Shri. B. V. V. Sangha's

Basaveshwar Engineering College, Bagalkote

Vision and Mission of the Institute

VISION

To be recognized as a premier technical institute committed to developing exemplary professionals, offering research based innovative solutions and inspiring inventions for holistic socio economic development.

MISSION

1) To pursue excellence through student centric dynamic teaching-learning processes, encouraging freedom of inquiry and openness to change
2) To carry out innovative cutting edge research and transfer technology for industrial and societal needs
3) To imbibe moral and ethical values and develop compassionate, humane professionals

Shri. B. V. V. Sangha's

Basaveshwar Engineering College, Bagalkote
Department of Electronics and Communication Engineering

Vision and Mission of the Department

VISION

"To be recognized and respected as one of India's premier academic departments and centers of professional excellence in the area of Electronics and Communication Engineering".

MISSION

1. To impart quality technical education in the field of Electronics and Communication Engineering
2. To carryout cutting edge research through innovations for the benefit of mankind

POs

a) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b) **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c) **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f) **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g) **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i) **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k) **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l) **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSOs

(1) Analyze and design systems for Electronics, Communication, and Signal Processing applications.

(2) Use domain specific tools for design, analysis, synthesis, and Validation of VLSI and embedded systems.

(3) Demonstrate the conceptual knowledge with respect to architecture, design analysis and simulation of computer networking and applications.

Program Educational Objectives (PEOs)

In order to prepare the students to excel in industry and higher education, the following Program Educational Objectives (PEOs) are framed.

PEO1: To prepare students to excel in postgraduate programmes or to succeed in industry/technical profession through global, rigorous education.

PEO2: To provide students with a solid foundation in mathematical, scientific, electronics and communication engineering, interdisciplinary subjects necessary to formulate, solve, and analyze engineering challenges.

PEO3: To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel products and solutions for the real-life problems.

PEO4: To inculcate in students professional and ethical attitudes, academic environment, aware of excellence, effective communication skills, leadership and managerial skills, ethical codes and guidelines and the lifelong learning needed for a successful professional career.

PEO5: To strengthen the knowledge of students in multi-disciplinary areas of engineering. To inculcate research attitude among students to meet the societal needs.

Basaveshwar Engineering College, (Autonomous), Bagalkot
Department of Electronics and Communication Engineering
Teaching and Examination Scheme for B.E. Electronics and Communication Engineering Course

Academic Year 2020–2021

Abstract of Credits Distribution

I Semester + II Semester = 40 Credits
III Semester + IV Semester + V Semester + VI Semester + VII Semester + VIII Semester = 135 Credits
Total = 175 Credits

Detailed Distribution of Total 175 Credits Across 1st Semester to 8th Semester

SL. No.	Learning Components	Credits								
		1st Sem	2nd Sem	3rd Sem	4th Sem	5th Sem	6th Sem	7th Sem	8thSem	Total
1	Humanities and Social Science (HSS)	-	-	3	2	1	1	-	2	**09**
2	Basic Science (PCM)	9.5	9.5	3	3	-	-	-	-	**25**
3	Engineering Science	10.5	10.5	-	-	-	-	-	-	**21**
4	Professional Core	-	-	15	19	13	16	5	-	**68**
5	Professional Elective	-	-	-	-	6	2	6	6	**20**
6	Open Elective	-	-	-	-	3	3	3	-	**09**
7	Project/ Internship/Technical Seminar	-	-	-	-	-	2*	3^{+}+ $2^{\bullet}$	12^{++}+1°	**20**
8	Online Courses	-	-	-	-	-	-	3	-	**03**
Semester Total		**20**	**20**	**21**	**24**	**23**	**24**	**22**	**21**	**175**

*	Mini Project	++	Final year project phase-II	$^{\circ}$	Technical Seminar
+	Final year project phase-I	•	Internship		

Basaveshwar Engineering College, Bagalkot

Department of Mechanical Engineering

Academic Year 2020 – 2021

1st Semester (175 Credits Regular) – PHYSICSGROUP

Sl. No	Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecturer	Tutorial	Practical	CIE	SEE	Total
1	UMA161C	Engineering mathematics-I	4	3	2	-	50	50	100
2	UPH162C	Engineering Physics	4	3	2	-	50	50	100
3	UME163C	Elements of Mechanical Engineering	3	2	2	-	50	50	100
4	UEE164C	Basic Electrical Engineering	3	2	2	-	50	50	100
5	UCS165C	Programming with C	3	3	-	-	50	50	100
6	UHS126M	Constitution of India*	-	2	-	-	50	50	100
7	UPH166L	Engineering Physics Laboratory	1.5	-	-	3	50	50	100
8	UCS167L	C Programming Laboratory	1.5	-	-	3	50	50	100
Total Credits :			**20**	**15**	**8**	**6**	**400**	**400**	**800**

*** Mandatory subject: Question paper will be of objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade/Class/Rank.**

2nd Semester (175 Credits Regular) – CHEMISTRY GROUP

Sl. No	Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecturer	Tutorial	Practical	CIE	SEE	Total
1	UMA261C	Engineering Mathematics-II	4	3	2	-	50	50	100
2	UCH268C	Engineering Chemistry	4	3	2	-	50	50	100
3	UEC269C	Basic Electronics	3	2	2	-	50	50	100
4	UCV270C	Engineering Mechanics	3	2	2	-	50	50	100
5	UBT233M	Environmental Studies*	-	2	-	-	50	50	100
6	UME271L	Computer Aided Engineering Graphics	2.5	1	-	3	50	50	100
7	UCH272L	Engineering Chemistry Laboratory	1.5	-	-	3	50	50	100
8	UBE273L	Basic Engineering Laboratory	2	-	-	4	50	50	100
9	UHS274K	English for Engineers	-	2					
Total Credits :			**20**	**15**	**8**	**10**	**400**	**400**	**800**

*** Mandatory subject: Question paper will be of objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade/Class/Rank.**

Basaveshwar Engineering College, Bagalkot

Department of Electronics & Communication Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 2020-21 (REGULAR) and 2021-22 (LATERAL ENTRY) BATCH

B.E III SEMESTER

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS/ WEEK			EXAMINATION MARKS		
				LECTURE	TUTORIAL	PRACTICAL	CIE	SEE	TOTAL
1	UMA391C	Numerical Techniques and Integral Transforms	3	3	0	0	50	50	100
2	UEC341C	Electronics Devices and Circuits	3	3	0	0	50	50	100
3	UEC342C	Digital Electronics and Logic Design	3	3	0	0	50	50	100
4	UEC348C	Network Analysis	3	3	0	0	50	50	100
5	UEC344C	Human Resource Management	3	3	0	0	50	50	100
6	UEC349C	Data Structures Using "C"	3	3	0	0	50	50	100
7	UEC346L	Electronic Devices and Circuits Laboratory	1.5	0	0	3	50	50	100
8	UEC347L	Digital Electronics Laboratory	1.5	0	0	3	50	50	100
9	UMA330M	Bridge course Mathematics-I*	-	3*	0	0	50*	50*	100*
10	UBT133M	Environmental studies*	-	2*	0	0	50*	50*	100*
		Total	**21**	**18 23***	**0**	**6**	**400 500***	**400 500***	**800 1000***

***Bridge Course Mathematics – I and Environmental Studies** are mandatory subjects only for diploma students admitted to BE 3rd Semester through Lateral Entry scheme. Passing the subject is compulsory, however marks will not be considered for awarding grade/class. PP/NP grade will be awarded for passing/not passing the subject respectively.

Note: Online course: (NPTEL / SWAYAM / COURSERA)

1. The course should be of as follows: 04 weeks - 01 credit, 08 weeks - 02 credits, 12 weeks - 03 credits
2. The Students has to qualify in MOOCs recommended course of total 01 credits during III/IV/V/VI/VII semester and to be evaluated in VII Semester

Basaveshwar Engineering College, Bagalkot

Department of Electronics & Communication Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 2020-21 (REGULAR) and 2021-22 (LATERAL ENTRY) BATCH

B.E IV SEMESTER

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS/ WEEK			EXAMINATION MARKS		
				LECTURE	TUTORIAL	PRACTICAL	CIE	SEE	TOTAL
1	UMA435C	Statistical Methods for Electrical Science	3	3	0	0	50	50	100
2	UEC441C	Signals and Systems	4	3	2	0	50	50	100
3	UEC442C	Linear Integrated Circuits and Applications	3	3	0	0	50	50	100
4	UEC443C	8051 Microcontroller	3	3	0	0	50	50	100
5	UEC444C	Electronic Circuits Design	3	3	0	0	50	50	100
6	UEC445C	Analog Communication	3	3	0	0	50	50	100
7	UHS001N	Fundamentals of Quantitative Aptitude and Soft Skills	1	2	0	0	50	50	100
8	UEC441L	Analog Communication Laboratory	1.5	-	-	3	50	50	100
9	UEC442L	Microcontroller Laboratory	1.5	-	-	3	50	50	100
10	UHS488C	Samskruthika Kannada**	1.0	2	-	-	50	50	100
	UHS489C	Balake Kannada***							
11	UMA430M	Bridge course Mathematics-II*	-	3*	-	-	50*	50*	100*
12	UHS226M	Constitution of India *	-	2*	-	-	50*	50*	100*
13	UHS226M	Universal Human Values	-	2	-	-	50*	50*	100*
		Total	**24**	**22 27***	**02**	**6**	**500 650***	**500 650***	**1000 1300***

***Bridge Course Mathematics – II and Constitution of India are** mandatory subjects only for diploma students admitted to BE 3rd Semester through Lateral Entry scheme. Passing the subject is compulsory, however marks will not be considered for awarding grade/class. PP/NP grade will be awarded for passing/not passing the subject respectively.

****Students who have studied Kannada at primary level**

***** Students who have not studied Kannada at primary level**

Note: Online course: (NPTEL / SWAYAM / COURSERA)

1. The course should be of as follows: 04 weeks - 01 credit, 08 weeks - 02 credits, 12 weeks - 03 credits
2. The Students has to qualify in MOOCs recommended course of total 01 credits during III/IV/V/VI/VII semester and to be evaluated in VII Semester

Basaveshwar Engineering College, Bagalkot

Department of Electronics & Communication Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 2020-21 (REGULAR) and 2021-22 (LATERAL ENTRY) BATCH

B.E V SEMESTER

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS/ WEEK			EXAMINATION MARKS		
				LECTURE	TUTORIAL	PRACTICAL	CIE	SEE	TOTAL
1	UEC551C	Digital Signal Processing	4	3	2	0	50	50	100
2	UEC542C	Digital Communication	3	3	0	0	50	50	100
3	UEC543C	Verilog Programming	3	3	0	0	50	50	100
4	UHS002N	Advanced Quantitative Aptitude and Soft Skills	1	2	0	0	50	50	100
5	**Professional Elective-I**								
	UEC545E	Computer Organization	3	3	0	0	50	50	100
	UEC546E	Electronic Instrumentation							
	UEC547E	Object-Oriented Programming with C++							
6	**Professional Elective-II**								
	UEC548E	Micro Electro Mechanical Systems	3	3	0	0	50	50	100
	UEC549E	Automotive Electronics							
	UEC540E	Biomedical Signal Processing							
7	**Open Elective-I***		3	3	0	0	50	50	100
8	UEC531L	Digital Signal Processing Laboratory	1.5	0	0	3	50	50	100
9	UEC532L	Verilog Laboratory	1.5	0	0	3	50	50	100
		Total	**23**	**20**	**02**	**06**	**450**	**450**	**900**

*** Open elective – I: It is offered by other department to Electronics and Communication Engineering Students.**

***Open Elective-I subjects offered by the department to other department students are**

1) UEC534N: Electronic Engineering Materials, 2) UEC535N: Fundamentals of Wireless Communications.

Note: Online course: (NPTEL / SWAYAM / COURSERA)

1. The course should be of as follows: 04 weeks - 01 credit, 08 weeks - 02 credits, 12 weeks - 03 credits
2. The Students has to qualify in MOOCs recommended course of total 01 credits during III/IV/V/VI/VII semester and to be evaluated in VII Semester

Internship: For awarding B.E. (Electronics and Communication Engineering) degree, each student has to complete minimum of 04 weeks or (02 weeks + 02 weeks) of Internship between 4th and 6th semester to earn 02 credits which will be evaluated during 7th Semester.

Basaveshwar Engineering College, Bagalkot

Department of Electronics & Communication Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 2020-21 (REGULAR) and 2021-22 (LATERAL ENTRY) BATCH

B.E VI SEMESTER

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS/ WEEK			EXAMINATION MARKS		
				LECTURE	TUTORIAL	PRACTICAL	CIE	SEE	TOTAL
1	UEC651C	Field Theory	3	2	2	0	50	50	100
2	UEC642C	Computer Networks	3	3	0	0	50	50	100
3	UEC643C	CMOS Digital VLSI Design	3	3	0	0	50	50	100
4	UEC644C	Control Systems	3	3	0	0	50	50	100
5	UHS003N	Career Planning and Professional Skills	1	2	0	0	50	50	100
6	**Professional Elective-III**								
	UEC655E	Embedded Systems	2	2	0	0	50	50	100
	UEC656E	Digital Verification							
	UEC657E	Mobile Communications							
7	**Open Elective-II***		3	3	0	0	50	50	100
8	UCS659L	Advanced "C" Laboratory	2	0	2	2	50	50	100
9	UEC631L	Computer Networks Laboratory	1	0	0	2	50	50	100
10	UEC632L	VLSI Laboratory	1	0	0	2	50	50	100
11	UEC634P	Mini Project	2	0	0	6	50	50	100
12	UHVXXXM	Universal Human Values	0	3	0	0	50	50	100
		Total	**24**	**21**	**04**	**12**	**600**	**600**	**1200**

*** Open elective – II: It is offered by other department to Electronics and Communication Engineering Students.**

Open Elective-II subjects offered by the Electronics and Communication Engineering department to other department students are
1) UEC634N: Modeling and Simulation of Engineering Systems, 2) UEC635N: Image Processing.

Note: Online course: (NPTEL / SWAYAM / COURSERA)

1. The course should be of as follows: 04 weeks - 01 credit, 08 weeks - 02 credits, 12 weeks - 03 credits
2. The Students has to qualify in MOOCs recommended course of total 01 credits during III/IV/V/VI/VII semester and to be evaluated in VII Semester

Internship: For awarding B.E. (Electronics and Communication Engineering) degree, each student has to complete minimum of 04 weeks or (02 weeks + 02 weeks) of Internship between 4th and 6th semester to earn 02 credits which will be evaluated during 7th Semester.

Basaveshwar Engineering College, Bagalkot

Department of Electronics & Communication Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 2020-21 (REGULAR) and 2021-22 (LATERAL ENTRY) BATCH

B.E VII SEMESTER

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS/ WEEK			EXAMINATION MARKS		
				LECTURE	TUTORIAL	PRACTICAL	CIE	SEE	TOTAL
1	UEC741C	Microwaves and Antennas	3	3	0	0	50	50	100
2	UEC742I	Internship	2	0	0	4	70	30	100
Professional Elective-IV									
3	UEC743E	Information Theory and Coding	3	3	0	0	50	50	100
	UEC744E	Multimedia Communication							
	UEC745E	Soft Computing							
Professional Elective-V									
4	UEC746E	Digital Signal Processing with Field Programmable Gate Arrays	3	3	0	0	50	50	100
	UEC747E	Wireless Networks					50	50	100
	UEC748E	Industrial Automation					50	50	100
5	**Open Elective-III***		3	3	0	0	50	50	100
6	UEC731L	Advanced Communication Laboratory	1	0	0	2	50	50	100
7	UEC732L	Modeling and Simulation Laboratory	1	0	0	2	50	50	100
8	UEC734P	Project Phase-I	3	0	0	06	50	50	100
9	UECXXXO	Massive Open Online Courses (MOOCs)**	3	-	-	-	-	-	-
		Total	**22**	**12**	**00**	**14**	**500**	**500**	**1000**

*** Open elective – III: It is offered by other department to Electronics and Communication Engineering Students.**

Open Elective-III subjects offered by the Electronics and Communication Engineering department to other department students are 1) UEC735N: Nanotechnology, 2) UEC736N: Research Methodology

Note: Online course: (NPTEL / SWAYAM / COURSERA)

1. The course should be of as follows: 04 weeks - 01 credit, 08 weeks - 02 credits, 12 weeks - 03 credits

2. The Students has to qualify in MOOCs recommended course of total 01 credits during III/IV/V/VI/VII semester and to be evaluated in VII Semester

Internship: For awarding B.E. (Electronics and Communication Engineering) degree, each student has to complete minimum of 04 weeks or (02 weeks + 02 weeks) of Internship between 4th and 6th semester to earn 02 credits which will be evaluated during 7th Semester.

Basaveshwar Engineering College, Bagalkot

Department of Electronics & Communication Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 2020-21 (REGULAR) and 2021-22 (LATERAL ENTRY) BATCH
B.E VIII SEMESTER

Sl. No	SUBJECT CODE	SUBJECT	CREDITS	HOURS/ WEEK			EXAMINATION MARKS		
				LECTURE	TUTORIAL	PRACTICAL	CIE	SEE	TOTAL
1	UEC840C	Project Management and Intellectual Property Rights	2	2	0	0	50	50	100
2	**Professional Elective-VI**								
	UEC842E	Satellite Communications	3	3	0	0	50	50	100
	UEC843E	Speech Processing							
	UEC844E	Advance Control Systems							
3	**Professional Elective-VII**								
	UEC845E	Wireless Sensor Networks	3	3	0	0	50	50	100
	UEC846E	Machine Learning							
	UEC847E	Optical Fiber Communication							
4	UEC833P	Project Phase-II	12	0	0	24	50	50	100
5	UEC831S	Technical Seminar	01	0	0	02	50	50	100
		Total	**21**	**08**	**00**	**26**	**250**	**250**	**500**

Syllabus for

B.E. I & II – Semester

(For students admitted to I year in 2020-21)

SUBJECT CODE: UEC169C/UEC269C	Basic Electronics	Credits: 03
L:T:P - **3-0-0**		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	xx Hrs.
Scope and Applications of Electronics and Communication Engineering. Diode Applications: Half Wave Rectification, Full Wave Rectification, Rectifier with Shunt Capacitor (qualitative analysis), Zener Diode, Voltage Regulator, DC Voltage Multipliers, Diode logic Gates. Bipolar Junction Transistors: Transistor operation, Transistor Voltages and Currents. **Self-Study Components:** Quantum Tunneling mechanism, VI-Characteristics of Esaki diode and Varactor diode.	
UNIT–II	**xx Hrs.**
BJT Characteristics: Common-Base Characteristics, Common-Emitter Characteristics and Common-Collector Characteristics. BJT Biasing and Applications: The DC Load Line and Bias Point, Base Bias, Collector to Base Bias, Voltage Divider Bias, Comparison of Basic Bias Circuits. Amplifier: Decibels and half power points, Single-Stage CE Amplifier. Oscillators: Concept of Feedback, Positive and Negative Feedback, Barkhausen criterion, BJT RC Phase Shift Oscillator, Hartley Oscillator, Colpitt's Oscillator. **Self-Study Components:** FET and its Operation, FET as an Amplifier, CE Feedback Amplifier.	
UNIT–III	**xx Hrs.**
Number Systems: Decimal, Binary, Octal and Hexadecimal Number Systems and conversions. Addition and subtraction in different number systems. Binary Coded Decimal Numbers (Addition and subtraction). Digital Logic: Boolean Algebra, Logic Gates, Universal Gates, Half Adder, Full Adder and Parallel Adder. **Self-Study Components:** Half Subtractor, Full Subtractor, Booth's Algorithm for Binary number Multiplication.	
UNIT–IV	**xx Hrs.**
Introduction to Communication Systems: Introduction to Communication, Elements of Communication System, Need for Modulation, Electromagnetic Spectrum and Typical Applications, Terminologies in Communication Systems. Elements of Analog Communication, Amplitude Modulation (AM) Technique. Theory of Angle Modulation Techniques: Frequency Modulation. Digital Modulation Techniques: Introduction, Basic Digital Modulation Schemes, Amplitude Shift Keying (ASK). **Self-Study Components:** Introduction to Fiber Optic Technology: History of Fiber Optics, Why Optical Fibers?, Introduction to Light, Optical Fiber and Fiber Cables.	
Reference Books *	

1. David A. Bell, “Electronic Devices and Circuits”, 4th edition, PHI, 2006.
2. George Kennedy, “Electronic Communication Systems”, 5th edition. TMH, 2011.
3. Floyd and Jain, “Digital fundamentals”, 8th edition, Pearson, 2006.
4. Jacob Milliman, Christos C. Halkies, “Electronics Devices and Circuits”, TMH, 2001.
5. A.P. Malvino, “Electronic Principles”, TMH, 2003.

Course Outcomes**

After completion of the course student will be able to

1. **Describe operation and characteristics of electronic devices and systems.**
2. **Understand the parameters and their significance of electronic devices in electronic systems.**
3. **Analyze the applications of electronic circuits and systems.**
4. **Solve numerical problems related to basic electronic circuits and systems.**
5. **Design basic electronic systems to meet given specifications.**
6. **Visualize applications of electronic devices and systems in real world.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	0	0	0	0	0	0	0	0	1	3	0	0
CO2	3	2	2		0	0	0	0	0	0	0	1	3	0	0
CO3	3	3	2		0	0	0	0	0	0	0	1	3	0	0
CO4	3	3	2		0	0	0	0	0	0	0	1	3	0	0
CO5	3	3	3		0	0	0	0	0	0	0	1	3	0	0
CO6	3	2	1		1	0	0	0	0	0	0	1	3	0	0

Syllabus for

B.E. III & IV – Semester

(For students admitted to I year in 2020-21)

SUBJECT CODE: UMA391C	Numerical Techniques and Integral Transforms	Credits: 03
L:T:P - **3-0-0**		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	**xx Hrs.**

Numerical Analysis-I

Introduction to root finding problems, Bisection Method, Newton-Raphson method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae. (Without proof), Lagrange's and Newton's divided difference interpolation formulae (without proof).

UNIT–II	**xx Hrs.**

Numerical Analysis-II

Numerical differentiation using Newton's forward and backward formulae-problems. Trapezoidal rule, Simpson's one third rule, Simpson's three eighth rule and Weddle's rule (no derivation of any formulae)-problems. Euler's and Modified Euler's method, Runge-Kutta 4^{th} order method.

UNIT–III	**xx Hrs.**

Fourier series Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.

UNIT–IV	**xx Hrs.**

Fourier transforms and z-transforms

Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms, Inverse Fourier sine and cosine transforms. Z-transforms-definition, standard forms, linearity property, damping rule, shifting rule-problems

Reference Books *

Textbooks:

1. Numerical Methods for Engineers by Steven C Chapra& Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi.

Reference Book:

1. Advanced Engineering Mathematics by E Kreyszig (John Wiley & Sons)

Course Outcomes**

After completion of the course student will be able to

1. **Solve engineering problems using non-linear equations and interpolation techniques.**
2. **Solve problems using numerical differentiation and numerical integration.**
3. **Perform numerical solutions of ordinary differential equations.**
4. **Understand Fourier analysis that provides a set of mathematical tools which enable the engineer to break down a wave into its various frequency components. It is then possible**

predict the effect of a particular waveform.

5. Understand the basic concepts of Fourier transforms and z –transforms, to solve ode, pde and difference equations.

* Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	--	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	--	--	--
CO2	1	2	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	--	--	--
CO3	1	--	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	--	--	--
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

UEC341C	Electronic devices and Circuits Design	Credits:03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10Hrs.

Field Effect Transistors: Introduction, construction, operation and characteristics of JFETs, transfer characteristics, depletion type MOSFET, enhancement type MOSFET, practical applications.

Thyristors: Introduction, construction, operation and characteristics of SCR, TRIAC, UJT.

Diode applications: clippers and clampers.

Self study component: Comparison between Si and Ge diode, study of Data sheets of different types of Si and Ge diodes, Zener diodes.

UNIT–II	10 Hrs.

Optoelectronic Devices: Light units, Light emitting diode (LED), liquid crystal displays (LCD), photo conductive cell, photo diode and solar cells, photo transistors, opto-couplers.

Miscellaneous Devices: Schottky diode, varactor diode, power diode, tunnel diode.

Self study components: Voltage Variable Capacitors (VVC), Thermistors: operation, characteristics and applications.

UNIT–III	10 Hrs.

FET Biasing: Introduction, Fixed bias configuration, Self bias configuration, Voltage divider biasing, Common gate configuration, Design, Trouble shooting, p-channel FETs, Universal JFET bias curve.

Self study components: Study of multistage amplifier: classification, distortions in amplifier, two stage RC coupled amplifier and its frequency response.

UNIT–IV	10 Hrs.

FET amplifiers: Introduction, JFET small signal model, voltage divider bias configuration.

Power Supplies (Voltage Regulators)**:**Introduction, general filter considerations, capacitor filter, RC filter, discrete transistor voltage regulation, IC voltage regulators.

Reference Books *

1. Nashelesky & Boylestead, 2009, “Electronic Devices & Circuit Theory” 10th Edition, Pearson
2. D.A.Bell, 2007, “Electronic Devices&Circuit” ,4th Edition, PHI
3. 3. M.D.Singh,K.B.Khanchandani,2007,"PowerElectronics",2nd Edition, McGrawHillPublication

Course Outcomes**

After completion of the course student will be able to

1. **Analyze different types of electronic devices and design clipper and clamper circuits.**
2. **Differentiate the characteristics and importance of different optoelectronic devices.**
3. **Choose a specific FET and other components to design an amplifier.**
4. **Design a regulated power supply to meet the given specifications.**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	3	**-**	-	-	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	
CO2	3	3	3	**-**	-	-	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	3	3	3	**-**	-	-	**-**	**-**	-	**-**	**-**	**-**	**3**	**-**	**-**
CO4	3	3	3	**-**	-	-	**-**	**-**	-	**-**	**-**	**-**	**3**	**1**	**-**

UEC342C	Digital Electronics and Logic Design	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 40		SEE Marks: 50

UNIT-I	10 Hrs.

Principles of Combinational Logic and Design: Review of Boolean algebra, simplification and implementation of Boolean expression using basic gates and universal gates. Definition of combinational logic, canonical forms, generation of switching equations from truth tables, K-maps(upto5variables),Quine-McCluskey minimization technique, map entered variables.

UNIT–II	10Hrs.

Analysis and Design of Combinational Circuit using MSI Components: General approach, binary adder and subtractors, cascading fulladders, look ahead carry, decimal adders, comparators, decoders, encoders, multiplexers.

UNIT–III	10Hrs.

Flip-Flops: The basic bistable element, latches, timing considerations, master-slave SR flip-flops, master slave JK flip-flop, edge triggered flip-flop, positive edge triggered D flip-flop, negative edge triggered D flip-flop, characteristic equations.

ApplicationsofFlip-Flops: Registers(SISO,SIPO,PISOandPIPO)andbidirectionalshiftregister.

UNIT–IV	10Hrs.

Applications of Flip-Flops: Counters, binary ripple counters, synchronous binary counters, counters based on shift registers, design of synchronous counters, design of asynchronous counter using clocked JK, D, T and SR flip-flops.

Sequential Circuit Design and Analysis: Introduction to Mealy and Moore models, state machine notation, synchronous sequential circuit analysis, construction of state diagrams.

Reference Books *

1. Donald DGivone,2002,“ Digital Principle and Design ”. TataMcGrawHill
2. John MYarbrough,2001,“Digital Logic Applications and Design”, Thomson Learning
3. ThomasL.Floyd,“DigitalFundamentals”,9th edition,PHI
4. CharlesHKoth,2004,“FundamentalsofLogicDesign”,Thomsonlearning
5. MenoandKim,2001,“LogicandComputerDesignFundamentals”,2 nd edition ,Pearson
6. MalvinoandLeech,“DigitalPrinciples&Applications”,2nd edition,PHI

Course Outcomes**

After completion of the course student will be able to

1. **Simplify the given Boolean expressions using Boolean algebra, K-map, Quine McCluskey and map entered variables methods.**
2. **Design and analyse combinational circuits using i) basic gates ii) universal gates iii) MUXs and iv) decoder and gates.**
3. **Analyse different types of latches, flipflops and shift registers.**
4. **Design, model and analyse synchronous and asynchronous sequential circuits**.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	1	**1**	1	-	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	
CO2	3	3	3	**2**	1	-	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	
CO3	3	3	3	**2**	1	-	**1**	**-**	-	**-**	**-**	**-**	**3**	**1**	
CO4	3	2	3	**2**	2	-	**1**	**-**	-	**-**	**-**	**-**	**3**	**1**	

SUBJECT CODE: UEC348C	Network Analysis	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	xx Hrs.

Basic concepts: Concept of voltage, current and power, ideal and practical representation of energy sources, source transformation, network reduction using star-delta transformation, mesh current and node voltage analysis with dependent and independent sources for AC and DC networks, concept of super mesh and super node.

UNIT–II	xx Hrs.

Network theorems: Superposition, Millman's, Thevenin's, and Maximum power transfer theorems.

Network topology: Graph of a network, concept of tree and co-tree, incidence matrix, tie-set matrix, cut-set matrix, analysis of networks, network equilibrium equations.

UNIT–III	xx Hrs.

Resonance circuits: Series and parallel resonance circuits, frequency of resonance, frequency responses, Q-factor, bandwidth.

Two port network parameters: Z, Y, h, transmission parameters and relationship between parameters.

UNIT–IV	xx Hrs.

Laplace transformation: Basic theorems, Laplace transform of periodic functions, application of Laplace transform to RL and RC circuits.

Attenuators: Symmetrical T, PI, bridge T, Lattice attenuators, Asymmetrical T, L, and PI attenuators.

Equalizers: Two terminal series and shunt equalizers.

Reference Books *

Textbooks:

1. Roy Choudhary, "Networks and systems", 2nd Edition, New Age International Publications, 2006.
2. G. K. Mithal, "Network Analysis", Khanna Publishers, 1997.

Reference Books:

1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", 6th Edition, TMH, 2006.
   M.E. Van Valkenberg "Network analysis", Prentice Hall of India, 3rd Edition, 2000.

Course Outcomes**

After completion of the course student will be able to

1. **Simplify networks using source transformation, star-delta conversion and determine current, voltage, power using nodal and mesh analysis to AC and DC networks.**
2. **Apply network theorems and topology for complex networks to find responses.**

3. **Analyze series and parallel resonant circuits and find different network parameters.**
4. **Apply concept of Laplace transformation to networks and waveforms, design attenuators and simple equalizers.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	2	1	1	-	-	1	-	-	1	3	-	-
CO2	3	3	1	2	1	1	-	-	1	-	-	1	3	-	-
CO3	3	3	1	2	1	1	-	-	1	-	-	1	3	-	-
CO4	3	2	1	2	1	1	-	-	1	-	-	1	3	-	-

SUBJECT CODE: UEC344C	Human Resource Management	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction: Nature of Human Resource Management (HRM), importance of human resource management, functions of human resource management, The changing environment of HRM and role of HRM in changing business scenario. **Procurement:** Job, job analysis, job description and job specifications, Man power Planning demand and supply forecasting, recruitment, methods of recruitment, Employees testing and selection, types of psychological tests and interviews, placement and induction.

UNIT–II	10 Hrs.

Development: Operative training and management development, methods of training and development. **Performance Appraisal:** Traditional and modern Methods. **Career Development:** career anchors, career development programme and the modern career problems. **Compensation:** Factor affecting compensation policy, job evaluation, methods of job evaluation.

UNIT–III	10 Hrs.

Variable Compensation: Individual & group, supplementary compensation-fringe benefits and current trends in compensation.**Integration:** Human relation, importance of industrial relations, causes and effects of Industrials disputes, Machinery for settlement of industrial disputes in India, Role of trade unions in maintaining relations. **Collective Bargaining:** concept, features, process and advantages. **Maintenance and separation:** Employee safety, health and welfare, Provisions under factory Act, 1948, Turnover, Retirement and Layoff.

UNIT–IV	10 Hrs.

International HRM: The growth of international business, HR and the international business challenge, effect of inter country difference on HRM, international staffing, international compensation and appraisal, international labor relations and Information Technology and HR.

Reference Books *

Textbooks :

1. Flippo Edwin B, “Personnel Management”, 6th Edition, McGraw Hills 2000.
2. Dresler Garry, “Human Resource Management”, 8th Edition, Pearson Education, New Delhi 2002.

Reference Book:

1. Memoria C B, “Personnel Management (Management of HRM)”, Himalaya Publication, New Delhi 1999.

Course Outcomes**

After completion of the course student will be able to

1. **Comprehend and demonstrate the basic knowledge of HRM concepts.**
2. **Know and demonstrate the application knowledge of different HRM concepts.**
3. **Analyze and evaluate various HRM related practical issues.**
1. **Plan and design HRM strategies for various HRM situations.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	0	0	0	0	0	0	2	3		3	0	0	2	0	0
CO1	0	0	0	0	0	0	2	3	2	2	0	0		0	0
CO2	0	0	0	0	0	0	2	3		3	3	0	3	0	0
CO3	0	0	0	0	0	0	2	3	2	0	0	0	3	0	0
CO4	0	0	0	0	0	0	2	3		3	0	0	2	0	0

SUBJECT CODE: UEC349C	Data Structures using "C"	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	xx Hrs.

Introduction: Data structures, classifications (primitive & non primitive), data structure operations, pointers and dynamic memory allocation, pointers to arrays , structures, self-referential structures, pointers to structures.

Functions: Functions (Passing structure variable as an argument, passing whole structure as argument, passing structure variable as a pointer argument, etc).

UNIT–II	xx Hrs.

Dynamically allocated arrays **(**Using calloc() or malloc()**)**, array Operations: traversing, inserting, deleting, searching, and sorting. Stacks: definition, stack operations (push, pop and display. Test: underflow and overflow conditions), array representation of stacks, stacks using dynamic arrays, Stack Applications: infix to postfix conversion, evaluation of postfix expression, program to evaluate postfix expression, program to convert Infix to Postfix expression.

UNIT–III	xx Hrs.

Recursion - Factorial, GCD, Fibonacci sequence, tower of Hanoi. Queues: Definition, array representation, queue operations (Insert, delete and display), circular queues operations (Insert, delete and display), De-queues(Insert, delete and display), Priority Queues(Insert, delete and display). programming examples.

UNIT–IV	xx Hrs.

Linked Lists: Definition, representation of linked lists in memory, Linked list operations: Traversing, searching, insertion, and deletion. Doubly linked lists(Traversing, searching, insertion, and deletion), Circular linked lists(Traversing, searching, insertion, and deletion). Implementation of stack and queue using singly linked list. Programming Examples.

Reference Books *

Text Books

1. Ellis Horowitz and Sartaj Sahni,'' Fundamentals of Data Structures in C'', Universities Press, 2nd Edition, 2014
2. Gilberg&Forouzan,'' A Pseudo-code approach with C'', Cengage Learning, 2nd Edition,2014
3. Seymour Lipschutz, Schaum's Outlines, '' Data Structures'', McGraw Hill, Revised 1st Edition, 2014
4. Behrouz A. Forouzan and Richard F. Gilberg, '' Computer Science A Structured Programming Approach Using C'', Thomson, 2ndEdition

Reference Books

1. A M Tenenbaum, '' Data Structures using C'', PHI, 1989

Robert Kruse, '' Data Structures and Program Design in C'', PHI, 2nd edition,1996
Course Outcomes**
After completion of the course student will be able to 1. **Demonstrate the concepts of a) various types of data structures, operations and algorithms,b) Sorting and searching operations.** 2. **Analyze the performance of stack, queue, lists, trees, and searching and sorting techniques.** 3. **Write the C programs for all the applications of data structures.** 4. **To solve real world problems by applying data structure concepts.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	-	-	-	2	1	-	-	-	-	1	2	-	2
CO2	3	2	-	-	-	1	1	-	-	-	-	2	2	-	2
CO3	3	3	-	-	-	1	1	-	-	-	-	3	2	-	2
CO4	3	2	-	-	-	1	2	-	-	-	-	3	2	-	2

SUBJECT CODE: UEC346L	Electronic Devices and Circuits Laboratory	Credits: 1.5
L:T:P – 0-0-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

LISTOFTHE EXPERIMENTS

Sl. No

1. V-I characteristics and analysis of diode.
2. Analysis of diode as a half-wave and full-wave rectifier.
3. V-I characteristics and their analysis of Zener diode.
4. Zener diode as a voltage regulator and its regulation analysis.
5. Input and output characteristics and their analysis of Bipolar Junction Transistor (BJT) in common base, common collector and common emitter configuration.
6. Design, implementation and frequency response of transistor (BJT) as an amplifier
7. Design and implementation of transistor (BJT) as an oscillator.
8. Input and output characteristics and their analysis of field effect transistor (FET).
9. Design, implementation and frequency response of FET as an amplifier.
10. V-I characteristics and analysis of unijunction transistor (UJT).
11. Implementation of UJT as a relaxation oscillator.
12. V-I characteristics and analysis of silicon controlled rectifier (SCR).
13. Study of SCR as half-wave and full-wave controlled rectifier.
14. Simulation and analysis of Amplifiers and Oscillators.
15. Simulation and analysis of DC and AC excited RL and RC circuits.

Course Outcomes**

After completion of the course student will be able to

1. **Characterize semiconductor devices based on their characteristics.**
2. **Realize rectifiers, controlled rectifiers and regulators.**
3. **Design amplifiers and oscillators for given specifications.**
4. **Simulate and analyze basic electronic circuits.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	1	2	2	1	2	2	2	2	2	3	0	0
CO2	3	2	2	2	3	2	2	3	2	2	2	1	3	0	0
CO3	3	2	2	2	2	3	2	3	2	3	2	3	3	0	0
CO4	3	2	2	1	3	1	2	3	1	2	1	3	3	0	0

SUBJECT CODE: UEC347L	Digital Electronics Laboratory	Credits: 1.5
L:T:P – 0-0-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

LIST OF THE EXPERIMENTS

Sl. No.	
1	Simplification, realization of Boolean expression(s) using basic logic gates.
2	Implementation of Boolean expression(s) using universal gates.
3	Design of full adder and full subtractor implementation using basic logic gates.
4	Realization of a. Parallel adder / subtractor using 7483chip b. Decoder chip to drive LED display
5	Design and implementation of code converters (any two).
6	Implementation of three variable Boolean expression(s) using a. 8:1MUX b. 4:1MUX
7	Implementation of three variable Boolean expression(s) using 3:8 decoder and gates.
8	Design of two-bit comparator using basic logic gates and study of 7485 magnitude comparator.
9	Truth table verification of flip-flops: a. Master Slave JK flip-flop implementation using only NANDgates b. JK flip flop using7476.
10	Design of a. 4-bit asynchronous up counter using JK flip-flop(7476) b. 4-bit asynchronous down counter using JK flip-flop(7476) c. Mod-n asynchronous counter (7476) (n <=4)
11	Design of a. UP counter using 74193 b. DOWN counter using 74193
12	Design of shift registers using 7 495 viz. SIPO, SISO, PISO, PIPO shift right, shift left.
13	Simulate any 6 experiments covering both combinational and sequential circuits using circuit simulator- PROTEUS VSM.

Course Outcomes**

After completion of the course student will be able to

1. **Should be able to design combinational circuits and implement it using a) basic logic**
2. **Gates b) universal gates, c) multiplexers and d) decoder and gates**
3. **Should be able to design and realize latches and flip flops**
4. **Should be able to design and implement asynchronous counters**
5. **Should be able to design and implement synchronous counters and shift registers**
6. **Should be able to simulate combinational and sequential circuit using PROTEUS software**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	0	0	0	0	0	1	1	0	0	2	3	0
CO2	2	2	3	0	0	0	0	0	1	1	0	0	2	3	0
CO3	1	2	3	0	0	0	0	0	1	1	0	0	2	3	0
CO4	2	2	3	0	0	0	0	0	1	1	0	0	2	3	0

SUBJECT CODE: UMA330M	Bridge Course Mathematics -I	Credits: Mandatory
L:T:P -		CIE Marks: 50
Total Hours/Week:03		SEE Marks: 50

UNIT-I	15 Hrs.

Differential Calculus: Review of elementary calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Taylor's and Maclaurin's series expansions for one variable (statements only) without proof. Problems

Partial differentiation: Introduction to function of several variables, Partial derivatives; Euler's theorem - problems. Total derivatives-differentiation of composite functions. Jacobians-problems

UNIT–III	15 Hrs.

Integral Calculus: Evaluation of double and triple integrals. Area bounded by the curve. Beta and Gamma functions: Definitions, Relation between beta and gamma functions-problems.

UNIT–IV	10 Hrs.

Vector Calculus: Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- problems

Reference Books *

Textbooks:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10thEd.(Reprint), 2016.

Reference Books:

1. Thomas' Calculus: Early Transcendentals, Single Variable (13th Edition)
2. **Calculus:** Early Transcendentals James Stewart
3. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
4. B.V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
5. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
6. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.

Course Outcomes**

After completion of the course student will be able to

1. **Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.**
2. **Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.**

3. **Apply the concept of multiple integrals and their usage in computing the area and volumes.**
4. **Apply the knowledge of vector calculus to solve the engineering problems**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
CO2	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
CO3	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
CO4	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0

SUBJECT CODE: UBT133M	Environmental studies	Credits: --
L:T:P – 2-0-0		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

UNIT-I	10 Hrs.
Environment & Ecology: Environmental segments, ecosystem and classification of ecosystem. Environmental impacts of human activities: agriculture, transportation, industry, mining, urbanization. Natural Resources:Forest, water, mineral, food, land resources and biodiversity. Energy sources: types of energy, renewable and non renewable energy sources. Renewable energy: Solar, wind, hydropower, tidal energy, ocean & geo thermal energy, biomass energy-biodiesel, bioethanol & biogas; hydrogen as fuel. Non renewable Energy: coal, petroleum, natural gas & nuclear energy.	
UNIT–II	**10 Hrs.**
Environmental pollution: Water pollution: water quality standards, water borne diseases, fluoride problem; air pollution, noise pollution; effect of electromagnetic waves. **Sustainable future : Concept of sustainable development, threats to sustainability, over exploitation of resources, strategies for sustainable development. Environment education, conservation of resources. Environment economics – concept of green building, clean development mechanism (CDM), carbon crediting.**.	
UNIT–III	**10 Hrs.**
Current environmental issues of concern: Population growth, greenhouse effect-greenhouse gases and global warming, climate change, ozone layer depletion, acid rain & eutrophication. **Environmental policy legislation rules & regulations: National environmental policy, environment protection act, legal aspects of air & water act. Functions of government agencies.**	
UNIT–IV	**10 Hrs.**
Fundamentals of waste management : Solid waste management: Sources, classification, characteristics, collection & transportation, disposal, and processing methods. Hazardous waste management andhandling. **Concept of waste water treatment , Bioremediation.** **Industrial waste management (Case studies: cement, chemical, E–waste, food & construction industry waste management.**	
Reference Books *	
Textbooks: 1) Benny Joseph "Environmental Studies" Tata McGraw Hill, 2005. 2) Dr. D. L. Manjunath, "Environmental Studies" Pearson Education, 2006 3) Koushik and Koushik "Environmental Science & Engineering" New Age International Publishers, New Delhi, 2006 **Reference Books:** 1) P. Venugopal Rao "Principles of Environmental Science & Engineering" Pranticce Hall of India, 2006. 2) Meenakshi "Environmental Science & Engineering" " Prentice Hall of India, 2006. 3) S. K. Garg "Environmental Science & Ecological Studies" Khanna Publishers New Delhi, 2007. P.D.Sharma "Ecology and Environment" Rastogi Publications, 2012.	
Course Outcomes**	

1. Ability to understand basic aspects of environment.
2. Ability to understand impacts of human activities on nature.
3. Ability to know about natural resources.
4. Ability to understand the pollution and its effects on nature.
5. Ability to understand the concept of sustainable development
6. Ability to know about acts regarding environmental protection

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**
CO1	0	0	0	0	0	1	3	0	0	0	0	3	3	1	1
CO2	0	1	0	0	0	2	3	0	0	0	0	3	3	1	1
CO3	2	0	0	0	0	0	3	0	0	0	0	3	3	1	1
CO4	0	2	0	0	0	2	2	0	0	0	0	3	3	1	1
CO5	0	0	0	1	0	2	2	1	0	0	0	3	3	1	1
CO6	3	0	2	2	0	0	2	0	0	0	0	3	3	1	1

SUBJECT CODE:UMA435C	Statistics and Probability Distributions	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Statistics: Curve fitting by the method of least squares $y = a + bx$, $y = ab^x$, $y = a + bx + cx^2$ Correlation, expression for the rank correlation coefficient and regression.	
UNIT–II	**10 Hrs.**
Probability: addition rule, conditional probability, multiplication rule, Baye's rule. Discrete and continuous random variables-Probability density function, Cumulative distribution function, Problems on expectation and variance	
UNIT–III	**10 Hrs.**
Probability distributions: Binomial distributions Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.	
UNIT–IV	**10 Hrs.**
Markov chains: Markov chains: Introduction, Probability vectors, Stochastic Matrices, Fixed Points and Regular stochastic Matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.	

Reference Books *

1. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
2. Theory and problems of probability by Seymour Lipschutz (Schaum's Series).
3. Advanced Engineering Mathematics by H. K. Dass
4. Advanced Engineering Mathematics by E Kreyszig (John Wiley & Sons)
5. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt.ltd 2nd edition 2012.
6. Advanced Engineering Mathematics by Peter V. O'Neil.Author/s last Name, initial (Year), Book Title (edition), Publisher

Course Outcomes**

After completion of the course student will be able to

1. **To apply the least square sense method to construct the specific relation for the given group of data.**
2. **To understand the concept of probability.**
3. **To apply the concept of probability to find the physical significance of various distribution phenomena.**
4. **To understand the concepts of probability distributions.**
5. **To apply the concept of Markov Chain for commercial and industry purpose.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	--	--	--	--	--	--	--	--	--	--	1	2	--
CO2	1	2	--	--	--	--	--	--	--	--	--	--	1	2	--
CO3	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--
CO4	1	--	---	--	--	--	--	--	--	--	--	--	1	--	---
CO5	1	--	--	--	---	--	--	--	--	--	--	--	1	--	--

UEC441C	Signals and Systems	Credits: 04
L:T:P - 3 : 2: 0		CIE Marks: 50
Total Hours/Week: 04		SEE Marks: 50

UNIT-I	10 Hrs.
Introduction: Definition of signals and systems, classification of signals, elementary signals, basic operations on signals, inter connection of systems and operations, properties of systems.	
UNIT–II	**10 Hrs.**
Time domain representation of LTI systems: Convolution sum, convolution integral, impulse response representation. Properties of impulse response.	
UNIT–III	**10 Hrs.**
Fourier and inverse Fourier representation of signals: Introduction to complex sinusoidal signals and their use in Fourier representation of periodic signals(brief review of CTFS and DTFS).Continuous time Fourier transform, Discrete time Fourier Transform(DTFT),properties of DTFT and applications.	
UNIT–IV	**10 Hrs.**
Z-Transforms: Introduction, properties of ROC, properties of Z-transform and relation of Z-transform with Fourier transforms. Inverse Z-transform, transform analysis of LTI systems, transfer function, stability and causality, and solution of difference equations using Z-transform.	

Reference Books *

1. Simon Haykin and Barry VanVeen, Signals and Systems (2nd Edition),JohnWiley&Sons
2. MichelJ. Roberts, 2003 , SignalsandSystems (2nd Edition),TataMcGrawHill
3. AllanV.Oppenheam,AlanS.Willsky,andHamidNawab, 1997,SignalsandSystems (2nd Edition),Pearson Education Asia.

Course Outcomes**

After completion of the course student will be able

1. **Represent, characterize, and analyze CT and DT signals and systems.**
2. **2.Analyze CT and DT systems in time domain using convolution.**
3. **3.Analyze CT and DT systems in frequency domain, using Fourier tools like CTFT and DTFT.**
4. **Applyz-transform and its properties in the analysis of discrete-time signals and systems.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0
CO2	3	3	1	0	0	0	0	0	0	0	0	0	3	0	0
CO3	3	3	1	0	0	0	0	0	0	0	0	0	3	0	0
CO4	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0

UEC442C	Linear Integrated Circuits and Its Applications	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Differential Amplifiers: Introduction, differential amplifier, differential amplifier circuit configurations, dual- input balanced output differential amplifier, dual- input unbalanced output differential amplifier, single input balanced output differential amplifier, single input unbalanced output differential amplifier, constant current bias, current mirror, cascaded differential amplifier stages, level translator.

Introduction to operational amplifiers: Introduction, block diagram representation of a typical op-amp, the ideal op-amp, equivalent circuit of an op-amp, ideal voltage transfer curve, open loop op-amp configurations.

Self study component: Numericals on differential amplifiers

UNIT–II	10 Hrs.

An op-amp with negative feedback: Block diagram representation of feedback configuration, voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifier.

The practical op-amp: Input offset voltage, input bias current, input offset current, total output offset voltage, common mode configuration, common mode rejection ratio, power supply rejection ratio, slew rate

Self study component: To derive gain, input resistance of differential amplifier with three op-amps

UNIT–III	10 Hrs.

General applications: The peaking amplifier, summing, scaling and averaging amplifiers, integrator, differentiator.

Active filters: First order and second order low pass butter worth filter, first order and second order high pass butter worth filter, higher order filters, band pass filter, band reject filters.

Self study component: To study All pass filter

UNIT–IV	10 Hrs.

Oscillators and waveform generator: Introduction, phase shift oscillator, wien bridge oscillator, square wave generator, triangular wave generator.

Comparators and converters: Basic comparator, zero crossing detector, sample and hold circuit.

The 555 Timer: Block diagram, connection diagram, 555 timer as Astable and Monostable multivibrators

Self study component: To study voltage-controlled oscillator and Schmitt trigger

Reference Books *

1. GayakwadRamakanth A. "Operational Amplifiers and Linear Integrated Circuits", 3rd& 4th Edition, PHI.
2. D. Roy Choudary, "Linear Integrated Circuits", 2nd Edition.

Course Outcomes**

After completion of the course student will be able to

1. Identify and analyze the different configurations of differential amplifier.
2. Analyze the different feedback amplifiers and various parameters of practical op-amp.
3. Design the active filters and amplifiers using op-amp.
4. Design waveform generators, data comparators and converters.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	1	1	-	-	-	1	-	-	-	3	1	-
CO2	3	3	1	1	1	-	-	-	1	-	-	-	3	1	-
CO3	3	3	2	2	1	1	1	-	1	-	1	1	3	1	-
CO4	3	2	2	1	1	1	1	-	1	-	1	1	3	1	-

SUBJECT CODE:UEC445C	Analog Communication	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Linear modulation: Baseband and carrier communication, time domain and frequency domain description, generation and detection of Amplitude Modulation (AM) waves.

DSB-SC modulation: Time and frequency domain representation, generation and detection of DSB-SC modulated waves.

SSB modulation: Time domain representation of SSB signal, generation and detection of SSB modulated waves, Quadrature Amplitude Modulation (QAM).

Vestigial sideband modulation: Frequency domain representation, generation and detection of VSB, comparison of amplitude modulation techniques, super heterodyne receiver.

UNIT–II	10 Hrs.

Angle modulation: Concept of angle modulation, relation between frequency and phase modulation, bandwidth of angle modulated wave.

Generation of FM: direct and indirect methods, PLL, demodulation of FM,pre-emphasis and de-emphasis, FM radio.

UNIT–III	10 Hrs.

Probability theory: Axioms of probability, properties of probability, conditional probability.

Random variables: Continuous and discrete random variable, statistical averages, distribution and density functions, central limit theorem.

Random processes: Specification of a random process, stationary, ensemble averages, ergodicity, power spectral density, Gaussian processes.

UNIT–IV	10 Hrs.

Noise: Shot noise, thermal noise, white noise, equivalent noise bandwidth, noise figure, equivalent noise temperature

Noise in continuous wave modulation systems: Noise in DSB-SC and SSB receivers, noise in AM receiver, noise in FM receiver.

Reference Books *

1. B. P. Lathi “Modern Digital and Analog Communication Systems”, 3rdEdition, Oxford University, 2006
2. George Kennedy “Electronic Communication Systems”, 3rdEdition, Tata McGraw-Hill Publication, 1984
3. B. P. Lathi “Communication Systems”, 3rd Edition, B. S. Publications, 2009
4. Simon Haykin “Communication Systems”, 3rd Edition, John Wiley and Sons, 2005

Course Outcomes**

After completion of the course student will be able to

1. **Explain amplitude modulation and demodulation techniques in communication systems**
2. **Explain angle modulation and demodulation techniques in communication systems**
3. **Apply the basics of probability to random variables and random processes for communication systems**

4. **Describe different types of noise and predictits effect on various analog communication systems**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	0	1	1	1	0	0	0	0	0	3	0	0
CO2	3	2	2	0	1	1	1	0	0	0	0	0	3	0	0
CO3	3	3	1	0	1	1	1	0	0	0	0	0	3	0	0
CO4	2	2	1	0	1	1	2	0	0	0	0	0	3	0	0

SUBJECT CODE: UEC443C	8051 Microcontroller	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Microprocessors and Microcontrollers: Introduction, Harvard Vs Von Neumann architecture, comparison between microprocessors and microcontrollers, 8051 Architecture: General features of 8051 Microcontroller, 8051 block diagram, programming model, pin description, 8051 oscillator and clock, general purpose and special function registers, internal RAM and ROM, stack, input/output pins, ports and circuits, external memory.	
UNIT–II	**10 Hrs.**
8051 Instructions and Programming: addressing modes, types of instructions, instruction set, data move instructions, external data move instructions, arithmetic instructions, logical instructions, jump and call instructions, bit-addressable instructions, programs using all the above instructions and concepts.	
UNIT–III	**10 Hrs.**
Programming peripherals in assembly: Timer and counter programming. Serial Port Programming: Basicsof serial communication, 8051 connection to RS232, 8051 serial port programming. Interrupts: 8051 interrupts, Programming timer interrupts.	
UNIT–IV	**10 Hrs.**
Programming external hardware interrupts and serial communication interrupts. Interfacing: Introduction, need for interfacing, interfacing the following devices using assembly-LCDmodule,ADC808/DAC808, key-pad,stepper motor. Interfacing with the 8255:Programming the 8255,Interfacing the 8255.	

Reference Books *

1. Kenneth J. Ayala, "The 8051 Micro controller Architecture, Programming & Applications", Penram International, 2nd Edition,1996
2. Muhammad Ali Mazidi, and Janice GillispieMazidi, "The 8051 Micro controller and Embedded Systems", Pearsons Education, 2nd edition, 2007.
3. Craig Steiner,"The 8051/8052 Microcontroller: architecture, assembly language, and Hardware interfacing", WP Publishers and Distributors, 200*6*.
4. DavidCalcutt,Fredcwon,"8051microcontroller",Elsevier,1stEdition,2004.
5. Dr.UmaRao and Dr.AndhePallavi, "The 8051 microcontroller architecture, programming and applications", Pearson Education,2010.

Course Outcomes**

After completion of the course student will be able to

1. **Comprehend the architecture of 8051 microcontroller.**
2. **Write programs in assembly language for 8051 to explore its capabilities.**
3. **Program inbuilt peripheral like timer/counter, serial and interrupt peripheral in assembly language.**
4. **Interface devices like LCD, Keypad, DAC, ADC, Stepper motor and PPI 8255 for different applications using assembly language.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	1	1	1	1	3	1	1	0	0	0	3	0
CO2	3	2	2	1	1	2	1	3	2	1	1	1	0	3	0
CO3	3	2	3	2	2	3	2	3	3	3	3	2	0	3	0
CO4	3	2	2	2	3	2	2	3	2	2	2	2	0	3	0

SUBJECT CODE: UEC444C	Electronic Circuits Design	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
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. Transistor amplifying action, Common- emitter configuration, Common collector configuration.	
UNIT–II	**10 Hrs.**
FET Biasing: Introduction, Fixed bias configuration, Self bias configuration, Voltage divider biasing, Common gate configuration, Special case of VGSQ = 0 V, Design, Troubleshooting, p-Channel FETs, Universal JFET bias curve	
UNIT–III	**10 Hrs.**
FET Amplifiers: Introduction, JFET small signal model, Fixed bias configuration, Voltage divider configuration, Common gate configuration, Source follower (Common drain) configuration	
UNIT–IV	**10 Hrs.**
Power Supplies: Introduction, General filter considerations, Capacitor filter, RC filter, Discrete transistor voltage regulation, IC Voltage regulators.	

Reference Books *

Text Books:

1) Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Publications, 10th Edition, 2009.
2) Jim Williams, “The art and science of Analog Circuit Design”, EDN series Elsevier publication, Volume 2, 1995.

Course Outcomes**

After completion of the course student will be able to

1. Design BJT amplifier using different biasing methods
2. Design and analyze different FET biasing methods used in amplifier
3. Analyze FET amplifier of different configurations
4. Design discrete and IC based regulated power supply

*Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	2	2	1	2	2	2	2	2	3	0	0
CO2	3	2	2	2	2	2	1	2	2	2	2	2	3	0	0
CO3	3	3	2	2	2	2	1	2	2	2	2	2	3	0	0
CO4	3	2	3	3	2	2	1	2	2	2	2	2	3	0	0

SUBJECT CODEUEC441L	Analog Communication Laboratory	Credits: 1.5
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

LIST OF EXPERIMENTS
1. Design and verification of second order active low pass filter 2. Design and verification of second order active high pass filter 3. Design and verification of second order active band pass filter 4. Design and verification of second order active band elimination filter 5. Realization of Amplitude Modulation (AM) and demodulation for a given modulation index 6. Realization of Frequency Modulation (FM) 7. Realization of Pulse Width Modulation (PWM) 8. Realization of Pulse Position Modulation (PPM) 9. Realization of Pulse Amplitude Modulation (PAM) 10. Realization of Pre-emphasis and De-emphasis circuits 11. Realization of frequency demodulation using PLL **12.** Generation of PN sequence
Course Outcomes**
After completion of the course student will be able to **1. Design and verify the frequency response of active filters for a given specifications.** **2. Design and characterize AM and FM modulation and demodulation circuits.** **3. Construct pre-emphasis and de-emphasis circuits.** **4. Verify the PAM, PWM & PPM circuits.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	1	0	0	0	2	2	0	1	3	0	0
CO2	3	2	2	1	1	0	0	0	2	2	0	1	3	0	0
CO3	3	2	2	1	1	0	0	0	2	2	0	1	3	0	0
CO4	3	2	2	1	1	0	0	0	2	2	0	1	3	0	0

SUBJECT CODE:21UEC442L	Microcontroller Laboratory	Credits: 1.5
L:T:P – 0-0-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

1. Move an 8-bit data byte to a register/memory using all addressing modes.
2. Block of data transfer in internal RAM locations.
3. Exchange block of data internal/external memory locations.
4. Average of n-eight bit numbers.
5. Programs on basic arithmetic operations.
6. Programs using logical instructions.
7. Search a byte in a given array.
8. Find largest/smallest number in an array.
9. Sorting the given array of numbers in ascending/descending order.
10. Code conversion programs.
11. Addition/multiplication of two matrices.
12. Determine Fibonacci series of a given number.
13. Programs on stack operations.
14. Programs on serial communication.
15. Programs on interrupts.

Part-B

Developing interfacing Embedded 'C' programs in keil cross-compiler, fusing machine code on flash board/Circuit and testing the code.

1. Stepper motor
2. DC motor
3. Buzzer
4. LCD
5. Keypad
6. Analog to Digital Conversion(ADC)
7. Digital to Analog Conversion(DAC)
8. Seven Segment Display (SSD)

Course Outcomes**

After completion of the course student will be able to

1. **Conduct experiments to understand fundamental concepts of 8051 microcontroller.**
2. **Write efficient programs in assembly level language of the 8051 microcontroller.**
3. **Write program to interface different peripherals.**
4. **Develop the embedded C program to perform a defined task.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	0	0	0	0	0	0	0	0	0	0	3	
CO2	3	2	2	0	1	0	0	0	0	0	0	0	0	3	
CO3	3	2	3	0	2	0	0	0	0	0	0	0	0	3	
CO4	3	2	2	0	3	0	0	0	0	0	0	0	0	3	

SUBJECT CODE:UMA430M	Bridge Course Mathematics-II	Credits: --
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	15Hrs.

Ordinary differential equations of first order: Variable separable, Homogeneous Exact form and reducible to exact differential equations. Linear and Bernoulli's equation.

UNIT–II	15 Hrs.

Laplace Transform: Introduction, Definition of Laplace Transform, Laplace Transform of Elementary functions, Properties: Shifting, differentiation, Integral and division by t. Periodic function, Heaviside's Unit step function

Inverse Laplace transforms – Properties. Convolution theorem. Solutions of linear differential equations

UNIT–III	10 Hrs.

Partial Differential Equations (PDE's): Introduction to PDE : Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Solution of Lagrange's linear PDE, method of separation of variables

Reference Books *

Text books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10thEd.(Reprint), 2016

Reference Books:

1. Thomas' Calculus: Early Transcendentals, Single Variable (13th Edition)
2. **Calculus:**Early Transcendentals James Stewart
3. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
4. B.V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
5. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.

Course Outcomes**

After completion of the course student will be able to

1. Explain various physical models through first and higher order differential equations and solve such linear ordinary differential equations.
2. Apply the Laplace transform techniques to solve differential equations.
3. Understand a variety of partial differential equations and solution by exact methods.
4. Solve PDE by direct integration and Solution of Lagrange's linear PDE, method of separation of variables.

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
CO2	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
CO3	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
CO4	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0

Syllabus for

B.E. V & VI – Semester

(For students admitted to I year in 2020-21)

SUBJECT CODE: UEC551C	Digital Signal Processing	Credits: 04
L:T:P – 3-2-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Discrete Fourier Transform: Frequency domain sampling and reconstruction of discrete time signals, DFT as a linear transformation, its relationship with other transforms, properties: multiplication of two DFTs, circular convolution and additional properties of DFT. Application of DFT in linear filtering: overlap add and overlap save method.	
UNIT–II	**10 Hrs.**
Fast Fourier Transform Algorithms: Need for efficient computation of DFT, Radix 2 FFT algorithms for computation of DFT and IDFT: Decimation in time and decimation in frequency algorithms. Goertzel algorithm and chirp-Z transform algorithm.	
UNIT–III	**10 Hrs.**
IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebyshev filters. Design of IIR filters from analog filters (i.e. Butterworth and Chebyshev), Transformation techniques: Impulse invariance method, Approximation of derivative (Backward difference and Forward difference) method. Bilinear transformation method.	
UNIT–IV	**10 Hrs.**
FIR filter design: Introduction to FIR filters, Design of FIR filters using windowing (Rectangular, Hamming, Hanning and Bartlet) method, FIR filter design using frequency sampling method. Implementation of discrete time systems - Structures for IIR and FIR systems: Direct form I, Direct form II, Cascade and Parallel realization.	

Reference Books *

Textbook:

1. Proakis and Manolakis, “Digital Signal Processing-Principles Algorithms and Applications” PHI Publication, III Edition, 1997.

Reference Books:

1. Oppenheim and Schaffer, “Discrete Time Signal Processing” PHI Publication, III Edition, 2003.

Course Outcomes**

After completion of the course student will be able to

1. **Compute and Use DFT for linear filtering applications.**
2. **Use FFT algorithms for efficient computation of DFT.**
3. **Design and implement IIR digital filters using Butterworh and Chebysheve approximations.**
4. **Design and implement FIR digital filters using windowing and frequency sampling techniques.**

* **Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	0	1	0	0	0	0	0	0	0	3	0	0
CO2	3	3	1	0	1	0	0	0	0	0	0	0	3	0	0
CO3	3	3	3	0	1	0	0	0	0	0	0	0	3	0	0
CO4	3	2	3	0	1	0	0	0	0	0	0	0	3	0	0

SUBJECT CODE: UEC542C	Digital Communication	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Model of digital communication systems Sampling process: Sampling Theorem, quadrature sampling of Band pass signal, reconstruction of a message from its samples, signal distortion in sampling. Line codes, unipolar, polar and Manchester codes and their power spectral densities.	
UNIT–II	**10 Hrs.**
Waveform Coding Techniques: PCM, Channel noise and error probability, quantization noise and SNR, robust quantization. DPCM, DM, ADM, Gram-Schmidt ortho-gonolisation procedure, Geometric Interpretation of signals	
UNIT–III	**10 Hrs.**
Digital Modulation Techniques: Digital Modulation formats, Coherent binary modulation techniques (ASK, PSK, FSK), Probability of error for each ASK, PSK, FSK. Coherent quadrature modulation techniques, MSK, (without derivation of probability of error equation). Non-coherent binary modulation techniques (FSK and DPSK).	
UNIT–IV	**10 Hrs.**
Model of a spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum communication, (SFH & FFH), Applications effect of dispreading on a narrow bond interference coherent binary PSK, signal space dimensionality & processing gain, frequency hop spread spectrum. Applications.	

Reference Books *

1. Simon Haykin, “Digital communications”, John Wiley, Edition 2014
2. John. G. Proakis, & Masoul salehi” Fundamental of Communication System” Pearson Education, Edition 2014
3. Bernard Sklar and Prabitrakumary Ray, “Digital Communication Fundamentals and Applications”, Pearson Publications, 2010
4. K. Sam Shanmugan, “Digital and Analog Communication Systems”, John Wiley & Sons, 2006

Course Outcomes**

After completion of the course student will be able to

1. **Design and implement sampling and reconstruction of low pass signals.**
2. **Design and implement uniform and non uniform quantizer and encoder for analog to digital conversion, representation of signals**
3. **Design and implement different digital modulation /demodulation techniques.**
4. **Comprehend the concept of signals estimation detection and spread spectrum communication.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	0	1	0	0	0	0	0	0	0	3	0	0
CO2	3	2	2	0	1	0	0	0	0	0	0	0	3	0	0
CO3	3	3	1	0	1	0	0	0	0	0	0	0	3	0	0
CO4	3	3	3	0	1	0	0	0	0	0	0	0	3	0	0

SUBJECT CODE: UEC543C	Verilog Programming	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Introduction to Verilog: Introduction, Computer-Aided Design, Hardware Description Languages, Verilog Description of Combinational Circuits, Verilog Modules, Verilog Assignments, Procedural Assignments, Modeling Flip-Flops Using Always Block, Always Blocks Using Event Control Statements, Delays in Verilog, Compilation, Simulation, and Synthesis of Verilog Code, Verilog Data Types and Operators, Simple Synthesis Examples, Verilog Models for Multiplexers, Modeling Registers and Counters Using Verilog Always Statements, Behavioral and Structural Verilog, Constants, Arrays,	
UNIT–II	**10 Hrs.**
Introduction to Verilog cont.: Loops in Verilog, Testing a Verilog Model. **Design Examples:** Introduction, BCD to 7-Segment Display Decoder, A BCD Adder, 32-Bit Adders, Traffic Light Controller, State Graphs for Control Circuits, Scoreboard and Controller, Synchronization and De-bouncing, A Shift-and-Add Multiplier, Array Multiplier, A Signed Integer/Fraction Multiplier, Keypad Scanner, Binary Dividers.	
UNIT–III	**10 Hrs.**
Additional Topics in Verilog: Introduction, Verilog Functions, Verilog Tasks, Multivalued Logic and Signal Resolution, Built-in Primitives, User-Defined Primitives, SRAM model, Model for SRAM Read/Write System, Rise and Fall Delays of Gates, Named Association, Generate Statements, System Functions, Compiler Directives, File I/O Functions, Timing Checks. **Hardware Testing and Design for Testability:** Introduction, Testing Combinational Logic, Testing Sequential Logic, Scan Testing, Boundary Scan, Built-In Self-Test.	
UNIT–IV	**10 Hrs.**
Component Test and Verification: Test-bench, Combinational circuit testing, Sequential circuit testing, Test-bench Techniques, Simulation control, Limiting data sets, Applying synchronized data, Synchronized display of results, An interactive test-bench, Random time intervals, Buffered data application, Design Verification, Assertion Verification, Assertion verification benefits, Open verification library, Using assertion monitors, Assertion templates	

Reference Books *

1.
2. Charles Roth, Lizy Kurian John, and ByeongKil Lee "Digital Systems Design Using Verilog" Cengage Learning, 2016
3. ZainalabedinNavabi "Verilog Digital System Design" Second Edition, Mcgraw Higher Ed,2008
4. Palnitkar, Samir. “Verilog HDL: a guide to digital design and synthesis” Vol. 1. Prentice Hall Professional,2003.
5. Sagdeo, Vivek. “The complete Verilog book”. Springer Science & Business Media,2007.
6. Smith, Douglas J., and Alex Foreword By-Zamfirescu. “HDL Chip Design: A practical guide for designing, synthesizing and simulating ASICs and FPGAs using VHDL or Verilog” Doone Publications,1998.
7. Bhasker, Jayaram. “A Verilog HDL Primer”. Star Galaxy Publishing,1999.

Course Outcomes**

After completion of the course student will be able to

1. **Verilog code for combinational and sequential circuits.**
2. **Verilog code for simple digital system for given specifications using different design styles.**
3. **Verilog code using advanced Verilog concepts.**
4. **Test benches to automate simulation and verification of design.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	0	1	1	3	0	0	0	0	0	0	0	0	3	0
CO2	1	0	1	1	3	0	0	0	0	0	0	0	0	3	0
CO3	1	0	1	1	3	0	0	0	0	0	0	0	0	3	0
CO4	1	0	1	1	3	0	0	0	0	0	0	0	0	3	0

SUBJECT CODE: UEC545E	Computer Organization	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts,BusStructures,Performance–ProcessorClock,BasicPerformanceEquation, Clock Rate, Performance Measurement, Historical Perspective.

Machine Instructions and Programs: Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing. Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions.

UNIT–II	10 Hrs.

Input/Output Organization: Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Interface Circuits, StandardI/OInterfaces–PCIBusand USB.

UNIT–III	10 Hrs.

Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size and Cost, Cache Memories–Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage. **Arithmetic:** Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers

UNIT–IV	10 Hrs.

Arithmetic Cont.: Signed, Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers and Operations.

Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control and Micro programmed Control.

Reference Books *

1) Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, Tata McGraw Hill, 5th Edition, 2002
2) David A. Patterson, John L. Hennessy, “Computer Organization and Design – The Hardware /Software Interface ARM Edition”, Elsevier, 4th Edition, 2009
3) WilliamStallings,“ComputerOrganization&Architecture”,PHI,7thEdition,2006

Course Outcomes**

After completion of the course student will be able to

1. **Have thorough knowledge about structure and performance of a modern digital computer.**
2. **Analyze the different ways of communicating with I/O devices and standard I/O interfaces**

in a compute including using interrupt.

3. **Analyze memory hierarchy including main memory, cache memory, virtual memory andsecondarymemoryconsideringcost/performance.Differentmappingfunctions of cache.**
4. **Implement arithmetic operations like multiplication, division and analyze the processofinstructionexecutionofacompleteinstructionintheprocessing unitandits control.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	2	1	2	0	0	0	0	0	0	0	0	0	2
CO2	1	1	2	1	3	0	0	0	0	0	0	0	0	0	3
CO3	1	1	2	1	2	0	0	0	0	0	0	0	0	0	2
CO4	1	1	3	1	3	0	0	0	0	0	0	0	0	0	3

SUBJECT CODE: UEC546E	Electronic Instrumentation	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Measurement and Errors: Definitions, accuracy and precision, significant figures, types of errors, statistical analysis, probability of errors, limiting errors, problems. Units, dimensions and standards: Introduction, SI mechanical units, scientific notation and metric prefixes, SI electrical units, dimensions, standards, problems. DC bridges: Introduction, Wheatstone bridge, Kelvin bridge.	
UNIT–II	**10 Hrs.**
Electronic instruments for measuring basic parameters**:** Introduction, amplified DC meter, AC voltmeter using rectifiers, true RMS responding voltmeter, electronic multimeter, considerations in choosing an analog voltmeter, digital voltmeter, component measuring instruments, Q-meter, measurement of power at high frequencies, bolometer method of power measurement, AC Bridges: Maxwells bridge, Hay bridge, Schering bridge, problems.	
UNIT–III	**10 Hrs.**
Oscilloscopes: Introduction, cathode ray tube, deflection amplifiers, wave form display, oscilloscope time base, dual trace oscilloscope, measurement of voltage, frequency and phase, pulse measurement, X-Y and Z displays. Storage oscilloscope, sampling oscilloscope, digital storage oscilloscope, DSO applications, high frequency oscilloscope.	
UNIT–IV	**10 Hrs.**
Signal generation and signal analysis: The sine wave generator, frequency synthesized generator, frequency divider, function generator, audio frequency signal generation. Wave analyzers, harmonic distortion analyzers, spectrum analyzers, applications of wave and spectrum analysers.	

Reference Books *

1. David A. Bell, “Electronic Instrumentation and Measurements”, PHI, Second Edition, 2010
2. Albert D. Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurements Techniques”, PHI, 2007
3. R. K. Rajput, “Electronic Measurements and Instrumentation”, S. Chand, First Edition, 2008

Course Outcomes**

After completion of the course student will be able to

1. **Comprehend the basic knowledge system errors, units, dimensions, standards and working principle of Wheatstone, kelvin bridges.**
2. **Use ofelectronic instruments for measuring basic parameters such as voltage, current, power, capacitance and inductance.**
3. **Use of some special oscilloscopes for different applications.**
4. **Analysis of different signal generators and signal analysis.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	0	1	1	1	0	0	0	0	0	3	2	0
CO2	3	2	1	0	0	1	2	0	0	0	0	0	3	0	0
CO3	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0
CO4	3	1	1	1	0	0	0	0	0	0	0	0	3	0	0

SUBJECT CODE : UEC547E	Object Oriented Programming with C++	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Functions: Introduction, The main function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Default Arguments, const Arguments, Recursion, Function Overloading, Friend and Virtual Functions.

Classes and Objects: Introduction, Specifying a Class, Defining Member Functions, A C++ program with Class, Making an outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, const Member Functions, Pointers to Members, Local Classes.

UNIT–II	10 Hrs.

Constructors and Destuctors: Introduction, Constructors, Parameterized Constructors, Multiple Constructors in a class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, const Objects, Destructors.

Operator Overloading and Type Conversions: Introduction, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators Using Friends, Manipulation of Strings Using Operators, Rules for Overloading Operators, Operator Overloading Examples, Type Conversions.

UNIT–III	10 Hrs.

Inheritance: Extending Classes, Introduction, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes.

Pointers, Virtual Functions and Polymorphism: Introduction, Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Virtual Constructors and Destructors.

UNIT–IV	10 Hrs.

Templates: Introduction, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Overloading of Template Functions, Member Function Templates.

Exceptions: Introduction, Basic of Exception Handling, Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, Rethrowing an Exception.

Reference Books *

Textbooks:

1. Robert Lafore, "Object Oriented Programming in C++", SAMS, 4th Edition
2. E Balagurusamy, "Object Oriented Programming with C++", Mc. Graw Hill , 6th Edition

Reference Book:

1. Stanler B. Lippon, "C++ Primer", Pearson, 4th Edition

Course Outcomes**
After completion of the course student will be able to **1. Use Functions, class, and objects** **2. Use the concept of Operator Overloading, Strings** **3. Write programmes with Inheritance and Virtual Functions** **4. Use Templates and handle Exceptions**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	0	2	0	0	0	0	2	0	2	2	2	0
CO2	3	3	3	0	2	0	0	0	0	2	0	2	2	2	0
CO3	3	3	3	0	2	0	0	0	0	2	0	2	2	2	0
CO4	3	3	3	0	2	0	0	0	0	2	0	2	2	2	0

SUBJECT CODE: : UEC548E	Micro Electro Mechanical Systems	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction to MEMS Technology: Basic definitions, history and evolution of MEMS. Feynman's vision, microelectronics and MEMS, microsensors, microactuators and microsystems, Types of MEMS, Applications of MEMS in various disciplines. Commercial MEMS products.

Multiphysics-Multiengineering aspects of MEMS: Introduction to design, modeling and simulation, optimization, fabrication, reliability and packaging of MEMS.

Scaling issues in microsystems, examples and numerical problems based on scaling laws.

UNIT–II	10 Hrs.

Design and Working Principles of MEMS: Transduction principles in microdomain- Biomedical sensor & biosensor and DNA sensor, chemical sensor, optical sensor, pressure sensor, thermal sensor. Actuation using thermal force, shape-memory alloy, piezoelectric and electrostatic forces.Mechanical sensors and actuators – beams and cantilevers, accelerometers. Electrostatic sensors and actuators – parallel plate capacitors, comb drive sensor and actuator. Optical MEMS – DLP mirror; construction and working.

UNIT–III	10 Hrs.

Modeling and Simulation of MEMS: Basic modeling elements in mechanical systems, electrical systems, microfluidic systems, thermal systems, magnetic domain and electrostatic systems. Measurement tools in microsystems: AFM, SEM and optical inferometry. Characterization methods. Simulation of MEMS: Need for simulation, FEM, MEMS design and realization tools – ANSYS/Multiphysics, CoventorWare, COMSOL. AFM as a measurement tool in microsystems. Case Studies: Microcantilever based sensor, electrothermal actuator, electrostatic actuator.

UNIT–IV	10 Hrs.

Microfabrication/Micromachining: Overview of micro fabrication, silicon wafer extraction and cleaning, structural and sacrificial materials in microfabrication, lithography, deposition, doping, etching, Introduction to MEMS fabrication methods like surface, bulk, LIGA and wafer bonding methods.

Reference Books *

4. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan, K. N. Bhat, V. K. Atre, "Micro and smart systems", Wiley, India, 2010.
5. N. P. Mahalik, "M EMS", Tata McGraw-Hill, 2007.
6. Tai, Ran Hsu,"MEMS and microsystems: design and manufacture", TMH, 2002.
7. James J. Allen, "Micro Electro Mechanical System design", CRC Press, Taylor & Francis Group, 2005.
8. Chang Liu, "Foundations of MEMS", Pearson education international, 2007.

Stephen D. Senturia, "Microsystem design", Springer International edition, 2001.

Course Outcomes**
After completion of the course student will be able to 1. Comprehend the fundamentals of MEMS and expose students to the basic scaling laws as applied to micro domain. 2. Design and understand the working principle of various microsensing and actuating devices. 3. Mathematically model and simulate the various types of micro-systems 4. Comprehend the various steps involved in microfabrication and micromachining of micro devices, structures and systems.

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	0	0	1	0	0	0	2	0	3	3	0
CO2	3	3	3	3	0	0	2	0	0	0	3	0	3	3	0
CO3	3	2	2	2	3	0	0	0	0	0	3	0	3	3	1
CO4	3	2	2	3	0	0	0	0	0	0	3	0	3	3	0

SUBJECT CODE : UEC549E	Automotive Electronics	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

The basics of Electronic Engine Control: Motivation for Electronic Engine Control, Exhaust Emissions, Fuel Economy, Federal Government Test Procedures, Concept of an Electronic Engine Control System, Definition of Engine Performance Terms, Exhaust Catalytic Converters, Electronic Fuel Control System, Analysis of Intake Manifold Pressure, Idle Speed Control, Electronic Ignition.

Sensors and Actuators: Automotive Control System Applications of Sensors and Actuators, Throttle Angle Sensor, Temperature Sensors, Typical Coolant Sensor, Sensors for Feedback Control, Knock Sensors, Angular Rate Sensor, LIDAR.

UNIT–II	10 Hrs.

Digital Video Camera, Flex-Fuel Sensor, Automotive Engine Control Actuators Variable Valve Timing, Electric Motor Actuators, Stepper Motors, Ignition System.

Digital Power train Control Systems: Introduction, Digital Engine Control, Digital Engine Control Features, Control Modes for Fuel Control, Discrete Time Idle Speed Control,EGR Control,Variable Valve Timing Control, Turbo charging, Direct Fuel Injection, Flex Fuel, Electronic Ignition Control.

UNIT–III	10 Hrs.

Integrated Engine Control System, Summary of Control Modes.

Vehicle Motion Controls: Representative Cruise Control System, Cruise Control Electronics, Antilock Braking System, Electronic Suspension System, Electronic Suspension Control System, Four-Wheel Steering Car.

UNIT–IV	10 Hrs.

Vehicle Communications: IVN, CAN, Local Interconnect Network, FlexRay IVN, MOST IVN, Vehicle to Infrastructure Communication, Vehicle-to-Cellular Infrastructure, Quadrature Phase Shifter and Phase Modulation (QPSR), Short-Range Wireless Communications, Satellite Vehicle Communication, GPS Navigation, The GPS System Structure , Safety Aspects of Vehicle-to-Infrastructure Communication.

Electronic Safety-Related Systems: Airbag Safety Device, Blind Spot Detection, Automatic Collision Avoidance System, Lane Departure Monitor, Tire Pressure Monitoring System, Enhanced Vehicle Stability.

Reference Books *

1. William B. Ribbens, “Understanding Automotive Electronics”, 8th Edition, Elsevier
   a. Publishing.
2. Robert Bosch Gmbh (Ed.) Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th edition, John Wiley & Sons Inc., 2007.

Course Outcomes**

After completion of the course student will be able to

1. **Explain the electronics systems used for control of automobiles**
2. **Select sensors, actuators and control systems used in automobiles**
3. **Diagnose the faults in the sub systems and systems used automobile**
4. **Explain the vehicle to vehicle communication and safety features of the vehicle.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	0	1	0	0	1	0	0	0	1	1	1	0	1
CO2	1	1	0	1	1	0	1	0	0	0	1	1	1	0	1
CO3	1	1	0	0	1	0	0	0	0	0	1	1	1	0	1
CO4	1	1	0	0	1	0	1	0	0	0	1	1	1	0	1

SUBJECT CODE: UEC540E	Biomedical Signal Processing	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction to Biomedical Signal: The nature of biomedical signals, objectives of biomedical signal analysis, difficulties encountered in biomedical signal analysis, Computer aided diagnosis.

Neurological Signal processing: Brain and its potentials, Electrophysiological origin of Brain waves, EEG signal and its characteristics, EEG analysis, Linear prediction theory, Autoregressive (AR)method,Recursive Estimation of AR parameters,Spectral error measure, Adaptive segmentation.

UNIT–II	10 Hrs.

Filtering for Removal of Artifacts: Random noise, structured noise and physiological interference, stationary versus non-stationary processes, typical case study, Time domain filters with application: Synchronized averaging, moving-average filters. Frequency domain filters with examples: removal of high frequency noise by Butterworth low pass filters, removal of low frequency noise by Butterworth high pass filter, removal of periodic artifacts by notch and comb filters. Optimal filtering: Weiner filter.

UNIT–III	10 Hrs.

Signal Averaging: Basics of signal averaging, Signal averaging as a digital filter, A typical averager, Software for signal averaging, Limitations of signal averaging.

Data Acquisition and classification of sleep stages, The Markov model and Markovchains, Dynamics of Sleep-wakeTransitions,HypnogramModelParameters.

Cardiological Signal Processing: ECG Parameters and their estimation

UNIT–IV	10 Hrs.

Adaptive Interference/Noise Cancellation: A review of wiener filtering problem, Principleof an adaptive filter, the steepest descent algorithm, Adoptive noise canceller, Cancellation of 60Hz Interference in ECG, Cancelling Donor heart Interference in Heart-transplant ECG, Cancellation of Electrocardiographic signals from the electrical activity of chest muscles, Cancelling of maternal ECG in Fetal ECG, Cancellation of higher frequency noise in electro- surgery.

ECG Data Reduction Techniques: Direct data compression techniques, Direct ECG data compression techniques, Transformation compression techniques, Other data compression techniques, Data compression techniques comparison.

Reference Books *

1. Rangaraj M Rangayyan,“Biomedical signal analysis- A case- study approach”, Wiley 2009.
2. D. C. Reddy, “Biomedical Signal Processing- Principles and Techniques”, Tata McGraw Hill, 2008.
3. WillisJ.Tompkins,“BiomedicalDigitalSignalProcessing”,PHI,2006.
4. AkayM,"BiomedicalSignalProcessing",Academic:Press1994.

Course Outcomes**
After completion of the course student will be able to 1. **Analyze the nature of Biomedical signals and related concepts.** 2. **Apply filters to remove noise from biomedical signals.** 3. **Apply averaging technique on biomedical signals and extract the features of EEG and ECG signals. Also analyze event detection techniques for EEG and ECG signals.** 4. **Applydifferentfiltersfornoisecancellationandsignalcompressiontechniqueson biomedical signals.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	3	3	3	3	2	1	1	1	1	2	3	0	0
CO2	3	3	3	3	3	3	1	0	0	0	0	2	3	0	0
CO3	3	3	3	3	3	3	0	0	0	0	0	2	3	0	0
CO4	3	3	3	3	3	3	0	0	0	0	0	2	3	0	0

SUBJECT CODE : UEC531L	Digital Signal Processing Laboratory	Credits: 1.5
L:T:P – 0-0-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

List of Experiments

1. Generation of different analog and digital signals (impulse, step, ramp, sine, cosine, square, rectangular and triangular) with given amplitude, frequency, phase and duration.
2. Verification of sampling theorem.
3. Implementation of amplitude scaling, time scaling, time reversal and time shift operations on given signal.
4. Response of continuous time and discrete time LTI systems to a given input.
5. Fourier series of given continuous time and discrete time periodic signal.
6. Fourier transform of given continuous time and discrete time aperiodic signal
7. N point DFT of a given sequence of length L when (a) N < L (b) N = L and (C) N >L and their corresponding IDFT.
8. Verification of conjugate symmetry property of DFT
9. Implementation of linear convolution using DFT and IDFT.
10. Design and implementation of IIR filter to meet given specifications.
11. Design and implementation of FIR filter using different windows to meet given specifications.
12. Implementation of linear and circular convolution of given two sequences using DSP processor.

Course Outcomes**

After completion of the course student will be able to

1. **Generate different analog and digital signals of given amplitude, frequency, phase and duration.**
2. **Implement different operations on digital and analog signals.**
3. **Convert given time domain signal into frequency domain and vice versa.**
4. **Design and implement IIR and FIR filters to meet the given specifications.**
5. **Implement simple DSP algorithms on DSP processor.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	0	1	0	0	0	0	0	0	1	3	0	0
CO2	3	2	2	0	1	0	0	0	0	0	0	1	3	0	0
CO3	3	2	1	0	1	0	0	0	0	0	0	1	3	0	0
CO4	3	2	3	0	1		0	0	0	0	0	1	3	0	0
CO5	3	2	3	0	1	0	0	0	0	0	0	1	3	0	0

SUBJECT CODE : UEC532L	Verilog Laboratory	Credits: 1.5
L:T:P – 0-0-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

LIST OF XPERIMENTS

1. Write Verilog code using a) concurrent signal assignment statement and b) operators for the following and test it on FPGA kit.
   Fulladder
   3:8 decoder with active low output
   4:1 MUX
2. For given Boolean expressions
   - F1(abc) = Σ(0,1,3,4,5); F2(abc) = π(1,2,3,5,7)

   Write Verilog code using (a) conditional signal assignment statement and (b) sequential statements and test it on FPGA kit.
   Full subtractor
   3:8 decoder with active low output
   4:1 MUX
3. For given Boolean expressions
   - F1(abc) = Σ(0,1,3,4,5); F2(abc) = π(1,2,3,5,7)

   Write Verilog code and test it on FPGA kit
   for 8-bit signed and unsigned adder
   1-bit magnitude comparator
   8-bit magnitude comparator
   T flipflop
   D flipflop
4. Write Verilog program for the following using component statements and test it on FPGA kit.
   Parallel adder using full adder as component.
   4-bit asynchronous up counter using T flip flop as component
   3-bit Johnson counter using D flip flop as component
5. Write Verilog code for the following and test it on FPGA kit.
   BCD to seven segment display decoder
   To display message on LCD display, Line 1 : BEC Line 2 : ECE
   To run message from left to right on LCD display, Line 1 : BEC Line 2 :ECE
   To run message from right to left on LCD display, Line 1 : BEC Line 2 :ECE
   To display and blink message every one second on LCD display, Line 1 : BEC Line 2 : ECE
6. Write Verilog code for the following and test it on FPGA kit
   4-bit up counter and display result on LEDS
   BCD up counter and display the result on seven segment displays
   00 to 99 up counter and display result on LCD
   6-bit SISO shift register display result on LEDs
7. Draw the state diagram and write Verilog code for Sequence Detector to detect the sequence 1010. Consider the overlapping of the sequence. System takes one bit as input and produces one bit output.
8. Write Verilog test bench to automate simulation and verification for following programs/design using

Full adder
3:8 decoder with active low output
4:1 MUX
for 4-bit up counter

9. Write Verilog code to interface IR remote.
10. Write Verilog code for interfacing either mouse or USB.
11. Write a Verilog program to write and read data from memory card.

Write Verilog code to interface RS232.

Course Outcomes**

After completion of the course student will be able to

1. **Write Verilog code for combinational circuits, sequential circuits and implement it on FPGAKits.**
2. **Write test benches using Verilog code to automate simulation and verification ofdesigns.**
3. **Write Verilog code for interfacing modules like IR remote/LCD/seven segment displays/USB/RS 232/Memory card.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	0	2	1	3	0	0	0	0	0	0	0	0	3	0
CO2	1	0	1	1	3	0	0	0	0	0	0	0	0	3	0
CO3	1	0	2	1	3	0	0	0	0	0	0	0	0	3	0
CO4	1	0	2	1	3	0	0	0	0	0	0	0	0	3	0

SUBJECT CODE: UEC651C	Field Theory	Credits: 03
L:T:P - 2 : 2 : 0		CIE Marks: 50
Total Hours/Week: 04		SEE Marks: 50

UNIT-I	10 Hrs.

Coulomb's Law and electric field intensity: Introduction to coulomb's law, field intensity, field due to continuous volume charge distribution, Field of a line charge & field of sheet charge, Electric flux density Gauss law and divergence: Electric flux density, Gauss law, Application of Gauss law for symmetrical charge distribution (point charge, Coaxial cable)and differential volume element, Divergence, Maxwell's first equation, vector operator dell and divergence theorem.

UNIT–II	10 Hrs.

Energy and potential: Energy expended in moving a point charge in an electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, potential field of system of charges, potential gradient, Energy density in an Electrostatics field.
Conductors, dielectrics and capacitance: Current and current density, continuity of current, conductor properties and boundary conditions, boundary conditions for perfect dielectrics, capacitance and examples (Parallel plate capacitor, Dielectric boundary normal to plates).

UNIT–III	10 Hrs.

Poisson's and Laplace's equations: Poisson's and Laplace's equations. Uniqueness theorem,examples of the solution of Lapalce and poisson's equations.
Thesteadymagneticfield:Biot-savart'slaw,Ampere'scircuitallaw,curl,stokestheorem, magnetic flux density, scalar and vector magnetic potentials.

UNIT–IV	10 Hrs.

Time varying fields and Maxwell's equations: Faraday's law, Displacement current, Maxwell's equation in point and integral form, retarded potentials.
Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, Plane wave in boundaries and indispersive media: Reflection of uniform plane waves at normal incidence, SWR.

Reference Books *

1. WilliamHHaytJr,JohnABuck,"EngineeringElectronics",TataMcGraw-Hill,7th edition, 2006
2. JohnKraussandDanielAFleisch,"Electromangeticswithapplication",McGraw- Hill, 5th edition, 1999
3. DavidKCheng,"FiledandwaveElectromangetics"PearsoneducationAsia,2nd edition,-1989, Indian Reprint-2001.

Course Outcomes**
After completion of the course student will be able to 1. **Understand the concept of scalar, vectors, Coulombs law, Electric filed intensity,Gauss law and its applications, divergence and analyze the problems based on the mentioned laws** 2. **Understand potential due to charges, potential gradient, continuity equation, boundary conditions and capacitance and Analyze the problems based on the mentioned laws** 3. **Understand Poisson's, Laplaces equation and its application, Uniqueness theorem, Biot-savart's law, ampere's law, stokes theorem and Curl with respect to magnetic fields and analyze the problems related to the mentioned laws** 4. **Understand about time varying fields, Maxwell's equation, retarded potential, wave propagation in free space, Poynting's theorem, uniform plane waves, Polarization of plane waves, Standing Wave Ratio (SWR) and analyze the problems based on the mentioned laws.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	2	2	2	1	0	0	0	0	3	0	0
CO2	3	2	3	2	1	2	2	1	0	0	0	0	3	0	0
CO3	3	2	3	2	2	2	2	1	0	0	0	0	3	0	0
CO4	3	3	3	3	3	3	3	1	0	0	0	0	3	0	0

SUBJECT CODE: UEC642C	Computer Networks	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Data Link Control: Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, HDLC, PPP.	
UNIT–II	**10 Hrs.**
MultipleAccesses:Randomaccess,Controlledaccess,Channelization,WiredLAN,Ethernet,IEEE standards,StandardEthernet.Changesinthestandards,FastEthernet,GigabitEthernet,Connecting LANs, Backbone and Virtual LANs	
UNIT–III	**10 Hrs.**
Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6, Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols.	
UNIT–IV	**10 Hrs.**
Transport layer Process to process Delivery, UDP, TCP, Application Layer: Domain name system, Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Resolution, DNS messages, Types of Records, Registrars, Dynamic Domain Name System, Encapsulation.	

Reference Books *

1. DataCommunicationandNetworking,"BehrouzA.Forouzan",4th Edition,TMH,India,2006.
2. AndrewS.Tanenbaum,"Computernetworks",Prentice-Hall,2010.
3. WilliamStallings,"DataandComputerCommunications",Prentice-Hall,2007.

Course Outcomes**

After completion of the course student will be able to

1. **Master the terminology and concepts of the OSI reference model and the TCP/IP reference model**
2. **Master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks**
3. **Identify, compare and contrast different techniques and design issues of core functions such as addressing, routing, internetworking, switching, multiplexing, error and flow control, medium access and coding.**
4. **Become familiar with widely-used Internet protocols such as TCP/IP, UDP,etc.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	3	2	1	1	1	0	0	0	0	0	1	0	3
CO2	3	3	2	2	1	1	1	1	0	0	0	0	1	0	3
CO3	3	2	3	2	1	1	1	0	1	1	1	0	1	0	3
CO4	3	3	3	2	1	1	2	1	1	1	1	1	1	0	3

SUBJECT CODE: UEC643C	CMOS Digital VLSI Design	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning. **MOS Transistor Theory:** Introduction, Long- Channel I-V Characteristics, C-V Characteristics (simple MOS capacitance models), Non ideal I-V Effects, DC Transfer Characteristics. **CMOS Processing Technology:** Introduction, CMOS Technologies.	
UNIT–II	**10 Hrs.**
Delay: Introduction, Transient Response, RC Delay Model, Linear Delay Model (Logical effort, parasitic delay, delay in logic gate, drive), Logical Effort of Paths, **Power:** Introduction, Dynamic Power, Static Power.	
UNIT–III	**10 Hrs.**
Interconnect: Introduction (wire Geometry), Interconnect Modeling, Interconnect Impact (Delay, Energy, Cross talk). **Combinational Circuit Design:** Introduction, Circuit families, Silicon-On-Insulator Circuit Design.	
UNIT–IV	**10 Hrs.**
Sequential Circuit Design: Introduction, Circuit Design of Latches and Flip Flops (conventional CMOS latches, conventional CMOS flip flops, pulsed latches, resettable latches and flip flops, enabled latches and flip flops, incorporating logic into latches, dual edge triggered flip flops. **Array Subsystems:** Introduction, SRAM (SRAM cells, ROW circuitry, column circuitry), Read-Only Memory, Serial Access Memories, Content Addressable Memory, Programmable Logic Arrays.	

Reference Books *

Text Book:

1. Neil H. E. Weste, David Harris “CMOS VLSI Design A Circuits and Systems Perspective”
2. Pearson Education Publisher, Fourth Edition, 2015.

Reference Books:

1. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic “Digital Integrated Circuits A Design
2. Perspective” Pearson Education Publisher, Second Edition. 2010.
3. John P Uyemura “Introduction to VLSI Circuits and Systems” Wiley Publication 2002.
4. R. Jcob Baker, Harry W. Li and David E Boyce “CMOS Circuit Design, Layout, and Simulation”

Course Outcomes**
After completion of the course student will be able to 1. **Appreciate the importance and scope of VLSI, Fabrication & MOSFET transistors.** 2. **To draw RC equivalent circuit of CMOS circuits and estimate delay and power.** 3. **To model & design of interconnects in chips, design of combinational circuits.** 4. **To Design basic buildings of sequential and memory blocks using MOSFET transistors.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	0	0	0	0	0	0	0	0	0	3	1	0
CO2	3	3	3	0	0	0	0	0	0	0	0	0	3	2	0
CO3	3	3	3	0	0	0	0	0	0	0	0	0	3	2	0
CO4	3	3	3	0	0	1	2	0	0	0	0	0	3	2	0

SUBJECT CODE: UEC655E	Embedded System	Credits: 02
L:T:P - 2 : 0 : 0		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

UNIT-I	07 Hrs.

Introduction to embedded systems, embedded system vs. general computing system, classifications, purpose of embedded system, major application areas including some novel applications. The typical embedded system: Core of embedded system, memory, sensors and actuators, communication interface, Characteristics and quality attributes of embedded systems.

UNIT–II	07 Hrs.

ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, architecture of ARM Cortex M3, various units in the architecture, debugging support, general purpose registers, special registers, exceptions, interrupts, stack operation, reset sequence.

UNIT–III	07 Hrs.

Hardware software co-design and program modeling: fundamental issues in hardware software co-design, computational models in embedded system, hardware software trade-offs. Embedded firmware design and development: design approaches, Mixing assembly and high level language, Programming in embedded C.

UNIT–IV	07 Hrs.

Real-time operating system based embedded system: operating system basics, need for RTOS, types of operating system, tasks, process and threads, multiprocessing and multitasking, task scheduling, threads, processes and scheduling : putting altogether, task communication, task synchronization, device drivers.

Reference Books *

1. Shibu K V, “Introduction to embedded systems”, Tata McGraw Hill private limited, 2010.
2. Joseph Yiu, “The definitive guide to the ARM CORTEX-M3”, Newnes, Second edition.
3. Rajkamal, “Embedded systems: architecture, programming and design”, Tata McGraw Hill private limited, second edition.
4. Frank Vahid, Tony Givargis, “Embedded system design: A unified hardware/software introduction”, John Wiley and Sons, 2001.

Course Outcomes**

After completion of the course student will be able to

1. Gain comprehensive knowledge about embedded systems, major application area of embedded systems and system components like memory, sensors and actuators.
2. Gain comprehensive knowledge about ARM-32 bit Microcontroller, architecture and other internal details.
3. Develop embedded applications on IDE environment and programming in embedded ‘C’.
4. Explore one open source RTOS and demonstrate the basic concepts of RTOS.

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	1	0	1	1	0	0	0	0	0	0	0	3	0
CO2	3	2	2	0	1	1	0	0	0	0	0	0	0	3	0
CO3	3	3	3	0	3	3	0	0	0	0	0	0	0	3	0
CO4	3	3	3	0	3	2	0	0	0	0	0	0	0	3	0

SUBJECT CODE : UEC656E	Digital Verification	Credits: 02
L:T:P – 2-0-0		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

UNIT-I	07 Hrs.

Verification Guidelines: The Verification Process, The Verification Methodology Manual, Basic Testbench Functionality, Directed Testing, Methodology Basics, Constrained-Random Stimulus, What Should You Randomize, Functional Coverage, Testbench Components, Layered Testbench, Building a Layered Testbench, Simulation Environment Phases, Maximum Code Reuse, Testbench Performance.

Procedural Statements and Routines: Procedural Statements, Tasks, Functions, and Void Functions, Task and Function Overview, Routine Arguments, Returning from a Routine, Local Data Storage, Time Values.

Connecting the Testbench and design: Separating the Testbench and Design, The Interface Construct, Stimulus Timing, Interface Driving and Sampling, Program Block Considerations, Connecting It All Together, Top-Level Scope, Program–Module Interactions, SystemVerilog Assertions, The Ref Port Direction.

UNIT–II	07 Hrs.

Basic OOP: Introduction, Think of Nouns, not Verbs, Your First Class, Where to Define a Class, OOP Terminology, Creating New Objects, Object Deallocation, Using Objects, Class Methods, Defining Methods Outside of the Class, Static Variables vs. Global Variables, Scoping Rules, Using One Class Inside Another, Understanding Dynamic Objects, Copying Objects, Public vs. Local, Straying Off Course Building a Testbench.

Randomization: Introduction, What to Randomize, Randomization in SystemVerilog, Constraint Details, Solution Probabilities, Controlling Multiple Constraint Blocks, Valid Constraints, In-Line Constraints, The pre_randomize and post_randomize Functions, Random Number Functions, Constraints Tips and Techniques, Common Randomization Problems, Iterative and Array Constraints, Atomic Stimulus Generation vs. Scenario Generation, Random Control, Random Number Generators, Random Device Configuration.

Threads and Interprocess communication: Working with Threads, Disabling Threads, Interprocess Communication, Events, Semaphores, Mailboxes, Building a Testbench with Threads and IPC, Basic Transactor, environment class.

UNIT–III	07 Hrs.

UVM Introduction: A Conventional Testbench for the TinyALU, SystemVerilog Interfaces and Bus Functional Models, Static Methods and Variables, Parameterized Class Definitions,The Factory Pattern,An Object-Oriented Testbench, UVM Tests, UVM Components,UVM Environments, A New Paradigm, Talking to Multiple Objects

UNIT–IV	07 Hrs.

UVM Contd..: Using Analysis Ports in a Testbench, Interthread Communication, Put and Get Ports in Action, UVM Reporting, Class Hierarchies and Deep Operations, UVM Transactions, UVM Agents,UVM Sequences, onward with the UVM.

Reference Books *

1. Chris Spear and Greg Tumbush "SystemVerilog for Verification: A Guide to Learning the Testbench Language Features" Third Edition, Springer, 2012
2. Ray Salemi "The UVM Primer: A Step-by-Step Introduction to the Universal Verification Methodology"Boston Light Press; First Edition, 2013
3. Donald Thomas "Logic Design and Verification Using Systemverilog" Createspace Independent

Pub, 2016
4. Mark A. Azadpour "SystemVerilog for Design and Verification using UVM" 2015
Ashok B. Mehta "ASIC/SoC Functional Design Verification: A Comprehensive Guide to Technologies and Methodologies" Springer, 2017

Course Outcomes**

After completion of the course student will be able to

1. **Appreciate the importance and scope of digital verification and UVM.**
2. **Write testbench using SystemVerilog and OOPs concept.**
3. **Write testbench using on SystemVerilog and UVM.**
4. **Write automated testbench using SystemVerilogand UVM.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0
CO2	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0
CO3	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0
CO4	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0

SUBJECT CODE: UEC657E	Mobile Communications	Credits: 02
L:T:P – 2-0-0		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

UNIT-I	07 Hrs.
Wireless standard organizations. Wireless transmission: Frequencies for radio communication, signals, antennas, signal propagation. Medium access control: Motivation for specialized MAC, SOMA, FDMA, TOMA, CDMA.	
UNIT–II	**07 Hrs.**
Telecommunication systems: GSM, UMTS and IMT2000, 4GLTE networks, 5G networks over view. Broadcast system: Overview, cyclical repetition of data, digital audio broadcasting, and digital video broadcasting.	
UNIT–III	**07 Hrs.**
Wireless LAN: IEEE802.11 system architecture, protocol architecture, physical layer, medium access controller, MAC management. 802.11b. and 802.11a. Bluetooth: user scenarios, architecture, radio layer.	
UNIT–IV	**07Hrs.**
Mobile network layer dynamic host configuration protocol, mobile Ad-hoc network. Mobile transport layer: Traditional TCP , classical TCP improvement, TCP over2.5/3G wireless network, performance enhancing proxies.	

Reference Books *

1. Jochen Schiller, 2003 "Mobile Communications", second edition Pearson Education.
2. Gary Mullett, 2006 “Introduction to wireless telecommunication systems and networks ", First Edition Cengage learning

Course Outcomes**

After completion of the course student will be able to

1. **identify the different mobile accessing techniques.**
2. **Identify the different architecture of mobile communications**
3. **Design and develop the different configurations of LAN systems.**
4. **Develop different network layer and transport layer protocols.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	-	2	**-**	3	-	**-**	**1**	**-**	**1**	**-**	**1**	**1**	**0**	**3**
CO2	2	-	2	**-**	3	-	**-**	**1**	**-**	**1**	**-**	**1**	**1**	**0**	**3**
CO3	2	-	3	**-**	2	-	**-**	**1**	-	**1**	**-**	**1**	**1**	**0**	**3**
CO4	2	-	3	**-**	3	-	**-**	**1**	-	**1**	**-**	**1**	**1**	**0**	**3**

SUBJECT CODE: UCS659L	Advanced "C" Laboratory	Credits: 02
L:T:P – 0-2-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	06 Hrs.
Multidimensional arrays. Self-referential structures and Unions. **Pointers:** Introduction, Pointers for inter function communication, Pointers to pointers,	
UNIT–II	**06 Hrs.**
Pointer Applications: Arrays and pointers, pointer arithmetic and arrays, passing an array to a function, memory allocation functions, array of pointers, Examples. Data Structures, Data structure Operations, Stacks: Definition, Stack Operations, Array Representation of Stacks.	
UNIT–III	**06 Hrs.**
Stacks using Dynamic Arrays, Stack Applications: Queues: Definition, Array Representation, Queue Operations. Programming Examples.	
UNIT–IV	**06 Hrs.**
Linked Lists: Definition, Representation of linked lists in Memory, Linked list operations: Traversing, Searching, Insertion, and Deletion. Applications of Linked lists. Implementation of stack and queue using linked list.	
Reference Books *	
List of Programms	

Part A

1. Write C program to accept and display 1D array Also write functions.
   to insert an element based at the specified position
   to delete element based on the position
   to delete based on the value
   function should take care of invalid data and accordingly display appropriate error messages.
2. Write C program to accept and display 2d array of user specified size.Also write functions to perform the following on the 2d array
   Function row_sum that takes row number as parameter and returns the sum of the row
   Function col_sum that takes column number as parameter and returns the sum of the column
   Function secondary _diagonal_sum that returns the sum of secondary diagonal elements if possible else should return -1
   Function primary_diagonal_sum that returns the sum of primary diagonal elements if possible else should return -1
3. Write C program to swap two integers using function.
4. Write C program to accept and display 1d array.Use external pointer to process the array.Use separate functions to
   Accept the array elements
   Display the array elements in forward direction
   Display the array elements in reverse direction
   To compute the average of the elements in the array

5. Write C program to store information(name,employee_id,designation,date of birth,stay details) about set of employees in a company. Here
designation is string that can take one of these values {md, manager,clerk,peon}
date_ of_ birth is a structure for holding birth date with fields day,month,year
stay_detail is a structure that contains street number and sector number and house number details.Write separate functions to accept & display the employees

Part – B

1. Write C program to implement stack of integers using array.
2. Write C program to implement linear queue of integers using array
3. Write C program to create & display singly linked list of integers
4. Write C program to implement stack using linked list

Write C program to implement queue using linked list

Reference Books *

1. Gilberg & Forouzan, "Data Structures: A Pseudo-code approach with C", Cengage Learning. 2nd Edition, 2014
2. Yashwant Kanetkar, "Data Structures through C", BPB Publications, 2017

Web links and Video Lectures:

https://nptel.ac.in/courses/106/106/106106130/
https://www.classcentral.com/course/edx-c-programming-pointers-and-memory-management-11533
https://academicearth.org/computer-science/
http://nptel.vtu.ac.in/econtent/courses/BS/15PCD23/index.php

Course Outcomes**

After completion of the course student will be able to

1. **Define advanced C programming concepts like pointers, data structures.**
2. **Apply the knowledge of advanced C programming concepts to implement given requirement specification or to solve real world problem.**
3. **Analyze different data structures and use suitable data structure to implement requirement specification.**
4. **Implement, interpret, debug and test any given advanced C program.**
5. **Develop software product using advanced C programming concepts to solve real world problem.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	-			
CO2	3	2	3	-	2	1	-	-	-	-	-	-			
CO3	3	2	3	-	3	-	-	-	1	-	-	-			
CO4	2	1	1	-	2	1	-	-	1	-	-	1			

SUBJECT CODE: UEC631L	Computer Networks Laboratory	Credits: 01
L:T:P - 0 : 0 : 2		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

Sl.No.	LIST OF EXPERIMENTS
1.	Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool
2.	Study of network components/devices:i)NICii)Hubiii)Switch
3.	Connecting computers on Local Area Network(LAN)
4.	Study of packet tracer
5.	Configuration of different network topologies using packet tracer
6.	Configuration of switch and establishing LAN using packet tracer
7.	Creation of Virtual LAN(VLAN)using packet tracer
8.	Configuration of basic routing using packet tracer
9.	Configuration of a network using Routing In formation Protocol(RIP)using packet tracer
10.	Configuration of a network using Open Shortest path First(OSPF)using packet tracer
11.	Configuration of DHCP using packet tracer
12.	Configuration of NAT using CISCO packet tracer

Course Outcomes**

After completion of the course student will be able to

1. To apply the concepts of Data Communication and Networking
2. To do Inter networking & devices
3. To develop new routing techniques
4. Practically know the functionality of devices using RIP, OSPF, DHCP, and NAT

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2	1	1	1	0	0	0	0	0	1	0	3
CO2	3	3	2	2	1	1	1	1	0	0	0	0	1	0	3
CO3	3	2	3	2	1	1	1	0	1	1	1	0	1	0	3
CO4	3	3	3	2	1	1	2	1	1	1	1	1	1	0	3

SUBJECT CODE: UEC632L	VLSI Laboratory	Credits: 01
L:T:P – 0-0-2		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

NAME OF THE EXPERIMENT
Design following CMOS/TG based circuits with given specifications* and complete the VLSI design flow mentioned below using appropriate tool: a) Draw the schematic and verify the following i) DC Analysis ii)Transient Analysis b) Draw the Layout and verify the DRC,ERC c) Check for LVS d) Extract RC and back annotate the same and verify the design. 1) CMOS inverter 2) CMOS two input NAND gate 3) CMOS two input NOR gate 4) CMOS two input OR gate 5) CMOS two input AND gate 6) TG based two input XOR and XNOR gates 7) Negative edge triggers D flip flop using TGs and inverters 8) 4:1 MUX using TGs and inverters 9) 3- Bit up counter 10 3-Bit SISO shift register **An appropriate constraint should be given*
Course Outcomes**
After completion of the course student will be able to **1. Design CMOS/ TG based gates, MUX, flipflops, counters and shift register.** **2. Draw the layout, run DC and transient analysis for designed CMOS standard cells.**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	0	2	0	3	0	0	0	0	0	0	0	3	0	0
CO2	1	0	2	0	3	0	0	0	0	0	0	0	3	0	0

Syllabus for

B.E. VII & VIII – Semester

(For students admitted to I year in 2020-21)

SUBJECT CODE: UEC741C	Microwaves and Antennas	Credits: 03
L:T:P - 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Introduction to microwaves: Microwave frequencies, IEEE microwave frequency bands. **Microwave transmission lines and rectangular waveguides**: Introduction, transmission line equations, characteristic and input impedances, reflection and transmission coefficients, standing wave and SWR. Introduction to rectangular waveguides, TE and TM modes in rectangular waveguides.
Microwave vacuum tube device: Introduction, reflex klystron oscillator (mechanism of oscillation, mode of oscillation, power output and efficiency, mode curve), two cavity klystron amplifier (mechanism of operation).

UNIT–II	10 Hrs.

Microwave network theory and passive devices: Introduction, S-matrix representation of multi-port network, properties of S-matrix, matched terminations, rectangular to circular waveguide transition, attenuators, precision phase shifter, waveguide tees, E-plane tee, H-plane tee, magictee, applications of magic tee, faraday rotation isolator, four-port circulator, 2-hole directional coupler.
Microwave application: Microwave radar systems (radar equation, pulsed radar, CW doppler radar, FMCW radar).

UNIT–III	10 Hrs.

Fundamental Parameters of Antennas: Introduction, radiation pattern, radiation power density, radiation intensity, beam width, directivity, antenna efficiency, gain, beam efficiency, bandwidth, polarization, effective height, input impedance, antenna radiation efficiency, maximum directivity and maximum effective area, Friis transmission equation.
Antenna arrays: Array of two point sources, broad side array, end fire array, n-isotropic array, pattern multiplication. binomial and Chebyshev arrays, phased array.

UNIT–IV	10 Hrs.

Antenna Aperture: aperture concept, types of aperture, maximum effective aperture of short dipole and half wave dipole.
Antenna practice: Yagi-Uda antenna, turnstile antenna, log periodic antenna, helical antenna, rhombic antenna, horn antenna, parabolic reflector antennas, micro strip antenna and their feed systems.

Reference Books *

1. AnnapurnaDas,SisirK.Das,"MicrowaveEngineering",TMH,2nd Ed,NewDelhi,2009.
2. SamuelY.Liao,"MicrowaveDevicesandCircuits",PearsonEducation,3rd Ed,NewDelhi, 2003.
3. JohnD.Krauss,RonaldJ.Marhefka,AhmadSKhan,"AntennasandWave Propagation", McGraw-Hill, 5th Ed, New Delhi, 2017.
4. ConstantineA.Balanis,"AntennaTheory:AnalysisandDesign",JohnWiley,4th Ed, New Delhi, 2016.
5. K.D.Prasad,"Antenna& Wave Propogation",Satyaprakshan,5th Ed,NewDelhi2009.

6. MerrillI.Skolnik,"IntroductiontoRadarSystems",TMH,3rdEd,NewDelhi,2001.
7. P.E.Collins,"AntennasandRadioPropagation",McGraw-Hill,NewDelhi,1985
8. EdwardC.Jordan,KeithG.Balmain,"ElectromagneticwavesandRadiatingsystems",
9. PHINewDelhi,1993.

Course Outcomes**

After completion of the course student will be able to

1. **Acquire the knowledge of transmission line theory, rectangular waveguides and describe microwave vacuum tube device.**
2. **Analyze microwave passive devices with scattering parameters, and apply microwave application in radar systems.**
3. **Compute basic antenna parameters using radiation patterns, analyzeand design antenna arrays.**
4. **Analyze The Importance Of Antenna Aperture, explain the working principle of different antennas and their usage in real time field.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	0	0	1	1	0	0	0	0	0	3	0	0
CO2	3	2	1	0	0	1	1	0	0	0	0	0	3	0	0
CO3	3	2	2	0	0	1	1	0	0	0	0	0	3	0	0
CO4	3	2	2	0	0	1	1	0	0	0	0	0	3	0	0

DEPARTMENT OF ELECTRONICSAND COMMUNICATION ENGINEERING

Outcome Based Education (OBE) and Choice Based Credit System(CBCS)

SEMESTER–VII

Internship

Course Code:	**UEC742I**	CIE Marks	70
Teaching Hours/Week(L:T:P)	**0-0-4**	SEE Marks	30
Credits	02	Hours	30 Min/Student

I. Internship:

Students need to meet following criteria to successfully complete the internship course.

II. Course objectives:

This objective of the course are to

- Enhance student's knowledge of a particular area(s) of Electronics and Communication Engineering.
- Experience integration of theory and practice existing in IT Industries.
- Develop systematic work culture and skills necessary for successful professional career.
- Build the abilities such as working in diverse areas, self learning, lifelong learning and technical documentation and reporting.

III. Components of Internship

1. Student's Diary/Daily Log

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated based on the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches, and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

2. Internship Report

The Internship report will be evaluated based on following criteria:

- Originality.
- Internship certificate from the industry.
- Adequacy and purposeful write-up.
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience.
- Practical applications, relationships with basic theory and concepts taught in the course

IV. Course outcomes:

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

1. Demonstrate the skills gained during the internship at the industry, through simulation/actual implementation.
2. Solve simple real time problems associated in their field of internship.
3. Exhibit abilities to use theoretical concepts in solving practical problems in their field of study.
4. Document and present technical matter to fellow colleagues effortlessly.

V. Evaluation:

The industrial training of the students will be evaluated in three stages:

1. Evaluation by Industry.
2. Evaluation through seminar presentation
3. Viva-voce at the Institute.

Evaluation Through Seminar Presentation/Viva-Voce at The Institute

The student has to give a seminar based on his/her training, before an expert committee constituted by theconcerneddepartmentaspernormsoftheinstitute.Theevaluationwillbebasedonthefollowingcriteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendancerecord,dailydiary,departmentalreportsshallalsobeanalysedalongwitheInternshipReport

Evaluation Criteria

Summary of Internship Evaluation	
Guide at the Industry	
Evaluation Criteria	**Marks**
Quality of Work	10
Ability to Learn	10
Initiative and Creativity	10
Character Traits	10
Dependability	10
Organizational Fit	10
Response to Supervision	10
Total (A)	**70**
Department Committee(Faculty Advisor+External+HoD/Nominee)	
Demonstration of experience	10
Report	10

Presentation	10
Total (B)	**30**
Total Score (A+B)	**100**

CourseArticulationMatrix:MappingofCourseOutcomes(CO)withProgrammeOutcomes(PO)andProgrammeSpecificOutcomes(PSO)

No	Programme Outcomes / Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
The students will be able to:																
1	Demonstrate the skills gained during the internship at the industry, through simulation/actual implementation.	3	**2**	**2**	**2**	**3**	**3**	3	1	3	**3**	3	3	**1**	**1**	**1**
2	Solve simple real time problems associated in their field of internship.	3	**2**	**2**	**2**	**3**	**3**	3	1	3	**3**	3	3	**1**	**1**	**1**
3	Exhibit abilities to use theoretical concepts in solving practical problems in their field of study.	3	**2**	**2**	**2**	**3**	**3**	3	1	3	**3**	3	3	**1**	**1**	**1**
4	Document and present technical matter to fellow colleagues effortlessly.	3	**2**	**2**	**2**	**3**	**3**	3	1	3	**3**	3	3	**1**	**1**	**1**

Evaluation of Internship – Grading Rubrics for Industry

Evaluation Dimensions	Performance Rating			Maximum Score
	Needs Improvement	Meets Expectations	Excellent	
	0-4	5-7	8-10	
Internship Evaluation Dimensions – Grading Criteria				
Quality of Work	Work was done in a careless manner and was of erratic quality; Work assignments were usually late and required review; Made numerous errors	With a few minor exceptions, adequately performed most work requirements; Most work assignments submitted in a timely manner; Made occasional errors	Thoroughly and accurately performed all work requirements; Submitted all work assignments on time; Made few if any errors	10
Ability to Learn	Asked few questions and rarely sought out additional information Unable or slow to understand new concepts, ideas, and work assignments; Unable or unwilling to recognize mistakes and was not receptive to making needed changes and improvements	Asked relevant questions and sought out additional information from appropriate sources; Acceptable understanding of new concepts, ideas, and work assignments; Willing to take responsibility for mistakes and to make needed changes and improvements	Consistently asked relevant questions and sought out additional information from appropriate sources; Quickly understood new concepts, ideas, and work assignments; Always willing to take responsibility for mistakes and to make needed changes and improvements	10

Initiative and Creativity	Had little observable drive and required close supervision; Showed little interest in meeting standards; Did not seek out additional work and frequently procrastinated in completing assignments; suggested no new ideas or options	Worked without extensive supervision; Found problems to solve and sometimes asked for additional work assignments; Set his/her own goals and, tried to exceed requirements; offered some creative ideas	A self-starter; Consistently sought new challenges and asked for additional work assignments; Regularly approached and solved problems independently; Frequently proposed innovative and creative ideas, solutions, and/or options	10
Character Traits	Regularly exhibited a negative attitude; Dishonest and/or showed a lack of integrity on several occasions; Unable to recognize and/or was insensitive to ethical and diversity issues; Displayed significant lapses in ethical and professional behavior	Except in a few minor instances, demonstrated a positive attitude; Regularly exhibited honesty and integrity in the workplace; Usually aware of and sensitive to ethical and diversity issues on the job; Normally behaved in an ethical and professional manner	Exceptionally positive attitude; Consistently exhibited honesty and integrity in the workplace; Keenly aware of and deeply sensitive to ethical and diversity issues on the job; Always behaved in an ethical and professional manner	10

Evaluation Dimensions	Performance Rating			Maximum Score
	Needs Improvement	Meets Expectations	Excellent	
	0-4	5-7	8-10	
Internship Evaluation Dimensions – Grading Criteria				
Dependability	Generally unreliable in completing work assignments; Did not follow instructions and procedures promptly or accurately; Careless, and work needed constant follow-up; required close supervision	Generally reliable in completing tasks; Normally followed instructions and procedures; Usually attentive to detail, but work had to be reviewed occasionally; Functioned with only moderate supervision	Consistently reliable in completing work assignments; Always followed instructions and procedures well; Careful and extremely attentive to detail; Required little or minimum supervision	10

Organizational Fit	Unwilling or unable to understand and support the organization's mission, vision, and goals; Exhibited difficulty in adapting to organizational norms, expectations, and culture; Frequently seemed to disregard appropriate authority and decision-making channels	Adequately understood and supported the organization‟s mission, vision, and goals; Satisfactorily adapted to organizational norms, expectations, and culture; Generally functioned within appropriate authority and decision-making channels	Completely understood and fully supported the organization‟s mission, vision, and goals; Readily and successfully adapted to organizational norms, expectations, and culture; Consistently functioned within appropriate authority and decision-making channels	10
Response to Supervision	Rarely sought supervision when necessary; Unwilling to accept constructive criticism and advice; Seldom implemented supervisor suggestions; Unwilling to explore personal strengths and areas for improvement	Sought supervision when necessary; Receptive to constructive criticism and advice; Implemented supervisor suggestions in most cases; Willing to explore personal strengths and areas for improvement	Actively sought supervision when necessary; Always receptive to constructive criticism and advice; Successfully implemented supervisor suggestions when offered; Always willing to explore personal strengths and areas for improvement	10

Evaluation of Internship – Grading Rubric for Department Evaluation Committee/Faculty				
Evaluation Dimensions	**Performance Rating**			Maximum **Score**
	Needs Improvement	**Meets Expectations**	**Excellent**	50
	0-4	**5-7**	**8-10**	
Internship Evaluation Dimensions – Grading Criteria				
Demonstration of experience	Offers little in the way of illustrating experiences Fails to adequately address how the experiences relate to the competencies.	Addresses the activities and experiences, but not so clearly and concisely	Well addressed activities and experiences as well as relating them to the program competencies.	10

Report	Unedited and difficult to read It is littered with grammatical and typographical errors, demonstrating little effort to producing a quality report. No reference is made to practical application. Lacks evidence and internship experience	Well-written for the most part but still has some what detracting errors that could have been fixed with additional editing prior to submission. Key conceptsrelated to the selected evidence and internship experience are inaccurate or incomplete. Some helpful practical applications are included.	Has been carefully edited and is free or nearly free of any grammatical or typographical errors. Well-organized report is easy to read and understand and stands alone as a quality piece of writing. An accurate and complete reflection of key concepts related to the selected evidence and internship experience Practical applications are included to illuminate issues.	10
Presentation	Information is lacking/unclear and communicated in such a way that the audience cannot understand the purpose of the evidence work and internship experiences.	Information is presented in a clear manner but still lacks practical experience	Information is communicated in a thorough manner and ideas are expressed in such a way that the audience can clearly understand the evidence work and internship experiences.	10

UEC743E	Information Theory and Coding	Credits: 03
L:T:P - 3 :0: 0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Information theory: Introduction, measure of information, average information content of symbols in long independent sequences, average information content of symbols in long dependent sequences, Markov statistical model for information source, entropy and information rate of Markov source.

Source Coding: Properties, Shannon's encoding algorithm, Shannon-Fano encoding algorithm, Huffman Coding.

UNIT–II	10 Hrs.

Communication channels: Discrete communication channels, entropy functions and equivocation, mutual information, properties of mutual information, rate of information transmission over a discrete channel, capacity of a discrete memory less channel, Shannon's theorem on channel capacity, channel efficiency and redundancy, symmetric/uniform channel, binary symmetric channel, binary erasure channel. Shannon-Hartley law and its implications.

UNIT–III	10 Hrs.

Error control coding: Introduction, types of errors, examples of error control coding, methods for controlling errors, types of codes. **Linear Block Codes:** Matrix description of LBC, encoding circuit for (n, k) linear block codes, syndrome and error correction, syndrome calculation circuit, Hamming weight, Hamming distance and minimum distance of LBC, error detection and correction capability of LBCs, standard array.

UNIT–IV	10 Hrs.

Binary Cyclic Codes: Algebraic structure of cyclic codes, encoding using (n, k) bit shift register, syndrome calculation, error detection and correction.

Convolution codes: Connection pictorial representation, time and transform domain approach, systematic convolutional codes, **Structural properties of convolution codes:** State diagram, code tree, trellis diagram.

Reference Books *

1. P.S. Satyanarayana,2004, Concepts of information theory and coding (2nd edition)Dynaram**.**
2. Bernard Sklar,2002, Digital communication fundamentals and applications (2nd edition) Pearson education.
3. K. Sam Shanmugam, 1996, Digital and analog communication systems**,** John Wiley.
4. Simon Haykin,2003, Digital communication**,**John Wiley.

Course Outcomes**
After completion of the course student will be able to **1.** Demonstrate the basic information theory concepts, entropy, need of coding and working of different types of source coding techniques. **2.** Derive channel capacity expression for different types of discrete communication channels and describe entropy functions, equivocation, mutual information of communication channels. **3.** Design an encoder, decoder, and error correction circuit for linear block code. **4.** Design an encoder, decoder and error correction circuit for cyclic code and demonstrate encoding of convolutional codes, also verify its structural properties using code tree and trellis diagram.

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	0	1	1	1	0	0	0	0	0	3	0	0
CO2	3	2	1	0	0	1	0	0	0	0	0	0	3	0	0
CO3	3	3	2	0	1	1	1	0	0	0	0	0	3	0	0
CO4	3	3	2	0	1	1	1	0	0	0	0	0	3	0	0

SUBJECT CODE: UEC744E	Multimedia Communication	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Introduction to Multimedia: Introduction, Multimedia and hypermedia, World Wide Web, overview of multimedia software tools, Graphics and Image Data Representations: Graphics image data types, popular file formats, color in image and video: color science, color models in images, color models in video.	
UNIT–II	**10 Hrs.**
Fundamental Concepts in Video and Digital Audio: Types of video signals, analog video, digital video, digitization of sound, quantization and transmission of audio. Basics of Digital Audio: Digitization of sound, Musical Instrument Digital Interface, quantization and transmission of audio.	
UNIT–III	**10 Hrs.**
Lossless compression algorithm: Run-Length coding, variable length coding, dictionary based coding, arithmetic coding, lossless image compression, Lossy compression algorithm: Quantization, transform coding, Wavelet-based coding, embedded zero tree of Wavelet coefficients Set Partitioning in Hierarchical Trees(SPIHT). Basic Video Compression Techniques: Introduction Video Compression, video compression based on motion compensation, search for motion vectors, MPEG, Basic Audio Compression Techniques.	
UNIT–IV	**10 Hrs.**
Multimedia Networks: Basics of Multimedia Networks, Multimedia Network Communications and Applications: Quality of multimedia data transmission, multimedia over IP, multimedia over ATM networks, transport ofMPEG-4, Media-on Demand (MOD).	

Reference Books *

Textbook:

1. Ze-NianLi,MarkS.Drew,''Fundamentals of Multimedia'',PHI/PEA.

Reference Books:

1. Parag Havaldar, Gerard Medioni,''Multimedia Systems'',Cengage,2009.
2. ColinMoock, SPDO,''Essentials Action Script3.0'',Reilly,2007.
3. Steinmetz, Nahrstedt, ''Multimedia Applications'',Springer.
4. Chapman, JennyChapmanNigel,''DigitalMultimedia'',Wiley Dreamtech.
5. SteveHeath,''Multimedia &CommunicationsTechnology'',Elsevier.

Course Outcomes**

After completion of the course student will be able to

1. Explain the concepts multimedia information representation and use the different

markup language for its communication.

2. Explain the needs of video and audio signal processing multimedia communication.
3. Apply The different information coding techniques image and video compression techniques
4. Explain The Various Standard Protocols used for multimedia communication.

***Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	0	1	0	0	1	0	1	0	0	1	1		1		1
CO2	0	1	0	1	1	0	0	0	1	1	1		1		1
CO3	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1
CO4	1	1	0	0	1	0	1	0	0	1	1		1		1

SUBJECT CODE: UEC745E	Soft Computing	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: Neural Networks, application scope of neural networks, fuzzy logic, genetic algorithm, hybrid systems, soft computing, Artificial neural networks: Fundamental concept, evolution of neural networks, basic models of artificial neural networks, important terminologies of ANNs, McCulloch-Pitts Neuron, linear separability, Hebb network. Supervised Learning Networks: Introduction, perceptron networks, adaptive linear neuron(Adaline), multiple adaptive linear neuron ,back-propagation network	
UNIT–II	**10 Hrs.**
Unsupervised Learning Networks: Introduction, fixed, Kohonen Self-organizing feature maps,learning vector quantization,counter propagation networks, adaptive resonance theory network.	
UNIT–III	**10 Hrs.**
Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to fuzzy logic, classical sets(CrispSets),fuzzysets.ClassicalrelationsandfuzzyRelations:Introduction,Cartesian Product Relation, classical relation, fuzzy relation, tolerance and equivalence relations, noninteractive fuzzy Sets. Membership Functions: Introduction, features of the membership functions, fuzzification, methods of membership value assignments. Defuzzification: Introduction, lambda-cuts for fuzzy sets (Alpha-Cuts),lambda-cuts for fuzzy relations, defuzzification methods. Fuzzy arithmetics, fuzzy measures	
UNIT–IV	**10 Hrs.**
Genetic Algorithm: Introduction, biological background, traditional optimization and search techniques, genetic algorithms and search space, genetic algorithm vs. traditional algorithms, basic technologies in genetic algorithm, simple GA,general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, problem solving using genetic algorithm, the schema theorem, classification of genetic algorithm Genetic programming	
Reference Books *	
Textbook: 1. N.Sivanandam, S.N.Deepa, Principles of Soft Computing,Wiley Publications, Second Edition-2011. 2. Rajasekaran S.And Vijayalakshmi Pai GA,"Neural Networks, Fuzzy logic and Genetic Algorithms: Synthesis and Applications", PHI Learning, NewDelhi,2006 **Reference Book:**	

1. Laurene Fausette,"Fundamentals of Neural Networks",Pearson Education, NewDelhi,2007.
2. EijiMizutani,ChuenTsaiSun, Jyh Shing RogerJang,"Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", Pearson Education, New Delhi,2008.
3. Bart Kosko, "Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence",PHI Learning, NewDelhi, 2008.

Course Outcomes**

After completion of the course student will be able to

1. **Apply Different soft computing design techniques for different applications.**
2. **Design and analyze neural network system for different applications.**
3. **Apply fuzzy logic techniques and fuzzy mathematics for the suitable systems.**
4. **Program Genetic Algorithms For Different applications.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**
****** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	-	2	2	-	-	-	-	-	-			
CO2	3	2	3	-	2	1	-	-	-	-	-	-			
CO3	3	2	3	-	3	-	-	-	1	-	-	-			
CO4	2	1	1	-	2	1	-	-	1	-	-	**1**			

SUBJECT CODE: UEC746E	Digital Signal Processing with FPGA	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: Overview of Digital Signal Processing (DSP), FPGA Technology, Classification by Granularity, Classification by Technology, Benchmark for FPLs, DSP Technology Requirements, FPGA and Programmable Signal Processors, Design Implementation, FPGA Structure, The Altera EP4CE115F29C7. **Computer Arithmetic:** Number Representation; Fixed-Point Numbers, Unconventional Fixed-Point Numbers, Binary Adders; Pipelined Adders	
UNIT–II	**10 Hrs.**
Computer Arithmetic: Binary Multipliers: Multiplier Blocks. Multiply-Accumulator (MAC) and Sum of Product (SOP): Distributed Arithmetic Fundamentals, Signed DA Systems, Modified DA Solutions. **Fourier Transforms:** The Discrete Fourier Transform Algorithms, Fourier Transform Approximations Using the DFT, Properties of the DFT, The Goertzel Algorithm, The Bluestein Chirp-z Transform, The Rader Algorithm The Fast Fourier Transform (FFT) Algorithms: The Cooley–Tukey FFT Algorithm, The Good–Thomas FFT Algorithm, Comparison of DFT and FFT Algorithms	
UNIT–III	**10 Hrs.**
Infinite Impulse Response (IIR) Digital Filters: IIR Theory, IIR Coefficient Computation, Summary of Important IIR Design Attributes, IIR Filter Implementation, Finite Word length Effects. Optimization of the Filter Gain Factor, Fast IIR Filter : Time-domain Interleaving, Clustered and Scattered Look-Ahead Pipelining, IIR Decimator Design, Parallel Processing, IIR Design Using RNS. Narrow Band IIR Filter: Narrow Band Design Example, Cascade Second Order Systems Narrow Band Filter Design, Parallel Second Order Systems Narrow Band Filter Design.	
UNIT–IV	**10 Hrs.**
Finite Impulse Response (FIR) Digital Filters: Digital Filters, FIR Theory3.2.1 FIR Filter with Transposed Structure, Symmetry in FIR Filters, Linear-phase FIR Filters, Designing FIR Filters, Direct Window Design Method, Equiripple Design Method. Constant Coefficient FIR Design: Direct FIR Design, FIR Filter with Transposed Structure, FIR Filters Using Distributed Arithmetic, Comparison of DA- and RAG-Based FIR Filters.	
Reference Books *	

1. Uwe Meyer-Baese, “Digital Signal Processing with Field Programmable Gate Arrays”, 4th Edition, Springer Publications, 2007
2. Roger Woods, John McAllister, Gaye Lightbody, Ying Yi “FPGA-based Implementation of Signal Processing Systems”, A John Wiley and Sons, Ltd., Publication
3. Volnei A. Pedroni “Circuit Design and Simulation with VHDL”, 2nd Edition, PHI Publication.

Proakis & Monalakis "Digital Signal Processing – Principles Algorithms & Applications", PHI, 3rd Edition, New Delhi, 1997.

Course Outcomes**

After completion of the course student will be able to

1. **Understand the working of FPGA**
2. **Design and implement the various DSP algorithms on FPGA, such as DSP transforms, IIR and FIR Filters**
3. **Compare the DSP transforms, FIR and IIR filters on the basis of performance**
4. **Use different number system suitable for implementation on FPGA**

***Books to be listed as per the format with decreasing level of coverage of syllabus**
****** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0
CO2	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0
CO3	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0
CO4	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0

SUBJECT CODE:UEC747E	Wireless Networks	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	10 Hrs.
Wireless networks: Wireless network architectures, classification of wireless networks, wireless switching technology, wireless communication problems, wireless network reference model, wireless networking issues, wireless networking standards. Wireless Body Area Network (WBAN): Properties, network architecture, network components, design issues, network protocols, WBAN Technologies, WBAN Applications. Wireless Personal Area Network (WPAN): Wireless Personal Area Network, network architecture, Piconet and Scatternet, WPAN components, WPAN technologies and protocols, WPAN Applications.	
UNIT–II	**10 Hrs.**
Wireless Local Area Network (WLAN):Network components, design requirements of WLAN, network architecture, WLAN standards, WLAN protocols, IEEE 802.11p, WLAN Applications	
UNIT–III	**10 Hrs.**
Wireless Metropolitan Area Network (WMAN): Wireless Metropolitan area networks, WMAN network architecture, network protocols, broadband wireless networks, WMAN Applications. Ad-hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.	
UNIT–IV	**10 Hrs.**
MAC Protocols for Ad-hoc wireless networks: Introduction, issues in designing a MAC protocol for Ad hoc wireless networks, design goals of a MAC protocol for Ad hoc wireless networks, classification of MAC protocols, contention based protocols with reservation mechanisms. Contention-based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols. Overview of ad hoc routing protocols.	

Reference Books *

1. Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, “Wireless and Mobile Networks: Concepts and Protocols”, Wiley-India, First Edition, 2010
2. C.SivaRamMurthy,B.S.Manoj“AdhocwirelessNetworks”,PearsonEducation,2nd Edition, 2005.
3. KavehPahlavan,P.Krishnamurthy,“Principles of WirelessNetworks”,Pearson Education, First Edition, 2002
4. Yi-BingLin,ImrichChlamtac,“Wireless and Mobile Network Architectures”,John Wiley, First Edition, 2001
5. MarlynMallick,“Mobile and Wireless Design Essentials”,Wiley, FirstEdition,2003
6. William C. Y. Lee, “Mobile Cellular Telecommunication – Analog and Digital Systems”, McGraw Hill, 2ndEdition, 1995

Course Outcomes**
After completion of the course student will be able to 1. Understand the fundamentals of wireless networks 2. Analyze unique characteristics and various design issues in wireless networks 3. Demonstrate basic skills for different types of wireless networks design 4. Apply knowledge of various TCP/IP protocols for wireless networking

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	3	2	1	1	1	0	0	0	0	0	1	0	3
CO2	3	3	2	2	1	1	1	1	0	0	0	0	1	0	3
CO3	3	2	3	2	1	1	1	0	1	1	1	0	1	0	3
CO4	3	3	3	2	1	1	2	1	1	1	1	1	1	0	3

SUBJECT CODE: UEC748E	Industrial Automation	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Introduction to industrial automation: Utility Automation, General structure of automated process, Examples Of Some simple automated systems. Introduction To Programmable Logic Controllers(PLC): Introduction to PLC operation- The digital concept, Analog signals, The input status file, The output statusfile, Input and output status files, Sixteen point I/O modules, PLC memory. Introduction to Logic: Thelogic, Conventional ladder v/s LPLC ladder, Series and parallel function of OR, AND, NOT, XOR logic; analysis of rung. Input modules - Discrete type, Discrete AC and DC type. Output Modules - Discrete Type, Solid-statetype, Switching Relay Type.

UNIT–II	10 Hrs.

PLC Instructions: The basic relay instructions normally open and normally closed instructions, Output Latching instructions, Understanding relay instructions and the programmable controller input modules. InterfacingstartstoppushbuttonandmotortoPLC,Developingladderdiagramwith Analytical Problems.

UNIT–III	10 Hrs.

Timer and counter Instructions: On delay and off delay and retentive timer instructions, PLC counter up and down instructions, Combining counters and timers, Developing ladder diagram with analytical problems. Comparison and data handling instructions: Data handling instructions, Sequencer instructions - Programming sequence output instructions, Developing ladder diagram with analytical problems.

UNIT–IV	10 Hrs.

Supervisory Control And Data Acquisition (SCADA): Introduction as applied to process control systems. Distributed Control System (DCS): Evolution of digital controllers, Advantages of digital control, Process control requirements of digital control, Computer network, Interconnection of networks and communication in DCS. Different bus configurations used for industrial automation: RS232, RS485, CAN, HART and OLE protocol, Industrial field bus- FIP (Factory Instrumentation protocol), PROFIBUS (Process field bus), Bit bus.(Fundamentals only).

Reference Books *

1. Garry Dunning, “Introduction to Programmable Logic Controllers”, 2nd Edition Thomson
2. MaduchandraMitra, Samarjitsen Gupta, Programmable Logic Controllers and IndustrialAutomation: An Introduction”, Penram International Publishing India Pvt Ltd.
3. M. Chidambaram, “Computer control of Processes”, Narosa Publishing.
4. Curtis Johnson, “Process Control Instrumentation Technology," Prentice Hall of India.
   Bela G. Liptak, Instrumentation Engineers Hand Book – Process Control”, Chilton Book Company, Pennsylvania.

Course Outcomes**
After completion of the course, student will be able to **1. Student will be able to explain the importance and benefits of industrial automation.** **2. Student will be able to demonstrate industrial process using PLC.** **3. To do different ways of programming PLC and analyze the programs.** **4. To do SCADA and DCS programming for automating a process.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	-	2	2	-	-	-	-	-	-	**3**	-	-
CO2	3	2	3	-	2	1	-	-	-	-	-	-	**3**	-	-
CO3	3	2	3	-	3	-	-	-	1	-	-	-	**3**	-	-
CO4	2	1	1	-	2	1	-	-	1	-	-	**1**	**3**	-	-

	SUBJECT CODE:UEC731L	**Advanced Communication Laboratory**	**Credits: 01**
	L:T:P - 0 : 0 : 2		CIE Marks: 50
	Total Hours/Week: 02		SEE Marks: 50

Sl.No.	**LIST OF EXPERIMENTS**
1.	Verification of Sampling Theorem
2.	Generation and detection of ASK signal
3.	Generation and detection of FSK signal
4.	Generation and detection of PSK signal
5.	Study of radiation pattern of DIPOLE antenna
6.	Study of radiation pattern of HORN antenna
7.	Study of radiation pattern of YAGI-UDA antenna
8.	Measurement of frequency and wavelength of a microwave source
9.	Study of mode characteristics of Reflex klystron
10.	Measurement of coupling factor, insertion loss and directivity of a Directional Coupler
11.	Study of MagicTee and its characteristics
12.	Study of V-I characteristics of Gunn diode and Gunn diode as an oscillator
13.	To Study the characteristics of low pass and high pass microstrip filter
14.	To Study the characteristics of bandpass and bandstop microstrip filters
15.	To study the characteristics of ring resonator in microstrip
16.	To study and plot the radiation pattern of microstrip patch antenna

Course Outcomes**

After completion of the course student will be able to

1. Design and test the digital modulation techniques and analyze the waveforms
2. Determine the radiation pattern of different antennas
3. Determine the characteristics and response of microwave devices
4. Determine the characteristics of micro strip antennas and devices and compute the parameters associated with it

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	3	1	2	0	0	1	2	2	1	0	3	0	0
CO2	2	2	3	1	2	0	0	1	2	2	1	0	3	0	0
CO3	2	2	3	1	2	0	0	1	2	2	1	0	3	0	0
CO4	2	2	3	1	2	0	0	1	2	2	1	0	3	0	0

SUBJECT CODE: UEC732L	Modeling and Simulation Lab	Credits: 01
L:T:P –0-0-2		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

LIST OF EXPERIMENTS

MATLAB:

1. Introduction to Simulink
2. Build a Second Order System Model and Simulate the Step Response
3. Implementation of Root locus, Bode and Nyquist Plots
4. Mathematical Modelling Of Simple Electrical systems
5. Amplitude modulation and demodulation
6. Analog filters design

LabVIEW:

1. Introduction to LabVIEW
2. Basic arithmetic and Boolean operations
3. Building Arrays Using For Loop And While Loop
4. Programming Exercises for Clusters and Graphs
5. Programming Exercises on case and sequence structures, file Input/output
6. To use the Format of String, Concatenate Strings, and String Length functions
7. Signal analysis using Express VIs
8. Water level monitoring system
9. Manually and Automatically controlled heating and cooling system

Course Outcomes**

After completion of the course student will be able to

1. **Ability to express and apply what they have learnt theoretically in the field of engineering through programming &simulation.**
2. **Ability To find importance of these softwares for lab experimentation.**
3. **Articulate importance of softwares in research through simulation.**
4. **In-depth knowledge of providing virtual instruments on LabVIEW Environment.**
5. **Ability To Write Basic Mathematical, electrical mechanical problems in Simulink.**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	1	3	0	0	0	1	1	1	0	3	2	0
CO2	0	0	1	1	3	0	0	0	0	0	0	0	2	3	0
CO3	0	1	1	0	3	0	0	0	0	0	0	0	3	1	0
CO4	0	0	0	0	3	0	0	0	0	0	0	0	0	2	0
CO5	3	3	3	1	3	0	0	0	0	0	0	0	3	2	0

Subject code: UEC733P	Project Phase - I	Credits:05
Hours/Week:8		CIEMarks:50
TotalHours:80		SEEMarks: 50

Phase–I of the project is part of the final year UG Project. Students have to take up Literature survey, formulate the problem of the project, define the project objectives and prepare the project implementation schedule. A certified report and a seminar is to be presented by the students. The seminar should highlight – Broad project area, literature survey, problems definition, Project objectives, implementation schedule of the project and work carried out. Guide will all ot CIE marks for 50. For SEE, student has to make a presentation of the work carried out to Project Evaluation Committee (PEC-guide,project coordinator, Hod/Nominee).PEC will allot SEE marks for 50

Course Outcomes

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

1. Apply their basic knowledge of mathematics, science and engineering to address the project topic.
2. Review the literature to identify and formulate problem for the project in contemporary issues.
3. Conduct detailed investigations of complex issues associated with project and develop the design procedures for the identified research topic and plan the schedule for the project work.
4. Prepare engineering documents and make effective presentation to communicate Effectively and collaboratively.

Course Outcomes-Programme Outcomes Mapping Table

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3						3	3	3	1	3
CO2	3	3		2		2		3	3	3	2	2
CO3	3	3	3	3	3	3	1	3	3	3	3	3
CO4	1	1	2					3	3	3	1	2

UEC840C	Project Management and IPR	Credits: 02
L: T:P - 2: 0:0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.

Concepts of Project Management: Concepts of a Project, Categories of projects, Phases of project life cycle, Roles and responsibility of project leader, Tools and techniques for project management. **Project Planning and Estimating:** Capital Expenditures: Importance and difficulties, Phases of capital Budgeting, Levels of decision making, Facets of Project Analysis, Feasibility Study: A schematic diagram, Objectives of Capital Budgeting. Preparation of cost estimation, Evaluation of the project profitability.

UNIT–II	10 Hrs.

Generation and Screening of Project Ideas: Generation of Ideas, Monitoring the Environment, Corporate Appraisal, Scouting for project ideas, Preliminary Screening, Project rating index, Sources of positive net present value, On being a Entrepreneur. **Organizing and staffing the project team:** Skills / abilities required for project manager, Authorities and responsibilities of project manager, Project organization and types accountability in project, controls, Tendering and selection of contractors.

UNIT–III	10 Hrs.

Tools & Techniques of Project Management: Bar (GANTT) chart, Bar chart for combined activities, Logic diagrams and networks, Project evaluation and review Techniques (PERT) Planning, Computerized project management. **Project Scheduling:** Project implementation scheduling, Effective time management, Different scheduling techniques, Resources allocation method, PLM concepts.

UNIT–IV	10 Hrs.

Introduction: Concept of Property, History of IPR, Different forms of IPR, Role of IPR in R & D. **Patents:** Meaning of Patent, Object & Value of Patent law, Advantages of patent to the invertors, Criteria for Patentability, Patents on computer programme, Govt. use of inventions, Infringement of patents & remedies for infringement, Patent (Amendment Act) 2005.

TextBooks *

1. Prasanna Chandra, 2009, Projects Planning Analysis Selection Implementation and Review (7th Edition), Tata McGraw Hill Publication.
2. P. Narayan, 2001, Intellectual Property Law (3rd edition), Eastern Law House.

ReferenceBooks *

1. Jack R. Meredith, Samuel J. Mantel, Jr., Project Management – A managerial approach (6th edition) Wiley.
2. Chaudhry S., 2001, Project Execution Plan: Plan for project Execution interaction.

3. G.B. Reddy, Intellectual Property Rights and Law (7th Edition), Gogia Law Agency.

Course Outcomes**

After completion of the course student will be able to

1. **Describe Project life cycle, responsibility of project leader, planning and estimation of project, can skillfully identify the tools, techniques for a project.**
2. **Discuss guidelines helpful in generation and screening of project ideas, organizing and staffing the project team.**
3. **Demonstrate the tools and techniques of project management, effective time management, Different Scheduling techniques, Resource allocation methods, PLM concepts.**
4. **Acquire the knowledge of fundamental aspects of IPR, different forms of IPR and Patent.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**

****** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0
CO2	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0
CO3	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0
CO4	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0

SUBJECT CODE:UEC842E	Satellite Communication	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Overview of Satellite Systems: Frequency Allocations for Satellite Services. INTELSAT 4, U.S.Domsats 9 ,Polar Orbiting Satellites 12,Argos System 18, Cospas-Sarsat.

Orbits and Launching Methods: Kepler's First Law, Kepler's Second Law, Kepler's Third Law, Definitions of Terms for Earth-Orbiting Satellites, Orbital Elements, Apogee and Perigee Heights, Orbit Perturbations, The subsatellite point, Predicting satellite position, Local Mean Solar Time and Sun-Synchronous Orbits, Problems. Launches and Launch Vehicles, Expendable Launch Vehicles (ELVs),Placing Satellites into Geostationary Orbit, Orbital Effects in Communications Systems Performance.

UNIT–II	10 Hrs.

The Geostationary Orbit: Antenna Look Angles, The Polar Mount Antenna, Limits of Visibility, Near Geostationary Orbits, Earth Eclipse of Satellite, Sun Transit Outage, Problems.
RadioWavePropagation:AtmosphericLosses,IonosphericEffects,RainAttenuation,Other Propagation Impairments,
Polarization: Antenna Polarization, Polarization of Satellite Signals, Cross-Polarization Discrimination, Ionospheric Depolarization, Rain Depolarization, Ice Depolarization.

UNIT–III	10 Hrs.

The Space Segment: The Power Supply, Attitude Control, Spinning Satellite stabilization, Momentum Wheel stabilization, Station Keeping, Thermal Control, TT&C Subsystem, Transponders, The wideband receiver, The input demultiplexer, The power amplifier Communications Subsystems: Description of the Communications System, Transponders, Satellite Antennas, Basic Antenna Types and Relationships, Example Global Beam Antenna Example Regional Coverage Antenna, Satellite Antennas in Practice, Equipment Reliability and Space

UNIT–IV	10 Hrs.

Low Earth Orbit and Non-Geostationary Satellite Systems: Orbit Considerations, Coverage Frequency & Considerations, Delay Throughput Considerations, System Considerations Operational NGSO Considerations Designs,
Satellite Navigation and the Global Positioning System:Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS NavigationMessage,GPSSignalLevels,TimingAccuracy,GPSC/ACodeAccuracy, Differential GPS.

Reference Books *

Textbook:

1. DennisRoddy,"Satellite Communications",4th edition,McGraw-Hill International Edition, 2010.

ReferenceBooks:

1. TimothyPratt,CharlesBostianandJeremyAllnutt,"SatelliteCommunications",2nd edition, John Wiley & Sons, 2003.
2. WilburL.Pritchard,Hendri.Suyderhoud,RoberA.Nelson,"SatelliteCommunication System Engineering", Prentice Hall, Second edition 1993.

Course Outcomes**

After completion of the course student will be able to

1. **How to describe the motion of satellite in the orbit.**
2. **Describe the concepts of subsystems, link design, rain fading and link availability.**
3. **Explain modulation techniques and the performance of satellite communication systems**
4. **Analyze the design requirements and the performance of satellite communication systems.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**

****** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0
CO2	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0
CO3	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0
CO4	3	2	1	0	0	0	0	0	0	0	0	0	3	0	0

SUBJECT CODE:: UEC843E	Speech Processing	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Digital representation of speech signal. Waveform representation and parametric representation. Sampling rate conversion. Introduction, the process of speech production and classification and basics of phonetics, phonetic description of phonemes, the acoustic theory of speech production, digital models for speech – vocal tract, radiation, excitation the complete model.	
UNIT–II	**10 Hrs.**
Introduction, time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, voiced/unvoiced/silence detection. Pitch period estimation (Rabiner and Gold method), short time autocorrelation function, short time average magnitude difference function, u/v/speech/silence detection.	
UNIT–III	**10 Hrs.**
Introduction, definitions and properties of short time Fourier transform (STFT), Fourier transform interpretation of STFT, linear filtering interpretation of STFT, sampling of STFT, speech analysis and synthesis systems (Vocoders), phase vocoder, channel vocoder.	
UNIT–IV	**10 Hrs.**
Introduction, homomorphic transformation, frequency domain representation of homomorphic systems, inverse cepstum transformation, the complex cepstrum of speech, cepstral vocoder, processing applications of cepstral analysis.	

Reference Books *

Textbook:

1. L.R.RabinerandR.W.Schafer**,**"DigitalProcessingofSpeechSignals,"Pearson Education (Asia) Pte. Ltd., 2004.

ReferenceBook:

1. D.O'Shaughnessy,"SpeechCommunications:HumanandMachine,"UniversitiesPress, 2001.
2. B.GoldandN.Morgan,"SpeechandAudioSignalProcessing:processingand perception of speech and music' Pearson Education, 2003.

Course Outcomes**

After completion of the course student will be able to

1. Explain the speech production and perception mechanism
2. Characterize and analyze speech signals in Time domain
3. Characterize and analyze speech signals in Frequency domain
4. Analyze speech signal using homomorphic transformation and LPC

*Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	0	1	1	0	0	0	0	0	0	3	0	0
CO2	3	3	2	0	1	1	0	0	0	0	0	0	3	0	0
CO3	3	2	1	0	1	1	0	0	0	0	0	0	3	0	0
CO4	3	3	1	0	1	1	0	0	0	0	0	0	3	0	0

SUBJECT CODE: UEC844E	Advanced Control Systems	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

State Variable Analysis and Design-Introduction, state space representation using physical variable, phase variable and canonical variables.
DerivationofTransferFunctionfromStateModel-Diagonalization,Eigenvalues,Eigen vectors, generalized Eigen vectors.

UNIT–II	10 Hrs.

State Space Analysis- Solution of state equation, state transition matrix and its properties, computation using Laplace transformation, power series method, Clay Hamilton method, concept of controllability and observability methods.

UNIT–III	10 Hrs.

Pole Placement Techniques- Stability improvements by state feedback, necessary and sufficient condition for arbitrary pole placement, state regulator design and design of state observer.
Controllers- Introduction and design of Proportional (P), Integral (I), Differential (D), PI, PD and PID.
Compensators-Introduction, lead, lag and lag-lead compensators.

UNIT–IV	10 Hrs.

Non-Linear Systems- Introduction, behavior of non-linear systems, common physical non linearity-saturation, friction, backlash, dead zone, relay, multivariable non-linearity. Phase plane method, singular points, stability of non-linear systems, limit cycles, construction of phase trajectories.**Liapunov Stability Criteria –** Liapunov function, direct method of Liapunov and the linear system, Hurwitz criterion and Liapunov's direct method, construction of Liapunov functions for non-linear system by Krasvskii's method.

Reference Books *

Textbook:

1. M.Gopal,"Digitalcontrolandstatevariablemethods",4th edition,THM,2012.

ReferenceBooks:

1. J.Nagarath,M.Gopal,"Controlsystemengineering",5th edition,Newage international Ltd., 2007.
2. NagoorKani,"Advancedcontroltheory",2nd edition,RBApublications.
3. KatsuhikoOgata,"Statespaceanalysisofcontrolsystems",5th edition,PrenticeHall Inc., 2000.
4. BenjaminCKuo,FaridGolnaraghi,"Automaticcontrolsystems",8th edition,John Wiley and Sons,2003.
5. RVParvatikar,'Moderncontroltheory',PrismbooksPvt.Ltd.,2015.

Course Outcomes**
After completion of the course student will be able to **1. Comprehend the fundamentals of state variable design and analysis.** **2. Solve the state equations and state transition matrix.** **3. Describe the pole placement techniques and also design and analyse various controllers and compensators.** **4. Analysethebehaviourofnon-linearsystemsandexaminethestabilitycriteriaofa given control system using various techniques.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	3	1	0	0	0	0	0	1	1	3	0	0
CO2	3	3	2	2	1	0	0	0	0	0	1	1	3	0	0
CO3	3	3	1	1	1	0	0	0	0	0	1	1	3	0	0
CO4	3	3	1	1	1	0	0	0	0	0	1	1	3	0	0

SUBJECT CODE: UEC845E	Wireless Sensor Networks	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: the vision, networked wireless sensor devices, applications, key design challenges. Network deployment: Structured versus randomized deployment, network topology, connectivity using power control, coverage metrics, and mobile deployment.	
UNIT–II	**10 Hrs.**
Routing: Metric-based approaches, routing with diversity, multi-path routing, lifetime- maximizing energy-aware routing techniques, geographic routing, routing to mobile sinks. Data-centric networking: Data-centric routing, data-gathering with compression, querying, data-centric storage and retrieval, the database perspective on sensor networks. Reliability and congestion control: Basic mechanisms and tunable parameters, reliability guarantees, congestion control, real-time scheduling.	
UNIT–III	**10 Hrs.**
Wireless characteristics: Basics, wireless link quality, radio energy considerations, SINR capture model for interference. Medium-access and sleep scheduling: Traditional MAC protocols, energy efficiency in MAC protocols, asynchronous sleep techniques, sleep- scheduled techniques, and contention-free protocols. Sleep-based topology control: constructing topologies for connectivity, constructing topologies for coverage, Set K-cover algorithms.	
UNIT–IV	**10 Hrs.**
Routing: Metric-based approaches, routing with diversity, multi-path routing, lifetime- maximizing energy-aware routing techniques, geographic routing, routing to mobile sinks. Data-centric networking: Data-centric routing, data-gathering with compression, querying, data-centric storage and retrieval, the database perspective on sensor networks. Reliability and congestion control: Basic mechanisms and tunable parameters, reliability guarantees, congestion control, real-time scheduling.	

Reference Books *

Textbook:

1. BhaskarKrismachari,“NetworkingWirelessSensors”,CambridgeUniversityPress

ReferenceBooks:

1. KazemSohraby,DanielMinoli,TaiebZnati,“WirelessSensorNetworks: Technology, Protocols, and Applications”, Wiley Inter Science.
2. EdgarH.Callaway,Jr,“WirelessSensorNetworks:ArchitecturesandProtocols”,
3. AuerbachPublications,CRCPress.
4. C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati, “Wireless Sensor Networks”,Springer.

Course Outcomes**
After completion of the course student will be able to **1. Familiar with the principle of sensor nodes, network deployment and architectures.** **2. Identify the issues of wireless sensor networks and propose the solution for conservation of sensor node energy.** **3. Analyze or compare the performance of different routing and MAC protocols.** **4. Compare the performance of various routing protocols of WSN.**

***Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	0	1	1	1	0	1	0	0	0	1	0	0	1	0	1
CO2	1	1	0	0	0	0	1	0	1	1	0	0	1	0	1
CO3	1	1	1	0	0	0	1	0	1	1	0	0	1	0	1
CO4	1	1	1	0	0	0	1	0	1	1	0	0	1	0	1

SUBJECT CODE: UEC846E	Machine Learning	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: What is Machine Learning? Python: Introduction, Data Types, Conditional statements, loops, functions, scikit-learn. Essential Libraries and Tools: Jupyter Notebook, Numpy, Pandas, Scipy, matplotlib, A First Application: Classifying Iris Species.	
UNIT–II	**10 Hrs.**
Supervised Learning: Classification and Regression, Generalization, Overfitting, and Underfitting, Supervised Machine Learning Algorithms: Some Sample Datasets, k-Nearest Neighbors, Linear Models, Naive Bayes Classifiers, Decision Trees, Neural Networks (Deep Learning).	
UNIT–III	**10 Hrs.**
Unsupervised Learning and Preprocessing: Types of Unsupervised Learning, Challenges in Unsupervised Learning, Preprocessing and Scaling, Dimensionality Reduction, Feature Extraction, and Manifold Learning, Clustering: k-Means Clustering, Agglomerative Clustering	
UNIT–IV	**10 Hrs.**
DimModel Evaluation and Improvement: Cross-Validation, Evaluation Metrics and Scoring. Working with Text Data: Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words: Applying Bag-of-Words to a Toy Dataset, Bag-of-Words for Movie Reviews, Stopwords.	

Reference Books *

Textbooks:

1. Andreas C. Müller & Sarah Guido, “Introduction to Machine Learning with Python”, Oreilly Publication, 1st Edition, 2016
2. Core Python Programming by Dr. R.NageswawaRao, Dreamtech press, 2nd Edition 2018.
3. Gourishankar S. Veena A, “Introduction to Python Programming”, CSC Press, 1st edition,2019

Reference Books:

1. Tom Mitchell,” Machine Learning”, McGraw- Hill, 2nd Edition, 2013.
2. EthemAlpaydin,” Introduction to Machine Learning”, MIT press, Cambridge, Massachusetts, London, 2nd
3. Edition, 2010
4. MiroslavKubat,” An Introduction to Machine Learning”, Springer, 2nd Edition, 2017
5. Christopher Bishop, “Pattern Recognition and Machine Learning”,Springer,2006
6. Kevin Murphy, “Machine Learning -aProbabilisticPerspective”,MITPress,2012.
7. Joachims, “Learning to Classify Text using Support Vector Machine s”,Kluwer,2002
8. Ian Good fellow and YoshuaBengio and Aaron Courville,“DeepLearning”,AnMIT Press book.

E-Resources:

1. Introduction to Machine Learning(IIT Madras)

2. https://nptel.ac.in/courses/106106139/ Introduction to Machine Learning(IIT Kharagpur)https://nptel.ac.in/courses/106105152/
Course Outcomes**
After completion of the course student will be able to **1. Explain Various Machine Learning Algorithms.** **2. Apply machine learning algorithm to solve problems of moderate complexity.** **3. Analyze performance of algorithms by varying some parameters** **4. To Formulate Machine Learning Model For The Simple Problem**

***Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1		2	2	2									1		1
CO2	1	3	3	2	3								2		2
CO3	1	3	3	3	3								3		3
CO4	1	3	3	3	3								3		3

SUBJECT CODE:UEC847E	Optical Fiber Communication	Credits: 03
L:T:P –3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
Overview of optical fiber communication: Optical Spectral Bands, Basic Principles, Fiber Modes and Configuration, Step-index and Graded index structures, Fiber Materials, Fiber Fabrication**.** **Signal degradation in optical fibers:** Attenuation, Signal Distortion in Optical Waveguides, Characteristics of Single Mode Fibers.	
UNIT–II	**10 Hrs.**
Optical sources: Characteristics of Light Sources for Communication, LED and LASER diode sources. **Power launching and coupling:** Source to Fiber Power Launching, Lensing Schemes for Coupling Improvement, Fiber-to-Fiber joints, LED Coupling to Single Mode Fibers, Fiber Splicing, Optical Fiber Connectors.	
UNIT–III	**10 Hrs.**
Photodetectors: Physical Principles of Photo Diodes, PIN Photodiode, Avalanche PhotoDiode **Optical receiver operation:** Fundamental Receiver Operation, Digital Receiver Performance Calculation, Analog Receivers.	
UNIT–IV	**10 Hrs.**
Digital links: Point-to-Point Links, Power Penalties **Analog Links:** Overview of Analog Links, Carrier – to-Noise Ratio, Multichannel Transmission Techniques, RF over Fiber, Radio –over –Fiber Links	

Reference Books *

1. GerdKeiser,"OpticalFiberCommunications",MGH,4th edition,2008
2. John M.Senior,"OpticalFiberCommunications",Pearsont,2nd edition,2006

Course Outcomes**

After completion of the course student will be able to

1. **Distinguish between the various modes of operation of optical fibers and identify the various causes for signal degradation**
2. **Categorize the types of sources of light on basis of physical construction and principle of operation**
3. **Classify the optical detectors on the basis of ability to efficiently detect**
4. **Generalize the optical fiber system performance for shorter/longer distance transmission**

*Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	1	1	1	0	0	0	0	0	3	0	0
CO2	3	2	2	2	1	1	1	0	0	0	0	0	3	0	0
CO3	3	3	2	2	1	1	1	0	0	0	0	0	3	0	0
CO4	3	3	3	2	2	1	2	0	0	0	0	0	3	0	0

SUBJECT CODE:UEC831S	Technical Seminar	Credits: 01
L:T:P - 0 : 0 : 2		CIE Marks: 50
Total Hours/Week: 02		SEE Marks: 50

Course Plan
Eachstudentshallidentifycurrenttopicrelevancetohis/herbranchofEngineering,get approval of concern faculty, collect sufficient literature on the topic, study it thoroughly, prepare own report and present in the class individually.
Course Outcomes**
After completion of the course student will be able to 1. **Acquire the basic skills for performing literature survey** 2. **Identify and analyze a current topic of professional interest** 3. **Provide better communication skills by preparing slides and presenting before the audience** 4. **Prepare the report**

*** Books to be listed as per the format with decreasing level of coverage of syllabus**
**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	0	1	2	1	0	0	1	0	0	0	1	1	1
CO2	2	3	0	1	0	1	0	0	0	0	0	1	1	1	1
CO3	0	0	0	0	2	0	0	1	1	3	0	0	1	1	1
CO4	1	1	0	1	2	0	0	0	2	3	0	1	1	1	1

Rubrics for Evaluation:

POs	Criteria	Poor	Fair	Good	Outstanding
a,b, d, h, I	Understand problems and select topic from Scopus indexed	Obsolete, Irrelevant, Out of scope	Old but relevant to the subject, Significance of the topic is not justified	Relevant and latest topic, Significance of the topic is justified properly, No	Relevant and latest topic, Significance of the topic is justified properly, It

	journal/transaction papers		properly	Research scope	has research scope and chance for doing project
f,g,h	Societal/ Environmental / Ethical relevance of the topic	No Societal/ Environmental/Ethical relevance	Socially relevant but no Environmental/ Ethical relevance	Socially and Environmentally Relevant but not Ethical	Socially and Environmentally Relevant and also Ethical
a,b, d, e, i, l	Ability to collect required number of back ground materials	Information is gathered from a single source	Information is gathered from 2 number of sources	Information is gathered from a limited number of sources	Information gathered from multiple and research-based sources
a,b, d, e, i, l	Ability to select papers with latest technical knowledge and tools	Select papers published before 8 years	Select papers published before5years	Select papers published within 2 to 5 years	Select recent papers. (published within two years) with latest techniques
e,h,j	Preparation of slides	Content not clear and insufficient, Has irrelevant contents unable to convey the idea, No Graphics used	Has more text than bullet points, No uniformity across slides, Limited use of Graphics	Content relevant but not precise, Has uniformity across slides	Precise and relevant contents, Able to convey the idea clearly, Used graphics wherever necessary
j	Presentation	Unable to convey the idea and poor Communication skills. Hard to follow	Good communication skills but idea not conveyed properly. No proper sequencing of contents	Idea conveyed properly, good communication skills but poor nonverbal communication skill, Has good logical sequencing of	Idea conveyed properly and has good non-verbal and verbal communication skills, Has good logical sequencing of

				presentation	presentation.
a,b, d	Knowledge on the topic	Not able to answe r any of the questi ons, Subject knowledge not adequate	Answered few questions, Subject knowledge is not adequate	Answered most of the questions, Failed to elaborate some f the concepts	Answered all questions With elaboration, Has excellent understandi ng of the topic
e,j	Report	Copied work and a lot of spelling mistakes, Copied from slides, No modern tool used	Own work, alignments are not proper, Content not sufficient, Have less mistakes, Conventional tools are used.	Own work, Alignment is Proper, Proper use of figures and tables, Convention al tools with graphs/plots/ch arts are used	Own work with no mistakes, Alignments are Proper, Proper use of figures and Tables, Modern tools used

Evaluation Sheet:

Department of Electronics and Communication Engineering

Name of the Student:

USN:

Sl.No.	Criteria	Poor	Fair	Good	Outstanding	Score
1	Understand problems and select topic from Scopus indexed journal/transaction papers					
		(1Mark)	**(2Marks)**	**(4Marks)**	**(6Marks)**	
2	Societal/ Environmental/ Ethical relevance of the topic					
		(1Mark)	**(2Marks)**	**(3Marks)**	**(4Marks)**	
3	Ability to collect required number of Background materials					
		(1Mark)	**(2Marks)**	**(4Marks)**	**(6Marks)**	
4	Ability to select papers with latest Technical knowledge and tools					
		(1Mark)	**(2Marks)**	**(4Marks)**	**(6Marks)**	
5	Preparation of slides					
		(4Mark)	**(6Marks)**	**(8Marks)**	**(10Marks)**	
6	Presentation					
		(15Mars)	**(20Marks)**	**(25Marks)**	**(30Marks)**	
7	Knowledge on the topic					
		(3Mark)	**(6Marks)**	**(7Marks)**	**(8Marks)**	
8	Report					
		(15Mars)	**(20Marks)**	**(25Marks)**	**(30Marks)**	
					Total Marks	

BVVS

BASAVESHEAR ENGINEERING COLLEGE (A), BAGALKOTDEPARTMENT OF ELETRONICS AND COMMUNICATION ENGINEERING

Academic year: xxxx-xx Class:

Date: Division:

Seminar Approval Form

USN	Roll No.	Name of the Student	Signature of student

Seminar Title with a very small description (**By the student**):

Guide Name: _____

Guide Suggestion (if any):

Guide Seminar Coordinator

HOD