CENTRAL UNIVERSITY OF KARNATAKA

ಕರ್ನಾಟಕ ಕೇಂದ್ರೀಯ ವಿಶ್ವವಿದ್ಯಾಲಯ

कर्नाटक केंद्रीय विश्वविद्यालय

CENTRAL UNIVERSITY OF KARNATAKA

B. Tech (Bachelor of Technology)

in

Electronics and Communication Engineering

Course Structure and Syllabus

(With effect from 2024-25)

Programme Code: UELEC

Dept. of Electronics and Communication Engineering

School of Engineering

Central University of Karnataka

Kadaganchi, Aland Road, Kalaburagi – 585367,

Karnataka, India.

Vision and Mission of the Department

Vision:

To develop skilled Manpower of international standards, with humane and societal concerns, at undergraduate, post graduate and doctoral levels and create new knowledge and technologies in different fields of Electronics and Communication Engineering.

Mission:

1. To produce human resources capable of working towards Nation-Building by designing the outcome-based Curriculum with Social Relevance and providing the best learning experiences to students at U.G., P.G., and Doctoral levels

2. To enhance the research capabilities in cutting edge areas of ECE by providing excellent infrastructure and modern software and hardware facilities

3. MS-3: To build a strong Industry-Institute Interaction by having MOUs with industries

4. MS-4: To collaborate with premier institutes in India and Abroad to achieve academic excellence of international standards

B. Tech (Electronics and Communication Engineering)

Course Structure (Effective from 2024-25) Programme Code: UELEC

Semester -- I												
Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC10109	BS	Engineering Physics	3	-	-	3	2	30	45	75	**3**
UECTC10102	BS	Engineering Mathematics-I	3	-	-	3	2	30	45	75	**3**
UECTC10103	EC	Basic Electronics	3	1	-	3	2	40	60	100	**4**
UECTC10104	ES	Programming for Problem Solving	2	-	2	4	2	30	45	75	**3**
UECTA10105	HSM	English for Technical writing	2	-	-	2	1.5	20	30	50	**2**
UECTS10106	ES	Design Thinking	1	-	-	1	1	10	15	25	**1**
UECTV10107	MC	Environmental Science	2	-	-	2	1.5	20	30	50	**2**
UECPC10108	ES	Basic Electronics Lab	-	-	4	4	2	20	30	50	**2**
		Total	**16**	**01**	**06**	**22**	**14**	**200**	**300**	**500**	**20**
BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses												

Semester -- II												
Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC20109	EC	Engineering Chemistry	3	-	-	3	2	30	45	75	**3**
UECTC20110	BS	Engineering Mathematics-II	3	-	-	3	2	30	45	75	**3**
UECTC20111	ES	Basic Electrical Engineering	3	1	-	4	2.5	40	60	100	**4**
UECTC20112	ES	Object Oriented Programming using JAVA	2	-	2	4	2	30	45	75	**3**
UECTC20113	ES	Engineering Graphics and Design	2	-	2	4	2	30	45	75	**3**
UECTV20114	HSM	Universal Human Values	1	-	-	1	1	10	15	25	**1**
UECPC20115	ES	Basic Electrical Lab	-	-	4	4	2	20	30	50	**2**
UECWC20116	ES	Workshop / Manufacturing Practices	-	-	4	4	2	20	30	50	**2**
		Total	**14**	**01**	**12**	**27**	**15.5**	**210**	**315**	**525**	**21**
BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses												

B. Tech (Electronics and Communication Engineering)

Course Structure (Effective from 2024-25) Programme Code: UELEC

Semester -- III											
Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC30201	EC	Analog Circuits	3	-	-	3	2	30	45	75	**3**
UECTC30202	EC	Digital System Design	3	-	-	3	2	30	45	75	**3**
UECTC30203	EC	Signals and Systems	3	-	-	3	2	30	45	75	**3**
UECTC30204	EC	Network Theory	3	-	-	3	2	30	45	75	**3**
UECCC30205	ES	Programming with Python	2	-	2	4	2	30	45	75	**3**
UECTV30206	MC	Indian Knowledge System -IV	2	-	-	2	1.5	20	30	50	**2**
UECPC30207	EC	Analog Electronics Lab	-	-	4	4	2	20	30	50	**2**
UECPC30208	EC	Digital System Design Lab	-	-	4	4	2	20	30	50	**2**
		Total	**16**	**00**	**10**	**26**	**15.5**	**210**	**315**	**525**	**21**
BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses											

Semester -- IV											
Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC40209	EC	Microprocessor and Microcontrollers	3	-	-	3	2	30	45	75	**3**
UECTC40210	EC	Electronic Devices	3	-	-	3	2	30	45	75	**3**
UECTC40211	EC	Analog Communication	3	-	-	3	2	30	45	75	**3**
UECTC40212	EC	Control System	3	-	-	3	2	30	45	75	**3**
UECTC40213	EC	Electromagnetic Waves	3	-	-	3	2	30	45	75	**3**
UECTV40214	MC	Constitution of India and Professional Ethics	2	-	-	2	1.5	20	30	50	**2**
UECPC40215	EC	Microprocessor and Microcontrollers Lab	-	-	4	4	2	20	30	50	**2**
UECPC40216	EC	Analog Communication Lab	-	-	4	4	2	20	30	50	**2**
		Total	**17**	**00**	**08**	**25**	**15.5**	**210**	**315**	**525**	**21**
BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses											

B. Tech (Electronics and Communication Engineering)

Course Structure (Effective from 2024-25) Programme Code: UELEC

Semester -- V											
Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC50301	EC	Digital Signal Processing	3	-	-	3	2	30	45	75	**3**
UECTC50302	EC	Digital Communication and Computer Networks	3	-	-	3	2	30	45	75	**3**
UECTC50303	EC	Embedded Systems	3	-	-	3	2	30	45	75	**3**
UECTC50304	EC	Information Theory and Coding	3	-	-	3	2	30	45	75	**3**
UECTD5030X	OE	Open Elective – 1	3	-	-	3	2	30	45	75	**3**
UECPC50308	EC	Digital Signal Processing Lab	-	-	4	4	2	20	30	50	**2**
UECPC50309	EC	Embedded Systems Lab		-	4	4	2	20	30	50	**2**
UECPC50310	EC	Digital Communication Lab	-	-	4	4	2	20	30	50	**2**
		Total	**15**	**00**	**12**	**27**	**16**	**210**	**315**	**525**	**21**

BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses

Open Elective – 1		
Sl. No	Course code	Course Title
1.	UECTD50305	Basics of Internet of Things
2.	UECTD50306	Signal Processing Applications
3.	UECTD50307	Introduction to Communications systems

Semester -- VI											
Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC60311	EC	Artificial Intelligence and Machine Learning	3	-	-	3	2	30	45	75	**3**
UECTC60312	EC	VLSI Design	3	-	-	3	2	30	45	75	**3**
UECTC60313	EC	Digital Image Processing	3	-	-	3	2	30	45	75	**3**
UECTA60314	MC	Yoga-Sports / NSS / NCC	-	-	4	4	2	20	30	50	**2**
UECTD6031X	OE	Open Elective - 2	3	-	-	3	2	30	45	75	**3**
UECTC6031X	PE-1	Program Elective - 1	3	-	-	3	2	30	45	75	**3**
UECPC60321	EC	Artificial Intelligence and Machine Learning Lab	-	-	4	4	2	20	30	50	**2**
UECPC60322	EC	VLSI Design Lab		-	4	4	2	20	30	50	**2**
		Total	**15**	**00**	**12**	**27**	**16**	**210**	**315**	**525**	**21**

BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses

Open Elective - 2		
Sl. No.	Course code	Course Title
1.	UECTD60315	Introduction to Bio Sensors
2.	UECTD60316	Programming in C
3.	UECTD60317	Wireless Communications

Program Elective - 1		
Sl. No.	Course code	Course Title
1.	UECTC60318	Antennas and Wave Propagation
2.	UECTC60319	Data Structure and Algorithms
3.	UECTC60320	Advanced Wireless Communications

B. Tech (Electronics and Communication Engineering)

Course Structure (Effective from 2024-25) Programme Code: UELEC

Semester -- VII

Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECTC70401	EC	Automation and Robotics	3	-	-	3	2	30	45	75	**3**
UECTC7040X	PE-2	Program Elective – 2	3	-	-	3	2	30	45	75	**3**
UECTC7040X	PE-3	Program Elective – 3	3	-	-	3	2	30	45	75	**3**
UECTD7040X	OE	Open Elective - 3	3	-	-	3	2	30	45	75	**3**
UECPC70411	EC	PCB Fabrication Lab	-	-	4	4	2	20	30	50	**2**
UECPC70412	EC	Optical and Microwave Lab	-	-	4	4	2	20	30	50	**2**
UECRC70413	EC	Mini Project	-	-	2	2	2	20	30	50	**2**
UECIC70414	EC	Internship	-	-	4	4	2	20	30	50	**2**
		Total	**12**	**00**	**14**	**26**	**16**	**200**	**300**	**500**	**20**

BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses

Program Elective - 2

Sl. No.	Course code	Course Title
1.	UECTC70402	Satellite and Optical Communications
2.	UECTC70403	Advanced Microcontrollers
3.	UECTC70404	Multimedia Communications

Program Elective - 3

Sl. No.	Course code	Course Title
1.	UECTC70405	Microwave Engineering
2.	UECTC70406	Deep Learning
3.	UECTC70407	Advanced Java

Open Elective - 3

Sl. No.	Course code	Course Title
1.	UECTD70408	Python Programming
2.	UECTD70409	Multimedia Communications
3.	UECTD70410	Wireless Sensor Networks

Semester -- VIII

Course code	Course Type	Course Title	Teaching Hrs./Week				Examination				Credits
			Lecture	Tutorial	Practical	Total	Duration (Hrs)	IA Marks	End Semester Marks	Total Marks	
			L	T	P						
UECRC80415	EC	Technical Writing and Seminar	-	-	6	6	2	30	45	75	**3**
UECRC80416	ECP	Major Project	-	-	30	30	-	150	225	375	**15**
		Total	**00**	**00**	**36**	**36**	**-**	**180**	**270**	**450**	**18**

BS-Basic Science course, EC-Program core course, ES-Engineering Science course, HSM-Humanities and Social Sciences including Management courses, MC-Mandatory courses

Semesters	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total Credits**
Credits	**20**	**21**	**21**	**21**	**21**	**21**	**20**	**18**	**163**

ENGINEERING PHYSICS

Semester	I	Internal Assessment	30
Course code	UECTC10109	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Solve 1 D problem in quantum mechanics.
2. Explain the basis of energy bands and gaps in solids and semiconductors.
3. Analyze and solve problems involving variety of wave phenomena.
4. Apply principles of electromagnetism and Maxwell's equation to simple systems.
5. Explain principles and techniques used in the field of Nanoscience.

UNIT-I

Waves and Oscillations: Rectilinear motion, Oscillations or Vibrations, Simple Harmonic Motion, Damped Harmonic motion: Real oscillatory system, Forced or Driven oscillation, Types of Wave; Superposition of Waves, Reflection and Refraction, Standing Waves and Normal Modes, Beats, Resonance, Doppler's Effect.

UNIT-II

Electricity and Magnetism: Physical concepts of gradient, divergence, and curl; Laplacian operator, Concept of electricity and magnetism, Coulomb's law, The Lorentz force, Maxwell's equations.

UNIT-III

Introduction to Solids and Semiconductors: Introduction to Quantum Mechanics, Free electron theory of metals, Fermi level, density of states in 1, 2 and 3 dimensions, Kronig Penney model and origin of energy bands, metals, semiconductors, and insulators.

UNIT-IV

Introduction to nanoscience: Origin of nanoscience, nanoscale, surface to volume ratio, quantum confinement, dominance of electromagnetic forces, random molecular motion, bottom-up fabrication: Sol-gel, CVD and PVD techniques, top-down fabrication: ball mill method, characterization by XRD, SEM and TEM.

TEXT BOOKS:

1. Griffiths, D.J. and Schroeter, D.F., 2018. Introduction to quantum mechanics, Cambridge University Press.
2. Griffiths DJ. Introduction to electrodynamics.
3. The Feynman Lectures on Physics, vol. 2.
4. Fitzpatrick, R., 2018. Oscillations and waves: an introduction. CRC Press.
5. Solid State Physics, A. J. Dekkar, Macmillan publishers Ind. Ltd.,
6. Solid State Physics, Charles Kittel, Wiley student edition.
7. Fundamentals of Physics, Alan Giambattisa, BM Richardson and Robert C Richardson, Tata McGraw hill
8. Thomas L. Floyed, "Electronic Devices" Pearson Education, 9th Edition, 2012

REFERENCE:

1. G. Main, "Vibrations and waves in physics", Cambridge University Press, 1993.
2. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
3. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago, 1997.
4. E.S. Yang, "Microelectronic Devices", McGraw Hill, Singapore, 1988.
5. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.

ENGINEERING MATHEMATICS-I

Semester	I	Internal Assessment	30
Course code	UECTC10102	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Solve the consistent system of linear equations.
2. Apply orthogonal and congruent transformations to a quadratic form.
3. Determine the power series expansion of a given function.
4. Find the maxima and minima of multivariable functions.
5. Solve arbitrary order linear differential equations with constant coefficients.
6. Apply the concepts in solving physical problems arising in engineering.

UNIT-I

Matrix Theory: Linear dependence and independence of vectors; Rank of a matrix; Consistency of the system of linear equations; Eigenvalues and eigenvectors of a matrix; Caley Hamilton theorem and its applications; Reduction to diagonal form; Reduction of a quadratic form to canonical form - orthogonal transformation and congruent transformation; Properties of complex matrices - Hermitian, skew-Hermitian and Unitary matrices.

UNIT-II

Differential Calculus: Taylor's theorem with remainders; Taylor's and Maclaurin's expansions; Asymptotes; Curvature; Curve tracing; Functions of several variables - partial differentiation; total differentiation; Euler's theorem and generalization; Change of variables - Jacobians; maxima and minima of functions of several variables (2 and 3 variables) - Lagrange's method of multipliers.

UNIT-III

Ordinary differential equations of first order: Formation of differential equations; variable separable equations; homogeneous and non-homogeneous equations; exact and non-exact equations; integrating factors; linear first order equations; Bernoulli’s equation; applications Newton’s law of cooling, Law of natural growth and decay, orthogonal trajectories.

UNIT-IV

Linear Differential Equations of Higher order: Definition, Complete solution, Operator D, Rules for finding complementary function, Inverse operator, Rules for finding particular integral, Method of variation of parameters, Cauchy’s and Legendre’s linear equations, Simultaneous linear equations with constant coefficients and applications of linear differential equations to oscillatory Electrical Circuits L-C, LCR – Circuits.

TEXT BOOKS / REFRENCES:

1. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", 5th Edition, Narosa Publishing House, 2016
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Eighth Edition, John Wiley and Sons, 2015
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 2015.

BASIC ELECTRONICS

Semester	I	Internal Assessment	40
Course code	UECTC10103	End Sem. Exam	60
Teaching Hours / Week (L:T:P)	3:1:0	Exam Duration (Hours)	2.5
Credits: 04			

COURSE OUTCOME

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

1. Describe the operation of Diodes and BJT
2. Design and explain the construction of rectifiers, regulators, and amplifiers.
3. Describe the general operating principles of optoelectronic devices and photodetectors.
4. Explain the different number system and their conversions and construct simple combinational and sequential logic circuits using Flip-flops.

UNIT-I

Semiconductors: Bonding forces in solids, Energy bands, Metals, Semiconductors and Insulators, Direct and Indirect semiconductors, Electrons and Holes, Intrinsic and Extrinsic materials, Conductivity and Mobility, Drift and Resistance, Effects of temperature and doping on mobility, Hall Effect.

UNIT-II

Forward and Reverse biased junctions: Qualitative description of Current flow at a junction, Reverse bias, Reverse bias breakdown- Zeener breakdown, avalanche breakdown, Rectifiers. Optoelectronic Devices, Photodiodes: Current and Voltage in an Illuminated Junction, Solar Cells, Photodetectors, Light Emitting Diode.

UNIT-III

Bipolar Junction Transistor: Fundamentals of BJT operation, Amplification with BJTS, BJT Fabrication, The coupled Diode model (Ebers-Moll Model), Switching operation of a transistor, Cutoff, saturation, switching cycle, specifications, Drift in the base region, Base narrowing, Avalanche breakdown.

UNIT-IV

Digital Electronics Fundamentals: Difference between analog and digital signals, Number system – Binary, Hexadecimal, Coversion – Decimal to binary, Hexagonal to decimal and vice-versa, Boolean Algebra, Basic to Universal gates, Half and full adder, Multiplexer, Decoder, SR and JK flip-flops, Shift register, 3 bit Ripple counter

TEXT BOOKS:

1. Ben. G. Streetman, Sanjay Kumar Banergee, "Solid State Electronic Devices", 7th Edition, Pearson Education, 2016, ISBN 978-93-325-5508-2.
2. Thomas L. Floyed, "Electronic Devices" Pearson Education, 9th Edition, 2012.

REFERENCE:

1. D.P. Kothari, I.J. Nagarath, "Basic Electronics", 2nd Edn. McGraw Hill, 2018.
2. S. M. Sze, Kwok K. Ng, "Physics of Semiconductor Devices", 3rd Edition, Wiley, 2018.

PROGRAMMING FOR PROBLEM SOLVING

Semester	I	Internal Assessment	30
Course code	UECTC10104	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	2:0:2	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Formulate simple algorithms for arithmetic and logical problems.
2. Translate the algorithms to programs (in C language).
3. Test and execute the programs and correct syntax and logical errors.
4. Implement conditional branching, iteration and recursion.
5. Decompose a problem into functions and synthesize a complete program using divide and conquer approach.

UNIT-I

Introduction to Programming: Introduction to Computer, Components of a Computer System, Evolution of languages- Machine languages, Assembly languages, High-level languages. Software basics and its types. System software's like operating system, compiler, linker, loader; Application programs like editor.

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

UNIT-II

Introduction to 'C' Programming Language: History of C Programming, Basic structure of C program, Executing a C program, Constants, Variables and Data types, Operators and Expressions, Programming examples and exercises.

UNIT-III

Managing Input and Output operations: Simple input and output with scanf and printf, formatted I/O, and Command line arguments.

Conditional Branching and Loops: Conditional branching Statements (if, if-else, nested if-else and switch statements) in C, Loop control statements (For, while-do, do-while) in C, break and continue, Programming examples and exercises.

UNIT-IV

Arrays: Concepts, Using Arrays (1-D and 2-D) in C, Array Applications, Searching and Sorting algorithms (Linear search, Binary Search, Selection and Bubble Sort), example programs.

Strings: Introduction to strings in C, handling strings as array of characters, basic string functions available in C, arrays of strings.

Functions: Functions in C, user defined functions, Argument Passing – call by value, call by reference, Recursion, Programming examples and exercises. .

TEXT BOOKS / REFRENCES:

1. Jacqueline Jones & Keith Harrow: Problem Solving with C, 1st Edition, Pearson 2011
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
4. R S Bichkar, Programming with C, University Press, 2012.

ENGLISH FOR TECHNICAL WRITING

Semester	I	Internal Assessment	20
Course code	UECTA10105	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	2:0:0	Exam Duration (Hours)	1.5
Credits: 02			

COURSE OUTCOME

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

1. Understand the purpose, summarize and paraphrase the information
2. Identify grammatical errors and correct them
3. Write a formal report and reference properly.
4. Develop your own style of sensible writing

UNIT-I

1. READING SKILLS

1.1 Types of Reading Skills

1.1.1 Skimming
1.1.2 Scanning
1.1.3 Extensive Reading
1.1.4 Intensive Reading

1.2 Reading Strategies

1.2.1 SQ3R Technique
1.2.2 Reading Efficiently by Reading Intelligently

1.3 Timed Reading Practice

1.3.1 Reading Groups of Words at Each Glance
1.3.2 Reading More Selectively

UNIT-II

2. WRITING AND GRAMMAR

2.1 Writing Letters - Part I

2.1.1 Formal Letters - Part I
2.1.2 Letters of Enquiry
2.1.3 Letters of Complaint and Apology
2.1.4 Letters of Request

2.2 Grammatical Elements

2.2.1 Phrase
2.2.2 Phrasal Verbs
2.2.3 Prepositional Phrasal Verbs
2.2.4 Adverbial Phrasal Verbs

UNIT-III

3. TECHNICAL WRITING PART- I

3.1 Introduction to Technical Writing

3.2 Technical Writing Basics

3.2.1 Structuring Your Writing
3.2.2 Positioning Your Writing
3.2.3 Choosing the Right Words
3.2.4 Avoiding Traps
3.2.5 Making Your Technical Writing More Interesting
3.2.6 The 5 Cs of Technical Writing
3.2.7 Referencing

UNIT-IV

4. Nature and Style of Sensible Writing

- 4.1 Describing
- 4.2 Defining
- 4.3 Classifying
- 4.4 Providing examples or evidence
- 4.5 Writing introduction and conclusion

5. Writing Practices

- 5.1 Comprehension
- 5.2 Précis Writing
- 5.3 Essay Writing

TEXT BOOKS / REFERENCES:

1. Laplante, Philip A. Technical Writing: A Practical Guide for Engineers and Scientists. Boca Raton: CRC Press, 2012.
2. Maitland, Iain. Write That Letter. 2nd Ed. New Delhi: Kogan Page, 2009.
3. Abraham, T. C. Effective Letter Writing. New Delhi: Commonwealth, 2009.
4. Terttu Nevalainen and Sanna-Kaisa Tanskanen. Letter Writing. Amsterdam/Philadelphia: John Banjamin's Publishing Company, 2007.
5. Seely John. Oxford Guide to Effective Writing and Speaking. New Delhi: OUP, 2009.
6. Inthira, S.R and V. Saraswathi (1995) Enrich your English Communication Skills Book (Book I) New Delhi: OUP & CIEFL., Hyderabad.
7. Inthira, S.R and V. Saraswathi (1995) Enrich your English: Academic Skills Book (Book II) New Delhi: OUP & CIEFL., Hyderabad.
8. Tickoo, M. L. and et al. Living English Grammar and Composition. Hyderabad: Orient Longman, 1993.
9. Crystal, David. A Little Book of Language. Hyderabad: Orient Blackswan, 2010.
10. Green, David. Contemporary English Grammar Structures and Composition. Delhi: Macmillan, 2011.
11. English Grammar by Wren and Martin
12. Practical English Usage. Michael Swan. OUP. 1995.
13. Remedial English Grammar. F.T. Wood. Macmillan.2007
14. On Writing Well. William Zinsser. Harper Resource Book. 2001
15. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
16. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
17. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

DESIGN THINKING

Semester	I	Internal Assessment	10
Course code	UECTS10106	End Sem. Exam	15
Teaching Hours / Week (L:T:P)	1:0:0	Exam Duration (Hours)	1
Credits: 01			

COURSE OUTCOME

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

Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.

UNIT-I

Basics of Design Thinking: Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test.

UNIT-II

Being Ingenious & Fixing Problem: Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving.

TEXT BOOKS / REFERENCES:

1. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company

ENVIRONMENTAL SCIENCE

Semester	I	Internal Assessment	20
Course code	UECTV10107	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	2:0:0	Exam Duration (Hours)	1.5
Credits: 02			

COURSE OUTCOME

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

1. Identify the Components of Environment Ecosystem: Types & Structure, Scope and the Impacts of Agriculture & Housing, Industry, Mining and Transportation.
2. Ascertain the importance of. Natural Resources and different types of Energy.
3. Comprehend the Environmental Pollutions and Global Environmental Issues.

UNIT-I

Introduction: Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. Impacts of Agriculture & Housing, Impacts of Industry, Mining & Transportation. Environmental Impact Assessment, Sustainable Development.

UNIT-II

Natural Resources, Water resources: Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulfur Cycle. Energy: Different types of energy, Conventional sources & Non-Conventional sources of energy solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.

UNIT-III

Environmental Pollution: Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. etc.

TEXT BOOKS:

1. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
2. R. J. Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012

REFERENCE:

1. Raman Sivakumar, "Principals of Environmental Science and Engineering", 2nd Edition, Cengage learning Singapore, 2005 63 64
2. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006
3. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007 4. ErachBharucha, "Text Book of Environmental Studies", for UGC, University press, 2005
4. ErachBharucha, "Text Book of Environmental Studies", for UGC, University press, 2005
5. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Tenth Edition, Thomson Brooks /Cole, 2004
6. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006
7. Dr.Pratiba Sing, Dr.Anoop Singh and Dr. PiyushMalaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi

BASIC ELECTRONICS LAB

Semester	I	Internal Assessment	20
Course code	UECPC10108	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Examine the characteristics of basic semiconductor devices.
2. Perform experiments to study the behavior of semiconductor devices for circuit design applications.
3. Calculate various device parameter values from their I-V characteristics.
4. Interpret the experimental data for a better understanding of the device behavior.

LIST OF EXPERIMENTS

1. Analyze the I-V Characteristics of normal PN Junction.
2. Analyze the I-V Characteristics of the Zener Diode.
3. Study and Analyze the I-V Characteristics of the CE Configuration of BJT.
4. Study and Analyze the I-V Characteristics of the CB Configuration of BJT.
5. Study and Analyze the I-V Characteristics of the CC Configuration of BJT.
6. Design and analyze constant power supply using a Zener Diode.
7. To construct a Half-wave rectifier circuit and analyze its output.
8. To analyze the HW rectifier output using a capacitor in shunt as a filter.
9. To construct a Full-wave rectifier circuit and analyze its output.
10. To analyze the FW rectifier output using a capacitor in shunt as a filter.
11. Design and analyze regulated power supply using ICs 7805 and 7812.

COURSE ASSESSMENT

A. Theory (4 credits) (100 marks)

1. **Continuous Assessment: (40 Marks)**
   Internal Assessment for 30 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (60 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Theory (3 credits) (75 marks)

1. **Continuous Assessment: (30 Marks)**
   Internal Assessment for 20 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (45 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

C. Theory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 10 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (30 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

D. Theory (1 credits) (25 marks)

1. **Continuous Assessment: (10 Marks)**
   Internal Assessment for 5 marks.
   The remaining 5 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (15 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

E. Laboratory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 20 marks.
2. **End Semester Examination (30 Marks)**
   An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –I ----------

ENGINEERING CHEMISTRY

Semester	II	Internal Assessment	30
Course code	UECTC20109	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Apply the chemistry knowledge in solving engineering problems of society.
2. Understand the fundamentals of electrochemistry, polymer chemistry and water technology.
3. Assemble the concepts of chemistry that are in immediate need for engineering disciplines.
4. Analyze various technologies available in electrochemistry, polymer chemistry, water & fuels.
5. Develop problem solving skills using chemistry knowledge in an integrated approach.

UNIT-I

Electrochemistry: Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Corrosion: Causes and effects of corrosion, Types of corrosion ,Corrosion control methods

Battery Technology: Classification of batteries, emf of batteries, Modern batteries. Fuel cells and their applications.

UNIT-II

Polymer Chemistry: Introduction, Classification of polymers, Use and disposal of polymers, Polymer terminologies, commercially important polymers with synthesis and applications (plastics, fibers, adhesives, elastomers, conducting polymers), properties of polymers Solubility, Molecular Weight, Crystallinity, Glass transition temperature, Role of additives in polymers, Reinforced plastics.

UNIT-III

Water Technology: Chemical analysis of water. Hardness of water. Determination of dissolved oxygen (DO) by Winkler or Iodometric method. Reverse osmosis. Source of water pollution. Chemical oxygen demand (COD) and Biological oxygen demand (BOD). Treatment of domestic waste. Nano-technology associated with water.

UNIT-IV

Chemical fuels: Introduction, classification with examples, calorific value-classification (HCV & LCV), determination of calorific value of solid and liquid fuels using Bomb calorimeter-numerical problems. Petroleum cracking -fluidized bed catalytic cracking. Reformation of petrol, Knocking in IC engine, its ill effects and prevention. Power alcohol and its advantages. Synthetic petrol – Bergius process. Renewable and non-renewable energies. Biofuel. Solar Energy. Nuclear fuel.

TEXT BOOKS:

1. Text book of Engineering Chemistry by Dr. K. Pushpalatha, published by Wiley publications 2nd Edition.
2. A text book of Engineering Chemistry 15th Edition by P.C.Jain and Monica Jain, Dhanpat Rai Publishing Co (P) Ltd., New Delhi.
3. A textbook of Engineering Chemistry: Jain and Jain, Dhanpatrai Publication.
4. A textbook of Engineering Chemistry: S. S. Dara, S. Chand Publication 2010.
5. A textbook of Engineering Chemistry: Shashi Chawla, Dhanpatrai Publication

REFERENCE:

1. Principles of Physical Chemistry by B.R.Puri, L.R.Sharma and M.S.Pathania, Nagin Chand and Co.
2. Text book of Physical Chemistry by Soni and Dharmatha, S.Chand & Sons.
3. Text book of Polymers science by Gowarikar and Vishwanathan.
4. Corrosion Engineering by M.G.Fontana, Mc Graw Hill Publications.
5. Introduction to Nanotechnology: Charles P. Poole, Frank J. Owens.

ENGINEERING MATHEMATICS-II

Semester	II	Internal Assessment	30
Course code	UECTC20110	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Analyze improper integrals.
2. Evaluate multiple integrals in various coordinate systems.
3. Apply the concepts of gradient, divergence and curl to formulate engineering problems.
4. Convert line integrals into area integrals and surface integrals into volume integrals.
5. Apply Laplace transforms to solve physical problems arising in engineering.

UNIT-I

Integral Calculus: Convergence of improper integrals; Beta and Gamma integrals; Differentiation under integral sign; Double and Triple integrals - computation of surface areas and volumes; change of variables in double and triple integrals.

UNIT-II

Vector Calculus: Scalar and vector fields; vector differentiation; level surfaces; directional derivative; gradient of a scalar field; divergence and curl of a vector field; Laplacian; Line and Surface integrals; Green's theorem in a plane; Stoke's theorem; Gauss Divergence theorem.

UNIT-III

Laplace Transforms: Laplace transforms; inverse Laplace transforms; Properties of Laplace transforms; Laplace transforms of unit step function, impulse function, periodic function; Convolution theorem; Applications of Laplace transforms - solving certain initial value problems, solving system of linear differential equations, finding responses of systems to various inputs viz. sinusoidal inputs acting over a time interval, rectangular waves, impulses etc.

TEXT BOOKS / REFERENCES:

1. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", 5th Edition, Narosa Publishing House, 2016
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Eighth Edition, John Wiley and Sons, 2015
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 2015

BASIC ELECTICAL ENGINEERING

Semester	II	Internal Assessment	40
Course code	UECTC20111	End Sem. Exam	60
Teaching Hours / Week (L:T:P)	3:1:0	Exam Duration (Hours)	2.5
Credits: 04			

COURSE OUTCOME

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

1. Apply basic laws and analyze electrical circuits.
2. Understand transformer working principle and its usage.
3. Understand electrical machines working principle and their applications.
4. Understand LT and domestic electrical safety, wiring and different measuring instrument and their use.

UNIT-I

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-II

Magnetic materials, BH characteristics, series and parallel magnetic circuits, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-III

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic, loss components, efficiency and applications. Construction, working, torque-speed characteristic and applications of separately excited dc motor. Construction and working of synchronous generators.

UNIT-IV

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. Lamps- fluorescent, CFL, LED. Electrical measuring instruments principle and applications- energy meter, megger, tong tester. Electrical Wiring

TEXT BOOKS / REFERENCES:

1. Fitzgerald, D. E. Higginbotham, A. Grabel, Basic Electrical Engineering, 5th Edition, McGraw-Hill, 2009.
2. William H. Hayt Jr. , Jack E. Kemmerly, Steven M. Durbin, Engineering Circuit Analysis, 6th Edition,TMH, 2002
3. Olle I. Elgerd, Basic Electric Power Engineering, Addison-Wesley, 1977. Edward Hughes, Electrical Technology,7th Edition, Longman, 1995.
4. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd Edition 2010, Tata McGraw Hill.
5. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010

OBJECT-ORIENTED PROGRAMMING USING JAVA

Semester	II	Internal Assessment	30
Course code	UECTC20112	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	2:0:2	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Explain the features and object oriented concepts in JAVA programming
2. Demonstrate proficiency in writing simple programs involving branching and looping structures.
3. Design a class involving data members and methods for the given scenario.
4. Develop simple programs based on polymorphism and inheritance.
5. Apply the concepts of inheritance and interfaces in solving real world problems.
6. Use the concept of packages and exception handling in solving complex problem

UNIT-I

An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords).

Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans), Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays.

Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses.

Control Statements: Java's Selection Statements (if, switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop, Nested Loops), Jump Statements (Using break, Using continue, return).

UNIT-II

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection.

Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Understanding static, Introducing final, Introducing Nested and Inner Classes.

UNIT-III

Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, Local Variable Type Inference and Inheritance, The Object Class.

Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface, Private Interface Methods.

UNIT-IV

Packages: Packages, Packages and Member Access, Importing Packages.

Exceptions: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions.

TEXT BOOKS:

1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007

REFERENCES:

1. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
2. Mahesh Bhave and Sunil Patekar, "Programming with Java", 1st Edition, Pearson Education,2008.
3. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
4. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

ENGINEERING GRAPHICS AND DESIGN

Semester	II	Internal Assessment	30
Course code	UECTC20113	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	2:0:2	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. To describe engineering design and its requirements to people and society.
2. To discuss the visual aspects of engineering design.
3. To use engineering graphics standards.
4. To illustrate solid modeling.
5. To use computer-aided geometric design.
6. To design creating working drawings.
7. To learn to inspect engineering drawing communication.

UNIT-I

Introduction to Computer Aided Sketching: Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning, and free hand practicing. Introduction to standard tool bar/menus. Dimensioning conventions. etc. in open source software

UNIT-II

Orthographic Projections: Projections of points (1^{st}, 2^{nd}, 3^{rd} and 4^{th} angle projection), Projections of straight lines (First Angle Projection), True and apparent lengths.

UNIT-III

Orthographic Projections of Plane Surfaces: Projections of plane surfaces. (First Angle Projection), True and apparent lengths.

UNIT-IV

Orthographic Projections of solids: Projections of solids, Algebra, Basic to Universal gates, Half and full adder, Multiplexer, Decoder, SR and JK flip-flops, Shift register, 3 bit Ripple counter

TEXT BOOKS:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
2. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.
3. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer
4. Graphics for Design and Production- by Luzadder Warren J., Duff John M., Eastern Economy
5. Edition, 2005- Prentice Hall of India Pvt. Ltd., New Delhi.
6. Engineering Graphics by K.R. Gopalakrishna, 32^{nd} edition, 2005- Subash Publishers Bangalore.

REFERENCES:

1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
3. Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers. (Corresponding set of) CAD Software Theory and User Manuals.

UNIVERSAL HUMAN VALUES

Semester	II	Internal Assessment	10
Course code	UECTV20114	End Sem. Exam	15
Teaching Hours / Week (L:T:P)	1:0:0	Exam Duration (Hours)	1
Credits: 01			

COURSE OUTCOME

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

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings?
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

UNIT-I

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Happiness and Prosperity – Current Scenario, Harmony in the Nature/Existence.

UNIT-II

Being Ingenious & Fixing Problem: Harmony in the Human Being , Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Understanding Harmony in the Self, Programme to ensure self-regulation and Health, Implications of the Holistic Understanding.

BASIC ELECTICAL LAB

Semester	II	Internal Assessment	20
Course code	UECPC20115	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Identify the common electrical components and measuring instruments used for conducting
2. Calculate and Analyze power consumed and power factor of lamps.
3. Determine the impedance of an electric circuit and power consumed in a three-phase load.
4. Measure the earth resistance and understand the usage of Megger.
5. Understanding the difference between single phase and three phase systems.

LIST OF EXPERIMENTS

1. Understanding basic electrical components, tools, domestic wiring and meters.
2. Measurement of current,power, and power factor of incandescent lamp, Fluorescent lamp and LED lamp.
3. Measurement of resistance and inductance of a choke using 3 voltmeter method.
4. Verification of KCL and KVL for DC Circuit.
5. Study of effect of open and short circuit in simple circuit.
6. Two way and three-way control of lamp and formation of truth table.
7. Measurement of earth resistance and understanding the usage of megger.
8. Verification of Thevenin's and Norton's theorems.
9. Measurement of three phase power using two wattmeter method
10. Determination of phase and line quantities in three phase star and delta connected loads.
11. Demonstration of cut-out sections of machines.

TEXT BOOKS / REFERENCES:

1. Fitzgerald, D. E. Higginbotham, A. Grabel, Basic Electrical Engineering, 5th Edition, McGraw-Hill, 2009.
2. William H. Hayt Jr. , Jack E. Kemmerly, Steven M. Durbin, Engineering Circuit Analysis, 6th Edition,TMH, 2002
3. Olle I. Elgerd, Basic Electric Power Engineering, Addison-Wesley, 1977. Edward Hughes, Electrical Technology,7th Edition, Longman, 1995.
4. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
5. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010

WORKSHOP / MANUFACTURING PRACTICES

Semester	II	Internal Assessment	20
Course code	UECWC20116	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. To fabricate components with their own hands.
2. To relate practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. To design small devices of their interest by assembling different components Binary, Hexadecimal, Conversion – Decimal to binary, Hexagonal to decimal and vice-versa, Boolean

LIST OF EXPERIMENTS

Fitting, soldering, welding and cutting, casting, 3D printing, electrical wiring, raspberry pi and Arduino etc.

1. Soldering of different components
2. Fitting of different composnets
3. Electical wiring
4. Sheet metal cutting and Joining
5. 3D Modelling of a single component
6. Assembly of CAD modelled Components
7. 3D Priting of modeled components
8. Inspection and defect analysis of the additively manufactured product.
9. Comparison of Additively manufactured product with conventional manufactured counterpart.
10. Casting (Demostration)
11. Welding shop (Arc welding + Gas welding). (Demostration)
12. Raspberry pi and adrino etc. (Demostration)

TEXT BOOKS / REFERENCES:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,” Manufacturing Technology – I” Pearson Education, 2008.
4. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
5. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw Hill House, 2017

COURSE ASSESSMENT

A. Theory (4 credits) (100 marks)

1. **Continuous Assessment: (40 Marks)**
   Internal Assessment for 30 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (60 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Theory (3 credits) (75 marks)

1. **Continuous Assessment: (30 Marks)**
   Internal Assessment for 20 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (45 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

C. Theory (1 credits) (25 marks)

1. **Continuous Assessment: (10 Marks)**
   Internal Assessment for 5 marks.
   The remaining 5 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (15 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

D. Laboratory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 20 marks.
2. **End Semester Examination (30 Marks)**
   An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –II ----------

ANALOG CIRCUITS

Semester	III	Internal Assessment	30
Course code	UECTC30201	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Describe the operation and Biasing of BJT
2. Design and explain the AC Analysis of BJT.
3. Describe the general operating principles Op Amps and Applications.
4. Explain the different Power Amplifiers and Applications.

UNIT-I

DC Biasing – BJTs: Introduction, Operating point, Fixed-Bias configuration, Emitter-Bias configuration, Voltage-divider Bias configuration, Collector feedback configuration, Emitter-follower configuration, Common-Base configuration, Current mirrors, Current source circuits.

UNIT-II

BJT AC Analysis: Introduction, Amplification in the AC domain, BJT Transistor modeling, the re transistor model, Common emitter fixed Bias configuration, Voltage divider bias configuration, Emitter follower configuration. Darlington connection.

The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit- Fixed bias, Voltage divider, Emitter follower configurations; Complete Hybrid equivalent model.

UNIT-III

Operational Amplifiers: The Ideal Op Amp, The Inverting configuration, The non-Inverting configuration, Difference Amplifiers, Integrators and Differentiators, DC Imperfections, Effect of Finite Open-Loop Gain and Bandwidth on Circuit Performance, Large-Signal Operation of Op Amps.

Power Amplifiers: Class A Amplifiers, Class B Amplifiers. Class C Amplifiers.

TEXT BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, Electronics Devices and Circuit Theory, Pearson, 11th Edition,
2. Adel S Sedra and Kenneth C. Smith, Microelectronic Circuits, New York, Oxfered University Press, 7th Edition

REFERENCES:

1. J. Millman and A. Grabel, Microelectronics, McGraw Hill Education, 1988.
2. Alan S Morris, Measurement and Instrumentation Principles, Butterworth-Heinemann, 2001.

DIGITAL SYSTEM DESIGN

Semester	III	Internal Assessment	30
Course code	UECTC30202	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand various number systems and their conversion techniques.
2. Analyze the logics gates and design of digital ICs using these basic gates.
3. Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.
4. Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.
5. Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

UNIT-I

Fundamentals of Digital Systems and Logic Families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs.

UNIT-II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III

Sequential Circuits & Systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flipflops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator.

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit.

TEXT BOOKS:

1. R. P. Jain, Modern Digital Electronics, Mc-Graw Hill Education, 2009.
2. M. M. Mano, Digital Logic and Computer Design, Pearson Education India, 2016.

REFERENCES:

1. Anand Kumar, Fundamentals of Digital Circuits, Pearson Education India, 2016.
2. Digital Fundamentals, Williom Floyd, 11th Edition, Pearson Education India, 2015.

SIGNALS AND SYSTEMS

Semester	III	Internal Assessment	30
Course code	UECTC30203	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand the mathematical description and representation of continuous-time and discrete-time signals.
2. Analyze the spectral characteristics of continuous-time periodic and aperiodic signals using Fourier analysis.
3. Convert a continuous-time signal into a discrete time signal and reconstruct the continuous time signals back from its samples.
4. Understand the process of sampling to convert an analog signal into a discrete signal and apply the Z-Transform of continuous-time and discrete-time signals for stability analysis.

UNIT-I

Signals and Systems: Continuous Time and Discrete Time signals, Exponential and Sinusoidal Signals, Unit Impulse and Unit Step Functions, Basic System Properties.

Linear Time Invariant Systems: Discrete Time LTI Systems, Continuous-Time LTI Systems, properties of LTI Systems.

UNIT-II

Fourier Series Representation of Periodic Signals: Response of LTI systems to Complex Exponentials, Fourier series Representation of CT periodic signals, properties of CT Fourier Series.

Continuous Time Fourier Transform: Representation of periodic signals by continuous FT, FT of periodic signals, Laplace Transforms.

UNIT-III

Time and Frequency Characterization of Signals and Systems: Magnitude and phase representation of FT, Magnitude and phase response of LTI systems, Time domain and Frequency domain aspects of ideal and non-ideal filters.

Discrete Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT): Properties of DTFT and DFT, convolution property, multiplication property, Duality, Systems characterized by Linear Constant Coefficient Difference Equations.

TEXT BOOKS:

1. Signals and Systems: AV Oppenheim, AS Willsky, S Hamid Nawab, PHI, 2nd edition, 2000.
2. Signals and Linear Systems: Robert A. Gable, Richard A. Roberts, John Wiley, 3rd edition,1995.

REFERENCES:

1. S.Haykin and B.VanVeen “Signals and Systems, Wiley, 1998.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3. John Alan Stuller, ―An Introduction to Signals and Systems, Thomson, 2007.

NETWORK THEORY

Semester	III	Internal Assessment	30
Course code	UECTC30204	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Analyze the circuit using Kirchhoff's law and Network simplification theorems
2. Infer and evaluate Transient response and Steady state response of a network
3. Analyze electrical networks in the Laplace domain and understand concept of network functions and stability.
4. Compute the parameters of a two-port network.

UNIT-I

Basic Concepts: Node and Mesh Analysis: Kirchoff's laws, Node and mesh equations, Matrix approach of complicated network containing voltage and current sources, and reactances, source transformation and duality.

UNIT-II

Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits.

Laplace Transform and its Properties: Partial fraction, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT-III

Two port network and interconnections: Behaviors of series and parallel resonant circuits.Transient behavior, concept of complex frequency, Driving points and transfer functions, Poles and zeros of immittance function, their properties.

Two Port Network Parameters: Definition of Z, Y, h (hybrid) and T (transmission) parameters, modeling with these parameters, relationship between parameters sets.

TEXT BOOKS / REFERENCES:

1. M. E. Van Valkenberg, Network Analysis, Prentice Hall of India, 3rd Edition, 2000.
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata Mcgraw-Hill New Delhi, 1994.
3. William Hayt, J. E. Kemmerly, J. D. Philips and S. M. Durbin, Engineering Circuit Analysis, Mc-Graw Hill 9th Edition, 2020

PROGRAMMING WITH PYTHON

Semester	III	Internal Assessment	30
Course code	UECCC30205	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	2:0:2	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Describe the core syntax and semantics of Python programming language.
2. Work with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Understand the usage of packages and Dictionaries.
5. Design GUI applications.

UNIT-I

Introduction to Python: Need of Python Programming, Advantages and Applications.
Basics of Python: Python Variables, local and global variables, keywords and strings.

UNIT-II

Operators and Expressions: Arithmetic, Relational, Logical and Bitwise Operators, Membership and Identity Operators. Expressions and order of evaluations.
Control Flow: if, if-elif-else, for, while, break, continue, pass
Data Structures: Data types, Lists, Tuples, Sets and Dictionaries.

UNIT-III

Functions: Defining Functions, Calling and Passing Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Scope of the Variables - Global and Local Variables.
Modules: Well-known modules, creating modules, import modules.
GUI Programming: Introduction to Tkinter and Python Programming. Simple GUI building.

TEXT BOOKS:

1. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt. Ltd. ISBN-13: 978-8126556014
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011. ISBN-13: 978- 9350232873
3. Reema Thareja, "Python Programming using problem solving approach", Oxford university press, 2017

INDIAN KNOWLEDGE SYSTEM -IV

Semester	III	Internal Assessment	20
Course code	UECTV30206	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	2:0:0	Exam Duration (Hours)	1.5
Credits: 02			

COURSE OUTCOME

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

1. To familiarize learners with major sequential development in Indian science, engineering and technology.
2. To review & strengthen the ancient discovery and research in physics, chemistry, maths, metallurgy, astronomy, architecture, textile, transport, agriculture and Ayurveda etc.
3. To help students to trace, identify and develop the ancient knowledge systems to make meaningful contribution to development of science today
4. To help to understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the scientific, technological and holistic development of physical, mental and spiritual wellbeing

UNIT-I

Indian Traditional Knowledge; Science and Practices: Introduction to the Science and way of doing science and research in India, Ancient Science in Intra & Inter Culture Dialogue & coevolution. Traditional agricultural practices, Traditional water-harvesting practices, Traditional

Livestock and veterinary Sciences Traditional Houses & villages, Traditional Forecasting, Traditional Ayurveda & plant based medicine, Traditional writing Technology.

UNIT-II

Ancient Indian Science (Physics, Chemistry, and Maths):

Physics in India: Vaisheshika darshan Atomic theory & law of motion, theory of panchmahabhoota, Brihath Shathaka (divisions of the time, unit of distance), bhaskarachaya (theory of gravity, surya siddhanta & sidhanta shriomani), Lilavati (gurutvakashan Shakti).

Chemistry in India: Vatsyayana, Nagarjuna,Khanda, Al-Biruni, Vagbhaṭa –building of the ras-shala (laboratory), working arrangements of ras-shala, material and equipment, Yaśodhara Bhaṭṭa-process of distillation, apparatus, saranasamskara, saranataila

Mathematics in India: Baudhayana's Sulbasutras, Aryabhaṭa, Bhaskaracharya-I, Severus Sebokht, Syria, Brahmagupta, Bhaskaracharya-II, Jyeṣṭhadeva

TEXT BOOKS / REFERENCES:

1. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
2. Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.
3. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
4. SK Das, The education system of Ancient hindus, Gyan publication house, India
5. R P Kulkarni, Glimpese of Indian Engineering and Technology (Ancient & Medieval period, Munshiram Manoharlal Publishers Pvt. Ltd. 2018
6. AK Pathak, Science and Technology in India, Anshika prakashan pratapgarh, 2016
7. PB Sharma, S. Narain, Doctors Scientists and Engineers of Ancient India, Kalpaz Publications 2017
8. NVP, Unithiri, Indian Scientific Traditions (Professor K.N. Neelakantan Elayath Felicitation Volume), publication division unieristy of Calicut, 2006
9. Anonyms, History of Science in India- Volume-I Part-I (Physics, Mathematics and Statistics), the national academy of science, India & the ramkrishna mission institute of culture, 2014
10. R N Basu, T K Bose, CS, Cakraborty History of Science in India - Agricultural Science (Volume V), the national academy of science, India & the ramkrishna mission institute of culture 2014
11. A Gosh, History of Science in India (Volume-I Part-II Astronomy), the national academy of science, India & the ramkrishna mission institute of culture, 2014

ANALOG ELECTRONICS LAB

Semester	III	Internal Assessment	20
Course code	UECPC30207	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Recognize and demonstrate functioning of semiconductor devices.
2. Evaluate the characteristics, switching, and power conversion by semiconductor devices.
3. Analyze the response and plot the characteristics of Transducers such as LDR, Photodiode etc.
4. Design analog circuits using OPAMPs for different applications.
5. Analyse analog circuits that uses ICs for different electronic applications.

LIST OF EXPERIMENTS

1. Conduct experiment to test diode clipping (Single / double ended) and clamping circuits (positive / negative).
2. Half-wave rectifier and Full-wave rectifier with and without filter and measure the ripple factor.
3. Design a Zener voltage regulator and determine line and load regulation.
4. Characteristics of LDR and Photo diode.
5. Design Adder, Integrator, and Differentiator circuits using Op-Amp.
6. Design a Schmitt trigger for the given UTP and LTP values and obtain the hysteresis.
7. Design a 4-bit R – 2R OPAMP Digital to Analog converter using 4-bit binary input.
8. Design Monostable and Astable multivibrator using 555 Timer.

TEXT BOOKS / REFERENCES:

1. David A. Bell, - Fundamentals of Electronic Devices and circuits Lab. Manual, 5th Edition, 2009, Oxford University Press.
2. Adel S Sedra, Kenneth S Smith, - Microelectronics Circuits, Theory and Applications, 6th Edition, Oxford, 2015

DIGITAL SYSTEM DESIGN LAB

Semester	III	Internal Assessment	20
Course code	UECPC30208	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Design, Realize and verify DeMorgan's Theorem, SOP, POS forms
2. Demonstrate the truth table of various expressions and combinational circuits using logic gates.
3. Design various combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.
4. Construct Flip-Flops and Counters.
5. Construct Shift Registers

LIST OF EXPERIMENTS

1. Verify i) DeMorgan's Theorem for 2 variables ii) The sum-of-product and product-of- sum expressions using universal gates.

2. Design and implement i) Half-adder and Full-adder using a) Basic gates b) NAND Gates ii) Half-substractor and Full-substractor using a) Basic gates and NAND gates.

3. Design and implementation of i) 1 bit comparator ii) 5-bit magnitude comparator using IC 7485. Ii) BCD to excess conversion and vice-versa.

4. Design and implement i) 4-bit parallel adder / subtractor using IC 7483.

5. Realize i) Adder and subtractor using IC 74153 ii) 4 Variable function using IC 74151 (8:1MUX)

6. Realize i) Adder and Subtractor using IC 74139 ii) Binary to Gray code conversion and vice-versa using 74139.

7. Realize the following flip-flops using NAND gates: Master-Slave J K, D and T Flip- Flops

8. Realize the following shift registers using IC 7474 / 7495: i) Ring ii) Johnson counter.

9. Realize i) Design Mod-N Synchronous Up counter and Down counter using 7476 JK Flip-Flop ii) Mod-N counter using IC 7490 / 7476.

10. Design Pseudo Random Sequence generator using 7495.

TEXT BOOKS:

1. D. P Kothari and J.S. Dhillon, - Digital circuits and Design, Pearson, 2016

REFERENCES:

1. Morris Mono, -. Digital Design, Prentice Hall of India, 3rd Edition

COURSE ASSESSMENT

A. Theory (3 credits) (75 marks)

1. **Continuous Assessment: (30 Marks)**
   Internal Assessment for 20 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (45 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Theory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 10 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (30 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

C. Laboratory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 20 marks.
2. **End Semester Examination (30 Marks)**
   An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –III ----------

MICROPROCESSORS AND MICROCONTROLLERS

Semester	IV	Internal Assessment	30
Course code	UECTC40209	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Develop a clear understanding of microprocessor, machine and assembly language.
2. Describe the architecture and functional block of 8085/8086 microprocessors.
3. Describe the architecture details of 8051 and Atmega328 microcontroller.
4. Develop an application using 8051 for the given specification.

UNIT-I

Introduction to Microprocessors: Definition, Need and evolution of microprocessors. Instruction Set Architecture of a CPU

Core of programming: Concept of machine language and assembly language. Building our own machine and assembly language.

UNIT-II

Intel 8085: Features, Architecture, Pin diagram, Memory, Instruction set, and Addressing modes, Assembly Language Programming of 8085.

UNIT-III

Intel 8051: Features, Architecture, Pin diagram, Ports, Internal memory, Instruction set, and addressing modes. Interrupts, Timers and Counters. Assembly Language Programming of 8051.

AVR Microcontrollers: Introduction to AVR, Atmega328 Architecture, Registers, Ports and DDR register and control operations.

TEXT BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition, Penram International Publishing.
2. D. V. Hall, Microprocessors and Interfacing. TMGH, 2nd Edition 2006.
3. Kenneth.J.Ayala. The 8051 microcontroller, 3rd Edition, Cengage learning,2010
4. Advanced microprocessors and peripherals-A. K ray and K.M.Bhurchandani, TMH, 2nd Edition 2006.

REFERENCES:

1. Muhammad Ali Mazidi , Janice Gillispie Mazidi and Rolin D McKinlay, The 8051 microcontroller and embedded systems using assembly and C, second edition Pearson education Asia
2. Mohamed Rafiquzzaman, Microprocessor & Microcomputer based system design, 2nd Edition, CRC press.
3. Danny Causey, Muhammad Ali Mazidi, and Rolin D. McKinlay, PIC Microcontroller and Embedded SystemsUsing Assembly and. C for PIC18. Pearson 2008.

ELECTRONIC DEVICES

Semester	IV	Internal Assessment	30
Course code	UECTC40210	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Describe the operation working principle of JFET.
2. Describe and explain the construction of MOSFET.
3. Describe the general operating Feedback and oscillators.
4. Explain the different MOSFET amplifiers and Applications.

UNIT-I

Field Effect Transistors: Construction and Characteristics of JFET, Transfer Characteristics, P-Channel FETs.

FET Biasing: Fixed Bias configuration, Self-Bias configuration, Voltage-Divider Biasing, Common- Gate configuration.

UNIT-II

MOS Field-Effect Transistors (MOSFETs): Device Structure, Operation with Zero Gate Voltage, Creating a Channel for Current Flow, Applying a Small V_{DS}, Operation as V_{DS} is Increased, Operation for $V_{DS} \geq V_{OV}$: Channel Pinch-Off and Current Saturation, The p-Channel MOSFET, Complementary MOS or CMOS, Current–Voltage Characteristics - The i_D–v_{DS} Characteristics, The i_D–v_{GS} Characteristic.

UNIT-III

Feedback and Oscillator Circuits: Feedback concepts, Feedback connection types, Practical feedback circuits.

Feedback Amplifier: Phase and frequency considerations, Oscillator operation, Phase shift oscillator, Wein Bridge oscillator, Tuned oscillator, Crystal oscillator.

TEXT BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, Electronics Devices and Circuit Theory, Pearson, 11th Edition.
2. Adel S Sedra and Kenneth C. Smith, Microelectronic Circuits, New York, Oxford University Press, 7th Edition.

REFERENCES:

1. J. Millman and A. Grabel, Microelectronics, McGraw Hill Education, 1988.
2. Alan S Morris, Measurement and Instrumentation Principles, Butterworth-Heinemann, 2001.

ANALOG COMMUNICATION

Semester	IV	Internal Assessment	30
Course code	UECTC40211	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand performance of analog modulation schemes in time and frequency domains.
2. Apply basics of AM to analyze AM-DSB, SSB, and VSB systems.
3. Determine the performance of systems for generation/detection of AM and FM signals.
4. Characterize various types of noises and analysis of random variables and processes.
5. Determine the performance of AM and FM system in the presence of noise.

UNIT-I

Amplitude Modulation: Introduction AM, Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector.

Double Side Band Suppressed Carrier Modulation (DSBSC): Time and Frequency Domain description, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves.

Single Side-Band Modulation (SSB): Quadrature carrier multiplexing, Hilbert Transform and Properties, Single side-band modulation, Frequency and Time Domain description of SSB wave, Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB waves, Radio broadcasting, AM radio.

UNIT-II

Angle Modulation: Angle Modulation: Basic definitions, FM, narrow band FM, wide band FM, transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM. Demodulation of FM waves, Phase-locked loop, Nonlinear model of the phase – locked loop, Linear model of the phase – locked loop.

Random Variables, Processes: Random variables, Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions.

UNIT-III

Noise: Introduction, shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise Figure, Equivalent noise temperature, cascade connection of two-port networks.

Noise in Analog Modulation: Introduction, Receiver model, Noise in DSBSC receivers, Noise in SSB receivers, Noise in AM receivers, Threshold effect. Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM.

TEXT BOOKS:

1. Simon Haykins & Moher, Communication Systems, 5th Edition, John Willey, India Pvt. Ltd, 2010.
2. Simon Haykins & Moher, An Introduction to Analog and Digital Communication, John Wiley India Pvt. Ltd., 2012.

REFERENCES:

1. H. Taub, D. Schilling and G. Saha, Principles of Communications, Mc-Graw Hill India, 2017.
2. B. P. Lathi, Modern digital and Analog Communication systems Oxford University Press., 4th Edition, 2010.

CONTROL SYSTEMS

Semester	IV	Internal Assessment	30
Course code	UECTC40212	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Develop the mathematical model of Mechanical and Electrical systems.
2. Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method.
3. Determine the time domain specifications for first and second order systems.
4. Determine the stability of a system in the time domain using the Routh-Hurwitz criterion.
5. Determine the stability of a system in the frequency domain using Nyquist and Bode plots.

UNIT-I

Introduction: Types of control system, Effect of feedback system, Differential equation of physical systems-Mechanical systems, Electrical systems, electromechanical systems, Analogous systems

UNIT-II

Block diagrams and Signal flow graphs: Transfer functions, Block diagram algebra, and signal flow graphs.

Time Response of Feedback Control Systems: Standard test signals, Unit step response of First and second order systems.

Time response specifications: Time response specifications of second order systems, steady state errors and error constants, Introduction to PI, PD and PID controllers.

UNIT-III

Stability Analysis: Concept of stability, necessary conditions for stability, Routh stability criterion, Introduction to Root-Locus Techniques, the root locus concepts, construction of rootloci.

Frequency domain analysis and Stability: Correlation between time and frequency response, Bode plots, Experimental determination of transfer function. Introduction to lead, lag and leadlag compensating network.

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TEXT BOOKS:

1. J. Nagarath and M. Gopal, - Control System Engineering, New Age International (P) Limited, Publishers, 5th Edition – 2005, ISBN: 81-224-2008-7.

REFERENCES:

1. Benjamin, C. Kuo -Automatic Control Systems, John Wily India PVT. Ltd., 8th Edition, 2008.
2. K. Ogata, - Modern Control Engineering, Pearson Education Asia / PHI, 4th Edition, 2002.

ELECTROMAGNETIC WAVES

Semester	IV	Internal Assessment	30
Course code	UECTC40213	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Define, understand and explain concepts on electrostatics and apply the same to solve numerical problems on various configurations of distribution of electric charges.
2. Explain and apply various laws involved in electrostatics and magnetostatics.
3. Summarize and solve Maxwell equations for time-varying electric and magnetic fields.
4. Explain and analyze EM wave propagation and understand the power flow mechanism in an unbounded media.

UNIT-I

Introduction to Static Electric Fields - I: Review of Vector analysis, Co-ordinate systems and transformations, Coulomb's law, Electric Field Intensity (EFI), EFI due to various charge configurations (line charge, surface charge and volume charge), Electric Flux Density (EFD),Gauss' Law & its applications, Gauss's Law in Point form, Divergence Theorem.

UNIT-II

Introduction to Static Electric Fields - II: Energy spent in moving charge, Definition of Potential Difference and Potential, Potential field due to Point Charge and System of Charge, Potential gradient, Energy Density, Boundary conditions of static electric field at the interface of materials, Laplace and Poisson's equations.

UNIT-III

Introduction to Static Magnetic Fields: Biot-Savart's Law, Ampere's circuital law, Stokes Theorem, Magnetic Flux, Flux Density, Scalar and Vector Magnetic Potentials Magnetic forces, Force on a moving charge

Time Varying Fields and Maxwell's Equations: Faraday's Law, Continuity equation for time varying field, Displacement Current, Maxwell's correction to Ampere's Circuit Law, Summary of Maxwell's Equations in Point, Integral and Harmonic form.

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TEXT BOOKS:

1. Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford University Press, 6th Edition, 2014 and onwards.
2. William H.Hayt Jr. and John A. Buck, "Engineering Electromagnetics", Mc.Graw-Hill Education, 2nd Edition, 2014 and onwards.
3. A. R. Harish and M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press, 2007 and onwards.

REFERENCES:

1. David K. Cheng, "Field and Wave Electromagnetics", Pearson Education Asia, 2nd Edition, 1989 and onwards.
2. V. V. Sarwate, "Electromagnetic Fields and Waves", Wiley Eastern Limited, 1st Edition, 1993 and onwards.
3. Joseph A. Edminister, "Theory and Problems on Electromagnetics", Schaum's outline series,Mc.Graw-Hill, 2nd Edition, 1993 and onwards.

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Semester	IV	Internal Assessment	20
Course code	UECTV40214	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	2:0:0	Exam Duration (Hours)	1.5
Credits: 02			

UNIT-I

Introduction and Basic Information about Indian Constitution: Introduction to the Indian constitution, The making of the Constitution, The Role of the Constituent Assembly – Nature of the Indian constitution, Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations.

Union Executive and State Executive: Parliamentary System, Centre-State Relations, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Supreme Court of India, Judicial Reviews and Judicial Activism, State Executives – Governor , Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts.

UNIT-II

Amendments and Emergency Provisions: Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Emergency Provisions, types of Emergencies, and their consequences.

Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India) : Profession, Professionalism, Professional Responsibility. Clash of Ethics, Conflicts of Interest.

TEXT BOOKS / REFERENCES:

1. Alan Gledhill, "The Republic of India: The Development of Its Laws and Constitution", Greenwood, 2013.
2. Durga Das Basu, "Introduction to the Constitution of India", S.C. Sarkar, 2008.
3. Vijaya Narain Shukla, Mahendra Pal Singh, "Constitution of India", Eastern Book Company, 2001
4. Sudhir Krishnaswamy, "Democracy and Constitutionalism in India: A Study of the Basic Structure Doctrine", OUP India, 2010.
5. Joginder Singh Khatra, "Constitutional Amendments in The Indian Constitution: A Horizontal Approach", K.K. Publications, 2021.

MICROPROCESSORS AND MICROCONTROLLERS LAB

Semester	IV	Internal Assessment	20
Course code	UECPC40215	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Implement assembly language programs for 8085.
2. Implement assembly language programs for 8051.
3. Implement subroutines in assembly language for 8085.
4. Implement subroutines in assembly language for 8051.
5. Interfacing and testing IO devices with 8051.

LIST OF EXPERIMENTS

A. 8085 Assembly programming:

1. Basic Arithmetic and Logical operations
2. Various addressing modes
3. Data movements programs
4. Sorting / Searching
5. Subroutines

B. 8051 Assembly programming

1. Basic Arithmetic and Logical operations
2. Various addressing modes
3. Data movements programs
4. Sorting / Searching
5. Subroutines

TEXT BOOKS / REFERENCES:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 6th Edition, Penram International Publishing.
2. D. V. Hall, Microprocessors and Interfacing. TMGH, 2nd Edition 2006.
3. Kenneth.J.Ayala. The 8051 microcontroller, 3rd Edition, Cengage learning,2010
4. Muhammad Ali Mazidi , Janice Gillispie Mazidi and Rolin D McKinlay, The 8051 microcontroller and embedded systems using assembly and C, 2nd edition Pearson education Asia

ANALOG COMMUNICATION LAB

Semester	IV	Internal Assessment	20
Course code	UECPC40216	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Design AM modulation and demodulation.
2. Apply basics of AM to design AM-DSB, and SSB systems.
3. Design FM modulation and demodulation.
4. Analyze Pre emphasis and de-emphasis systems.
5. Understand the working of PLL.

LIST OF EXPERIMENTS

1. Amplitude modulation using transistor/FET (Generation and detection).
2. Amplitude demodulation diode/envelop detector.
3. Frequency modulation using IC 8038/2206
4. Frequency demodulation.
5. Pre emphasis and de-emphasis
6. DSBSC generation using Balance Modulator IC 1496/1596.
7. SSB Modulation and demodulation.
8. Frequency synthesis using PLL.

TEXT BOOKS:

1. Simon Haykins & Moher, Communication Systems, 5th Edition, John Willey, India Pvt. Ltd, 2010.
2. Simon Haykins & Moher, An Introduction to Analog and Digital Communication, John Wiley India Pvt. Ltd., 2012.

REFERENCES:

1. H. Taub, D. Schilling and G. Saha, Principles of Communications, Mc-Graw Hill India, 2017.
2. B. P. Lathi, Modern digital and Analog Communication systems Oxford University Press., 4th Edition, 2010.

COURSE ASSESSMENT

A. Theory (3 credits) (75 marks)

1. **Continuous Assessment: (30 Marks)**
   Internal Assessment for 20 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (45 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Theory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 10 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (30 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

C. Laboratory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 20 marks.
2. **End Semester Examination (30 Marks)**
   An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –IV ----------

DIGITAL SIGNAL PROCESSING

Semester	V	Internal Assessment	30
Course code	UECTC50301	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. To describe signals mathematically and understand how to perform mathematical operations on signals.
2. To compute the DFT of signals and implement efficient algorithms like the FFT for faster computation.
3. To design digital FIR and IIR filters using appropriate techniques and evaluate their frequency response.

UNIT-I

Basic elements of digital signal processing: Concept of frequency in continuous time and discrete time signals, Sampling theorem, discrete time systems, Analysis of linear time-invariant systems, Convolution and correlation, Z transform.

UNIT-II

Discrete and Fast Fourier Transforms: Efficient computation of DFT, Properties of DFT, Discrete convolution, Discrete Time Fourier Transform (DTFT), Fast Fourier Transform (FFT), Composite-radix FFT, Fast convolution, correlation.

UNIT-III

Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) Design: Design of FIR filters: Windowing techniques (Rectangular, Hamming, Hanning), Frequency response of FIR filters, Design of IIR filters: Impulse Invariant and Bilinear Transform methods, Analog filter approximations: Butterworth and Chebyshev.

TEXT BOOKS:

1. Digital Signal Processing: Proakis J G and Manolakis D G, , Pearson Education India
2. Discrete Time Signal Processing: AV Oppenheim, AS Willsky, S Hamid Nawab, PHI, 2nd edition, 1989.
3. Digital Signal Processing: S Salivahanan, A. Vallavaraj, C Gnanapriya. Tata McGraw Hill.

REFERENCES:

1. Oppenheim A V, Willsky A S and Young I T, “Signal & Systems”, Prentice Hall, (1983).
2. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.
3. DeFatta D J, Lucas J G and Hodgkiss W S, “Digital Signal Processing”, J Wiley and Sons, Singapore, 1988
4. Sanjit K Mitra “Digital Signal Processing” TMH

DIGITAL COMMUNICATION AND COMPUTER NETWORKS

Semester	V	Internal Assessment	30
Course code	UECTC50302	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Apply the concepts of Bandpass sampling to well specified signals and channels.
2. Analyze and compute performance parameters and transfer rates for low pass and bandpass symbol under ideal and corrupted non band limited channels.
3. Identify the protocols and services of different layers.

UNIT-I

Conversion of Analog waveforms into Coded Pulses

Introduction, Sampling Theory, Pulse-Amplitude Modulation, Quantization and its Statistical Characterization, Pulse-Code Modulation, Noise Considerations in PCM Systems, Differential Pulse-Code Modulation, Delta Modulation, Line Codes. Introduction, Geometric Representation of Signals, Conversion of the Continuous AWGN Channel into a Vector Channel.

UNIT-II

Signaling over AWGN Channels

Optimum Receivers Using Coherent Detection, Phase-Shift Keying Techniques Using Coherent Detection, M-ary Quadrature Amplitude Modulation, Frequency-Shift Keying Techniques Using Coherent Detection.

Signaling over Band-limited channels

Introduction, Error Rate Due to Channel Noise in a Matched-Filter Receiver, Intersymbol Interference, Ideal Nyquist Pulse for Distortionless Baseband Data Transmission, Raised-Cosine Spectrum, Square-Root Raised-Cosine Spectrum, The Eye Pattern.

UNIT-III

Data communication

Components, Data representation, Data flow, Networks: Network criteria, Physical Structures, Network types: LAN, WAN, Switching, The Internet, Network Models, Protocol Layering, Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite, Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP.

TEXT BOOKS:

1. Simon Haykin - Digital Communication Systems, Willy Publisher 2014 ISBN: 978-0-471-64735-5.
2. Forouzan, "Data Communications and Networking" , 5th Edition, McGraw Hill, 2013, ISBN: 1-25 906475-3.
3. K Sam Shanmugam, "Digital and analog communication systems", John Wiley India Pvt. Ltd, 1996.
4. Hari Bhat, Ganesh Rao, "Information Theory and Coding", Cengage, 2017.
5. Todd K Moon, "Error Correction Coding", Wiley Std. Edition, 2006.

REFERENCES:

1. H. Taub, D. Schilling and G. Saha, Principles of Communications, Mc-Graw Hill India, 2017.
2. James J Kurose, Keith W Ross, Computer Networks, , Pearson Education.
3. John G Proakis and Masoud Salehi, "Fundamentals of Communication Systems", 2014 Edition, Pearson Education, ISBN 978-8-131-70573-5.

EMBEDDED SYSTEMS

Semester	V	Internal Assessment	30
Course code	UECTC50303	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Evaluate the requirements of programming Embedded Systems.
2. Students can develop the hardware for embedded system application based on the processors.
3. Students can choose appropriate microcontroller for the design specification with reference to a real world problem.
4. Incorporate suitable microcontroller along with appropriate interfacing circuits and implement the same for an application with software programs.
5. Apply advanced level knowledge, techniques, skills and modern tools in the field of microcontroller and embedded system

UNIT-I

Introduction: Definition, Classification and Application of Embedded Systems. Purpose and Characteristics of Embedded Systems.

Core of Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Microcontrollers, Commercial Off-The-Shelf Components (COTS).

UNIT-II

Embedded Hardware

Intel MCS: Features of 8051, Architecture, Pin diagram, Internal Memory, Addressing modes and Programming 8051.

AVR: Introduction to AVR, Architecture, Pin Configuration, Registers, Ports, DDR registers and control operations, Programming AVR.

UNIT-III

Embedded Software:

Embedded C: Introduction, Features and Advantages of "C". Difference between normal and Embedded "C". Storage classes, Structures, Unions, Functions, Command-line arguments,

Embedded System Design: Challenges and Issues in embedded software development, Embedded System life cycle.

Embedded System case studies.

TEXT BOOKS / REFERENCES:

1. Shibu K V, "Introduction to Embedded Systems", TMH Education Private Limited, 2009.
2. Rajkamal, "Embedded Systems- Architecture, Programming & Design", TMH, 2007.
3. Santanu Chattopadhyay, "Embedded System Design", 3rd Edition, PHI Learning Pvt. Ltd, 2023.
4. Kenneth Ayala, "The 8051 Microcontroller", 3e, Cengage, 2007.
5. Alan Trevennor, "Practical AVR Microcontrollers", 1st Edition, 2012, APres.
6. Brian W. Kernighan, Dennis M. Ritchie, "The C programming language", Prentice Hall.

INFORMATION THEORY AND CODING

Semester	V	Internal Assessment	30
Course code	UECTC50304	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Explain the concept of information and entropy
2. Apply Shannon's theorem to compute source codes.
3. Compute capacity of various information channels & the performance of Viterbi decoding technique

UNIT-I

Basics of Information Theory: Properties of Logarithm, Introduction to information, Measure of information, Information content of message, Entropy of long independent sequences, Entropy of long dependent sequences, Markov statistical model of information sources, Entropy and information rate of Markoff sources.

UNIT-II

Source Coding Techniques: Source coding theorem, Prefix codes, Kraft Mc-Millan Inequality property – KMI. Encoding techniques of discrete sources.

UNIT-III

Information Channels & Channel Coding Techniques: Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels. Channel Codes : Linear Block Codes, Binary cyclic codes, Golay codes, BCH Codes, Channel Codes (Convolution Codes): Time and Frequency domain approach, Code tree, Trellis and State diagram, The Veterbi algorithm. Introduction to Low Density Parity Check (LDPC) codes & Turbo codes.

TEXT BOOKS:

1. Information Theory and Coding, M. Kulkarni, K. S. Shivaprakasha, Wiley India Pvt. Ltd, 2015.
2. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
3. N. Abramson, Information and Coding, McGraw Hill, 1963.
4. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.

REFERENCES:

1. Shu Lin and D. J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
2. Digital communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

DIGITAL SIGNAL PROCESSING LAB

Semester	V	Internal Assessment	20
Course code	UECPC50308	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Generate and analyze discrete-time signals and systems.
2. Perform and interpret linear and circular convolution for discrete signals.
3. Compute the Discrete Fourier Transform (DFT) and implement Fast Fourier Transform (FFT) algorithms.
4. Design and implement FIR and IIR filters using MATLAB/Python.

LIST OF EXPERIMENTS

1. Generation of Discrete-Time Signals: Unit impulse, step, exponential, and sinusoidal signals.
2. Design Linear and Circular Convolution: Using time-domain methods and built-in functions.
3. Design Auto-correlation and Cross-correlation.
4. Analyse DFT and IDFT Computation: Using built-in functions and direct formula.
5. Design Fast Fourier Transform (FFT): Implement 4-point FFT and inverse FFT.
6. Analyse Frequency Response of FIR Filters: Using different windowing techniques (Hamming, Hanning, etc.).
7. Design an IIR filter: Butterworth or Chebyshev using bilinear transformation.
8. Implementation of Filters Using Difference Equation: FIR and IIR filters through difference equations.

TEXT BOOKS / REFERENCES:

1. Digital Signal Processing: Proakis J G and Manolakis D G, , Pearson Education India
2. Digital Signal Processing: S Salivahanan, A. Vallavaraj, C Gnanapriya. Tata McGraw Hill.

EMBEDDED SYSTEMS LAB

Semester	V	Internal Assessment	20
Course code	UECPC50309	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Storage classes, Files handling, Command line arguments, and Structures in "C".
2. Interfacing and testing various interface various IO devices with 8051.
3. Interfacing and testing various interface various IO devices with AVR / Arduino

LIST OF EXPERIMENTS

A) "C" programming on Linux / Windows:

1. Experiments on storage classes
2. Basic calculator using command line
3. File copy programming using command line
4. Database maintain (Students or Books)

B) Embedded Programming with 8051:

1. Interfacing LED
2. Binary UP/DOWN Counter
3. Interfacing SSD
4. Decimal UP/DOWN Counter using SSD
5. Interfacing Push Button and LED
6. Interfacing Buzzer and Relay

C) Embedded Programming with AVR / Arduino:

1. Interfacing LED
2. Binary UP/DOWN Counter
3. Interfacing SSD
4. Decimal UP/DOWN Counter using SSD
5. Interfacing Push Button and LED
6. Interfacing Buzzer and Relay

TEXT BOOKS / REFERENCES:

1. Kenneth Ayala, "The 8051 Microcontroller", 3e, Cengage, 2007.
2. Alan Trevennor, "Practical AVR Microcontrollers", 1st Edition, 2012, APres.
3. Brian W. Kernighan, Dennis M. Ritchie, "The C programming language", Prentice Hall.

DIGITAL COMMUNICATION LAB

Semester	V	Internal Assessment	20
Course code	UECPC50310	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Design of Sampling and Detection
2. Design of Time Division Multiplexing and and Demultiplexing.
3. ASK and FSK generation and detection.
4. PSK generation and detection
5. Simulate point to point network and Ethernet LAN using NS2/ NS3/ OPNET/ NCTUNS/ NetSim/QualNet or any other equivalent tool

LIST OF EXPERIMENTS

PART-A:

1. Pulse sampling, flat top sampling and reconstruction.\
2. Time Division Multiplexing and Demultiplexing of two bandlimited signals.
3. ASK generation and detection.
4. FSK generation and detection.
5. PSK generation and detection.

PART-B:

Simulation experiments using NS2/ NS3/ OPNET/ NCTUNS/ NetSim/QualNet or any other equivalent tool

1. Implement a point to point network with four nodes and duplex links between them. Analyze the network performance by setting the queue size and varying the bandwidth.
2. Implement a four node point to point network with links n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP.
3. Implement Ethernet LAN using n (6-10) nodes. Compare the throughput by changing the error rate and data rate.

TEXT BOOKS:

1. Simon Haykins & Moher, "Communication Systems", 5th Edition, John Willey, India Pvt. Ltd, 2010.
2. Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill, 2013, ISBN: 1-25- 906475-3.

REFERENCES:

1. H. Taub, D. Schilling and G. Saha, Principles of Communications, Mc-Graw Hill India, 2017.
2. James J Kurose, Keith W Ross, Computer Networks, , Pearson Education.

COURSE ASSESSMENT

A. Theory (3 credits) (75 marks)

3. **Continuous Assessment: (30 Marks)**
   Internal Assessment for 20 marks.
   The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
4. **End Semester Examination (45 Marks)**
   Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Laboratory (2 credits) (50 marks)

3. **Continuous Assessment: (20 Marks)**
   Internal Assessment for 20 marks.
4. **End Semester Examination (30 Marks)**
   An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –V ----------

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Semester	VI	Internal Assessment	30
Course code	UECTC60309	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand core concepts and algorithms in Artificial Intelligence and Machine Learning.
2. Develop practical skills in implementing ML models.
3. Analyze and evaluate the performance of various AI/ML techniques.

UNIT-I

Introduction to Artificial Intelligence: Definition and Scope of AI, History and Evolution of AI, Intelligent Agents and Rationality, differences between AI vs. ML vs. DL, Applications.

UNIT-II

Fundamentals of Machine Learning: Introduction to Machine Learning (ML) and its types, linear regression, Logistic regression, Neural Network representation, Perceptron, Feedforward Neural networks. Gradient descent and the back propagation algorithm, Multi-layer Perceptron.

UNIT-III

Advanced Topics in Machine Learning: Introduction to deep learning, Activation function, Optimization techniques, Cost functions, Regularization, Building blocks of a convolutional neural network (CNN), and Deep CNN models.

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, (Indian edition), 2013.
2. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (4th Edition), Pearson, 2020.
3. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, *Deep Learning*, MIT Press, 2016.

REFERENCES:

1. François Chollet, *Deep Learning with Python*, 2nd Edition, Manning, 2021.
2. Nils J. Nilsson, *the Quest for Artificial Intelligence*, Cambridge University Press, 2010.

VLSI Design

Semester	VI	Internal Assessment	30
Course code	UECTC60312	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand the concept of MOSFETs
2. Able to write the code using Verilog HDL
3. Illustrate the design of FPGA systems.

UNIT-I

Introduction to VLSI: CMOS Logic Combinational and sequential circuits, CMOS fabrication and layouts, Logic design, Circuit design, Physical design, Design verification, fabrication, packaging and testing.

MOSFETs: Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, MOSFET as an amplifier and as a switch, Biasing in MOS amplifier Circuits.

UNIT-II

Introduction to Verilog HDL: Verilog as HDL, Levels of Design Description, Top-down and Bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block, Verilog Data types and Operators.

Gate-Level Modeling: Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays.

UNIT-III

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

TEXT BOOKS / REFERENCES:

1. Douglas A. Pucknell & Kamran Eshraghian, Basic VLSI Design, PHI 3rd Edition.
2. Neil H.E. Weste, David Harris, Ayan Banerjee, CMOS VLSI Design- A Circuits and Systems Perspective-, 3rd Edition, Pearson Education.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, 2nd Edition.
4. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL" Pearson (Prentice Hall), 2nd Edition.
5. Padmanabhan, Tripura Sundari, "Design through Verilog HDL", Wiley, 2016.

DIGITAL IMAGE PROCESSING

Semester	VI	Internal Assessment	30
Course code	UECTC60313	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Implement basic image processing operations.
2. Apply and develop new techniques in the areas of image enhancement and restoration.
3. Understand the image segmentation algorithms.
4. Understand different compression techniques to compress video.

UNIT-I

Fundamentals of Image Processing: Introduction, applications of image processing, steps in image processing applications, digital imaging system, pixel connectivity.

Case Study: Study of image processing toolbox and basic image processing operations.

UNIT-II

Image Enhancement: Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Case Study: Understand enhancement techniques using Matlab.

UNIT-III

Image Restoration: Noise models, Restoration in the presence of noise only using spatial filtering and frequency domain filtering, linear, position invariant degradation, estimating the degradation function, inverse filtering, edge linking and boundary detection, thresholding.

TEXT BOOKS:

1. R. Gonzalez and E. Rechard, "Digital Image Processing", 4th Edition, Pearson Education, 2018.
2. A. K. Jain, "Fundamentals of Digital Image Processing", PHI, 2011.
3. Fred Halsall, "Multimedia Communications", Pearson education, 2001 ISBN - 9788131709948.

REFERENCES:

1. M. Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision.

ANTENNAS AND WAVE PROPAGATION: Program Elective 1

Semester	VI	Internal Assessment	30
Course code	UECTC60318	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Describe the basic working principle of an antenna.
2. Analyze a basic antenna using conventional techniques.
3. List, define & derive expressions for key parameters of dipole antennas.
4. List the different types of antennas and their typical applications.
5. Discuss the working principle and operation of smart, millimeter and fractal antenna.

UNIT-I

Fundamentals of an Antenna and Its Parameters: Introduction, Types of Antennas, Radiation Mechanism, Current Distribution Radiation Pattern, Field Regions, Radiation Power Density & Intensity, Directivity, Gain, Beam Width, Beam Efficiency, Bandwidth, Input Impedance, Polarization, Antenna Efficiency, Radiation Efficiency, Aperture Area, Maximum Directivity, Maximum Area, Antenna Temperature.

UNIT-II

Vector Potentials and Its Applications: Vector Potential A, Vector Potentials F, Solution for Vector Potentials, Far Field Radiation, Duality & Reciprocity Theorem. Infinitesimal Dipole: General Expression for E & H, Expression for E & H in other Regions, Directivity, Small Dipole: Expression for E & H, Directivity, Finite Length Dipole: Expression for E & H, Directivity, Half Wavelength Dipole, Expression for E & H, Directivity.

UNIT-III

Antenna array and wave propagation: Arrays: Two Element N- Element: Uniform Spacing/Amplitude, Derivation for Null & Other factors, Broadside & Ordinary End fire Array: Derivation for Null & Other factors, N-Element Array: Directivity, N- Element: Non-Uniform Amplitude, Concepts of Folded Dipole, Long wire, Rhombic Antenna, Traveling Wave Antenna, Microstrip Antennas: Rectangular Patch, Circular Patch, Quality Factor, Bandwidth, Efficiency, millimeter wave, Propagation of EM Waves, Propagation of EM Waves (Contd.), Space Wave, Troposphere, Ionosphere propagation, Effect of Radio waves.

TEXT BOOKS:

1. C. A. Balanis: Antenna Theory, 3rd Ed., John Wiley & Sons, New Delhi
2. F. E. Terman: Radio Engineering, TMH.

REFERENCES:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th Ed., 2010.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

DATA STRUCTURE AND ALGORITHMS: Program Elective 1

Semester	VI	Internal Assessment	30
Course code	UECTC60319	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

4. Explain the concept of Data structure.
5. Implement data structure operation.
6. Implement stacks, queue and Linked list.

UNIT-I

Introduction: Data Structures, Classifications, Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.

Array Operations: Traversing, inserting, deleting, searching, and sorting.

UNIT-II

Stacks: Definition, Operations, Array Representation of Stacks, Stacks using Dynamic Arrays.

Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays,

Stacks and Queues programming examples.

UNIT-III

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation;

Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists and Circular linked lists. Linked Stacks and Queues. Applications of Linked lists

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked
Representation of Binary Trees, Binary Tree Traversals,

TEXT BOOKS / REFRENCES:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
3. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning, 2014.
4. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
5. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013

ADVANCED WIRELESS COMMUNICATIONS: Program Elective 1

Semester	VI	Internal Assessment	30
Course code	UECTC60320	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Discuss various path loss models in wireless communication channels.
2. Develop mathematical models for time-varying fading channels.
3. Discuss the performance of different digital modulation schemes in a wireless communication scenario
4. Discuss the various features of 5G/6G networks and its protocols
5. Analyze the features of intelligent reflecting surface

UNIT-I

Fundamentals of Wireless Communications: Signal, channel, and noise representations: extension to MIMO, Linear channel equalization, Single-carrier frequency-domain equalization, Basics of radio propagation, Large-scale phenomena, Array steering vectors, Array factor and beamforming, MIMO channel models in standards. Real-time examples.

UNIT-II

Fading Channels: Characterization of Multipath Fading Channels, Modeling Fading and Shadowing, Bit Error Probability in Frequency-Nonselective Slowly Fading Channels, Frequency-Selective Slowly-Fading Channels, Resource Allocation in Fading Channels.

UNIT-III

Performance of 5G/6G networks and protocols and IRS: 5G core architecture, 5G key capability, network slicing, Intelligent Reflecting Surface, Specular or Anomalous Reflection, Active or Passive IRS, Smart Radio Environment, Coverage Enhancement, IRS and Index Modulation.

TEXT BOOKS:

1. Robert W Heath Jr. “Foundations of MIMO Communications” Cambridge University press 2017.
2. Mehmet Safak, “Digital Communications”. Wiley, 1st Edition. 2017.
3. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005
4. Saro Veirajan, “An Introduction to 5G wireless networks”, Notion Press, 2020

REFERENCES:

1. David Tse, Pramod Viswanath “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
2. Gordon L Stuber, “Principles of Mobile Communication,” 4th Edition, Springer, 2017.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

Semester	VI	Internal Assessment	20
Course code	UECPC60321	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Understand core concepts and algorithms in Artificial Intelligence and Machine Learning.
2. Analyze and evaluate the performance of various AI/ML techniques.
3. Develop practical skills in implementing ML models.

LIST OF EXPERIMENTS

1. Implementation of a Simple Rule-Based Chatbot.
2. Implement the Tic-Tac-Toe game using the Minimax algorithm.
3. Linear Regression for Predictive Analysis.
4. Logistic Regression for Binary Classification.
5. Decision Tree Classifier Implementation.
6. k-Nearest Neighbors (k-NN) for Classification.
7. Implement Support Vector Machine (SVM) for classification.
8. K-Means Clustering for Unsupervised Learning.
9. Principal Component Analysis (PCA) for Dimensionality Reduction.
10. Image Classification using Convolutional Neural Network (CNN) with MNIST Dataset.

TEXT BOOKS / REFERENCES:

1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, (Indian edition), 2013.
2. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (4th Edition), Pearson, 2020.
3. François Chollet, *Deep Learning with Python*, 2nd Edition, Manning, 2021.
4. Nils J. Nilsson, *The Quest for Artificial Intelligence*, Cambridge University Press, 2010.

VLSI Design LAB

Semester	VI	Internal Assessment	20
Course code	UECPC60322	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Understand characteristics of MOSFET.
2. Work with FPGA.
3. Able to implement basic gates and logic circuits.

LIST OF EXPERIMENTS

1. V-I characteristics of N channel/P-channel MOSFET.
2. Study of Common Source (CS) MOSFET amplifier.
3. Study of Basic Logic Gates using CMOS.
4. Study of design based on FPGA.
5. Design of Logic Gates using HDL and simulate the same using Xlink .
6. Design of half adder, full adder, half substractor, and full substratcors.
7. Write VHDL codes for 8:1 multiplexer and 1:8 Demultiplexer .

TEXT BOOKS / REFERENCES:

1. Douglas A. Pucknell & Kamran Eshraghian, Basic VLSI Design, PHI 3rd Edition.
2. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, 2nd Edition.
3. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL" Pearson (Prentice Hall), 2nd Edition.
4. Padmanabhan, Tripura Sundari, "Design through Verilog HDL", Wiley, 2016.

COURSE ASSESSMENT

A. Theory (3 credits) (75 marks)

1. **Continuous Assessment: (30 Marks)**
    a. Internal Assessment for 20 marks.
    b. The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.
2. **End Semester Examination (45 Marks)**
    a. Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Laboratory (2 credits) (50 marks)

1. **Continuous Assessment: (20 Marks)**
    a. Internal Assessment for 20 marks.
2. **End Semester Examination (30 Marks)**
    a. An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –VI ----------

AUTOMATION AND ROBOTICS

Semester	VII	Internal Assessment	30
Course code	UECTC70401	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand Automation and their needs.
2. Understand to apply the two automated lines how functions in industry.
3. Understand the industrial robots.

UNIT-I

Introduction to Automation: Basic elements of an automated system, advanced automation functions, levels of automation, process industries versus discrete manufacturing industries. Hardware components for automation and process control, sensors, actuators, analog to digital converters, digital to analog converters, input/output devices for discrete data.

UNIT-II

Automated Production Lines: Fundamentals of automated production lines, application of automated production lines, analysis of transfer lines, automated assembly systems, fundamentals of automated assembly systems, automatic identification methods, barcode technology, radio frequency identification, and other AIDC technologies.

UNIT-III

Industrial Robotics: Robotic configuration, robot anatomy and related attributes, robot control systems, end effectors, sensors in robotics, industrial robot applications, robot accuracy and repeatability, different types of robotics, various generations of robots.

TEXT BOOKS:

1. Automation, Production systems, and computer integrated manufacturing-MikellP.Groover 3rd Edition, Pearson 2009
2. Industrial Robotics-Groover, Weiss, Nagel, McGraw Hill International, 2nd Edition, 2012

REFERENCES:

1. Robotics for Engineers YoramKoren, McGraw Hill International, 1st Edition, 1985.
2. Robotic Engineering - An Integrated approach, Klafter, Chmielewski and Negin, PHI, 1st Edition, 2009.
3. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk.

SATELLITE AND OPTICAL COMMUNICATIONS: Program Elective - 2

Semester	VII	Internal Assessment	30
Course code	UECTC70402	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Classification and characterization of optical fibers and devices used for optical communication.
2. Describe the satellite orbits and its trajectories with the definitions of parameters associated with it.
3. Understand the functioning of satellites for communication, remote sensing, and weather and navigation applications.

UNIT-I

Optical Fiber Structures: Optical Fiber Modes and Configurations, Mode theory for circular waveguides, Single mode fibers, Fiber materials, Photonic Crystal Fibers, Fiber Optic Cables. Attenuation and **Dispersion: Attenuation:** Absorption, Scattering Losses, Bending loss, Signal Dispersion: Modal delay, Group delay, Material dispersion.

Optical Sources and detectors: Light Emitting Diode: LED Structures, Light source materials, Quantum efficiency and LED power, Laser Diodes: Modes and threshold conditions, Rate equations, External quantum efficiency, resonant frequencies, Photodetectors: The pin Photodetectors, Avalanche Photodiodes.

UNIT-II

Optical Amplifiers: Basic Applications and types, Erbium doped fiber amplifiers.

Satellite Orbit and Trajectories: Definition, Basic Principles, Orbital parameters, Injection velocity and satellite trajectory, Types of Satellite orbits.

Satellite In-orbit Operations: Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle.

UNIT-III

Satellite Hardware: Satellite Subsystems, Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload.

Earth Station: Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking.

Communication Satellites: Introduction, Related Applications, Frequency Bands, Payloads, Satellite Vs. Terrestrial Networks, Satellite Television, Satellite Data Communication Services.

Applications: Remote Sensing Satellites: Classification, Orbits, payloads. Weather Forecasting Satellites: Overview, Fundamentals, orbits and payload. Global Positioning Satellite System.

TEXT BOOKS:

1. Gerd Keiser, Optical Fiber Communication, 5th Edition, McGraw Hill Education (India) Private Limited, 2016.
2. Anil K Maini, Varsha Agrawal, Satellite Communication, Wiley India Pvt. Ltd., 2015, ISBN: 978-81265-2071-8
3. Dennis Roddy, Satellite Communications, McGraw Hill.

REFERENCES:

1. John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3
2. Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd , 2017, ISBN: 978-81-265-0833-4

ADVANCED MICROCONTROLLERS: Program Elective - 2

Semester	VII	Internal Assessment	30
Course code	UECTC70403	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Develop a clear understanding of ARM processor and assembly language.
2. Describe the architecture and functional block of ARM Cortex M3.
3. Describe the architecture details of STM32 and MSP430 microcontroller.
4. Develop an application using STM32 for the given specification.

UNIT-I

ARM Microcontroller: Introduction, Architecture of ARM Cortex M3, Various Units in the architecture, Debugging support, General Purpose and Special Registers. Thumb-2 technology.

UNIT-II

STM32: Introduction and features of STM32 ARM cortex family. STM32 Architecture and, Memory organization/map. STM32 IO Interfacing and GPIO Programming.

UNIT-III

MSP430: Introduction and Architecture of MSP430. Addressing Modes and Instruction Set.
IO Interfacing and GPIO Programming
Application development using microcontroller.

TEXT BOOKS / REFRENCES:

1. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", Elsevier Science, 2011.
2. Vincent Mahout, "Assembly Language Programming ARM Cortex-M3", Wiley, 2012.
3. Majid Pakdel, "Advanced Programming with STM32 Microcontrollers", Elektor Verlag, 2020.
4. Warren Gay, "Beginning STM32: Developing with FreeRTOS, Libopencm3 and GCC", 2020.
5. Deepali A. Godse, Atul P. Godse, "Microcontrollers", UNICORN Publishing Group, 2020.

MULTIMEDIA COMMUNICATIONS: Program Elective - 2

Semester	VII	Internal Assessment	30
Course code	UECTC70404	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Deploy the right multimedia communication models.
2. Apply QoS to multimedia network applications with efficient routing techniques.
3. Solve the security threats in the multimedia networks and develop the real-time multimedia network applications

UNIT-I

Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles. Text, images, audio and video.

UNIT-II

Text and image compression, compression principles, text compression- Runlength, Huffman, LZW, Document Image compression using T2 and T3 coding, image compression- GIF, TIFF and JPEG.

UNIT-III

Audio and video compression, audio compression – principles, DPCM, ADPCM, Adaptive and Linear predictive coding, Code-Excited LPC, Perceptual coding, MPEG and Dolby coders video compression, video compression principles.

TEXT BOOKS:

1. Fred Halsall, “Multimedia Communications”, Pearson education, 2001 ISBN - 9788131709948.
2. Raif Steinmetz, Klara Nahrstedt, “Multimedia: Computing, Communications and Applications”, Pearson education, 2002.

REFERENCES:

1. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, “Multimedia Communication Systems”, Pearson education, 2004.
2. John Billamil, Louis Molina, “Multimedia : An Introduction”, PHI, 2002.

MICROWAVE ENGINEERING: Program Elective - 3

Semester	VII	Internal Assessment	30
Course code	UECTC70405	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Describe the use and advantages of microwave transmission.
2. Analyze various parameters related to microwave transmission lines and waveguides.
3. Identify microwave passive devices for several applications.
4. Identify microwave Active devices for several applications.
5. Analyze various microwave oscillators and amplifiers for various applications.

UNIT-I

Microwave Transmission Lines: Microwave Frequencies, Microwave devices, Microwave Systems, Transmission Line equations and solutions, Reflection Coefficient and Transmission Coefficient, Standing Wave and Standing Wave Ratio. Line Impedance and Admittance, Smith Chart, Impedance matching, Single Stub matching.

UNIT-II

Microwave waveguides and components: Rectangular Waveguides, Solutions of wave Equations in Rectangular Coordinates, TE Modes in Rectangular Waveguides, TM Modes in Rectangular, Rectangular-Cavity Resonator.

Microwave Hybrid Circuits: Waveguide Tees, Magic Tees (Hybrid Trees), Hybrid Rings (Rat-Race Circuits).

UNIT-III

Directional Couplers: Two-Hole Directional Couplers, S-Matrix of a Directional Coupler, Hybrid Couplers.

Circulators and Isolators: Microwave Circulators, Microwave Isolators

Microwave Tubes: Introduction, Reflex Klystron Oscillator, Mechanism of Oscillations, Modes of Oscillations, Mode Curves, Two-cavity Klystron, Slow-wave structure, Traveling-wave Tube, Microwave crossed-field tubes, Magnetrons.

TEXT BOOKS:

1. Microwave Devices and circuits- Samuel Y Liao, Pearson Education
2. Microwave Engineering – Annapurna Das, Sisir K Das, TMH, Publication, 2nd, 2010.

REFERENCES:

1. Microwave Engineering – Sushrut Das, Oxford Higher Education, 2nd, , Edn, 2015.
2. Microwave Engineering - David M Pozar, John Wiley India Pvt. Ltd., 3rd ,Edn, 2008.

DEEP LEARNING: Program Elective - 3

Semester	VII	Internal Assessment	30
Course code	UECTC70406	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Understand the fundamentals of deep learning, including neural network architectures, optimization techniques, and regularization methods.
2. Evaluate model performance using appropriate metrics and apply model selection and tuning techniques to improve generalization.
3. Apply advanced deep learning techniques such as Convolutional Neural Networks (CNNs), and Transformers to real-world problems.

UNIT-I

Introduction to Deep Learning: Overview of Artificial Intelligence, Machine Learning, and Deep Learning, Neural Networks vs Traditional Machine Learning, Perceptron and Multi-Layer Perceptron (MLP), Applications of Deep Learning: NLP, CV, Speech, Robotics, Healthcare.

UNIT-II

Deep Neural Networks: Activation Functions: Sigmoid, Tanh, ReLU, Leaky ReLU, Softmax, Loss Functions: MSE, Cross Entropy, Forward and Backward Propagation, Gradient Descent and Optimizers (SGD, Adam, RMSProp), Vanishing/Exploding Gradients, Batch Normalization, Dropout and Regularization Techniques, Hyperparameter Tuning.

UNIT-III

Convolutional Neural Network (CNNs): Convolutional Layers, Filters/Kernels, Pooling, CNN architectures (U-Net, and SegNet architectures), and Generative Adversarial Networks (GANs).

TEXT BOOKS:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).

REFERENCES:

1. Neural Networks and Deep Learning by Michael Nielsen (Free online)
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron (O'Reilly)
3. Dive into Deep Learning by Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola (Free online)

ADVANCED JAVA: Program Elective - 3

Semester	VII	Internal Assessment	30
Course code	UECTC70407	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	3:0:0	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Describe the basic working of Frameworks.
2. Develop applications for strings and swing.
3. Develop applications with JDBC.

UNIT-I

Collections and Framework: Collections Overview, Collection Interfaces, Collection Classes, accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working with Maps, Comparators, The Collection Algorithms, Arrays, The legacy Classes and Interfaces.

UNIT-II

String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf( ).
Introducing Swing: Origin of Swing, Two Key Swing Features, MVC Connection, Components and Containers, Swing Packages, A Simple Swing Application.

UNIT-III

Introducing servlets: Background: The Life Cycle of a Servlet; Servlet development using Tomcat; A simple Servlet; The Servlet API; The Jakarta. Servlet Package; Reading Servlet Parameter.
JDBC Objects: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection.

TEXT / REFERENCE BOOKS:

1. Herbert Schildt: JAVA the Complete Reference. 12th Edition, Tata McGraw-Hill.
2. Jim Keogh, The Complete Reference J2EE, Tata McGraw-Hill 2007
3. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
4. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.
5. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

PCB FABRICATION LAB

Semester	VII	Internal Assessment	20
Course code	UECPC70411	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Ability to simulate and analyze the V-I characteristics of diodes, BJTs, and MOSFETs, and interpret their switching and amplification properties using ORCAD.
2. Ability to design and simulate encoder and multiplexer circuits, and demonstrate their function in digital systems for data selection and encoding.
3. Ability to design, simulate, and analyze flip-flop based counter circuits, and evaluate their counting sequence and frequency division behavior.
4. Ability to design, simulate, and analyze a Butterworth filter to achieve desired frequency response characteristics, and evaluate its performance using EM Simulation tools/Orcad
5. Ability to design, model, and simulate microstrip patch antennas or substrate integrated waveguide (SIW) antennas for specified frequency bands using EM simulation tools and validate using fabrication equipment.
6. Ability to design, simulate, and analyze microwave bandpass or lowpass filters for specified frequency ranges using industry-standard EM tools.

LIST OF EXPERIMENTS

1. Diode-BJT-MOSFET Characteristics
2. Encoders and Multiplexers
3. Flipflop Counters.
4. V-Character Semiconductor:
5. Butterworth Filter
6. Design of Microstrip/ SIW Antenna and validate using fabrication equipment.
7. Microwave Filter Design and validate using fabrication equipment.

TEXT BOOKS:

1. Anuradha De, Fiber Optic Communications, New Age International Publishers, Latest Edition.
2. Samuel Y. Liao, Microwave Devices and Circuits, Pearson Education, 3rd Edition.
3. Microwave Engineering - David M Pozar, John Wiley India Pvt. Ltd., 3rd Edition, 2008.

TEXT REFERENCES:

1. David M. Pozar, Microwave Engineering, Wiley, 4th Edition
2. R.L. Boylestad, Electronic Devices and Circuit Theory, Pearson

OPTICAL AND MICROWAVE LAB

Semester	VII	Internal Assessment	20
Course code	UECPC70412	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	2
Credits: 02			

COURSE OUTCOME

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

1. Ability to measure and compute the numerical aperture of optical fibers and interpret light acceptance properties.
2. Ability to evaluate optical power loss and quantify attenuation in fiber links using standard techniques.
3. Ability to analyze analog and digital data transmission over optical fiber and assess link performance.
4. Ability to measure bending loss and understand its impact on fiber optic communication systems.
5. Ability to characterize reflex klystron operation and analyze mode patterns for microwave generation.
6. Ability to study the I-V characteristics of Gunn diode and understand microwave generation principles using solid-state devices.
7. Ability to measure VSWR, guide wavelength, and frequency of microwaves using slotted line and waveguide setup.
8. Ability to measure and plot antenna radiation patterns and interpret antenna parameters like beamwidth and directivity.

LIST OF EXPERIMENTS

1. Measurement of Numerical Aperture (NA) of an Optical Fiber
2. Measurement of Attenuation in Optical Fiber.
3. Analog and Digital Link Performance.
4. Optical Fiber Bending Loss Study.
5. Reflex Klystron Characteristics.
6. Gunn Diode Characteristics.
7. Measurement of VSWR and Measurement of Guide Wavelength and Frequency
8. Radiation Pattern Measurement

TEXT BOOKS:

1. Anuradha De, Fiber Optic Communications, New Age International Publishers, Latest Edition.
2. Samuel Y. Liao, Microwave Devices and Circuits, Pearson Education, 3rd Edition.
3. Microwave Engineering - David M Pozar, John Wiley India Pvt. Ltd., 3rd Edition,, 2008.

TEXT REFERENCES:

1. David M. Pozar, Microwave Engineering, Wiley, 4th Edition

MINI PROJECT

Semester	VII	Internal Assessment	20
Course code	UECRC70413	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	--
Credits: 02			

COURSE OUTCOME

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

1. Identify, analyze and formulate project with a systematic approach.
2. Summarize and analyze the literature review and relate them to current project.
3. System integration skills.
4. Develop problem solving and documentation skills.
5. Develop Project management skills to work effectively and constructively.

GUIDELINES

There shall be a mini-project to be developed in house under the supervision of department faculties..
The following points need be followed for mini project

1. Students may do project in any topic from Electronics and Communications / Electrical Engineering / Computer Science Engineering.
2. Students should select the projects according to the suggestions of the assigned supervisor.
3. The project should be done in house only.
4. Every student must carry out project independently
5. Students who are willing to do project with other departments of the University should consult the designated supervisor of the department and with appropriate permission from HoD / Dean.
6. It is the responsibility of the student to report the progress of work regularly to concerned supervisor.
7. The project shall be submitted in a synopsis form and presented.
8. Synopsis of at least 20 pages must be submitted to the department duly signed by supervisor and HoD.
9. Final Synopsis should be prepared as per the following guidelines.
    a. A4 size, 1.5 inches margin on left side and 1 inch margin on remaining three sides.
    b. Times New Roman fonts:
        i. -Title of the Project: 24, Bold
        ii. -Main/Chapter Header (1, 2, etc..): 16, Bold
        iii. -Sub title: 14, Bold -Running Text: 12, Regular
        iv. -Lines Spacing: 1.5 Lines
        v. -Paragraph Beginning: 0pt. (No Space)
        vi. -Paragraph Spacing: 6pt.
        vii. -Figure Caption (Below Figure, Center Justified)): 10, Regular Times New Roman
        viii. -Table Caption (Above Table, Center Justified): 10, Regular Times New Roman
        ix. -References must be placed at the end of Report
        x. -References must be cited in square brackets as [1][2], [3-5], [6-9, 11, 12] etc.

INTERNSHIP

Semester	VII	Internal Assessment	20
Course code	UECIC70414	End Sem. Exam	30
Teaching Hours / Week (L:T:P)	0:0:4	Exam Duration (Hours)	--
Credits: 02			

COURSE OUTCOME

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

1. Transfer their analytical, integrative, team skills honed in the classroom to the workplace.
2. Understand the complexities of the corporate world first hand.
3. Focus on a narrow problem within a selected topic/field.
4. In-depth study with quantitative/qualitative approach.
5. Identify opportunities for networking with people in industry/ corporates/organizations.
6. Aim for pre-placement offers where feasible/appropriate.

GUIDELINES

There shall be a Summer Internship, in collaboration with an industry / institution / organization of their specialization.

1. Students should register for internship immediately after VI semester examinations and pursue it during summer vacation.
2. The duration of the internship will be of continuous four to eight weeks.
3. Industrial Oriented Summer Internship shall be submitted in a report form.
4. Internship report should be of at least 20 pages.
5. Internship report should be submitted to the department duly signed by HoD / Dean.
6. Final Internship report should be prepared as per the following guidelines.
    a. A4 size, 1.5 inches margin on left side and 1 inch margin on remaining three sides.
    b. Times New Roman fonts:
        i. -Title of the Project: 24, Bold
        ii. -Main/Chapter Header (1, 2, etc..): 16, Bold
        iii. -Sub title: 14, Bold -Running Text: 12, Regular
        iv. -Lines Spacing: 1.5 Lines
        v. -Paragraph Beginning: 0pt. (No Space)
        vi. -Paragraph Spacing: 6pt.
        vii. -Figure Caption (Below Figure, Center Justified)): 10, Regular Times New Roman
        viii. -Table Caption (Above Table, Center Justified): 10, Regular Times New Roman
        ix. -References must be placed at the end of Report
        x. -References must be cited in square brackets as [1][2], [3-5], [6-9, 11, 12] etc.

COURSE ASSESSMENT

A. Theory (3 credits) (75 marks)

1. Continuous Assessment: (30 Marks)

Internal Assessment for 20 marks.

The remaining 10 marks can be divided among – assignments /seminars / quizzes /class work, etc.

2. End Semester Examination (45 Marks)

Each question may contain sub-divisions from different units. Marks need to be properly distributed among the units.

B. Laboratory (2 credits) (50 marks)

1. Continuous Assessment: (20 Marks)

Internal Assessment for 20 marks.

2. End Semester Examination (30 Marks)

An experiment will be allotted and the same has to be designed and performed by the student. For designing (theory part) 15 marks will be given and remaining 15 will be given for performing the experiment and showing the output.

---------- END OF SEMETSER –VII ----------

TECHNICAL WRITING AND SEMINAR

Semester	VIII	Internal Assessment	30
Course code	UECRC80415	End Sem. Exam	45
Teaching Hours / Week (L:T:P)	0:0:6	Exam Duration (Hours)	2
Credits: 03			

COURSE OUTCOME

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

1. Identify, analyze and formulate seminar topic with a systematic approach.
2. Summarize and analyze the literature review and relate them to current project.
3. Enhance presentation and report writing skills.
4. Develop creative thinking abilities.

GUIDELINES

There shall be a seminar to be presented by the students.

The following points need be considered for seminar

1. Student has to select a seminar topic either of their own interest or in consultation with faculty members of the department.
2. The topic of the seminar must be in one of the thrust areas with in-depth review and analysis on a current topic that is relevant to industry or on-going research.
3. Every student will register for seminar title at the time of commencement of VIII semester.
4. Every student must present the seminar independently along with report.
5. The seminar shall be presented and submitted in a report form before the committee.
6. A report of at least 10 pages must be submitted to the department.
7. Final report should be prepared as per the following guidelines.
    a. A4 size, 1.5 inches margin on left side and 1 inch margin on remaining three sides.
    b. Times New Roman fonts:
        i. -Title of the Project: 24, Bold
        ii. -Main/Chapter Header (1, 2, etc..): 16, Bold
        iii. -Sub title: 14, Bold -Running Text: 12, Regular
        iv. -Lines Spacing: 1.5 Lines
        v. -Paragraph Beginning: 0pt. (No Space)
        vi. -Paragraph Spacing: 6pt.
        vii. -Figure Caption (Below Figure, Center Justified)): 10, Regular Times New Roman
        viii. -Table Caption (Above Table, Center Justified): 10, Regular Times New Roman
        ix. -References must be placed at the end of Report
        x. -References must be cited in square brackets as [1][2], [3-5], [6-9, 11, 12] etc.

MAJOR PROJECT

Semester	VIII	Internal Assessment	180
Course code	UECRC80416	End Sem. Exam	270
Teaching Hours / Week (L:T:P)	0:0:30	Exam Duration (Hours)	--
Credits: 15			

COURSE OUTCOME

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

1. Identify, analyze and formulate project with a systematic approach.
2. Summarize and analyze the literature review and relate them to current project.
3. System integration skills.
4. Develop problem solving and documentation skills.
5. Develop Project management skills to work effectively and constructively.
6. Develop problem solving skills.

GUIDELINES

There shall be a major-project, in collaboration with an Industry / Department faculties / Educational institute of national repute of their specialization.

The following points need be followed for Major Project

1. Students may do project in any topic from Electronics and Communications / Electrical Engineering / Computer Science Engineering.
2. They may continue with the project chosen in 7th Semester.
3. Those who would like to go for external project with industry/an educational institute of national importance may continue the existing project or may choose different one as per the suggestion of external supervisor.
4. The major-project shall be submitted in a report form and presented before the committee.
5. In case students would like to work with other institute or industry, they have to inform the HoD /Dean and take appropriate permission.
6. Student is expected to complete the project implementation and should keep the working model ready at the time of final internal demonstration/external examination.
7. Evidence of paper publication or acceptance in any of the International Conferences is highly appreciated.
8. Final report should be prepared as per the following guidelines.
    a. A4 size, 1.5 inches margin on left side and 1 inch margin on remaining three sides.
    b. Times New Roman fonts:
        i. -Title of the Project: 24, Bold
        ii. -Main/Chapter Header (1, 2, etc..): 16, Bold
        iii. -Sub title: 14, Bold -Running Text: 12, Regular
        iv. -Lines Spacing: 1.5 Lines
        v. -Paragraph Beginning: 0pt. (No Space)
        vi. -Paragraph Spacing: 6pt.
        vii. -Figure Caption (Below Figure, Center Justified)): 10, Regular Times New Roman
        viii. -Table Caption (Above Table, Center Justified): 10, Regular Times New Roman
        ix. -References must be placed at the end of Report
        x. -References must be cited in square brackets as [1] [2], [3-5], [6-9, 11, 12] etc.
    c. Report must be tested against Plagiarism and percentage of duplication must be less than 20 %. (As suggested by UGC).

---------- END OF SEMETSER –VIII ----------