File Ref.No.39548/Ac A IV/2023/UOK

UNIVERSITY OF KERALA

(Abstract)

Revised Scheme and Syllabus of B.Sc. Electronics in Learning Outcome based Curriculum Framework (LOCF) with effect from 2023 admission - approved - orders issued - reg.-

Ac A IV

5685/2023/UOK Dated: 27.06.2023

Read:-1. Item No.IV.H.I of the minutes of the Faculty of Applied Sciences and Technology held on 14/03/2023.

2. Item No. II.xi. of the minutes of the Academic Council held on 25/05/2023

ORDER

The Academic Council vide paper read as (2) above , approved the Scheme and Syllabus of the B.Sc. Electronics in Learning Outcome based Curriculum Framework (LOCF)(CRCBCS Group 2(b)) with effect from 2023 admission, as recommended by the Board of Studies in Electronics and as endorsed by the Faculty of Applied Sciences and Technology vide paper read as(1)above.

Copy of the respective syllabus is appended.

Orders are issued accordingly.

MAYA DEVI C.B

DEPUTY REGISTRAR
For REGISTRAR

To

To
1. Chairman , BoS in Electronics
2. Dean , Faculty of Applied Sciences and Technology.
3. PA to CE/ Registrar
4. PS to V.C / P.V.C
5. Principals of Affiliated Colleges where B.Sc Electronics Course is offered.
6. University Library
7. Tabulation section
8. AR/ DR/ JR (Academic)
9. AR/ DR/ JR (Exam)
10. PRO for uploading scheme and syllabus in the website.
11. Stock file / File copy.

Forwarded / By Order
Sd/-
Section Officer

UNIVERSITY OF KERALA

Learning Outcomes based Curriculum Framework
B.Sc Electronics
Undergraduate Programme

CAREER RELATED FIRST DEGREE

PROGRAM UNDER

CHOICE BASED CREDIT AND SEMESTER (CBCS) SYSTEM

Group 2 (b)

ELECTRONICS

COURSE STRUCTURE AND SYLLABUS

(2023 admissions onwards)

Preamble

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B.Sc Electronics is a professional program which needs to develop a specialized skill set among the graduates to cater the need of industries. In recent years, electronic science has made unprecedented growth in terms of new technologies, new ideas and principles. The research organizations and industries that work in this frontier area need highly skilled and scientifically oriented manpower. This manpower can be available only with flexible, adaptive, and progressive training programs and a cohesive interaction among the research organizations, academicians, and industries. The key areas of study within subject area of Electronic Science comprise: Semiconductor Devices, analog and digital circuit design, microprocessors & Microcontroller systems and communication technologies, computer coding/programming in high level languages etc. B.Sc Electronic covers topics that overlap with areas outlined above and with applied fields such as embedded system, advanced computer and data communication, nanoelectronics etc.

The learning outcomes are designed to help learners understand the objectives of studying B.Sc Electronics, that is, to analyze, appreciate, understand and critically engage with learning of the subject. Each course in Electronics have definite and justifiable course outcomes and their realization by the end of the course/program.

Aim of the Program

The overall aims of the B.Sc Electronics are to:

1. Provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronic science and equip students with advanced cientific/technological capabilities for analyzing and tackling the issues and problems in the field of electronics.
2. Develop ability in students to apply knowledge and skills they have acquired to the solution of specific theoretical and applied problems in electronics.
3. Develop abilities in students to design and develop innovative solutions for benefits of society, by diligence, leadership, teamwork and lifelong learning.
4. Provide students with skills that enable them to get employment in industries or pursue higher studies or research assignments or turn as entrepreneurs.

Program Specific Outcome

The following program outcomes have been identified for B.Sc Electronics

PSO1	Ability to apply knowledge of mathematics & science in solving electronics related Problems
PSO2	Ability to design and conduct electronics experiments, as well as to analyze and interpret data
PSO3	Ability to design and manage electronic systems or processes that conforms to a given specification within ethical and economic constraints
PSO4	Ability to identify, formulate, solve, and analyze the problems in various disciplines of electronics.
PSO5	Ability to function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility
PSO6	Ability to communicate effectively in term of oral and written communication skills
PSO7	Recognize the need for and be able to engage in lifelong learning.
PSO8	Ability to use techniques, skills, and modern technological/scientific/engineering software/tools for professional practices

Atributes for preparing the Course outcomes

Sl No	Cognitive Level (CL)
1	Remembering (R)
2	Understanding (U)
3	Applying (Ap)
4	Analysing (An)
5	Evaluating (E)
6	Creating (Cr)

Sl No	Knowledge Dimension (KD)
1	Factual Knowledge (F)
2	Conceptual Knowledge (C)
3	Procedural Knowledge (P)
4	Metacognitive Knowledge (M)

Course Structure

B.Sc. Electronics

A. Credits –

Total 120 credits will be required for a student to be eligible to get degree of B.Sc Electronics.

B. Structure of B.Sc. Electronics

	Credit Details
I Core Course (26 Papers)	
Core Courses (Theory) Core Course (Practical)	16 ×3 = 48 8 ×3 = 24 2 ×4 = 08
II Elective Course (3 Courses)	
Discipline Specific Electives (2 Courses) Open Course (1 Course)	2×3 = 6 1×2 = 2
III Ability Enhancement Courses (9 Courses)	
Ability Enhancement Courses Environmental science/English/Mathematics/Complimentary Courses	2×2 = 4 6×3 = 18 1×2 = 02
IV Skill Enhancement Courses	
Practical (2 Courses)	2×4 = 8
Total	120

I. GENERAL STRUCTURE FOR THE CAREER RELATED FIRST DEGREE PROGRAMME IN ELECTRONICS

Semester 1

Course	Course Code	Course Title	Marks for CE	Marks for ESE	Instructional Hrs/week			End Semester Exam.Hrs.	Credits
					L	T	P		
Language Course	EN 1111	English I Listening and Speaking Skills	20	80	3	0	0	3	2
Foundation Course	MM 1131.1	Mathematics I	20	80	4	0	0	3	3
Core Courses	EX 1141	Environmental Studies	20	80	3	0	0	3	3
	EX 1142	Basic Electrical and Electronics Engg.	20	80	3	0	0	3	3
	EX 1143	Electrical & Electronics workshop	20	80	0	0	4	3	3
	EX 1144	Digital Electronics lab	20	80	0	0	4	3	3
Comple-mentary Course	EX 1131	Digital Electronics	20	80	4	0	0	3	3
		Total			17	0	8		20

Semester II

Course	Course Code	Course Title	Marks for CE	Marks for ESE	Instructional Hrs/week			End Semester Exam. Hrs.	Credits
					L	T	P		
Language Course	EN 1211	English II Writing and Presentation Skills	20.	80	2	0	0	3	2
Foundation Course	MM 1231.1	Mathematics II	20	80	4	0	0	3	3
Core Courses	EX 1241	Solid State Electronics	20	80	4	0	0	3	3
	EX 1242	Network Analysis	20	80	4	0	0	3	3
	EX 1243	Basic Electronics Lab	20	80	0	0	4	3	3
	EX 1244	C Programming Lab	20	80	0	0	4	3	3
Comple-mentary Course	EX 1231	Programming in C	20	80	3	0	0	3	3
		Total			17	0	8		20

SEMESTER III

Course	Course Code	Course Title	Marks for CE	Marks for ESE	Instructional hrs. / week			End Semester Exam. Hrs.	Credits
					L	T	P		
Core Courses	EX 1341	Electronic Circuits	20	80	4	0	0	3	3
	EX 1342	Communication Engineering	20	80	3	0	0	3	3
	EX 1343	Microprocessor and Interfacing	20	80	4	0	0	3	3
	EX 1344	Electronics Circuits Lab	20	80	0	0	4	3	3
	EX 1345	Microprocessor Lab	20	80	0	0	4	3	3
Comple-mentary Course	MM 1331.1	Mathematics III	20	80	3	0	0	3	3
	EX 1332	Computer Organization	20	80	3	0	0	3	2
		Total			17	0	8		20

Semester IV

Course	Course Code	Course Title	Marks for CE	Marks for ESE	Instructional Hrs. / week			End Semester Exam. Hrs.	Credits
					L	T	P		
Core Courses	EX 1441	Applied Electro-magnetic Theory	20	80	4	0	0	3	3
	EX 1442	Linear Integrated Circuits	20	80	4	0	0	3	3
	EX 1443	Electronic Instrumentation	20	80	3	0	0	3	3
	EX 1444	Microcontrollers and applications	20	80	3	0	0	3	3
	EX 1445	Linear IC Lab	20	80	0	0	4	3	3
	EX 1446	Microcontroller Lab	20	80	0	0	4	3	3
Elective Course	EX 1461	Elective – I	20	80	3	0	0	3	3
		Total			17	0	8		20

Semester V

Course	Course Code	Course Title	Marks for CE	Marks for ESE	Instructional Hrs/week			End Semester Exam. Hrs.	Credits
					L	T	P		
Core Courses	EX 1541	Digital Signal Processing	20	80	4	0	0	3	3
	EX 1542	Digital Communication	20	80	4	0	0	3	3
	EX 1543	Computer Networks	20	80	4	0	0	3	3
	EX 1544	Mini Project	20	80	0	0	5	3	4
	EX 1545	Communication Lab	20	80	0	0	5	3	4
Open Course	EX 1551	Elective – II	20	80	3	0	0	3	2
		Total			15	0	10		20

Semester VI

Course	Course Code	Course Title	Marks for CE	Marks for ESE	Instructional Hrs. / week			End Semester Exam. Hrs.	Credits
					L	T	P		
Core Courses	EX 1641	Optical Communication	20	80	4	0	0	3	3
	EX 1642	Biomedical Engineering	20	80	3	0	0	3	3
	EX 1643	Nanoelectronics	20	80	4	0	0	3	3
	EX 1644	Simulation Lab	20	80	0	0	4	3	4
Elective Course	EX 1661	Elective – III	20	80	4	0	0	3	3
Project	EX 1645	Project	20	80	0	0	6	3	4
		Total			15	0	10		20

II LIST OF ELECTIVES

Elective I

EX1451.1: Principles of Mobile Communication
EX1451.2: Principles of Management

Open Course (Elective II)

EX1551.1: Entertainment Electronics Technology
EX1551.2: Introduction to Mobile Communication

Elective III

EX1651.1: Internet of Things and applications
EX1651.2: Microwave Engineering

III. OPEN COURSE (ELECTIVE II)

During the program the students have to undergo three elective courses. The students can opt two courses from Electronics department (Electives I and III) and one from other departments (Elective II).

IV. CONTINUOUS EVALUATION

There will be continuous evaluation (CE) based on continuous assessment for each course and carries 20% weightage as shown below:

(a) Theory

Component	Marks
Attendance	5
Assignment	5
Class tests	10 (minimum two tests)

*Class tests***:** Each test paper may have duration of minimum two hours. For each course there shall be a minimum of two written tests during a semester.

*Assignments***:** Each student is required to submit two assignments for a theory course.

(b) Practical

Component	Marks
Attendance	5
Performance	5
Laboratory record	5
Test	5

Separate records are to be used for each practical course. A candidate shall be permitted to attend the end semester practical examination only if he/she submits a duly certified record book. This is to be endorsed by the external examiner.

(c) Mini Project

Component	Marks
Attendance	5
Performance	5
Presentation	5
Report	5

(a) Project

Component	Marks
Attendance	5
Presentation	5
Report	5
Internship Report	5

(b) The allotment of marks for attendance shall be as follows.

Grade	Marks
≥ 90%	5
< 90% but ≥ 80%	4
< 80% but ≥ 70%	3
< 70% but ≥ 60%	2
< 60%	1

V. END SEMESTER EXAMINATION

There will end semester examination (ESE) conducted by the University for each course and carries 80% weightage.

(a) Theory

1. The examination has duration of 3 hours, marks 80.
2. Each question paper has four parts A, B, C & D.
3. Part A contains 10 questions spanning the entire syllabus and the candidate has to answer all questions. Each question carries 1 mark.
4. Part B contains 12 short answer questions spanning the entire syllabus. Out of this, the candidate has to answer 8 questions. Each question carries 2 marks.
5. Part C contains 9 short essays/problems spanning the entire syllabus and the candidate has to answer 6 of them. Each question carries 4 marks.
6. Part D contains 4 long answer questions, one from each module, in which the candidate has to answer 2 questions. Each question carries 15 marks.

(b) Practical

The practical examinations shall be conducted by the University. The examiners shall be selected from a panel of experts prepared by the University. For each examination, there shall be two examiners, one external to the institution and the other from the institution. The mark sheet

prepared after the evaluation and duly signed by both the examiners shall be sent to the University within 5 days after the examination. The evaluation criterion for the end semester practical examinations shall be as follows:

Component	Marks
Circuit, Design	20
Setting up circuit and trouble shooting	15
Result: waveform, tabulation etc	30
Viva Voce	15

For Software labs, the criterion shall be as follows:

Component	Marks
Flow chart/Algorithm	10
Programme	20
Compilation, trouble shooting	10
Result	25
Viva Voce	15

(c) Mini Project

The evaluation of the mini project shall be according to the scheme given below.

Component	Marks
Novelty	10
Demonstration-cum-Result	20
Presentation	15
Viva Voce	15
Report	20

The evaluation of the mini project shall be done by two examiners (one external to the institution and the other from the institution) according to the scheme given above. Each candidate shall be evaluated separately. There shall be a maximum of 10 candidates per session with two sessions per day. The mark sheet prepared after the evaluation and duly signed by both the examiners shall be sent to the University within 5 days after the examination.

(d) Internship Program

The students have to undertake an internship program for a duration not less than 15 days in a recognized research institute (public/private) or university research department or in a recognized industry or in colleges offering such internship programs. Each student has to submit a report after the successful completion of internship program and its evaluation will be done along with the sixth semester project examination. Being a career related course, the goal of the internship program is to impart an exposure to industrial/research environment such that the theoretical and practical knowledge acquired thereby in various

areas of electronics may be extended to develop new ideas and apply in the successful completion of their projects in the coming semesters and envision their future as well. The internship can be done either during the summer vacation/semester break or during weekends. The students have to complete the internship program before the commencement of sixth semester.

(e) Project

The evaluation of the project shall be according to the scheme given below.

Component	Marks
Novelty	10
Demonstration-cum-Result	20
Presentation	15
Viva Voce	15
Project report	10
Internship report	10

The evaluation of the project shall be done by two examiners (one external to the institution and the other from the institution) according to the scheme given above. Each candidate shall be evaluated separately. There shall be a maximum of 10 candidates per session with two sessions per day. The mark sheet prepared after the evaluation and duly signed by both the examiners shall be sent to the University within 5 days after the examination.

VI. PASS REQUIREMENTS

For each subject (including theory, practical, seminar and project), a student should get a minimum of 35% marks for continuous evaluation and a minimum of 35% marks for end semester examination for a pass.

SYLLABUS

EX 1141: ENVIRONMENTAL STUDIES

Course Outcomes: After the completion of the course the student will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Gain knowledge about environment and ecosystem.	R
CO 2	Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.	U
CO 3	Gain knowledge about the conservation of biodiversity and its importance.	U
CO 4	Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.	U
CO 5	Students will learn about social issues and the environment and also increase in population growth and its impact on environment	U

MODULE I

NATURE OF ENVIRONEMENTAL STUDIES:

Definition, Meaning and Importance;
Ecology & Ecosystems: Concept of an Ecosystem structure and function of an Ecosystem. Producers, Consumers and decomposers: Energy flow in the Ecosystem: Ecological succession, food chain, food web, Ecological pyramids: Introduction, Types, Characteristic feature, structure and function of forest ecosystem, Grassland ecosystem, Desert ecosystem and aquatic ecosystem (Ponds, streams, rivers, lakes, oceans, estuaries)

MODEULE II

BIODIVERSITY AND ITS CONSERVATION:

Introduction, Definition; Ecosystem, Genetics and species, diversity; value of Biodiversity – Consumptive, productive, social, ethical, aesthetic and option values. Biodiversity at global, national and local level; India as a mega diversity nation, Hotspots of Biodiversity, Threats of Biodiversity- Habitat loss, poaching of wildlife; conservation of Biodiversity, In-situ conservation, Ex-situ conservation. Endangered and endaemic species of India; **Environmental pollution** – definition, cause, effects, and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards: **Solid waste management**- Types and sources: causes of solid waste, effects of solid waste pollution, control measures of solid waste, role of individual in prevention of pollution.

MODULE III

NATURAL RESOURCES:

Features and types of natural resources – Renewable and non renewable resources; natural resources and associated problems of **(a) Air resources (b) Forest resources** – use and over exploitation, Deforestation, effects of deforestation; timber extraction, mining on forests (**c) water resources**;- use, utilisation and over utilisation of surface and ground water. Floods, drought, conflicts over water. Benefits and problems of dams, management of water resources. **(d) Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources, **(e) Food resources**: World food problems, changes caused by agriculture and over grazing, Effects of modern agriculture, fertilizer-pesticide problems, water logging. Salinity. **(f) Energy resources**:- classification of energy resources. **(g) Land resources**: - Land as a resource, soil, land degradation, over exploitation of natural resources. Conservation of natural resources- soil, forest, wildlife, mineral, energy; water conservation- measures to conserve water in day today life. Sustainable water utilisation, rain water harvesting- methods; water shed management.

MODULE IV-

SOCIAL ISSUES AND THE ENVIRONMENT:-

Unsustainable to sustainable development, urban problems related to energy. Resettlement rehabitilisation of people; environmental ethics; climate change; greenhouse effect and global warming- effects and remedial measures; acid rain; ozone layer depletion, water land declamation, consumerism and waste products, ecomark.

HUMAN POPULATION AND THE ENVIRONMENT: -

Population growth; population exploitation; family welfare programme, environment and human health, urban environment and health, value education, women and child welfare; HIV and AIDS.

Text

Systematic Approach to Environmental Studies: Dr. K.G.C.Nair, Dr. Dipa, Dr. Yohannan

References

1. A text book of Environmental studies: Erach Bharucha
2. A text book of Environmental studies: Dr. Vijaykumar Tiwari.

EX 1142 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Study circuits in a systematic manner suitable for analysis and design	U
CO 2	Analyze the electric circuit using KCL and KVL	An
CO 3	Understand fundamental laws governing Magnetism, Electro Magnetic induction, AC generation	U
CO 4	Evaluate rms value, average value of different waveforms	E
CO 5	Understand the concept of band gap, working of different semiconductor diodes.	U

MODULE I

Basic Concept in Electrical Engineering: Introductory concepts and basic elements, resistance in series, resistance in parallel, effect of temperature on resistance. DC voltage sources: ideal and non ideal case; DC current sources: ideal and non ideal case; open circuit voltage and short circuit current sources, basic problems.

Kirchoff's Laws: Introduction, Kirchoff's current law, Kirchoff's voltage law, voltage divider circuit, current divider circuit; source transformation – voltage source to current source and current source to voltage source, basic problems.

MODULE II

Magnetic Circuits: Introduction, magnetic field around a bar magnet, magnetic field around a current carrying conductor, magnetic flux, magnetic flux density, magnetomotive force, magnetic field intensity, permeability, relative permeability, reluctance, permeance, comparison of electric and magnetic circuits, leakage flux in magnetic circuit; Magnetic hysteresis.

Electromagnetic induction: Faraday's laws of electromagnetic induction, Lenz's law, Electromagnetically induced emf, Dynamically induced emf, Fleming's right hand rule, Fleming's left hand rule, statically induced emf, mutually induced emf, mutual inductance.

MODULE III

AC Fundamentals: Introduction, generation of sinusoidal emf, definitions of waveform, instantaneous value, cycle, time period, amplitude, frequency, phase, phase difference, phase angle, RMS value, average value; Determining the RMS and average value of sine wave, half and fully rectified sine wave, saw tooth and triangular waveforms.

MODULE IV

Introduction to Electronics: Semiconductor diodes – Introduction, PN junction, PN junction with no external voltage, Forward and Reversed biased PN junction, VI characteristics of PN junction diode, static and dynamic resistance of diode, types of diodes – Zener diode, photo diode, LED and solar cell (basic idea only)

Text books

1. Mittle,VN, Basic Electrical Engineering, TMH
2. Navas, KA and Suhail, TA, Basic Electrical and Electronics Engineering, Rajat Publishers, Kochi
3. Rajendran, N, Basic Electrical and Electronics Engineering, Moonlight Publishers, Trivandrum
4. Thankachan, Aneesh P, Basics of Electronics Engineering, Phoenix, Kollam
5. Babu, Suresh V and Gopi, Varun P, Basics of Electronics Engineering, Owl Books, Trivandrum

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each, spanning the entire syllabus and the candidate has to answer all questions. Part B contains 12 short answer questions of 2 marks each, spanning the entire syllabus and the candidate has to answer any 8. Part C contains 9 short essays/problems of 4 marks each, spanning the entire syllabus and the candidate has to answer any 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer any 2.

EX 1143: ELECTRICAL and ELECTRONICS WORKSHOP

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Verify the network theorems and operation of typical electrical circuits	Ap
CO 2	Choose the appropriate equipment for measuring electrical quantities and verify the same for different circuits.	U
CO 3	Prepare the technical report on the experiments carried.	Ap

List of Experiments

Electrical Engineering: **(use soldering for all connections)**

1. Ohm's Law: To verify Ohm's Law using a known value resistance, ammeter and a DC source.
2. Study of resistance when connected in series: To find the total resistance, the current flowing in the circuit and the voltage dropped across each resistor, both theoretically and practically.
3. Study of resistance when connected in parallel: To find the total resistance, the current flowing in the circuit and the current flowing through each resistor and the voltage dropped across each resistor, both theoretically and practically.

4. Study of resistance in a series- parallel connection: To find the total resistance, the current flowing in the circuit, the current flowing each resistor, the voltage dropped across each resistor, both theoretically and practically.
5. Designing and etching a PCB for a simple circuit

Wiring Experiments:

6. Demonstration of one lamp controlled by one switch
7. Demonstration of staircase wiring: one lamp controlled by two switches
8. Demonstration of house wiring - Two lamps controlled by two switches

Electronics Experiments

9. To plot the VI characteristics of a PN junction diode
10. To plot the VI characteristics of an LED

Continuous Evaluation: 20 marks

1.	*Attendance*	*5*
2.	*Performance*	*5*
3.	*Test*	*5*
4.	*Fair Record*	*5*

End Semester Examination: 80 marks

1	*Circuit/wiring layout/PCB layout*	*20*
2	*Assembly/Soldering*	*15*
3	*Performance and Troubleshooting*	*15*
3	*Result*	*15*
4	*Viva voce*	*15*

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX 1144: DIGITAL ELECTRONICS LAB

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Verify the truth tables of different digital circuits	An
CO 2	Choose the appropriate equipment for measuring electrical quantities and verify the same for different circuits.	U
CO3	Design simple digital circuits	Cr
CO 4	Prepare the technical report on the experiments carried.	Ap

List of Experiments

1. TTL & CMOS Characteristics
2. Realization of Combinational Circuits using Gates
3. Binary to BCD converter.
4. Clocked SR, JK, Master Slave JK Flip Flops using Gates.

5. Arithmetic Circuits – Half Adder, Full Adder
6. BCD addition using 7483.
7. 1 bit magnitude comparator using gates.
8. Octal to Binary encoder using Gates.
9. Realisation of 4 to 1 MUX using gates and 8 to 1 MUX using 74151.
10. Realisation of 1 to 4 Demultiplexer using gates and 1 to 16 Demultiplexer using 74154.
11. Realisation of Shift registers-SISO, SIPO, PISO, PIPO using flip flops.
12. Realisation of asynchronous decade up counter using flip flops.
13. Design and implementation of MOD 7 sychronous up counter using flip flops.
14. Realisation of Johnson and Ring counter using CD 4017.
15. Implementation of a BCD counter using IC 7490
16. Realisation of asynchronous decade up counter using flip flops.
17. Design and implementation of MOD 7 sychronous up counter using flip flops.
18. Realisation of Johnson and Ring counter using CD 4017.
19. Implementation of a BCD counter using IC 7490

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Circuit and design	20
2	Assembly and troubleshooting	15
3	Result	30
4	Viva voce	15

Minimum 14 experiments should be conducted from the above list and the examination is to be conducted from it. Students shall submit the duly certified record

EX1131: DIGITAL ELECTRONICS

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Understand and represent numbers in powers of base and converting one from the other, carry out arithmetic operations	U
CO2	Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions	U
CO3	Analyze and design combinatorial as well as sequential circuits	An, Ap
CO 4	Familiarize different logic ICs	U

MODULE I

Number systems – Decimal, Binary, Octal & Hexadecimal – conversions, Digital codes – BCD, Excess 3, Gray code-conversions, ASCI I codes, Boolean algebra & theorems, SOP & POS, De Morgan's theorem, Simplification of Boolean expressions using Boolean Algebra & K Map(upto four variables). Logic gates.

MODULE II

Different Logic families: TTL, CMOS, ECL, Open Collector & its characteristics.

Combinational circuits: Adders - Half adder and Full adder. Subtractors - Half and Full subtractor. Comparators - 1-bit magnitude & 2-bit magnitude. Decoders - 2 to 4 & 3 to 8. Encoders - Octal to Binary & Decimal to BCD, Code converters - Gray to Binary, Binary to Gray and Binary to BCD.

MODULE III

Multiplexers: 2 input, 4 input & 8 input. Demultiplexers: 1 to 4 & 1 to 8. Realization of Boolean expression using multiplexers and demultiplexers. Familarisation of popular ICs: 7483, 74151, 74154 and its applications. Sequential circuits: Flip Flops: RS latch, clocked RS, D, JK, T and Master slave. Applications – Latches, Shift registers, typical circuits & applications as Ring counter and Johnson counter.

MODULE IV

Counters: State diagram & State table. Asynchronous counters: Concepts and Design of 2bit & 4 bit Up/Down counter, MOD 10 up counter. Synchronous counters: Design for random sequence generator. Familiarization of popular ICs: 7490, 4017 and 7446.

Converters: ADC – Flash, Successive Approximation, Counter Ramp. DAC-Weighted Resistor and R-2R Ladder. Parameters of DAC and ADC. Familiarization of ICs: 0808,0800 and application.

Text Books

1. Anand kumar, *Fundamentals of digital circuits*, PHI, 2/e, 2012.
2. Thomas L Floyd, *Digital Fundamentals*, Pearson, 10/e, 2011.

References

1. John MYarbrough, *Digital logic- Application and Design*, Thomson Learning, 2006.
2. John Wakerly, *Digital Design Principles and Practice*, Pearson, 4/e, 2012.
3. Morris Mano, Ciletti, *Digital Design*, 4/**e**, Pearson ,4/e, 2009
4. Thomas A.DeMessa, Zack Ciecone: *Digital Integrated Ciruits*, Wiley India, 2007
5. Ghoshal, *Digital Electronics*, Cengage, 2012.
6. Malvino & Leach, Digital principles and applications, TMH.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1241: SOLID STATE ELECTRONICS

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Remember symbols of various electronic devices	R
CO1	Describe the behavior of semiconductor materials	U
CO2	Reproduce the I-V characteristics of diode/BJT/MOSFET devices	An
CO3	Apply standard device models to explain/calculate critical internal parameters of semiconductor devices	Ap
CO 4	Understand the behavior and characteristics of power devices such as SCR/UJT etc.	U

MODULE I

Semiconductor Physics: Energy bands in solids, Energy band structure of conductors, insulators and semiconductors, Conduction in solids, Drift and diffusion currents, Fermi Dirac energy distribution.
Intrinsic semiconductors: Conduction in intrinsic semiconductors, Effect of heat and light on conductivity of intrinsic semiconductors, Fermi level in intrinsic semiconductors.
Extrinsic semiconductors: P type and N type semiconductors. Effect of temperature on extrinsic semiconductors, Majority and minority charge carriers, Mass action law, Charge density in an extrinsic semiconductor, Conductivity of semiconductors, Fermi level in an extrinsic semiconductor, Hall Effect.

MODULE II

PN junction diode: Formation of depletion layer in a PN junction, Forward biasing, Reverse biasing, V I Characteristics, Important terms used in a PN junction, break down mechanisms, Transition capacitance, Diffusion capacitance.Diode current equation . PN Diode switching times. Diode applications.
Special purpose diodes: (working principle and VI characteristics are only required) Zener diode, Tunnel diode, Varactor diode, Light emitting diode, Photodiode, Solar cell

MODULE III

Bipolar Junction Transistor: Construction, Operation of a transistor, Transistor currents, Transistor circuit configurations, Current gain, Relation between α and ß. Ebers –Moll model. Leakage current, VI characteristics in CB and CE configurations. Hybrid model of transistor in common base configuration.
Field Effect Transistor: Operation of JFET, Transfer and drain characteristics, Comparison of BJT and FET.

MODULE IV

MOSFET: Types of MOSFET, Working of depletion Type and enhancement type MOSFET, VI characteristics, Complimentary MOSFET.
Thyristors : UJT, SCR, DIAC, TRIAC – operation, structure and VI characteristics.

Text Book

1. Electronic devices and circuits - J B Gupta - S K Kataria and sons (Module I)
2. A Text book of applied electronics -R S Sedha - S Chand and Company Ltd (Module II, III and IV)

References

1. Solid State Devices and Technology –V Sureshbabu - Sanguine Technical Publishers
2. Solid State Electronic Devices, Ben G. Streetman - Pearson Education.
3., Basic Electronics & Linear Circuits, Bhargava N. N., D C Kulshreshtha and S C Gupta - TMH
3. Electronic Devices -Thomas L. Floyd - Pearson Education
4. Principles of electronics - V K Mehta - S Chand and company Ltd

5. Electronic devices and circuit theory -Robert L Boylestad and Louis Nashelsky - Pearson Education
6.Electrical and Electronics engineering - B L Theraja - S Chand and Company

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1242: NETWORK ANALYSIS

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Analyze the electric circuit using network theorems	An
CO 2	Determine Transient and steady state response for RL,RC and RLC circuits	Ap
CO 3	Understand time domain, complex frequency, poles and zeros.	An
CO 4	Determine the stability	Ap
CO 5	Understand the two–port network parameters with an ability to find out two-port network parameters	U

MODULE I

Energy sources: Voltage and current sources - dependent sources and independent sources - Kirchhoff's Laws (using resistance only) - KCL and KVL - Node and mesh analysis (using resistance only) – Network Theorems (using resistance only) - Super position theorem - Thevenin's Theorem - Norton's theorems - Maximum power transfer theorem

MODULE II

Transient and steady state analysis: AC analysis of RC, RL and RLC circuits, time constant. Laplace Transform in the Network Analysis: Initial and Final conditions, Transformed impedance and circuits; Transient analysis of RL, RC, and RLC networks with impulse and step and inputs.

MODULE III

S -Domain analysis: The concept of complex frequency, Network functions for the one port and two port - Poles and Zeros of network functions, Significance of Poles and Zeros, Time domain response from pole zero plot. Stability criteria - Routh Hurwitz Criteria

MODULE IV

Two port network: Short circuited admittance, open circuited impedance, hybrid parameters and transmission parameters.
Resonance: Series resonance, bandwidth, Q factor and Selectivity.

Text Books

1. Roy Choudhary, Networks and Systems, New Age International, 2/e, 2013.

2. Sudhakar and Shyam Mohan, Circuits and Networks- Analysis and Synthesis, TMH, 3/ e,2006.

References

1. Van Valkenburg, Network Analysis, PHI, 3/e, 2011
2. Franklin F. Kuo, Network Analysis and Synthesis, Wiley India, 2/e, 2012.
3. Umesh Sinha, Network Analysis & Synthesis, Satya Prakashan, 7/e, 2012.
4. Ghosh, Network Theory – Analysis & Synthesis, PHI, 2013.
5. B.R.Gupta and Vandana Singhal, Fundamentals of Electrical Networks, S.Chand, 2009.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each, spanning the entire syllabus and the candidate has to answer all questions. Part B contains 12 short answer questions of 2 marks each, spanning the entire syllabus and the candidate has to answer any 8. Part C contains 9 short essays/problems of 4 marks each, spanning the entire syllabus and the candidate has to answer any 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer any 2.

EX1243: BASIC ELECTRONICS LAB

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Examine the characteristics of basic semiconductor devices.	U
CO 2	Perform experiments for studying the behavior of semiconductor devices for circuit design applications.	Ap
CO3	Calculate various device parameters' values from their IV characteristics	E
CO 4	Interpret the experimental data for better understanding the device behavior	An

List of experiments

1. Characteristics of Zener diodes
2. Characteristics of Transistors (CE configuration)
3. Characteristics of Transistors (CB configuration)
4. Characteristics of FET
5. Characteristics of UJT
6. Characteristics of SCR
7. Frequency response of RC Low pass and high pass filters
8. Integrating and Differentiating circuits
9. Simple Zener Regulator
10. Realization of logic gates using diodes and transistors
11. Clipping and clamping circuits.
12. Rectifiers-half wave, full wave, Bridge with and without filter

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Circuit and design	20
2	Assembly and troubleshooting	15
3	Result	30
4	Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX1244: C PROGRAMMING LAB

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Write code in C language for arithmetic and logical problems	U, An
CO 2	Implement conditional branching, iteration and recursion.	Ap
CO3	Use concept of modular programming by writing functions and using them to form a complete program	Ap
CO 4	Prepare the technical report on the experiments carried.	Cr

The laboratory work will consist of 15 experiments from the list shown below:

1. Program to find the largest among three numbers.
2. Program to calculate simple and compound interest.
3. Solution of a Quadratic Equation.
4. Program to compute sum of series using while loop.
5. Program to calculate the sum of N natural numbers
6. Printing of multiplication table using do…while loop.
7. Program to find whether the given number is a positive number, negative number or zero.
8. Program to sort a list of numbers
9. Program to sort the strings.
10. Program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
11. Preparation of the rank list of a class of students.
12. Program to implement Matrix addition
13. Program to implement transpose of a Matrix
14. Program to implement Fibonacci series.
15. Program to find factorial of given N numbers without recursion.
16. Program to find factorial of given N numbers with recursion.
17. Program to count number of characters, words & lines in a text.
18. Program to develop a pattern (eg: pyramid, square)

19. Write a function to swap the values of two variables to illustrate the concept of pass by reference.
20. Write a program to arrange the given N names in alphabetical order.
21. Write a function to calculate the sum and average of given three numbers. Write a main function to call the above function.

Continuous Evaluation: 20 marks
1. Attendance 5
2. Performance 5
3. Test 5
4. Fair Record 5

End Semester Examination: 80 marks
1 Flow chart/Algorithm 10
2 Progrmme 20
3 Compilation and Troubleshooting 10
4 Result 25
5 Viva voce 15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX1231: PROGRAMMING IN C

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Write code in C language for arithmetic and logical problems	U, An
CO 2	Implement conditional branching, iteration and recursion.	Ap
CO3	Use concept of modular programming by writing functions and using them to form a complete program	Ap
CO 4	Understand the concept of arrays, pointers and structures and use them to develop algorithms and programs for implementing searching and sorting	U, Ap

MODULE I

Introduction: Concept of Programming Languages - High Level, Low Level, Assembly Language – Concept of Algorithms and Flow Charts - Language translators: Assemblers, Compilers, Interpreters (Only concept and differences) - Overview of C, Features of C fundamentals - Character Set, Identifiers, Keywords, Data Types, Constants, Variables , Operators- Arithmetic, Logical, Relational, Unary, Assignment, Conditional And Bitwise Operators –expressions.

MODULE II

Structure of C Program - Library Functions - Data input and output-,Compilation and Execution of C programs - Control Statements - If Statement, If…….Else Statement, Nesting of If ……..Else Statement – Operator - Switch Statement - Loop Controls – For, While, Do-While Loops, Break Continue, Exit, go..to Statement.

MODULE III

Arrays -Single and Multi dimensional arrays, Declaration and Initialization of arrays and strings, pointers and one dimensional arrays-Structures-Definition, declaration of structure variables, accessing structure members unions

MODULE IV

The Need of a Function - definition - User Defined and Library Function - Prototype of a Function - Calling of a function - Function Argument - Passing arguments to function - Return Values - Nesting of Function - main() -recursion. Data files-opening and closing a data file, creating a data file.

Text Book

Balaguruswami, Programming with C, TMH.

References

1.Yashvant P Kanetkar ,Let Us C
2. Mahapatra, Thinking in C, PHI.
3. Brain W Kernighan and Dennis M Ritchie, The C Programming language, PHI.
4. Byron Gottfried, Programming with C, Schaum's Outline Series,TMH.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1341: ELECTRONIC CIRCUITS

Course Outcomes

At the end of this course, students will be able to

CO1: Illustrate about rectifiers, transistor and FET amplifiers and its biasing. Also compare the performances of its low frequency models.
CO2: Describe the frequency response of FET and BJT amplifiers.
CO3: Explain the concepts of feedback and construct feedback amplifiers and oscillators.
CO4: Summarizes the performance parameters of amplifiers with and without feedback
CO5: Describe the concept of power amplifiers and understand various types of distortions in large signal amplifiers
CO6: Design and construct single stage amplifiers, oscillators and wave shaping circuits.

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)
CO1	PSO1	R,U	F,C
CO2	PSO1	R,U	F,C
CO3	PSO1	R,U	F,C
CO4	PSO1	R,U	F,C
CO5	PSO1	R,U	F,C
CO6	PSO2, PSO4	Ap, An	P

MODULE I

Rectifiers: Half wave, Full wave and bridge rectifiers – average value – ripple factor – efficiency. Filters: simple capacitor filter, RC, LC, CLC filters – comparison of filter circuits. Biasing of BJTs: Transistor biasing circuits, Stability factors, DC analysis of BJTs - Hybrid equivalent circuit.

Amplifiers: Concept of amplification, RC coupled amplifier – Frequency response – Analysis of voltage gain, current gain, input impedance and output impedance – concept of gain bandwidth product – emitter follower – applications.

MODULE II

Biasing of JFETs, FET Amplifier: Principle of operation – Small signal model – typical amplifier circuits – high frequency effects – comparison of BJT & FET amplifiers. Feedback Amplifiers: Concept of positive and negative feedback in amplifiers – characteristics negative feedback amplifiers - different types of feedback topologies – applications.

MODULE III

Concept of power amplifiers – class A, class B, class C – operation – types of distortions in power amplifiers – typical power amplifier circuits – principle of operation – transistor ratings – use of heat sinks. Oscillators: Principle of sinusoidal oscillators – Barkhausen criteria – RC, LC, Crystal oscillators – typical circuits – principle of operation – calculation of frequency oscillation – applications.

MODULE IV

RC Circuits: Response of high pass and low pass RC circuits to step and square wave inputs. Differentiator, Integrator, clipping and clamping circuits. Multivibrators – Circuit diagram and working of astable, monostable and bistable multivibrators. Schmitt trigger –principle of operation – output wave forms and applications.

Text books

1. Boylstad & Nehlasky, Electronic Devices & Circuit Theory, PHI.
2. Bhargava, Kulsheshtha & Gupta: Basic electronics and linear circuits, TMH

References

1. David Bell, Solid state pulse circuits, PHI.
2. Millmann and Halkias : Integrated Electronics, TMH.
3. Millmann and Taub, Pulse Digital and Switching Waveforms, TMH.
4. Neamen, Donald, Electronic Circuit Analysis and Design, TMH.
5. Spencer & Ghausi, Introduction to Electronic Circuit Design, Pearson Education, 2003.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1342: COMMUNICATION ENGINEERING

At the end of this course, Students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO 1	Understand the requirements and the protocols employed in the fundamental components in a communication network.	U

CO 2	Determine the suitability of a particular communication system to a given problem	An
CO3	Describe the concept of "noise" in analog and digital communication systems	A
CO 4	Understand the concept of different telephone systems	U

MODULE I

Introduction to communication system: Block diagram of a communication system, Bandwidth, Modulation, Need for modulation, various modulation schemes.

Amplitude Modulation: Introduction, AM signals and spectra, Power relations, block diagram of an AM transmitter, block diagram of a Superheterodyne receiver, sensitivity, image rejection.

MODULE II

Single Sideband Modulation: Principles, Balanced Modulators – SSB Generation – Filter Method. SSB Reception. Angle modulation- FM spectrum, modulation index, phase modulation.

Study of various modulation schemes: Comparison of various modulation schemes, angle modulation and demodulation circuits, AFC, amplitude limiters, pre-emphasis and de-emphasis.

MODULE III

Angle modulator Circuits: Varactor Diode Modulator, FM Transmitters (block diagram only) – Direct & Indirect Methods.

Angle modulation detector: Foster-Seeley discriminator. Pulse Modulation - PAM - TDM, PPM, PWM.

MODULE IV

Telephone Systems: Standard Telephone Set, functions of a telephone set, tones in auto exchange – dial tone, ring tone, busy tone, number unobtainable tone (brief explanation with waveforms only), concept of DTMF and multi frequency; Mobile phones (different standards and block diagram explanation only).

Text Books

1. George Kennedy, Communication System, TMH.
2. Biswas, N N, Principles of Telephony, Radiant Books, Bangalore
3. Thankachan, Anish P, Analog Communication Engineering, Phoenix, Kollam

References

1. Dennis Roody & John Coolen, Electronic Communication, 4/e. PHI.
2. Leon W.Couch II, Digital and Analog Communication Systems, 6/e, Pearson Education.
3. Taub and Schillings, Principles of Communication Systems, PHI.
4. Simon Haykin, Communication Systems, 4/e, John Wiley.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each, spanning the entire syllabus and the candidate has to answer all questions. Part B contains 12 short answer questions of 2 marks each, spanning the entire syllabus and the candidate has to answer any 8. Part C contains 9 short essays/problems of 4 marks each, spanning the entire syllabus and the candidate has to answer any 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer any 2.

EX1343: MICROPROCESSOR & INTERFACING

Course Outcomes

At the end of this course, students will be able to

SI Number	DESCRIPTION	COGNITIVE LEVEL
CO1	Understand the Architecture of 8085 Microprocessor	U
CO2	Familiarize 8085 instruction set and construct 8085 assembly language program	U
CO3	Analyze the time of Execution and performance of the 8085 processor	An
CO4	Evaluate the performance of 8085 using 8255	E
CO5	Analyse the Data transfer through 8237&8259&8251	An
CO6	Understand the architecture of 8086	U

MODULE I

Introduction to Microcomputer- types, CISC and RISC architecture overview and comparison. Microprocessors – Evolution. Intel 8085 Microprocessor – Internal architecture – address, data and control buses- Pin functions of 8085, addressing modes, instructions sets and programming.

MODULE II

Timing – Instruction cycle, machine cycle, fetch and execute cycles, 8085 bus activities during a read/write operation, timing diagrams for simple instructions. Stacks and subroutines. Addressing memory and ports, memory mapping and I/O mapping.

MODULE III

Interrupt structure of 8085 and interrupt response, hardware and software interrupt applications. Interfacing peripherals: 8255 PPI – block diagram description, modes of operation, Mode0, mode1 and mode2.

MODULE IV

Functional block diagram description of 8259 priority interrupt controller, 8257 DMA controller and 8251 USART. 8086 – internal architecture, programming model, registers, memory segmentation.

Text Books

1. R. S. Gaonkar, *Microprocessor Architecture Programming and Application with 8085*, Penram International Publishers.
2. A. Nagoor Kani, 8085 Microprocessor and Its Applications, McGraw Hill Education Publishers.

References

1. D. V. Hall, *Microprocessors and Interfacing: Programming and Hardware*, Tata McGraw Hill, 1999.

2. N. Mathivanan, Microprocessors, PC Hardware & Interfacing, Prentice Hall (India).

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1344: ELECTRONICS CIRCUITS LAB

Course Outcomes

At the end of this course, students will be able to

CO1: Understand and analyze electronic circuits.
CO2: Choose the appropriate equipment for measuring electrical quantities and verify the same for different circuits.
CO3: Able to understand and apply circuit theorems and concepts in engineering Applications
CO4: Prepare the technical report on the experiments carried.
CO5: Able to design and troubleshoot various electronic circuits using discrete components

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)
CO1	PSO1	U, An	F, C
CO2	PSO2	Ap	P
CO3	PSO4	U, Ap, E	C, P
CO4	PSO6	U,An	F,C
CO5	PSO8	Ap, Cr	P

1 Biasing Circuits – Fixed Bias with and without R_E – measure operating point – draw the DC load line – observe â dependency with another transistor.

2 Biasing Circuit – Voltage Divider – design – measure operating point – draw DC load line – observe the dependency on â

3 Single stage RC coupled amplifier – design –measure DC operating point -frequency response plot – find bandwidth, mid band voltage gain

4 FET Amplifier (self bias) – design – measure DC operating point – plot the frequency response find mid band gain, bandwidth.

5 Negative feedback amplifier (current series) – design – measure dc operating point – plot frequency response – find gain band width product.

6 Sinusoidal oscillator (RC phase shift) – design – measure operating point – measure frequency of oscillation.

7 Sinusoidal oscillator (Wein bridge) – design – measure operating point – measure frequency of oscillation.

8 Mutivibrators (astable) – design – measure frequency of oscillation – plot output waveforms

9 Mutivibrators (mono stable) - design – measure the time constant – plot output waveforms

10 Series Voltage regulator-design-observe the regulated output voltage-measure regulation factor.

11 Schmitt trigger – design – observe the UTP and LTP – plot the hysteresis graph.

12 UJT Relaxation oscillator- design- measure frequency of oscillation-plot output waveforms.

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Circuit and design	20
2	Assembly and troubleshooting	15
3	Result	30
4	Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX1345: MICROPROCESSOR LAB

Course Outcomes

At the end of this course, students will be able to

CO1 Be proficient in use of IDE's for designing, testing and debugging microprocessor based system
CO2 Interface various I/O devices and design and evaluate systems that will provide solutions to real-world problem
CO3 Prepare a technical report on the experiments carried

List of Experiments

1. Addition and subtraction of two numbers.
2. Addition of an array of 8-bit numbers.
3. Addition of an array of 8-bit BCD numbers.
4. Multiplication of two 8-bit numbers.
5. Division of two 8-bit numbers.
6. Largest and smallest number among an array of 8-bit numbers.
7. Ascending and Descending order sorting of an array of 8-bit numbers.
8. Block transfer.
9. Square root of a given 8-bit number.

10. Conversion of BCD number to binary and binary number to BCD.

11. Interfacing with stepper motor and seven segments LED display.

12. Interfacing with ADC and DAC.

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Flow chart/Algorithm	10
2	Progrmme	20
3	Compilation and Troubleshooting	10
3	Result	25
4	Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX 1332: COMPUTER ORGANIZATION

Course Outcomes

At the end of this course, students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Recall the basic structure of Computers.	R
CO2	Explain Multibus Organization.	U
CO3	Understand the concepts of Memory Structure.	U
CO4	Understand the concepts of optical storage devices.	U
C0 5	Explain the concept of Operating Systems.	U
CO 6	About computers in the corporate world.	U

MODULE I

Basic structure of computers: SMPS, Motherboard, BIOS, CMOS, Ports and Interfaces, Expansion Cards, Ribbon Cables, ASCII, operational concepts. CPU: data path, micro-operations on data path, control signals. Addressing modes. Execution of instructions, fetch cycle, execution cycle. ALU and bit sliced ALU.

MODULE II

Processing units: Fundamental concepts, execution of complete instructions, Multibus organization.
Memory Structure: Concepts of main memory, semiconductor RAM memories, semiconductor ROM memories, memory location and addresses, memory operations, Cache and Virtual memory.
Secondary storage devices: Magnetic storage systems – basic concept, working of pen drive, Hard disk.

MODULE III

Optical storage devices: Concept of optical storage devices, CD, DVD. Concept of I/O units, Concept of Video terminals, video displays, alphanumeric displays, graphic displays, Concept of graphic input devices – Concept of multimedia hardware
Operating systems: Concept of operating systems, Introduction to Linux, Real Time Operating Systems – concept of multitasking – concept of LAN, WAN, MAN. Network topologies

MODULE IV

Computers in the corporate world: Introduction to Information Systems, resources, classification, organizational foundation of information systems, contemporary approach to information systems, System concept, classification of information system, transaction processing system, decision support system (DSS), process of developing DSS, decision making concept, brief introduction to GDSS and EDSS.

Text Books:

1. Mano, Morris M, Computer System Architecture, PHI
2. De, Rahul, Managing Information Systems in Business, Government and Society, Wiley, India

References:

1. Hamacher, Computer Organization, Mc Graw Hill
2. Hayes, J P, Computer Organization and Architecture, PHI
3. Pratap, Bhanu, Computer Fundamentals, Cyber Tech Publications, New Delhi
4. Jain, V K, Computer Fundamentals, BPB Publications, New Delhi
5. Babu, Ramesh V, Samyukta, R and Munirathnam, M Digital Computer Fundamentals, VRB Publications, Chennai

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each, spanning the entire syllabus and the candidate has to answer all questions. Part B contains 12 short answer questions of 2 marks each, spanning the entire syllabus and the candidate has to answer any 8. Part C contains 9 short essays/problems of 4 marks each, spanning the entire syllabus and the candidate has to answer any 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer any 2.

EX 1441: APPLIED ELECTROMAGNETIC THEORY

Course Outcomes

At the end of this course, students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Understand the fundamentals of Electrostatics and Magnetostatics hence get the insight of the characteristics of materials and their interactions with electric and magnetic fields	U
CO2	Understand the application of Vector Differential and Integral operators in Electromagnetic Theory.	U
CO3	Interpret Maxwell's equations in differential and integral forms, both in time and frequency domains.	Ap
CO4	Describe the complex ε, μ, and σ, plane waves	U, An
C0 5	Understand the concept of TE, TM, TEM waves	U

MODULE I

Review of Vector Analysis: Vector algebra, dot product, cross product, Physical interpretation of gradient, divergence, curl. Vector field & scalar field. Review of rectangular, cylindrical and spherical co-ordinate systems and transformation equations (No derivations required). The Del operator, Laplacian operator

MODULE II

Electrostatics: Coulomb's law, Electric field intensity, electric potential due to point charge,. Gauss Law, Poisson's equation, Laplace equation. Overview of capacitance, dielectrics and dielectric polarization. Electrostatic energy stored in electric fields (derivation). Boundary conditions for dielectric interface& conductor- dielectric interface.

MODULE III

Magneto statics: Faraday's Law of Magnetic Induction, Magnetic flux, Flux density, magnetic field intensity, Biot-Savart's Law, Ampere's circuital (work) law in integral form, Energy stored in magnetic field. Magnetic vector potential. Boundary conditions for magneto static fields

MODULE IV

Maxwell's Equations: Inconsistency of Ampere's circuital law. Conduction current and displacement current- Maxwell's equations- differential and integral form, word statement and interpretation. Poynting theorem and Poynting vector- Uniform Plane waves- Solution for free space condition-Intrinsic impedance. Concepts of TE, TM and TEM waves.

Text Book:

Applied Electromagnetic field theory with applications -B.Premlet - Phasor Books

Reference Books:

1. Engineering Electromagnetics – Haytt (McGraw-Hill Education)
2. Elements of Electromagnetics--Matthew N. O. Sadiku (Oxford University Press)
3. Electromagnetic Field Theory and Transmission Lines--G. S. N. Raju (Pearson Education)

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1442: LINEAR INTEGRATED CIRCUITS

Course Outcomes

At the end of this course, students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.	U,Ap
CO2	Elucidate and design the linear and non linear applications of an op-amp and special application ICs.	U, Ap, An
CO3	Explain and compare the working of multi vibrators using special application IC 555 and general purpose op-amp.	Ap, An
CO4	Understand the concept of voltage regulators and design a simple regulator circuits using special IC's	U, Ap
C0 5	Understand the concept of active filters, analyze its frequency response and design of simple first order butterworth filters	U, An, Ap

MODULE I

Basic Differential Amplifier Circuit-Operation-AC and DC Analysis. Operational Amplifiers: block diagram-ideal characteristics-Op amp Parameters-Inverting and Non-Inverting Amplifier-Voltage Follower- Summing Amplifier-Differential Amplifier- Instrumentation Amplifier-V to I and I to V converter- Integrator-Differentiator-Typical circuits-Applications.

MODULE II

Active filters: Introduction – First order and second order– Butter worth – Low pass, High pass, Band pass, Band Reject, and Notch Filters – Typical circuits. Wave form generators: sine wave oscillators (Phase shift, Wien Bridge Oscillators), multivibrators (astable and monostable), sawtooth

wave generator. Introduction to Timer-Monostable and Astale Multivibrator using 555.

MODULE III

Basic circuit configuration and characteristics of voltage regulators – Basic blocks of linear voltage regulator – three terminal fixed regulators, Variable voltage Regulators (723) – Typical circuits for low and high voltage regulation. Introduction to switching regulators. ADC and DAC - DAC characteristics, Weighted resistor and R-2R DAC, ADC characteristics, Counter ramp and Successive approximation ADC.

MODULE IV

Basic comparator – Characteristics -Typical comparator circuits using op amp – zero crossing detector - Schmitt trigger - Operation - Application-Window detector. Precision Rectifiers (half wave and full wave). Positive and negative clampers-Peak detectors. Sample and Hold circuit. PLL – block diagram, operating principle, applications and typical circuits.

Text

1. Gayakwad , Op-Amps and Linear Integrated Circuits , PHI,4/e.2013.
2. Roy Chowdhary, Linear Integrated Circuits, New Age International, 2/e, 2010.

References

1. Franco, Design with Operational Amplifiers and Analog Integrated Circuits, TMH,3/e,2008.
2. Botkar, Integrated Circuits, Khanna Publishers,9/e, 2003.
3. George Clayton & Steve Winder, Operational Amplifiers, Elsevier.
4. Salivahanam and Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX 1443: ELECTRONIC INSTRUMENTATION

Course Outcomes
At the end of this course, students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Describe the working principle of different measuring instruments	U
CO2	Choose appropriate measuring instruments for measuring various parameters in their laboratory courses	Ap
CO3	Correlate the significance of different measuring instruments, recorders and Oscilloscopes	An

MODULE I

Introduction, General measurement system, characteristics, definitions; Transducers, different types of Transducers, Static – Resistive, Strain gauge, Capacitive, Inductive, LVDT; Dynamic Transducers - Piezo electric, Temperature, Thermocouple, Thermisters, Photoelectric.

MODULE II

Signal conditioning (concept only), Bridges – Wheat Stone, Maxwell, Hays, Scherring. Amplifiers – Instrumentation, Chopper.

MODULE III

Recording instruments, Graphic and Self balancing potentiometer, X –Y and Magnetic recorders. Multimeter – Analog and Digital; Signal generators – Introduction, Sine and Square wave only.

MODULE IV

Cathode Ray Oscilloscope – Introduction, Block Diagram, Lissagous Figures, Introduction to Digital Storage Oscilloscope, Applications. Analysers - Logic, Spectrum,
(Block diagram description only).

Text books

1. Sawhney, A K, Electrical & Electronic Measurement & Instrumentation, Dhanpat Rai &Sons.
2. Kalsi, H S, Electronic Instrumentation, TMH .

References

1. Bell, David A, Electronic Instrumentation and Measurements - (module 4)
2. Hellfric & Cooper, Modern electronic instrumentation & measuring technique, PHI.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each, spanning the entire syllabus and the candidate has to answer all questions. Part B contains 12 short answer questions of 2 marks each, spanning the entire syllabus and the candidate has to answer any 8. Part C contains 9 short essays/problems of 4 marks each, spanning the entire syllabus and the candidate has to answer any 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer any 2.

EX1444. MICROCONTROLLERS AND APPLICATIONS

Course Outcomes

At the end of this course, students will be able to

Sl No	Description	Cognitive Level
CO1	Understand the architecture of 8051 microcontroller	U
CO2	Familiarize the instruction set and construct assembly language program	U & Cr
CO3	Analyze the performance of peripheral Devices interfacing with 8051	An
CO4	Understand the architecture of PIC16F877A architecture	U
CO5	Analyze the serial communication using USART,SPI, I2C	An
CO6	Evaluate the performance of LED, Switch, LCD,Stepper motor using PIC16F877	E

Module I

Introduction, Microcontrollers and Microprocessors, 8 bit and 16 bit microcontrollers, MCS-51 architecture, Registers in MCS-51: accumulator, B register, register bank, stack pointer, program counter, data pointer, PSW register, input/ output register, special function Registers, 8051 Pin description, 8051 connections,8051 parallel I/O ports, Memory organization of 8051
(Refer Text 1)

Module II

Addressing modes: - direct, indirect, immediate, register, register specific, indexed. Classification of Instruction: - Arithmetic, logic, data transfer, Boolean, branching instruction. Assembly language programs: - data transfer operations, 8 bit arithmetic: addition, subtraction, multiplication, division, logical operations, byte level, bit level, rotate, swap.

(Refer Text 1)

Module III

Programming 8051 with C, advantages and disadvantages of programming in C, declaring variables, data types, arrays and strings, number representation, writing a C program, delay generation in C, programming ports of 8051 with C, operators in 8051 C, serial port programming, code conversions in C, code space, simple programs.

(Refer Text2)

Module IV

Interrupts in MCS -51, interrupt priorities, Timers and counters, modes, serial communication, multiprocessor communication, Applications of MCS-51, square wave generation, pulse generation, pulse width modulation, sine wave generation. Interfacing of seven segment displays.

PIC microcontrollers – Overview and features, internal architecture of 16C6X/7X (block diagram explanation only).

(Refer Text1)

Text Books:

1. Ajay V Deshmukh, " Microcontrollers – Theory and Applications ", Tata McGraw Hill
2. K. Uma Rao , Andhe Pallavi, "The 8051 microcontrollers: Architecture, Programming and Applications ", PEARSON

References

1. Kenneth J Ayala, The 8051 Microcontrollers Architecture, Programming and Applications" IInd Edition, CENGAGE Learning.

2. Mohammed Ali Mazidi, The 8051 Microcontroller and Embedded Systems (using assembly and C) IInd Edition, PEARSON

3) Mohammed Ali Mazidi, PIC Microcontroller and Embedded Systems: Using assembly and C for PIC 18, 1e Paperback – 2008.

EX1445: LINEAR IC LAB

Course Outcomes

At the end of this course, students will be able to

CO1: Interpret op-amp data sheets.
CO2: Analyze and prepare the technical report on the experiments carried out.
CO3: Design application oriented circuits using Op-amp and 555 timer ICs
CO4: Create and demonstrate live project using ICs.

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)
CO1	PSO1	U, An	F, C
CO2	PSO6	An	P
CO3	PSO2	U, Ap, E	C, P

CO4	PSO5	Ap, Cr	F,C

1. OPAMP - Noninverting & inverting Amplifier using IC 741
2. Adder & subtractor using IC 741
3. RC phase shift oscillator using IC 741 - design, output waveform.
4. Wein Bridge oscillator using IC 741 - design, output waveform.
5. Astable Multivibrator using IC 741 - design, output waveform.
6. Mono stable Multivibrator using IC 741 - design, output waveform.
7. Schmitt trigger using IC 741 - design, output waveform.
8. Timer IC 555 – Astable and Multivibrator - design, output waveform.
9. Timer IC 555 - Mono stable Multivibrator - Design, output wave forms.
10. Fixed voltage Regulators using 78xx and 79xx - calculation of regulation
11. Variable voltage regulator using 723 - Calculation of regulation.
12. PLL NE 565 - Characteristics - Lock range, capture range.
13. Active 1st order filters - LPF, HPF, BPF using IC 741 - design, frequency response.
14. Integrators & Differentiators using IC 741- design, waveforms.
15. Precision rectifiers (Half wave & Full wave) using IC 741

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Circuit and design	20
2	Assembly and troubleshooting	15
3	Result	30
4	Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX 1446: MICROCONTROLLER LAB

Course Outcomes

At the end of this course, students will be able to

CO1 - Be proficient in use of IDE's for designing, testing and debugging microprocessor and microcontroller based system

CO2 - Interface various I/O devices and design and evaluate systems that will provide solutions to real-world problem

CO3 - Prepare the technical report on the experiments carried.

I. ASSEMBLY LANGUAGE PROGRAMMING -8051

The following experiments are to be done using keil uvision

1. Data Transfer - Block move, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division
3. Code conversion: ASCII – Decimal; Decimal - ASCII;
4. HEX - Decimal and Decimal - HEX.
5. Programs to generate delay

II. INTERFACING

The following experiments are to be done using 8051 trainer kit.

1. Stepper and DC motor interface to 8051.
2. Temperature sensor interface with 8051.
3. Generate Sine, Square waveforms using 8051

III. Experiments Using PIC 16F877A

Following experiments can be done with Micro C/PIC C/ HITEC C/ MP LAB IDE.

1. Interfacing I/O devices: Switch and LED.
2. Interfacing LCD module.
3. Interfacing Acceleration sensor.
4. Frequency counter using Timer.
5. Motor speed control using PWM.
6. Interfacing DS 1307 (I^2C Real Time Clock).

Continuous Evaluation: 20 marks

1. Attendance	5
2. Performance	5
3. Test	5
4. Fair Record	5

End Semester Examination: 80 marks

1 Flow chart/Algorithm	10
2 Programme	20
3 Compilation and Troubleshooting	10
3 Result	25
4 Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX1451.1: PRINCIPLES OF MOBILE COMMUNICATION

Course Outcomes

At the end of this course, students will be able to

CO1: Illustrate about different communication standards.

CO2: Describe different radio transmission techniques.

CO3: Explain the concepts of multiple access techniques.

CO4: Understand a basic cellular system

CO5: Describe the concept of GSM
CO6: Describe various traffic routing techniques

MODULE I

Introduction to wireless networks, examples of wireless communication systems, examples of mobile radio systems - paging systems, cordless telephone systems, cellular telephone systems, differences between wireless and fixed telephone networks. PSTN, limitations in wireless networking, evolution of mobile radio communications.

MODULE II

Radio Transmission techniques- Simplex, Half duplex, Full duplex, Frequency division duplexing, Time division duplexing techniques. Mobile Radio Propagation: Free space loss, Fading, Doppler shift, Overview of Multiple Access Techniques for Wireless Communications: FDMA, TDMA, CDMA. Cellular Concept. Operational Channels- Forward voice channel, Reverse voice channel, Forward control channel, Reverse control channel.

MODULE III

A basic cellular system, Frequency reuse, Channel assignment strategies -fixed and dynamic, Hand off strategies, Prioritizing Handoffs, Practical Handoff Considerations, definition of co-channel interference and adjacent channel interference, Co channel interference reduction factor, Capacity of cellular systems, Methods to improve Coverage and Capacity in Cellular Systems, Cell Splitting- permanent and dynamic, Sectoring, repeaters for range extension, micro cell zone concept.

MODULE IV

How a mobile call is actually made. Traffic routing in wireless networks- circuit switching and packet switching. Global System for Mobile (GSM), GSM services and features, GSM system architecture, GSM radio subsystems.

Text books

1. T. S. Rappaport, Wireless Communications: Principles and Practice, 2/e, Pearson.
2. William C.Y. Lee, Mobile Cellular Telecommunications, Analog and Digital Systems, MGH.

References

1. Jochen Schiller Mobile Communications, 7/e, Pearson Education, 2003.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX 1451.2: PRINCIPLES OF MANAGEMENT

Course Outcomes

At the end of this course, students will be able to

Sl No	Description	Cognitive Level
CO 1	Students will be able to have clear understanding of managerial functions like planning, and have same basic knowledge on international aspect of management and understand the concepts related to Business.	U

CO 2	Demonstrate the roles, skills and functions of management such as directing, leadership and communicate effectively.	An
CO 3	Analyze effective application of knowledge of practical principles of management to diagnose and solve organizational problems and to develop optimal managerial decisions.	An
CO 4	Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities	U
CO 5	To analysis isolate issues and formulate best control methods	An

MODULE I

Introduction to Management: Meaning and definition of management, scope and importance of management, management and administration, levels of management – management as a science, art and profession- Henry Fayol's principles of management (conceptual framework only).

MODULE II

Planning: Meaning, objectives in planning, types of plans, steps in planning and limitations of planning (conceptual framework only).

MODULE III

Organizing: Concept, significance, types- formal and informal, line and staff and functional, centralisation, decentralisation, delegation and departmentation (conceptual framework only).

MODULE IV

Staffing: Importance, sources of recruitment and selection, training and development (conceptual framework only).

MODULE V

Directing: Meaning of direction, elements of direction (conceptual framework only).

Controlling: Meaning of controlling, steps in controlling, methods of establishing control (conceptual framework only).

Text Books:

1. Nair, KGC; Dipa and James, Biji, Principles of Management, Chand Books, Trivandrum
2. Abraham, M M, Business Management, Prakash Publications
3. Ibrahim, Arish, Principles of Management, Edudrive Publishers, Trivandrum

Reference Books:

1. Donnel, Koontz O, Principles of Management, Tata Mc Graw Hill, Publishing Co, New Delhi.
2. Prasad, L M , Principles and Practice of Management, Sultan Chand and Sons, New Delhi
3. Bhatia, R C, Business Organisation and Management, Ane Books Pvt Ltd, New Delhi
4. Tripathi, P C & Reddy, P N, Principles of Management, TMH.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire

syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX 1541: DIGITAL SIGNAL PROCESSING

Course Outcomes

At the end of this course, students will be able to

CO1: Understand Digital Signal Processing Systems. Signals Elementary of Discrete Time Signals, Discrete Time Systems - Various Classifications of Discrete Time Systems. Discrete Time Fourier Transform (DTFT

CO2: Explain and Calculate Discrete Fourier Transform, Circular Convolution, Linear Convolution using. Computation of IDFT.

CO3: Understand and explain Fast Fourier Transforms

CO4: Understand and create IIR and FIR systems

CO5: understand and apply Filters, Design of Analog Butterworth Low Pass filter, Impulse Invariant and Bilinear Transformation

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)
CO1	PSO3	R,U	F,C
CO2	PSO1	R,U,Ap	F,P
CO3	PSO2	R,U,Ap	F,P
CO4	PSO1	R,U, Cr	F,P
CO5	PSO4	R,U,Ap	F,C

MODULE II

Digital Signal Processing Systems : Block Diagram - Applications – Advantages - Limitations.

Signals : Introduction - Classification of signals – Representation methods of Discrete time Signals -Elementary of Discrete Time Signals - Mathematical operations on Discrete Time Signals.**Systems** : Definition - Discrete Time Systems - Various Classifications of Discrete Time Systems .

Z transform – Definition - Properties - Linearity, Time Shifting, Time Reversal, Multiplication by an Exponential Sequence, Differentiation, Convolution Theorem. Inverse Z Transform – Relation Between DTFT And Z-Transform.

MODULE II

Discrete Fourier Transform: Properties of DFT- Periodicity, Linearity, Time Reversal, Time Shifted sequences, Circular Convolution .Computation of DFT – Circular Convolution using DFT-IDFT method ,Graphical method and matrix method. Inverse Discrete Fourier Transform (IDFT) - Computation of IDFT.

MODULE III

Fast Fourier Transform : Introduction - FFT Algorithms(Radix 2 only) – Signal flow graph for 8-point DIT radix-2 FFT(Butterfly Diagram) - Computation of 8 point DFT using radix-2 DIT-FFT - signal flow graph for 8-point DIF radix-2 FFT - Computation of 8 point DFT using radix-2 DIF-FFT.

MODULE IV

Realization of IIR and FIR systems: Block Diagram representation of LTI systems -

Realization of IIR systems - Direct form I, Direct form II, Cascade representation and Parallel representation. Realization of FIR systems - Direct form representation and Cascade representation.

Filters: Comparison between Analog and Digital filters – Design of analog butterworth Low Pass Filters - comparison between FIR and IIR filters - IIR Filter Design by Impulse Invariance, Bilinear Transformation .

Text book:

1. Digital signal processing – A. Nagoor kani ,RBA publications. *(Refer chapter 1,2 ,3 and 4)*

References:

1. Digital Signal Processing - P.Ramesh Babu ,Scitech Publications
2. Digital signal processing – Salivahan,vallavaraj and gnanapriya ,TMH Publications.
3. Digital signal processing – Anand kumar ,PHI Publications.
4. Digital Signal Processing – Rabiner & Gold,
5. Digital Signal Procesing – Oppenheim & Ronald W Schafer, PHI

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1542: DIGITAL COMMUNICATION

Course Outcomes

At the end of this course, students will be able to

CO1: Understand and Explain different pulse modulation schemes.
CO2: Explain digital modulation techniques.
CO3: Understand and explain multiplexing techniques.
CO4: Understand and explain digital transmission schemes.
CO5: Understand and explain spread spectrum techniques.

MODULE I

Introduction to Digital Communication: Pulse modulation – Processes of Sampling (brief explanation only), *Nyquist Rate*, Aliasing; Pulse Amplitude Modulation (PAM): Generation of PAM (Flat top sampling). Pulse Width Modulation, Pulse Position Modulation.

MODULE II

Pulse Code Modulation (PCM): Block diagram, Block diagram of PCM generator and receiver.

Differential Pulse Code Modulation (DPCM) Schemes: Block diagram and working of DPCM; Block diagram and working of Delta Modulation.

MODULE III

Multiplexing Techniques: TDM and FDM (explanation and block diagram only).

Digital Transmission schemes: Introduction - ASK, FSK and PSK (waveform only), QPSK (transmitter

and receiver).

Jamming in communication systems: Concept of jamming, avoidance of jamming.

MODULE IV

Spread Spectrum Techniques: Principle of spread spectrum modulation, Pseudorandom Noise Sequence, generation of PN sequence, Direct sequence Spread Spectrum, Block diagram of DSSS transmitter and receiver; Frequency Hopping Spread Spectrum, Block diagram of FHSS transmitter and receiver; Advantages of spread spectrum modulation.

Text books

1. Simon Haykin, Communication systems, 4/e, John-Wiley & sons.
2. Bernard Sklar, Digital Communication, 2/e, Pearson Education, 2001.

References

1. Harold Kolimbris, Digital Communication Systems, 1/e, Pearson Education, 2000.
2. Sam Shanmugham, Digital and Analog Communication systems, Wiley India.
3. Leon W.Couch II, Digital and Analog Communication Systems, 6/e, Pearson Education.
4. John G. Proakis, Masoud Salehi, Communication Systems Engineering, 3/e, Pearson Education.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1543: COMPUTER NETWORKS

Course Outcomes

At the end of this course, students will be able to

CO1: Remember various network technologies, design issues and characteristics.
CO2: Understand the purpose of computer networks and basic issues in information security.
CO3: Apply the use of layer architecture for networking systems, information security measures.
CO4: Analyses the concept of different models of network and the working of various layers.
CO5: Evaluate data link controls and Information Security policies.
CO6: Describe the different routing algorithms and its concepts.

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)

CO1	PSO1	R,U,An	F,C
CO2	PSO1,PSO3	R,U	F,C
CO3	PSO1, PSO2	R,U,Ap	F,C,P
CO4	PSO1,PSO4	R,U,An	F,C,M
CO5	PSO1,PSO2	E,U	F,C
CO6	PSO2, PSO4	Ap, U	F,C

MODULE I

Concepts of Packet Switching, Circuit Switching, Protocol. Protocol Layering- Application layer, Transport Layer, Link Layer, Physical layer, OSI Model. Transport layer -Multiplexing and De multiplexing, Connectionless transport: UDP-UDP segment structure, Connection oriented transport: TCP-TCP Segment structure. Principles of congestion Control-Causes of congestion, TCP Congestion Control.

MODULE II

Network Layer- IPv4 addressing, IPv6 addressing, Forwarding and Routing-Routing Algorithms-Distance Vector Routing (Concepts only), Link State Routing (Concepts only), Hierarchical Routing (Concepts Only), Intra Autonomous System Routing- OSFP, Inter Autonomous System Routing- BGP. Concepts of Broadcast and Multicast routing.

MODULE III

Data link Layer- Error detection and correction techniques-Parity checks, cyclic redundancy check, Checksum method. Link layer addressing-MAC addresses, Address Resolution Protocol. Ethernet- Frame structure, Concepts of Ethernet Technologies, CSMA/CD.

MODULE IV

Physical layer: Cables for Networking Coaxial cables, UTP, Fiber Optic cables. Wireless networks-CDMA, WiFi- 802.11 Wireless LAN, Architecture. Concepts of Bluetooth and ZigBee. Concepts of 4G-LTE, VoIP. Importance of Network Security.

Text Books

1. ***J F Kurose, Computer Network A Top down Approach Featuring the Internet - 3/e, Pearson.***
2. ***Peterson, Larry and Davie, Bruce S, Computer Network - A System Approach, 4/e, Elsevier India***

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each, spanning the entire syllabus and the candidate has to answer all questions. Part B contains 12 short answer questions of 2 marks each, spanning the entire syllabus and the candidate has to answer any 8. Part C contains 9 short essays/problems of 4 marks each, spanning the entire syllabus and the candidate has to answer any 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer any 2.

EX1544: MINI PROJECT

Each student should conceive, design, develop and realize an electronic product. The basic elements of product design - the function ergonomics and aesthetics - should be considered while conceiving and designing the product. The electronic part of the product should be an application of the analog & digital systems covered so far. The realization of the product should include design and fabrication of PCB. Study of PCB design (single sided and double sided) may use any available software. The student should submit the report at the end of the semester. The product should be demonstrated at the time of examination.

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Presentation	5
3.	Performance	5
4.	Report	5

End Semester Examination: 80 marks

1	Novelty	10
2	Presentation	15
3	Demonstration and Result	20
3	Report	20
4	Viva voce	15

Students shall submit the duly certified record.

EX 1545: COMMUNICATION LAB

Course Outcomes

At the end of this course, students will be able to

CO1: Understand basic elements of a communication system.

CO2: Analyze the baseband signals in time domain and in frequency domain.

CO3: Build understanding of various analog and digital modulation and demodulation techniques.

CO4: Prepare the technical report on the experiments carried.

1. Study of AM generator using AD534 or AD633 multiplier Integrated circuit - Double side band suppressed carrier and double side band double side band full carrier – plot the waveforms of modulating signal, carrier wave and modulated signal – calculate modulation index.

2. Study of Frequency Modulator using IC555 – design - draw the waveforms of the baseband signal, carrier wave, and modulated signal – calculate frequency deviation.

3. Realization of Pulse Amplitude Modulator and Demodulator using CD4016 Integrated circuit - Natural PAM – design - draw the waveforms of the baseband signal, sampling pulse wave, and modulated signal – verify Nyquist rate condition and aliasing condition

4. Realization of Pre-emphasis and De-emphasis using passive components – design – plot characteristics curve.

5. Study of Mixer Circuit – design a frequency converter circuit to produce an output of 455 KHz using discrete components from two input waveforms - measure output frequency

6. Realization of delta modulator circuit using Integrated circuits - design – plot waveforms

7. Study of BASK Modulator using Integrated circuits (4016, 7404) – design – draw the inputs and output waveforms.

8. Study of Frequency multiplier using CD4046 Integrated circuit – design – plot the waveforms at the input and output.

9.Study of BFSK Modulator circuit – design – plot the waveforms at the inputs and output.

10. Study of BPSK Modulator (using 4016, 741 and 7404), – design – plot the waveforms of input and

output.

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Circuit and design	20
2	Assembly and troubleshooting	15
3	Result	30
4	Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX1551.1: ENTERTAINMENT ELECTRONICS TECHNOLOGY

Course Outcomes

At the end of this course, students will be able to

CO1: Understand basic elements of a recording and reproduction system.

CO2: Understand and explain the concept of different types of speakers.

CO3: Understand and explain Television standards .

CO4: Understand and explain various electronic gadgets.

MODULE 1

Recording and reproduction principles - Optical recording on compact disc, play back process, Advantage of compact disc. Hi-Fi Stereo reproducing system-Pre amplifiers, recording amplifiers. Microphones: construction, working principles and applications of Carbon, Moving coil and Crystal microphones. Headphones: Principle of operation of crystal and dynamic headphones.

MODULE II

Loud Speakers: construction, working principles and applications of crystal, condenser and dynamic loudspeakers. Tweeters and Woofers. Acoustics: reflection and absorption of sound, reverberation, acoustic design of auditorium. Principle of video recording on magnetic tapes, block diagram of VCR, VHS tape transport mechanism.

MODULE III

Public address system - Block diagram, need and use, Requirements of Public Addressing system for public meeting in a park and for an auditorium. Television: Television standards, frequency bands, Scanning, interlacing and synchronization, bandwidth, block diagram of monochrome transmitter and receiver, color concepts, concepts of luminance, Hue and Saturation, Color TV (PAL Systems). Cable TV concepts, Closed Circuit Television.

MODULE IV

Principle of operation of digital clocks, electronic calculator, microwave ovens, cellular phones, washing machines, air conditioners, ATMs and set-top-boxes.

Text Book

1. S P Bali, Consumer Electronics, Pearson.

References

1. Ajay Sharma, Audio video and TV Engineering-Consumer Electronics, Dhanpat Rai and co.
2. R.G. Gupta, Audio and Video systems, Tata Mc Graw Hill Publishing Co.Ltd.
3. R. Gulati, Monochrome and Color Television, New Age International (P) Ltd, New Delhi.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1551.2: INTRODUCTION TO MOBILE COMMUNICATION

Course Outcomes

At the end of this course, students will be able to

CO1: Illustrate about different communication standards.
CO2: Describe different radio transmission techniques.
CO3: Understand a basic cellular system
CO4: Describe the concept of GSM
CO5: Describe various traffic routing techniques

MODULE I

Introduction to wireless networks, examples of wireless communication systems, examples of mobile radio systems - paging systems, cordless telephone systems, cellular telephone systems, differences between wireless and fixed telephone networks,evolution of mobile radio communications.

MODULE II

Radio Transmission techniques- Simplex, Half duplex, Full duplex, Frequency division duplexing, Time division duplexing techniques. Cellular Concept. Operational Channels- Forward voice channel, Reverse voice channel, Forward control channel, Reverse control channel.

MODULE III

A basic cellular system, Concept of Frequency Reuse & Handoff, Capacity of cellular systems, Methods to improve Coverage and Capacity in Cellular Systems, Cell Splitting- permanent and dynamic, Sectoring, repeaters for range extension, micro cell zone concept.

MODULE IV

How a mobile call is actually made. Traffic routing in wireless networks- concepts of circuit switching and packet switching. Global System for Mobile (GSM), GSM services and features, GSM system architecture.

Text books

1. T. S. Rappaport, Wireless Communications: Principles and Practice, 2/e, Pearson.
2. William C.Y. Lee, Mobile Cellular Telecommunications, Analog and Digital Systems, MGH.

References

2. Jochen Schiller Mobile Communications, 7/e, Pearson Education, 2003.

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire

syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX 1641: OPTICAL COMMUNICATION

Course Outcomes: After the completion of the course the student will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Recollection of basic principles of optics transmitting light on a fiber. Classification of Optical Fibers.	R
CO2	Understand the Signal Degradation In Optical Fibers.	U
CO3	Understand the Optic Fiber Couplers ,Splicing Techniques and Optic fiber Connectors.	U
CO4	Understandig Optical sources and Detectors.	U

MODULE I

Advantages of optical Communication-Recollection of basic principles of optics transmitting light on a fiber, light propagation in fibers and characteristics, Critical angle - Total internal reflection. Classification of Fibers: Single mode and multimode Fibers, Step index and Graded index Fibers – Refractive Index profile - Effect of index profile on propagation - Acceptance angle - acceptance cone – Numerical aperture - Mode field diameter, Cut off wavelength

MODULE II

Signal degradation in optical fibers: Attenuation in single mode and multimode fibers – Absorption loss, scattering loss, Bending loss - Dispersion – Material dispersion, Waveguide dispersion, modal dispersion, Polarization mode dispersion - Band Width limitation.

MODULE III

Optic fiber couplers: types of couplers – Fiber to fiber joints: Splicing techniques- Fusion splice, V groove splice, Elastic tube splice - Optical fiber connectors -Structure of a connector Optical Communication System, point to point transmission systems, modulation, transmission system limits and characteristics, optical systems engineering,

MODULE IV

Optical sources and detectors: light production, LEDs, characteristics, lasers, DFB lasers, tunable DBR lasers, photoconductors, photodiodes, and phototransistors, Optical receiver - Optical amplifiers- SOAs – EDFAs

Text Books

1. G. Keiser, Optical Fiber Communications, 3/e, MGH 2000
2. John M senior, Optic Fibre Communication, PHI.

References:

1. J.R. Dutton, Understanding Optical Communications, Prentice Hall, 1999.
2. D K Myabaev & L L Scheiner, Fiber Optics Communications Technology, Pearson Education, 2001.
3. G.P. Agrawal, Fiber Optic Communication, John Wiley & Sons.
4. J H Franz & V.K Jain, Optical Communication, Narosa Publishing House, 2001.
5. Subir Kumar Sarkar, Optical Fibre and Fibre Optic Communication, S Chand & Co. Ltd.
6. Djafer K Mynbaev, Fibre Optic Communication technology, Pearson Education.

EX 1642: BIOMEDICAL ENGINEERING

MODULE I

At the end of this course, students will be able to

SI No:	DESCRIPTION	COGNITIVE LEVEL
CO1	Understand the basic knowledge of physiology.	U
CO2	Explore the occurrence of potential and operation of cardiovascular measurements.	U, An
CO3	Understand the basic knowledge on respiratory and pulmonary measurements.	U
CO4	Describe the methods used for monitoring the patients.	U, An

Human Physiological Systems

Introduction, Cells and their structure, the human cell, cell as a bioelectric generator, transport of ions through the cell membrane, the excitable cell, resting and action potential, propagation of action potentials.

Bio Potential Electrodes and Transducers

Design criteria of medical instruments, components of the bio-medical instrument system, electrode theory, biopotential electrodes, microelectrodes, body surface electrodes, depth and needle electrodes, surface electrodes (basic theory only)**.**

MODULE II

Bio Potential Recorders: Characteristics of a recording system, writer and pen damping effects, The ECG Amplifier, basic characteristics of ECG recorder, Electrocardiography, Lead systems for recording ECG, brief introduction to Electroencephalography; Electromyography (basic theory only).

Operation Theatre Equipment: Introduction, Pacemakers and their pacing modes, ventilators, defibrillators, diathermy- short wave, microwave and ultrasonic types, therapeutic effect of heat.

MODULE III

Radiodiagnosis and Imaging Systems: Principles of medical imaging, X-ray, CT Scan, Ultrasound, MRI, brief introduction to thermography and thermal imaging (basic theory only).

MODULE IV

Safety Instrumentation: Introduction to electrical safety, Radiation safety instrumentation, Physiological effects due to 50Hz current passage, Micro current and Macro current shocks and their hazards, devices to protect against electrical hazards (basic theory only).

Text Books

1. L. Cromwell, F. J. Weibell, and L. A. Pfeiffer, *Biomedical Instrumentation and Measurements*, Pearson Education, Delhi, 1990

2. J. J. Carr and J. M. Brown, *Introduction to Biomedical Equipment Technology*, 4th ed., Pearson Education, Delhi, 2001

3. Arumugam, M, Biomedical Instrumentation, Anuradha Agencies, Chennai, 2009

Reference Books

1. J. G. Webster, *Medical Instrumentation Application and Design*, 3rd ed., John Wiley & Sons, N.Y., 1998

2. R. S. Khandpur, *Handbook of Biomedical Instrumentation*, 2nd ed., Tata McGraw Hill, New Delhi

3. Agrawal, A, Modern Diagnostics, National Book Trust, India, 2001

EX1643: NANOELECTRONICS

Course Outcomes

At the end of this course, students will be able to

CO1: Describe the principles of nanoelectronics and the processes involved in making nano components and material.

CO2: Explain the advantages of the nano-materials and appropriate use in solving practical problems.

CO3: Explain the various aspects of nano-technology and the processes involved in making nano components and material.

CO4: Understand and analyze various techniques for characterizing nanomaterials.

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)
CO1	PSO1	R,U	F,C
CO2	PSO1	U, An	F,C
CO3	PSO7	U	F,C
CO4	PSO8	U	F,C

MODULE I

Introduction nanoelectronics, Impacts, Limitations of conventional microelectronics. Introduction to methods of fabrication of nanonaterials- grinding with iron balls, sol gel, fabrication of nano-layers - PVD, CVD, laser ablation, Ion Implantation.

MODULE II

Introduction to characterization tools of nano materials- -principle of operation of STM, AFM, SEM, TEM, XRD, PL, IR, Raman & UV instruments.

MODULE III

Nano Materials-carbon nano materials, nano tubes and nano wires, types of nano tubes and nano wires, production of nano tubes and nano wires, properties and applications of nano tubes and nano wires, Graphene, Quantum wells, wires and dots(Qualitative)

MODULE IV

Semiconductor Nanodevices: Single Electron devices- Nano scale MOSFET – Resonant Tunneling Transistor – Single Electron Transistors - Nanorobotics and Nanomanipulation - Mechanical Molecular Nanodevices – MEMS-NEMS

Text Books

1. B Premlet, Nanoelectronics, Phasor books

References

1. J.M. Martinez-Duart, R J Martin Palma & F Agulle Rueda, Nanotechnology for Microelectronics and Optoelectronics, Elsevier, 2006.

2. T Pradeep, NANO: The Essentials-Understanding Nanoscience and Nanotechnology" McGraw-Hill.

3. Poole, Introduction to Nanotechnology, John Wiley, 2006.

4. K.P.Jain, "Physics of semiconductor Nanostructures", Narosa Publishers, 1997

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX1644: SIMULATION LAB

Course Outcomes

At the end of this course, students will be able to
CO1: Simulate the characteristics of electronic devices
CO2: Design and Simulate simple electronics circuits and observe its output
CO3: Preparing a Written Report on the Study conducted for presentation to the Department.

PART I - SPICE Based:

Models of resistor, capacitor, inductor, energy sources (VCVS, CCVS, Sinusoidal source, pulse, etc), transformer, Models of DIODE, BJT, FET, MOSFET, etc. sub circuits. Simulation of following circuits with BJT using spice (Schematic entry of circuits using standard packages. Analysis- transient, AC, DC)

1. Rectifiers
2. Integrator & Differentiator
3. Diode Characteristics.
4. BJT Characteristics.
5. FET Characteristics.
6. RC Coupled amplifiers - Transient Analysis and Frequency response.
7. Astable Multivibrator
8. Zener regulator
9. Clipping & Clamping
10. Schmitt Trigger

PART II - MATLAB Based:

Introduction to Matlab, Study of Matlab Functions and Simulation using Simulink.

1. Writing simple programs using Matlab for handling arrays, files, plotting of functions etc.
2. Writing M files for Creation of analog & discrete signals, plotting of signals etc.
3. Filtering of analog & digital signals using convolution
4. Generation of noise signals (Gaussian, Rrandom, Poisson etc)
5. Design of analog low pass, band pass, high pass and band elimination filters using Butterworth approximation.
6. Design of analog low pass, band pass, high pass and band elimination filters using Chebyshev approximation.
7. Bode plot of transfer functions

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Performance	5
3.	Test	5
4.	Fair Record	5

End Semester Examination: 80 marks

1	Programme	20
3	Compilation and Troubleshooting	15
3	Result	30
4	Viva voce	15

The examination is to be conducted covering experiments given above. Students shall submit the duly certified record.

EX 1651.1 INTERNET OF THINGS AND APPLICATIONS

Course Outcomes
At the end of this course, Students will be able to
CO1 Describe the operation principles IoT
CO2 Familiarize with Applications of IoT
CO3 Design an Application of IoT in the daily life

Module I

What Is IoT, Evolutionary Phases of the Internet, IoT and Digitization, IoT Impact, IoT challenges, A Simplified IoT Architecture, IoT applications, Connectivity layers, Connectivity terminologies, IoT Network configurations, Gateways, IPv4 vs IPv6, Different types of Sensors and Actuators, Basics of IoT networking.
(Refer Text 1, 2, 3 and reference 1)

Module II

Wireless sensor networks-introduction, concepts of MQTT SMQTT, CoAP, XMPP, AMQP, Communication protocols: Features of IEEE 802.15.4, Features of ZigBee, Features of 6LoWPANs, RFID features, overview of connectivity technologies, Near field communication (NFC)- Zwave, Zwave Vs ZigBee. Concept of Machine to machine communication.
(Refer Text 1and reference 1)

Module III

Interoperability- its importance in context of IoT, Introduction to Arduino, Features of Arduino, Types of Arduino board, Arduino UNO, Board details, Arduino IDE, setup, sketch structure, Supported data types, Arduino function Libraries, Example- Blinking LED, Blink image setup. operators, Control statement, Loops, Arrays, String, Math Library, Random number, Interrupts, Example program: Traffic control system. Integration of sensors and Actuators with Arduino, Introduction to Raspberry Pi- Specifications, Basic architecture.
(Refer text 1, 2 and reference 1)

Module IV

Introduction to Python Programming, Python IDE, Data types in Python, controlling statements, Functions In Python, Functions as Objects, Variable Scope in Python, Example showing Global variable, Example showing variable scope, Modules in Python, Exception handling in Python, Example code: to check the number is prime or not. Image Read/Write operations, Output. Networking in Python.
(Refer text 1, 2 and reference 1)

TEXT BOOKS

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Internet of Things: A Hands-on Approach, by Arshdeep Bahga and Vijay Madisetti (Universities Press)

3. David Hanes, " IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things", Cisco Press, Pearson, 2017.

REFERENCES

1. Course material of NPTEL online course on Introduction to Internet of things
2. Internet of Things Principles and Paradigms -Rajkumar Buyya ,Amir Vahid Dastjerdi, MK
4. Internet of things with Audrino blue prints, Pradeeka Seneviratne , pckt publishing – open source
6. Learning Python -- Mark Lutz, O'Reilly.
7. Programming in Python 3, A Complete Introduction to the Python Language— Mark Summerfield Second Edition.

EX1651.2: MICROWAVE ENGINEERING

Course Outcomes

At the end of this course, students will be able to

CO1	Understand Microwave frequency band and transmission line used in microwave communication	U
CO2	Apply Waveguide theory and Analyze the wave pattern	Ap
CO3	Understand the operation of various microwave devices	U
CO4	Analyze the working of various Microwave amplifier and oscillator	An
CO5	Understand the working of microwave solid state devices	U

MODULE I

Introduction to Microwaves: Microwave region and band designation, advantages and applications. Transmission lines: Introduction, Two wire parallel transmission lines, voltage and current relationships on a transmission line, characteristic impedance, reflection coefficient, input impedance, standing waves, VSWR, impedance at a voltage minimum and at a voltage maximum, losses due to mismatch in transmission lines, impedance matching.

MODULE II

Wave guides, comparison with transmission lines, Types of waveguides, propagation of waves in rectangular waveguides, propagation of TEM modes, TE and TM modes, cutoff frequency of a waveguide, guide wavelength, group velocity, phase velocity. Waveguide couplings, Bends and Corners, Taper and Twists, T junctions, Magic Tees, Directional Couplers, Isolators, Circulators.

MODULE III

Microwave Tubes: Two cavity Klystron -operation-performance characteristics, applications (mathematical analysis not required), Reflex klystron- construction-operation-operating characteristics (mathematical analysis not required). Magnetrons- cavity magnetron-operation (mathematical analysis not required)- performance characteristics- applications.

MODULE IV

Trasferred electron devices. Gunn diode-operation performance characteristics-applications, Varactor diodes- construction-figure of merit- applications. PIN diode-operation, applications. Constructional features and operational characteristics of IMPATT diode.

Text Books

Microwave and Radar Engineering, Dr. M. Kulkarni, 5th Edition, Umesh Publications, Delhi

References

1. Samuel Y. Liao, Microwave Devices and Circuits, 3/e, Pearson Education.
2. Anoop singh & Seema Verma, Fundamentals of Microwave Engineering: Principles, Waveguides, Microwave Amplifiers and Applications, PHI.
3. David M Pozar, Microwave Engineering, 3/e, Wiley India

Structure of the question paper

Question paper shall consist of four parts. Part A contains 10 questions of 1 mark each spanning the entire syllabus and the candidate has to answer all. Part B contains 12 short answer questions of 2 marks each spanning the entire syllabus and the candidate has to answer 8. Part C contains 9 short essays/problems of 4 marks each spanning the entire syllabus and the candidate has to answer 6. Part D contains 4 long answer questions of 15 marks each, one from each module, of which the candidate has to answer 2.

EX 1645: PROJECT

Course Outcomes

At the end of this course, students will be able to

CO1: Survey and study of published literature on the assigned topic.
CO2: Working out a preliminary Approach to the Problem relating to the assigned topic.
CO3: Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/ Feasibility.
CO4: Preparing a Written Report on the Study conducted for presentation to the Department.
CO5: Final Seminar, as oral Presentation before an Internal & External evaluation committee.

Course Outcomes	Program Specific Outcome (PSO)	Cognitive Level (CL)	Knowledge Dimension (KD)
CO1	PSO1	U	F, C
CO2	PSO2, PSO4	An	P
CO3	PSO3, PSO4, PSO5, PSO8	Ap, E, Cr	C, P
CO4	PSO6, PSO7	U,An	F,C
CO5	PSO6	Ap, Cr	P

The objective of the project is to estimate the ability of the student in transforming the theoretical knowledge acquired so far and the practical training received through internship program into the design of a working model in allied areas of electronics. In this practical course, each group consisting of a maximum of four students is expected to design a project coming under allied areas of electronics and with practical applications. The basic concepts of product design may be taken into consideration while designing the project. Literature survey is to be carried out as part of project finalization/design. The project may be implemented using software, hardware, or a combination of both. The project work may be undertaken in Electronics/Communication/ Computer science or any allied area and **should be done within the Institution**. Students should execute the project work using the facilities of the institute. The student is expected to complete the project work assigned to him/her and submit the project report by the end of semester. This report shall be of a hard bound type.

Continuous Evaluation: 20 marks

1.	Attendance	5
2.	Presentation	5
3.	Performance	5
4.	Report	5

End Semester Examination: 80 marks

1	Novelty	10
2	Presentation	15
3	Demonstration and Result	20
3	Report	20
4	Viva voce	15

Students shall submit the duly certified report.