Syllabus for

B.E. VII & VIII – Semester

for academic year 2023 – 2024

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

VII Semester Syllabus

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,analyze and 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 ELECTRONICS AND 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)	--	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 andan evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completionof 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 theconcerned department as per norms of the institute. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analysed along with theInternship Report

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**

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) andProgramme Specific Outcomes (PSO)

No	Programme Outcomes / Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2	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 somewhat detracting errors that could have been fixed with additional editing prior to submission. Key conceptsrelated to the selected evidence and internship experience are inaccurate o r incomplete. Some helpfu l 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 *

10. P.S. Satyanarayana,2004, Concepts of information theory and coding (2nd edition)Dynaram**.**
11. Bernard Sklar,2002, Digital communication fundamentals and applications (2nd edition) Pearson education.
12. K. Sam Shanmugam, 1996, Digital and analog communication systems**,** John Wiley.
13. 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,colorinimageandvideo: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). BasicVideoCompressionTechniques: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 andApplications: Quality of multimedia data transmission, multimedia over IP, multimedia over ATMnetworks,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,Hebbnetwork. 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,simpleGA,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,Chuen TsaiSun, 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. **Applyfuzzylogic 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 PSKsignal
5.	Study of radiation pattern of DIPOLE antenna
6.	Study of radiation pattern of HORNantenna
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 Gunndiode 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

	Programme Outcomes (POs)	Program Specific

Course Outcomes													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 WhileLoop
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.**

	Programme Outcomes (POs)	Program Specific Outcomes (PSOs)

Course Outcomes	**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:08		CIEMarks:50
TotalHours:80		SEEMarks: 50

Phase–Ioftheprojectispartofthefinalyear UGProject.StudentshavetotakeupLiterature survey, formulate the problem of the project, define the project objectives andprepare the project implementation schedule. A certified report and a seminar is to bepresented by the students. The seminar should highlight – Broad project area, literaturesurvey, problems definition, Project objectives, implementation schedule of the project andworkcarriedout.GuidewillallotCIEmarksfor50.ForSEE,studenthastomakeapresentationofth eworkcarriedouttoProjectEvaluationCommittee(PEC-guide,project coordinator,Hod/Nominee).PECwillallotSEEmarksfor50

CourseOutcomes

Attheendofthiscourse,studentswillbeableto

1. Apply their basic knowledge of mathematics, science and engineering to address theprojecttopic.
2. Review the literature to identify and formulate problem for the project in contemporaryissues.
3. Conduct detailed investigations of complex issues associated with project and developthe design procedures for the identified research topic and plan the schedule for theprojectwork.
4. Prepareengineeringdocumentsandmakeeffectivepresentationtocommunicate effectivelyandcollaboratively.

CourseOutcomes-ProgrammeOutcomesMappingTable

CourseOutcomes	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**

SUBJECT CODE: UEC736N	Research Methodology	Credits: 03
L:T:P – 3-0-0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I	xx Hrs.
Research Methodology: Introduction: Meaning of Research, Objectives of Research,Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. **Defining the Research Problem:** Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.	
UNIT–II	**xx Hrs.**
Research Design: Meaning of Research Design, Need for Research Design, Features of Research Design, Important Concepts Relating to Research Design, Different Research Designs and Experimental Designs. **Reviewing the literature**: Place of the literature review in research, Bringing clarity and focus to research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.	
UNIT–III	**xx Hrs.**
Design of sample Surveys: Sample Survey, Sampling and Non-sampling Errors, Sample Survey Vs. Census Survey, Types of Sampling Designs, Non-Probability Sampling, Probability Sampling, Complex Random Sampling Designs. **Data Collection:** Experiments and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.	
UNIT–IV	**xx Hrs.**
Testing of Hypothesis: Basic Concepts Concerning Testing of Hypothesis, Testing the Hypothesis, Test Statistic and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis testing, Hypothesis Testing for :Mean, Proportions, Variance, Difference of Two Mean, Difference of Two Proportions, Difference of Two Variances, *P*-Value Approach, Power of Test, Limitations of the Test of Hypothesis. **Interpretation and Report Writing:** Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.	

Reference Books *

1. C. R. Kothari and Gaurav Garg, “Research Methodology: Methods and Techniques”, 4th edition, New Age International Publishers.
2. Ranjt Kumar, “Research Methodology: A Step by Step Guide for Beginners”, 3rd Edition, SAGE Publishers

Course Outcomes**

After completion of the course student will be able to

1. **Comprehend the research methodology and techniques of defining a research problem.**
2. **Use various research designs and characteristics for research problems and carryout systematic literature review and develop theoretical framework forthe research problem.**
3. **Design sample surveys using appropriate method of data collection.**
4. **Identify and compare different testing hypothesis and also review different mechanism to write a good research report.**

VIII Semester Syllabus

UEC840C	Project Management and IPR	Credits: 02
L: T:P - 3: 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 (7^{th} Edition), Tata McGraw Hill Publication.
2. P. Narayan, 2001, Intellectual Property Law (3^{rd} edition), Eastern Law House.

ReferenceBooks *

1. Jack R. Meredith, Samuel J. Mantel, Jr., Project Management – A managerial approach (6^{th} edition) Wiley.
2. Chaudhry S., 2001, Project Execution Plan: Plan for project Execution interaction.
3. G.B. Reddy, Intellectual Property Rights and Law (7^{th} 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,OrbitPerturbations,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.

TheGeostationaryOrbit:AntennaLookAngles,ThePolarMountAntenna,LimitsofVisibility, 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 Wheelstabilization, Station Keeping, Thermal Control,TT&CSubsystem, 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 ConsiderationsOperational 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. Explainthespeechproductionandperceptionmechanism
2. Characterizeandanalyzespeechsignalsin Timedomain
3. Characterizeandanalyzespeechsignalsin Frequency domain
4. Analyzespeechsignalusinghomomorphictransformationand 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 AnalysisandDesign-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,lagandlag-leadcompensators.

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. Comprehendthefundamentalsofstatevariabledesignandanalysis.
2. Solvethestateequationsandstatetransitionmatrix.

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. Bhaska rKrismachari,“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. Familiarwiththeprincipleofsensornodes,networkdeploymentandarchitectures.
2. Identifytheissuesofwirelesssensornetworksandproposethesolutionfor conservation of sensor node

energy.

3. Analyzeorcomparetheperformanceofdifferentrouting andMACprotocols.
4. ComparetheperformanceofvariousroutingprotocolsofWSN.

*__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. Analyzeperformanceofalgorithmsbyvaryingsomeparameters **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:21UEC803S	TechnicalSeminar	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. Acquirethebasicskillsforperformingliteraturesurvey 2. Identify andanalyzeacurrenttopicofprofessionalinterest 3. Provide better communication skills by preparing slides and presenting before the audience 4. Preparethereport

* **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

RubricsforEvaluation:

POs	Criteria	Poor	Fair	Good	Outstanding
a,b,d, h, l	Understand problems and select topic from Scopus indexed journal/transaction papers	Obsolete, Irrelevant, Outofscope	Old but relevant to the subject, Significanceofthe topic is not justified properly	Relevant and latest topic, Significance of the topic is justified properly, No researchscope	Relevantandlatest topic, Significance of the topic is justified properly, It has researchscopeand chance for doing project
f,g,h	Societal/ Environmental/ Ethical relevanceof the topic	No Societal/ Environmental/Ethical relevance	Sociallyrelevant but no Environmental/ Ethicalrelevance	Sociallyand Environmentally relevantbutnot Ethical	Sociallyand Environmentally relevantandalso Ethical

a,b,d, e, i, l	Ability to collect requirednumber of back ground materials	Information is gatheredfroma 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 paperswithlatest technical knowledge and tools	Select papers publishedbefore 8 years	Select papers published before5years	Select papers publishedwithin 2 to 5 years	Select recent papers. (published within two years) with latest techniques
e,h,j	Preparationof slides	Contentnotclear and insufficient, Has irrelevant contents unableto convey the idea,No graphicsused	Has moretext than bullet points, No uniformity across slides, Limiteduseof Graphics	Contentrelevant but not precise, Has uniformity across slides	Precise and relevant contents, Able to convey the idea clearly,Used graphics wherever necessary
j	Presentation	Unableto convey the idea and poor Communication skills.Hard to follow	Good communication skills but idea not conveyedproperly. No proper sequencing of contents	Idea conveyed properly,good communicationskills but poor nonverbal communication skill, Has good logical sequencing of presentation	Idea conveyed properly and has good non-verbal and verbal communicationskills , Has good logical sequencingof presentation.
a,b,d	Knowledgeonthe topic	Notableto answerany of the questions, Subject knowledgenot adequate	Answered afew questions, Subjectknowledge is not adequate	Answered most of the questions, Failed to elaboratesome f the concepts	Answeredall questions withelaboration, Has excellent understandingof the topic
e,j	Report	Copied work and a lot of spelling mistakes, Copied from slides, No moderntoolused	Own work, alignments are not proper,Content not sufficient,Have less mistakes, Conventional tools are used.	Ownwork, Alignment is Proper,Proper use offiguresandtables, Conventional tools with graphs/plots/charts areused	Own work with no mistakes,Alignments are Proper, Proper use of figures and Tables,Modern tools used

EvaluationSheet:

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	Abilityto collect required number of backgroundmaterials					
		(1Mark)	**(2Marks)**	**(4Marks)**	**(6Marks)**	
4	Abilityto select papers with latestTechnical knowledge and tools					
		(1Mark)	**(2Marks)**	**(4Marks)**	**(6Marks)**	
5	Preparationofslides					
		(4Marks)	**(6Marks)**	**(8Marks)**	**(10Marks)**	
6	Presentation					
		(15Marks)	**(20Marks)**	**(25Marks)**	**(30Marks)**	
7	Knowledgeonthetopic					
		(3Marks)	**(6Marks)**	**(7Marks)**	**(8Marks)**	
8	Report					
		(15Marks)	**(20Marks)**	**(25Marks)**	**(30Marks)**	
					TotalMarks	

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

Academicyear:xxxx-xxClass:

Date: Division:

SeminarApprovalForm

USN	RollNo.	Name ofthe Student	Signatureofstudent

SeminarTitlewithaverysmalldescription(**Bythestudent**):

Guide Name: _____

GuideSuggestion(ifany):

Guide SeminarCoordinator
HOD