. L. Ginzton
6. Microwave Components, Devices and Active Circuits – P.F. Combes, Jacques Graffeuil, Jaen, Francios Sautereau.
7. Microwave Circuits and Passive Devices , M. L. Sisodia and G.S. Raghuvanshi.
8. Microwave Engineering – Annapurna Das, TMH.
9. Electronic and Radio Engineering by F.E.Terman, McGraw-Hill Book Company
10. Introduction to Radar Systems Menill I Skolink, TMH Publishing Company

ELE – 23: Power Electronics- II

Unit 1) Choppers:-
Introduction, classification of choppers, control strategies.1) Pulse width modulation 2) Constant pulse width variable frequency. 3) Current limit control. 4) Variable pulse width & frequency. Chopper configurations, Single quadrant chopper, Four- quadrant chopper, Step down type & chopper with resistive load. Step up chopper impulse comm. Chopper impulse comm. Three thyrister choppers, resonant pulse chopper.

Unit 2) Transistorized Inverter :-
a) Half Bridge Inverter:
Square Wave half bridge inverter, Quasi-square wave inverter, PWM, inverter, thyristorised half bridge inverter, Device utilization factor, basic device isolation etc. Push pull inverter, Single-phase bridge inverter with resistive and inductive load, PWM bridge inverter, three phase inverters, CSI and variable dc link inverter.

b) Voltage control of single phase inverter.
SPWM, MPWM, Sinusoidal PWM, Modified Sinusoidal pulse width modulation and Phase displacement control. Voltage control of three phase inverters

Unit 3)
Thyristorised Inverters.:
Forced commutated thyrister inverters. i.e. Auxillary commutated inverters, Mc Murray commutated inverter, Complementary commutated inverters/ Mc Murray Bedford inverter, Current source inverter, Series resonant inverter with unidirectional and bi-directional switches, Parallel resonant inverters, Resonant DC link inverter.

Cycloconverter:
Single phase to single phase, Three phase to single, Three phase to three phase Cycloconverters, reduction of O/P harmonics, Control circuits for Cycloconverter.

Unit 4)
PWM Converters:
Introduction, topologies and applications, Linear regulator, buck regulator, boost regulator, Buck-Boost regulator and Link regulator, advantages & disadvantages of these topologies, Voltage regulators.

Power conditioners:
Transient suppressors, EMI/ RFI filters, CVT, Voltage regulators, tap changing regulators, Solid state regulators, Electronic generators, UPS online & OFF line, reliability of UPS system. Batteries used for UPS, Important terms related to the UPS System & comparison of UPS system.
Applications of Power Electronics:
Electronic ballast, Power factor correction, Induction heating, Dielectric heating.

Reference books:

1. Power Electronics – By M. Rashid
2. Electronic drives- Concept & Applications –Vedam Subrahmanyam(THM)
3. Power Semiconductor drives-S.B.Dewan, G.R.Sleman, A.Strauphan(Wiley Int.Publ.-John Wiley Sons.)
4. Power Electronics – By P.C.Sen.
5. Power Electronics –J.S.Katre (Technover Publication)

ELE – 24: Interfacing and Modern Architectures:

Modern Architectures:
Unit 1: (15)
PIC:
Introduction: PIC microcontroller features, PICmicro Architecture, Program memory, Addressing Modes, Instruction set, Instruction Format, Byte-Oriented Instructions, Bit-Oriented Instructions, Literal Instructions, Control Instructions (CALL and GOTO), Destination Designator (d)

MPLAB overview: Using MPLAB, Toolbars, Select Development Mode And Device Type, Project, Text Editor, Assembler, MPLAB Operations.

Unit 2: (15)
PICmicro Hardware: reset, clock, control registers, register banks, program memory paging, Ports, interrupts, Timer and Counter, watchdog timer, power up timer, sleep mode, state machine programming.

Unit 3: (15)
AVR:
Introduction to AVR, Architecture and Hardware Resources of AVR Microcontrollers. Architecture: The Arithmetic Logic Unit, Program and Data Memories, Downloadable Flash Program Memory, SRAM Data Memory, General-Purpose Register File, I/O Register, EEPROM Data Memory, Peripherals, Timer/Counter, Watchdog Timer, Serial Peripheral Interface SPI, Universal Asynchronous Receiver and Transmitter, Analog Comparator, I/O Ports, Reset and Interrupt System, Interrupt Vector Table, Reset Sources, Clock, Handling the Hardware Resources
Development Tools: ATMEL AVR Assembler and Simulator, ATMEL AVR Studio.

Unit 4: (15)
AVR programming model and Instruction set: Memory Addressing Modes, Register Direct Addressing, I/O Direct Addressing, SRAM Direct Addressing, SRAM Indirect Addressing, Constant Addressing Using the LPM Instruction, Jumps and Calls, Instruction Set, Reset and Interrupt Handling, Watchdog Handling, Stack, Program Constructs, Conditional Branches, Program Loops, Refreshing Port Pins and Important Registers, Polling Inputs
Overview of Interfacing Methods :
Memory interface and expansion, I/O interface and expansion, keyboards and display interface, interfacing LED and LCD, switch, relay, thumb wheel, optocoupler, Interfacing ADC and DAC firing of thyristors, Specifications of current RAM and EPROM in use.

Books (Interfacing)
The 8051 Microcontroller –K.J. Ayala, Penram International
Microcontroller – Jim Stewart, Psicataway, New Jersey, PHI.

Programming and Customizing the 8051 Microcontroller MYKE Predko, TMH, New Delhi.

Books: (PIC)

PIC Microcontrollers : An Introduction to Microelectronics, Martin P. Bates, Elsevier.
www.newnespress.com
Embedded Design with the PIC18F452, John B. Peatman,
Programming & Customizing PICmicro Microcontrollers, Myke Predko, TMH.
PIC in Practice, David W Smith, Newnes.
PIC Microcontroller: An Introduction to Software & Hardware Interfacing, Han-Way Huang, Thomson.
PIC: Your Personal Introductory Course, John Morton, Newnes.

Books: (AVR)

Embedded C Programming and the Atmel AVR, Richard H. Barnett, Sarah A. Cox, Larry D. O'Cull, Thomson.
AVR: An Introductory Course, John Morton, Newnes.
AVR RISC Microcontroller Handbook, Claus Kuhnel, Newnes.
Programming and Customizing the AVR Microcontroller, Dhananjay Gadre, TMH.
A primer of microcontroller AVR, Yoshio Kato.

ELE 25:Mathematical Techniques- II (Total teaching hours: 30)

Unit 1: Floating point Arithmetic (05)

Representation of integer and floating point numbers in Computer, Machine Epsilon, Round-Off error, Truncation error, Random Number generation techniques, Gaussian Distribution.

Case studies using MATLAB and NLIB:

i. Catastrophic cancellation in voltage measurement
ii. Monte Carlo Integration
iii. White noise for communication applications.

Unit 2: Direct methods for Linear Systems of Equation (10)

Formulation of algebraic equations using vector and matrix notation, pre and post multiplication of two matrices, Gauss-Jordan elimination method, Identification of square, uper-triangular, lower triangular, tri-diagonal and sparse matrices, Computation of matrix determinant and inverse, Gaussian Elimination method.

Case studies using MATLAB and NLIB:

i. Modeling two-axis planar robotic arm.
ii. Solving tridiagonal system of R-2R ladder network.
iii. Modeling permanent magnet DC motor.
iv. Analysis of DC bridge circuit.

Unit 3: Eigen Values and Eigen Vectors (04)

Basic theorems, Direct and inverse power method, Jacobi's method, Case study of proportional control of DC motor.

Unit 4: Curve Fitting (04)

Difference between interpolation and extrapolation, Piecewise interpolation, Long range interpolating polynomials, Newton's forward difference formula, Case study of Cubic Spline interpolation of Zener Diode Characteristics.

Unit 5: Numerical Differentiation and Integration (05)

Forward, central and backward formulae for differentiation, Noise corrupted sensor response with differentiator and integrator, Simpson and midpoint integration, Case study of numerical implementation of RC differentiator and integrator using MATLAB.

Unit 6: Solution of Ordinary Differential Equation (02)

Taylor series method, Runge Kutta method, Boundary value problems, Case study of modeling Phase Locked Loop using MATLAB.

Reference Books:

1. Applied Numerical Methods for Engineers using MATLAB and C, Robert J Schilling and Sandra L Harries, Thompson Publishers, 1999.
2. Computer Oriented Numerical Methods by V. Rajaraman
3. Numerical methods for Scientists and Engineers by Richard Hamming.
4. AN introduction to Numerical emthods: A MATLAB approach by Abde/Wahab Kharab, Ronald B Guenther.
5. MATLAB manual.

ELE31 – Electronic Circuit and System Design

Unit 1: Components Device and Design
Specifications, ranges and reliability of LCR, Heat sinks and their design, specifications of diodes, zeners, transistors. Rectifier design with discrete components, and ICs (741, 723, 78xx), Current sources and their design with discrete components and ICs.

Unit 2: Linear IC's
Characteristics and performance of op-amp, A702, 740, 741, LM 308, NE351 and NE536. Op-amp applications, Specifications of LM555. Design of astable, monostable multivibrator, schmitt trigger, triangular waveform generator. Making o/p of LM555 TTL compatible and driving inductive loads. Wein bridge oscillator, phase shift oscillator, PLL IC LM565 and its applications, VCO, analog multiplexer ICs CD4051, CD4052.

Unit 3: Digital IC's :
Comparison of digital IC families, HTL, LSTTL, ECL, NMOS, CMOS, HMOS, and HCMOS, Specifications of TTL, LSTTL, COMS, HMOS and HCMOS, Basic rules for handling TTL, MOS and COMS IC's, Power dissipation, Noise immunity, Loading consideration of TTL, MOS etc, COMS –TTL and TTL to COMS interfaces, Design of clock and waveform generators, Design of sequential and combinational circuits, memory: RAM, ROM, EEPROM, memory interfacing.

Unit 4: Data converters:
DAC – comparison with respect to resolution, accuracy, speed, cost etc., comparison of popular ADC, Designing with ADC 0809, 0804 and DAC 1408, DVM, its design multiranging technologies for display in DVM. IC 7107: 3½ Digit, LED Display with ADC.
Digitally Programmable frequency generator and its design, Frequency synthesizer, display and display system design. 7 segment display interface to microcontroller using 7447, 16 * 2 LCD display interface.

Reference Books:

1. Introduction to system Design using IC's – B.S. Sonde, Wiley Western Ltd.
2. Circuit Consultants Handbook – Hemmnigway
3. Microprocessor and Micro-computer – B.P.B. Handbook
4. Digital fundamentals – Flyod, UBS, New Delhi.
5. Designing with op-amps and Analog and Digital IC's – S. Francio, MC Graw Hill.
6. Applications and Design with analog IC's, J. Michel Jaocb, Prentice Hall of India.

ELE 32: Computer Organization

Unit 1: (15)

- Introduction and Historical Perspectives: Architecture basics, Complex Instruction Set Computers (CISC) and Reduced Instruction Set Computers (RISC) processors, Advantages and Drawbacks of CISC & RISC, Logical Similarity with example of a typical microprocessor, Short Chronology of Microprocessor Development with reference to CISC families such as INTEL, AMD and MOTOROLA, RISC families development of POWER PC, Alpha, Sparc.

Unit 2: (15)

- Fundamental Architectures: Defining a Computer Architecture e.g. degree of pipelining, basic topology, technology used etc., Von Neumann and Haward Architectures, Single Processor Systems, Parallelism Implementation using pipelines and multiple units, Superpipelining, Superscalar, Very Long Instruction Word (VLIW) architectures, Building multithreaded processors,

Unit 3: (15)

- Multiple Processor Systems - SIMD, MIMD and multi-computer approaches.
- Implementation Considerations: Memory Hierarchy, prefetching techniques, coherent caches, pipelining, ternary logic, packaging considerations, wafer scale integration.

Unit 4: (15)

- Implementation of Functional Units: Memory Management, Arithmetic Logic Unit, Floating Point Unit, Branch Unit, Vector Unit, Load/Store Unit.
- Development Tools: Microcomputer Development Systems (MDS), In Circuit Emulator (ICE), Assembler, Editors, Logic Analyser.
- Case Study of INTEL x86 family: Overview and Features in brief.

Text / Reference Books:

- Computer Organization by Carl Hamacher, Zvonko Varnesic and Safwat Zaky, McGraw Hill Higher Education, Fifth Education
- The Electronics Handbook Edited by Jerry C. Whitaker, Published by CRC Press and IEEE Press (1996), Section VII: Microelectronics and Section XIX: Computer Systems
- Computer Organization by Stalling
- Microprocessors and Interfacing, D.V. Hall, McGraw Hill (1986)
- The Intel Microprocessors: Barry B. Brey, Prentice Hall Of India Ltd. (1997)
- Microprocessors and Microcomputer Based Systems: M. Rafiqzzuman, Universal Book Stall (1990)

ELE 41 Operating Systems and Computer Networking

Unit 1: Unix Operating System:
Introduction, applications Unix Shell, Kernel and Application layer, file system features and benefits, File Management inutilities : pwd, cd, ls, cat, mv, ln, rm, rmdir, find, cut and paste etc., Internal file structure, Directory and directories used by Unix system, The Shell: Shell commands, I/O redirection, pipes and filters, pipe fitting, wildcard, matching background processing, shell script shell variables, shell as programming language, Unix vi editor.

Computer Networking:
Unit 2: LAN, Cabling and Topologies: Various transmission media, Twisted and untwisted pairs, coaxial cables, fiber-optic cables and characteristics, wireless LAN, Cabling Topologies: hierarchical, bus, ring, star, collapsed star, mesh.
Origin and definition of LAN, types and uses of LAN, LAN components: NIC N/W cables, hubs, and OS, LAN types: MAP, ARCnet, Apple Talk etc., MAN and WAN, repeaters, Bridges, Routers, Gateways, Backbones etc.

Unit 3: The O.S.I. reference model :
N/W architecture, OSI reference model, data transmission, FDM, TDM, circuit switching, message switching, packet switching, hybrid switching, LAN static and dynamic channel allocation, LAN protocols, IEEE standard 802 for LAN, comprises of LAN's, The Internet: Introduction, Architecture,

Unit 4: Internet addresses: Three primary classes of IP addresses, Dotted decimal notation, network, broadcast and loopback address.
Internet Protocol (IP) – Connectionless Datagram Delivery, Routing, Error and Control Messages.
User Datagram Protocol (UDP): Introduction, Format of UDP Messages, UDP encapsulation, UDP port numbers.
Transmission Control Protocol (TCP): Reliability of transmission, ports, connections and endpoints, Concept of sliding windows, TCP segment format, Establishing, closing and resetting a TCP connection, TCP port numbers, ATM Network.
Applications: Remote Login (TELNET), File transfer (FTP), Electronic Mail, (SMTP), Future of TCP/IP – Ipv6 (introduction)

Reference Books:
1. Unix for you – Pramod Koparkar, Tata McGraw Hill
2. Unix utilities – R. S. Tare, McGraw Hill.
3. Understanding Unix – J.R. Groff and P.N. Weiberg, Que Tech. Publication, Singapore.
4. Internetworking with TCP/IP – Volume I, II, III, Author – Douglas E. Comer, Prentice Hall of India.
5. TCP/IP Protocol Suite, Behrouz A Forouzan, McGraw Hill.
6. Computer Networks, Andrew S. Tanenbaum, PHI.

ELE –42 DIGITAL SIGNAL PROCESSING

Unit 1: (15)
Fundamentals of discrete time system:
Basic definitions, important sequence, Linear and time invariant systems, impulse response, shifting, convolution, stability, Linear constant coefficients difference equations, FIR, IIR systems. Illustrations of the above concepts using MATLAB.

Frequency domain analysis:
Fourier transform of sequences, properties, Inverse F.T., sampling of continuos time signal, Nyquist rate and aliasing problem, interpolation formula, frequency response of rectangular window, recovery of analog signal.

Unit 2 : (15)
Discrete Fourier Transform:
DFT and its computation, properties, circular and linear convolution, FFT, Time and frequency decimation, IDFT, Interpretation of DFT results, DFT-FT relationship.

Unit 3: (15)
Z-transform :
Z-transform, properties, calculation of IZT, Application to the solution of difference equations, System function of a digital filter, combination of filter sections, implementation of digital filter using system function.

Unit 4: (15)
Design of digital filters:
Digital filter structure, Design using numerical solution, Bilinear Transformation (BLT), IIR filters, direct cascade and parallel realization, FIR filters, design using windowing method. Design of FIR and IIR filters using MATLAB.
Programmable DSP Chips:
Architecture and features of TMS 320C50 and ADSP 2181 signal processing chips. Typical applications (only review)

Reference Books:

1. Fundamentals of Digital Signal Processing – B.C, Ludeman, Harper & Row Publications.
2. Introduction to Digital Signal Processing- Roman Kuc, MGH
3. Introduction of Digital Signal Processing – J. G. Prokis, D.G. Manolakis
4. Digital Signal Processing – A.V. Oppenhiem, R.W. Schafer, Prentice Hall.
5. Theory and applications of digital Signal Processing- R.L. Rabiner, B. Gold, Prentice Hall of India.
6. Introduction of Digital Signal Processing – J. R. Johnson, Prentice Hall of India.
7. ADSP2181 DATASHEET
8. TMS320C50 DATASHEET

ELE 33(C) DIGITAL COMMUNICATION (DCOM)

Unit 1 : (15)
Signals Analysis :
Complex Fourier spectrum, Fourier transform, Properties of F.T, sampling theorem, random signals and noise, correlation and power spectrum.

Unit 2: (15)
Digital Communication Systems:
A/D and D/A converter, Coded communication, AM, PWM, PPM, PCM, delta modulation, adaptive delta modulation, quantization and noise consideration.
Digital Transmission and Reception:
Timing, base band systems, ASK, FSK, PSK, QAM.

Unit 3 : (15)
Error detection and coding:
Parity check, CRC, Hamming distance, Hamming codes, Cyclic codes, line synchronization codes, Manchester code, NRZ coding, Walsh codes.

Unit 4 : (15)
Case studies:
Paging system, cellular telephone, global positioning satellite, Facsimile, Videotext.

Reference Books:
1. Analog and Digital Communication systems- M.S. Roden, 3rd Edition, Prentice Hall of India.
2. Modern Digital and Analog Communication Systems- B.P. Lathi.
3. Communication Techniques for digital and Analog signals – M. Kanefsky, John Wiley and Son.
4. Telecommunication – T.H. Brewster, McGraw Hill.
5. Principles of Digital communication, Das, Chatterjee and Mallick, Wiley Eastern Ltd.

ELE 34 (C) SATELLITE COMMUNICATION

Unit 1 : Satellite Systems:

History of satellite communications, orbital mechanical, look angle determination, orbital perbutations, satellite subsystems - AOCS, TTC and M, power systems, communications subsystems, satellite antennas, satellite frequency bands, satellite multiple access formats.

Unit 2: Modulation, Encoding and Decoding:

Analog modulation, Digital Encoding, Spectral shaping, Digital decoding, Error-correction Encoding, Block Waveform Encoding, Digital Throughput.
The Satellite Channel:
Electromagnetic field propagation, Antennas, Atmospheric losses, receiver Noise, Carrier-to-noise ratios, satellite link analysis, Frequency Re-use by dual polarization, Spot beams in satellite downlinks.

Unit 3: The satellite Transponder:

The transponder model, the satellite front end, RF filtering of digital carriers, Satellite signal processing, Transponder Limiting, Nonlinear satellite amplifiers, Effect of nonlinear amplification on digital carriers.
Satellite Ranging System:
Ranging system, Component Range Codes, Tone-Ranging Systems.

Unit 5 : Multiple access formats

FDMA: FDMA system, Nonlinear amplification with multiple FDMA Carriers, FDMA, FDMA Nonlinear analysis, FDMA characterization, AM/PM conversion with FDMA, Satellite-switched FDMA.
TDMA: The TDMA system, preamble design, Satellite Effects on TDMA performance, Network synchronization, SS-TDMA.
CDMA: Direct-Sequence CDMA system, Performance of DS-CDMA, satellite systems, Frequency-Hopped CDMA, Antijam advantages of spectral spreading, Code Acquisition and Tracking.

Reference Books:

1. Satellite Communication – Robert M. Gagliardi (CBS Publishers and Distributors)

ELE 33 (E) MICROCONTROLLER BASED SYSTEMS

Unit 1: Microprocessor and Microprocessors:
Specifications, 89C51, and variants, Generation of addresses, data and control buses, selection of proper buffers, loading considerations, clock circuits and power on reset design, Technologies and comparison of Intel 8 to 32 bit Microprocessor and Microcontroller, Special features of microcontrollers.

Unit 2: System Design:
Minimum system with 89C51 to monitor frequency, voltage, displacement, liquid level, weight, speed, traffic light control system with s/W development for above.

Isolation Techniques:
Various realys, opto-couplers and their specifications, Interfacing of Relays and opto-couplers, isolation methods for heavy and a.c. loads

Signal Transmission:
V to I and I to V cConversion, V to F and F to V Conversion, netic and Electrostatic Shielding and Grounding.

Unit 3: System design for Control Applications :
Transducers for temperature, pressure and speed and interfacing them to signal conditioners, Instrumentation Amplifiers for thermocouple, bridge and LVDT, System design with 89C51 for measurement and control of temperature, pressure, speed using ON/OFF, Proportional and PID modes, stability aspects of the system, s/w development for above.

Unit 4:
Features of RISC architectures, CISC and RISC architecture comparison, advantages of RISC, Power saving methods.
ARM Architecture: Introduction to ARM processor and its important features, and Architecture Programming model, Processor Operating State, Memory Formats, Instruction, Length, Data Types, Operating Modes, Exceptions and Interrupts Latencies and Reset.

Reference Books:

1. Programming and Customizing 8051 Microcontroller, Padrik, Tata McGraw Hill.
2. Microprocessors application in Process control – S.I. Ahson, Tata Negraw Hill.
3. The 8051 Microcontroller – K.J. Ayala, Penram International.
4. Microprocessors and Microcontroller handbook – B.P.B. Publishers.
5. Industrial Control Electronics, J.M. Jacob, Prentice Hall of India.
6. Transducer Interfacing Handbook, D.H. Sheingold, Analog Devices Technical Handbook Norwood, USA.
7. ARM Architecture Reference Manual, David Seal, Addison-Wesley.

ELE 34 (E) FUZZY LOGIC AND NEURAL NETWORK

Unit 1: (15)
Introduction to fuzzy sets and Fuzzy Logic
History of Fuzzy set and fuzzy Logic, Transition from Fuzzy Set to Fuzzy Logic, Benefits, Limitations and Applications.
Fuzzy set theory:
Basic Concepts, Definition of Fuzzy Set, Basic types and their representation, Properties of Fuzzy sets: Support, Width, Height, Normality, Convexity, Cardinality, Relative Cardinality, Alpha cut and Decomposition, Fuzzy Number and Extension Principle.
Fundamental Operations, Union Intersection, Compliment, Equality, Empty Universal Fuzzy Sets,
Algebraic Operations: Cartesian Multiplication and Algebraic Product, Algebraic Sum, Bounded Sum and Difference, Convex Combination.
Realizations of Fuzzy Sets on Computer and Fundamental Operation using Arrays.
Fuzzy relations:
Fundamental concepts, Operations of Fuzzy relations, Composition of Fuzzy Relations, Types of Fuzzy Relations, Projection of Fuzzy Relations and Cylindrical Extension, Geometrical Model of Fuzzy Set, Application Examples of Fuzzy Relation.

Unit 2: (15)
Fuzzy Logic control :
Introduction, Conventional Control Systems, Fuzzy Logic Control Systems, Concept of Fuzzy Systems-Fuzzification-Module, Knowledge Representation Module,
Fuzzy Reasoning: Classification of Fuzzy Reasoning, Mamdani's direct method, TSK Method of linear function reasoning, Simplified Fuzzy reasoning method, Application Example of each method.
Defuzzification-Module, Types of Defuzzification method.
Designing Fuzzy Logic Controller: Construction of Control Rules, Parameter Tuning, Revision of Control Rules, Applications of Fuzzy Logic Control.
Case Studies:
1. Pressure Control
2. Temperature Control
3. Speed Control

Unit 3: (15)
Introduction to Electronic Neural Network:
Biological System, Neuron Learning, Learning-Hebbian Learning, Grossberg Learning, Kohonen's Learning, Back-propagation Learning, Fuzzy Leraning, Neural Network Models: Perception, Pictorial Illustration of Perception, Behavior, Multi-layer Perception and Back-propagation, Recurrent Networks, Unsupervised Competitive Learning, VLSI implementation of Neural Networks.

Unit 4: (15)
Fuzzy Neural Network:
Introduction, Fuzzy Multi-layer Perception, Fuzzy Competitive Learning, FuzzyART, Fuzzy min-Max Neural Networks, Fuzzy Neurons.
Fuzzy Neural Control:
Traditional Control, Neural Control, Fuzzy control and Fuzzy Control Applications.
Case Studies:
1. Fuzzy Neural Control for a Car and for Call processing and switching in Communication.

Reference Books:

1. An introduction to Fuzzy Logic for Practical Application – K. Tanaka Springier
2. Introduction to Applied Fuzzy Electronics – A.M. Ibrahim, Prentice Hall of India, New Delhi.
3. Fuzzy sets and Fuzzy Logic- G.J. Klir and B. Yuan, Prentice Hall of India.
4. C++ Neural Networks and Fuzzy Logic – V.B. Rao and H.V. Rao, B.P.B. Publications.
5. Aritifical Neural Network by B. Yegnanarayana, PHI, New Delhi
6. Fuzzy Logic Intelligence, Control and Information by J. Yen and R. Langari, Pearson Education Pvt.Ltd. India
7. Introduction to Neural Network by Alision carling, Galgotia Publications, New Delhi.
8. Neural Network and Fuzzy System by B. Kosko, PHI, New Delhi
9. Understanding Neural Network and Fuzzy Logic, S.V. Kartalopoulos, PHI, New Delhi

ELE 34 (P) POWER ELECTRONIC CIRCUIT DESIGN

Unit 1:

Design of triggering circuits:-

Design of triggering circuits Design for half controlled, fully controlled, Bridge converter (Single phase & Three phase) with resistive & inductive load. Design of power transformer for converter.

Unit 2:

Chopper Design:-

Design of Commutation circuits (Class A to D) , Design of Voltage and Current, commuted chopper, Design of Jone's chopper.

Inverter design:-

Design of Series inverter, parallel inverter, Design of ott filter, Design of single phase auxiliary commutated & complementary commutated bridge inverter. Design of PWM inverters.

Unit 3:

Pulse Transformer Design:-

Design of pulse transformer up to 30 KHz. Design of protection circuits against over voltage, over current, radio interference, di/dt, Design of snubber circuits, Design of fuse rating & surge current rating of the devise.

Unit 4:

Microcomputer control of Motor:-

Development of microprocessor based controlling scheme for closed loop speed of D.C. motor, Development of microprocessor based control scheme for three phase induction motor (v / f control) & stepper motors, Design of microcontroller based controlling scheme for closed loop control of D. C. motor & A. C. motor.

Reference books:

1. A monogram of electronic circuit design. Goyal Khetan
2. Power Electronics P.C. Sen
3. Power Electronics R.M. Jalnekar & N.B. Pasalkar
4. Thyristor power Controllers. C.K Dubey, S. R. Doradla, A. Joshi & R.M. Sinha
5. G.E.C. manual.
6. Pulse Transform. Nadkarni
7. Power Electronics. Katre

ELE43 (C) Optical Fiber Communication:

Unit 1: (15)

- Introduction: Historical developments, optical fiber communication system, advantages of optical fiber communication, total internal reflection, acceptance angle, numerical aperture, skew rays, cylindrical fiber, single mode fibers.
- Transmission characteristics of optical fibers(A): Attenuation, material absorption losses in silicon glass fibers, linear scattering losses, non linear scattering losses, fiber bend loss,

Unit 2: (15)

- Transmission characteristics of optical fibers (B): mid-infrared and far-infrared transmission, intermodal and intramodal dispersion, overall fiber dispersion, polarization.
- Optical fibers and cables: preparation of Optical fibers, liquid phase (melting) techniques, vapour phase deposition techniques, fluoride glass fibers, optical fibers, optical fiber cables.

Unit 3: (15)

- Optical fiber connection: joints and couplers, fiber alignment and joint loss, splices, connectors, couplers.
- Optical sources and detectors: Absorption and emission of radiation, Einstein's relation, population inversion, optical emission from semiconductors, semiconductor injection laser, LED power and efficiency characteristics.

Unit 4: (15)

- Optical detection principles, absorption, quantum efficiency, responsivity, long-wavelength cutoff, p-n photodiode, p-i-n diode, photo transistors.
- Optical fiber measurements: Fiber attenuation measurements, dispersion measurements, refractive index profile measurements, cut-off wavelength measurements, numerical aperture measurements.

Reference books:

- Optical fiber communications, Principles and Practice, John M. Senior, PHI.
- Optical fiber systems: Technology, design and applications, Charles K Kao, Mc-Graw Hill International Edition.
- Optical fiber communications, Gerd Keiser, Mc-Graw Hill International Edition.
- Optical fiber communication, J. Gower, PHI.

ELE 44 (C) CELLULAR MOBILE COMMUNICATIONS

Unit 1: Introduction to Cellular mobile systems, Elements of Cellular radio system design, specifications of analog systems, Cell coverage for signal and traffic,

Unit 2: Cell-site antennas and mobile antennas, co-channel interference reduction. Types of non co-channel interference, frequency management and channel assignment.

Unit 3: Handoffs and dropped calls, operational techniques and technologies, switching and traffic.

Unit 4: Introduction to digital systems, Digital Cellular systems. Intelligent cell construction and applications. Features of handset, SMS, Security.

Reference Books:

1. Mobile communication Engineering- W.Y.C. Lee, McGraw Hill.
2. Mobile Cellular Telecommunication: Analog and Digital Systems, William C.Y. Lee, Mc Graw Hill

ELE 43(E) ARM Programming and Embedded Communication Protocols:

Total teaching hours: 56

ARM Programming:

Unit I:

- ARM instruction set , Thumb instruction set
- ARM memory interface: Cycle Types, Address Timing, Data Transfer Size, Instruction Fetch, Memory Management, Locked Operations, Stretching Access Times, The ARM Data Bus, The External Data Bus.

Unit II:

- ARM Debug Interface: Debug Systems, Debug Interface Signals, Scan Chains and JTAG Interface, Reset, Pullup Resistors, Instruction Register, Public Instructions, Test Data Registers, ARM7TDMI Core Clocks, Determining the Core and System State, The PC's Behaviour During Debug, Priorities / Exceptions, Scan Interface Timing, Debug Timing.

Embedded Communication Protocols:

Unit III:

- Inter-Integrated Circuit (I2C) BUS: I2C bus specification, general characteristics, bus signals, Address mechanism, Extensions to the standard-mode I2C-bus specification, Applications.
- System Management Bus (SMBus): Introduction, General characteristics, Physical Layer, data link layer, Network layer, differences between SMBus and i2c, Device addressing.

Unit IV:

- Controller Area Network (CAN): Specifications, basic concepts, Frame types, bus signals, Error handling, Addressing.
- Serial peripheral interface (SPI): Introduction, Specifications, master slave configuration, applications.

Books:

1. Real-Time Embedded Multithreading : Using ThreadX® and ARM®, Edward L. Lamie, CMPbooks.
3. ARM System Developer's Guide : Designing and Optimizing System Software (The Morgan Kaufmann Series in Computer Architecture and Design), Andrew Sloss, Dominic Symes, Chris Wright.
4. ARM Architecture Reference Manual (2nd Edition), David Seal. Addison-Wesley.
5. ARM System-on-Chip Architecture (2nd Edition), Steve Furber, Addison-Wesley.

ELE 44(E) Embedded ‘C’ and RTOS:

Total teaching hours: 56

Unit 1: (15)
Embedded ‘C’:

- Introduction to ANSI C, Basics of ANSI C, Control Structures: branching and looping, pointers, arrays, structures, unions, etc.
- Keil Cx51 Compiler and compiler control directives.
- Cx51 Language extensions: Keywords, memory types, memory models.

Unit 2: (15)
Embedded ‘C’:

- Cx51 Language extensions: data types, bit manipulation, etc.
- Preprocessor and preprocessor directives.
- Cx51 Compiler Library reference.

RTOS:

- Introduction to RTOS: Introduction, What is an RTOS, RTOS Scheduler, objects, services, Key characteristics of an RTOS.
- Commercially available RTOS (PSOS, ThreadX, VXWorks, Nucleus, WinCE), Introduction to VxWorks

Unit 3: (15)
RTOS:

- Tasks: Introduction, Defining a task, task states and scheduling, task structures, synchronization, communication and concurrency.
- Kernel objects: Semaphores, queues, pipes, event registers, signals, and condition variables.
- Exceptions and interrupts: Introduction, Exception v/s Interrupt, Applications of exceptions and interrupts.

Unit 4: (15)
RTOS:

- Timer and timer services: Introduction, Real-time clock and system clock, Programmable interval timers, Timer ISRs, Timing wheels, soft timers.
- I/O subsystem: Basic I/O concepts, The I/O subsystem.
- Memory Management: Introduction, Dynamic memory allocation in Embedded systems, Fixed-size memory allocation, blocking v/s non-blocking memory functions, H/W memory management units

Books: (Embedded ‘C’)

- The C Programming Language, Second Edition, Kernighan & Ritchie, Prentice-Hall, Inc.
- Keil Cx51 compiler and library reference: user’s guide, Keil Software.
- C: A Reference Manual, Second Edition, Harbison & Steel, Prentice-Hall Software Series

- C and the 8051: Programming and Multitasking, Schultz, P T R Prentice-Hall, Inc.

Books: (RTOS)

- Real-Time Concepts for Embedded Systems, Qing Li, Caroline Yao, CMP Books.
- An Embedded Software Primer, David E. Simon, Addison-Wesley.
- Patterns for Time-Triggered Embedded Systems: Building Reliable Applications with the 8051 Family of Microcontrollers (with CD-ROM), Michael J. Pont, Addison-Wesley
- Embedded C (With CD-ROM), Michael J Pont, Addison-Wesley.
- Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C, Jean J. Labrosse, CMP Books.
- C Programming for Embedded Systems, Kirk Zurell, RD Books (CMP Books).

ELE43 (P) INDUSTRIAL AUTOMATION

Unit 1. Process Models :-
Static model dynamic models, Step response methods- two parameter model, three parameter model & four parameter model. Models for oscillatory system, method of moments. Disturbance models- measuring noise characteristics.

Unit 2. Controller Principles :-
Process Characteristics - process equation, process load, process lag, self regulation Control system parameters- Error, variable range, control parameter range, control lag, dead time, cycling.
Control modes: - Discontinuous- two position, multi position, floating contro Continuos – proportional, integral, derivative & composite modes Control paradigms- Cascade control, Feed forward control, Neural Network- Basic concepts (neurons, feed forward network, learning & applications), Fuzzy controls (elements of fuzzy logic, fuzzy controller, fuzzy inference, defuzzification,) Matlab aided control system design. Conventional Fuzzy Neural.

Unit 3. Tuning of Controllers :-
Criteria for controller tuning-specified decay ratio, minimum integral of absolute error (IAE), minimum integral of time & absolute error.
(ITAE) closed loop response methods: ultimate method damped oscillation method Process reaction curve & open loop tuning.
Programmable Logic Controllers :-
ISA logic symbols, Ladder diagrams, Relay sequences,
Programmable Controllers – functional diagram, operation, programming.

Unit 4. Matlab aided control System Design:-
Conventional system design : System model. Required performance specifications, linearing modeling, discretize the design model. Simple lag-lead design, state-space design. Matlab aided neural-fuzzy control system design for simple system.

References:-
1) Industrial Automation : By Mrs. S.S.Agashe. “Technova “ Publishing House, Pune.
2) Digital ontrol & Stable variable methods-By M.Gopal, Tata McGraw Hill.New delhi.
3) Johnson C – Process control instrumention technology,PHI New Delhi.
4) Harriot P – Process control.TMH New Delhi.
5) Krishnakant – Computer based industrial Control.
6) Patranabis D. –Principle of process control.Tata McGraw Hill, new Delhi.

ELE 44 (P) ADVANCED DRIVES AND CONTROLS

Unit 1: DC. Motor control:
Characteristics of d.c. motors, 3-phase induction motors & synchronous motors, breaking and starting of electric motors, stability considerations of electric drives, dynamic conditions of a drive system, power losses and heating of electric motors ,requirement of a drive motor, classes of duty and selection of motors.

Unit 2: D.C. Motor Control:-
D.C. motors conventional speed control methods, Four quadrant operation, Electric circuits analog of a D.C. motor, Single phase SCR drives, half controlled bridge, discontinuous armature, Chopper controlled D.C. drives .reversing and breaking by chopper drives ,phase locked loop control of d.c. motor closed loop control system.

Unit 3: Control of Electric motors:
Advantages of converter fed I.M.drive, stator voltage, control, speed reversal using voltage control, breaking of motor by plugging ,static schrblus drive, variable frequency .control, v/f control, cycloconverter fed I.M.drive, inverter fed I.M.drive.
Rotor resistance control:
Conventional and chopper control, advantages and applications, speed control using slip energy recovery scheme using cycloconverter in rotor resistance, principle of field oriented control, synchronous motor control by variable frequency supply (Ref.1).

Unit 4: Stepper motors:-
Classification, types, modes of excitations, Drive requirements, Unipolar voltage drive for various reluctance, motor bipolar voltage drive for permanent magnet and hybrid step motors (Ref.5).
Drives for specific applications:
Drive considerations for textile mills, steel rolling mills, cranes and hoist drives, cement mills, sugar mills, paper mills, coal mills, centrifugal pumps.

Reference book :

1) Electronic drives- Concept & Applications –Vedam Subrahmanyam(THM)
2) Power Semiconductor drives-S.B.Dewan, G.R.Sleman, A.Strauphan (Wiley Int.Publ.-John Wiley Sons.)
3) Power Electronics – By P.C.Sen.
4) Power Electronics –J.S.Katre (Technover Publication)
5) Power Electronics –C.W.Lander(MHI Publication)

ELE43(V) Introduction to Microelectromechanical Systems
Total Teaching Hours : 60 (15 per unit)

Unit 1: Basics of MEMS with Fundamantal Devices and Processes:
History of MicroElectroMechanical Systems (MEMS), market for MEMS, basics of microtechnology, lithography and etching techniques, principles of bulk and surface micromachining: subtractive processes, additive processes (evaporation, sputtering, epitaxial growth).
Fundamental Devices and Processes:
Fundamental devices and processes, Multi User MEMS Process (MUMPs), SUMMiT: design rules; applications; micro hinges and deployment actuators,

Unit 2: CMOS and Bio MEMS:
CMOS MEMS, cleanroom lab techniques, MicroOptoElectroMechanical Systems (MOEMS), bioMEMS and biomaterials, piezoresistivity; scanning probe microscopy, scaling laws, applications.

Unit3: Lumped elements in MEMS:
Lumped element modeling and design, Electrostatic Actuators , Electromagnetic Actuators, Linear and nonlinear system dynamics, resonant systems, Elasticity (stress, strain, material properties),

Unit 4: Mechanical details for MEMS and Application case studies:
Mechanical structure basics (bending of beams, torsion, natural frequency), Optical system design basics (Gaussian beam optics, matrix optics, resolution)
Application case studies:
Application case studies: MEMS Scanners and Retinal Scanning Displays (RSD), Grating Light Valve (GLV), Digital Micromirror Devices (DMD), Optical switching, Capacitive Micromachined Ultrasonic Transducers (CMUT)

Reference Books:

1) Gregory T A 1998, Kovacs Micromachined Transducers Sourcebook, WCB McGraw-Hill.
2) Nadim Maluf, An introduction to Microelectromechanical system design, Artech House, 2000
3) Victor M. Bright, Editor, Selected papers on Optical MEMS, SPIE Milestone Series, Volume MS 153, SPIE Press, 1999
4) Mohamed Gad-el-Hak, Editor, The MEMS Handbook, CRC Press, Baco Raton, 2001
5) Marc Madou, Fundamentals of Microfabrication, CRC Press, New York, 1997.
6) Gregory T. A. Kovacs, Micromachined Transducers Sourcebook, WCB / McGraw-Hill
7) W. Trimmer, Editor, Micromechanics and MEMS: Classic and Seminal Papers to 1990, IEEE Press, 1996

ELE44 (V) Computer Aids for VLSI Design
Total Teaching Hours : 60 (15 per unit)

Unit 1: The Characteristics of Digital Electronic Design and Representation issues
Design, Hierarchy Views, Connectivity, Spatial Dimensionality, Design Environments, System Level, Algorithm Level, Component Level, Layout Level

Unit 2: Representation
General Issues of Representation, Hierarchy Representation, View Representation, Connectivity Representation, Geometry Representation

Unit 3: Synthesis and Static Analysis Tools
Introduction, Cell Contents Generation and Manipulation, Generators of Layout Outside the Cells, Cells and Their Environment, Silicon Compilers, Postlayout Generators
Static Analysis Tools: Node Extraction, Geometrical Design-Rule Checkers, Electrical-Rule Checkers, Verification, Dynamic Analysis Tools
Circuit-Level Simulators, Logic-Level Simulators, Functional- and Behavioral-Level, Simulation Issues, Event-Driven Simulation, Hardware and Simulation

Unit 4:The Output of Design Aids and hardware issues:
Circuit Boards, Integrated Circuits, Implementation Issues, Programmability, Imperative Programming, Declarative Programming, Hierarchy
Graphics Display Graphics, Hardcopy Graphics, Input Devices, Human Engineering, Task and User Modeling, Information Display, Command Language
And Feedback, Electric, Representation, Programmability, Environments, Tools For Designing a Chip, Formats: Gerber Format, Caltech Intermediate Format, GDS II Format, Electronic Design Interchange Format, EBES Format

Reference Books:

1) Algorithms for VLSI Design Automation by Sabih H. Gerez, Wiley Publications
2) Computer Aids for VLSI Design, Second Edition, Steven M. Rubin
3) Silicon VLSI Technology: Fundamentals, Practice, and Modeling, James D. Plummer, Michael D. Deal, Peter B. Griffin,