ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2022 Rank Band : 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.
काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
(An Autonomous Institute under Kakatiya University, Warangal)
(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)
Estd: 1980 KITSW
website: www.kitsw.ac.in E-mail: principal@kitsw.ac.in : +91 9392055211, +91 7382564888

VISION OF THE INSTITUTE

- *To make our students technologically superior and ethically strong by providing quality education with the help of our dedicated faculty and staff and thus improve the quality of human life*

MISSION OF THE INSTITUTE

- *To provide latest technical knowledge, analytical and practical skills, managerial competence and interactive abilities to students, so that their employability is enhanced*
- *To provide a strong human resource base for catering to the changing needs of the Industry and Commerce*
- *To inculcate a sense of brotherhood and national integrity*

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION OF THE DEPARTMENT

- *Develop the department into a full-fledged center of learning in various fields of Electronics and Communication Engineering in pursuit of excellence in Education, Research, Entrepreneurship and Technological services to the society*

MISSION OF THE DEPARTMENT

- *Imparting quality education to develop innovative and entrepreneurial professionals fit for globally competitive environment*
- *To nurture the students in the field of Electronics and Communication Engineering with an overall back-ground suitable for attaining a successful career in higher education, research and industry*

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

UG - ELECTRONICS AND COMMUNICATION ENGINEERING - ECE

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	**Within first few years after graduation**, the **ELECTRONICS AND COMMUNICATION ENGINEERING** graduates will be able to …
PEO1: Technical Expertise	*building on fundamental knowledge, graduate should continue develop technical skills within and across disciplines in electronics and communication engineering for productive and successful career maintaining professional ethics*
PEO2: Successful Career	*graduates should develop and exercise their capabilities to demonstrate their creativity in engineering practice and team work with increasing responsibility and leadership*
PEO3: Soft Skills and Life Long Learning	*graduates should refine their knowledge and skills to attain professional competence through lifelong learning such as higher education, advanced degrees and professional activities*

PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)	
UG - ELECTRONICS AND COMMUNICATION ENGINEERING - ECE	
PROGRAM OUTCOMES (POs)	**At the time of graduation**, the **Electronics and Communication Engineering** graduates will be able to …
PO1: Engineering Knowledge	*apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.*
PO2: 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*
PO3: 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.*
PO4: 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.*
PO5: 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.*
PO6: 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.*
PO7: 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.*
PO8: Ethics	*apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice*
PO9: Individual and team work	*function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings*
PO10: 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*
PO11: 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*
PO12: 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*
PROGRAM SPECIFIC OUTCOMES (PSOs):	
PSO1	*readiness for immediate professional practice.*
PSO2	*an ability to use fundamental knowledge to investigate new and emerging technologies leading to innovations.*

URR-18

(Applicable from the Academic Year 2018-19)

B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)

AUTONOMOUS – REVISED SCHEME & SYLLABI (URR'18)

(*w.e.f. 2018-19)*

Of

B.Tech ECE SYLLABI (I to VIII SEMESTERS)

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(*An Autonomous Institution under Kakatiya University*)

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

URR18-R22

SCHEME OF INSTRUCTIONS & EVALUATION FOR B.TECH. 4-YEAR DEGREE PROGRAMME

BRANCH : B.Tech. – CE / EEE / ECE/ECI/CSE (AI &ML) (Stream – II)

SEMESTER : FIRST

Sl. No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH101	Engineering Mathematics - I	3	1	-	4	10	30	40	60	100
2	ESC	U18CS102	Programming for Problem Solving using C	3	-	-	3	10	30	40	60	100
3	BSC	U18CH103	Engineering Chemistry	3	1	-	4	10	30	40	60	100
4	ESC	U18ME104	Engineering Drawing	2	-	4	4	10	30	40	60	100
5	ESC	U18CE105	Engineering Mechanics	3	1	-	4	10	30	40	60	100
6	ESC	U18CS107	Programming for Problem Solving using C Laboratory	-	-	2	1	40	-	40	60	100
7	BSC	U18CH108	Engineering Chemistry Laboratory	-	-	2	1	40	-	40	60	100
8	MC	U18CH109	Environmental Studies*	2	-	-	-	10	30	40	60	100
9	MC	U18EA110	EAA* : Sports/Yoga/NSS	-	-	2	_	100	-	100	-	100
10	MC	U18EA111	Universal Human Values-I (Induction Program)	-	-	-	-	-	-	-	-	-
			Total	**16**	**3**	**10**	**21**	**240**	**180**	**420**	**480**	**900**

L - Lectures; T – Tutorials; P – Practicals C = Credits

EAA – Extra Academic Activity

*** indicates mandatory non-credit course**

Contact hours per Week : 29

Total Credits : 21

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

URR18-R22

SCHEME OF INSTRUCTIONS & EVALUATION FOR B.TECH. 4-YEAR DEGREE PROGRAMME

BRANCH: B.Tech. – CE / EEE / ECE/ECI/CSE (AI &ML) (Stream – II)

SEMESTER : SECOND

Sl.No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
								CIE			ESE	Total Marks
				L	T	P	C	TA	MSE	Total		
1	BSC	U18MH201	Engineering Mathematics - II	3	1	-	4	10	30	40	60	100
2	ESC	U18CS202	Data Structures through C	3	-	-	3	10	30	40	60	100
3	BSC	U18PH203	Engineering Physics	3	1	-	4	10	30	40	60	100
4	HSMC	U18MH204	English for Communication	2	-	2	3	10	30	40	60	100
5	ESC	U18EE205	Basic Electrical Engineering	3	1	-	4	10	30	40	60	100
6	ESC	U18EE206	Basic Electrical Engineering Laboratory	-	-	2	1	40	-	40	60	100
7	ESC	U18CS207	Data Structures through C Laboratory	-	-	2	1	40	-	40	60	100
8	BSC	U18PH208	Engineering Physics Laboratory	-	-	2	1	40	-	40	60	100
9	ESC	U18ME209	Workshop Practice	-	-	2	1	40	-	40	60	100
10	MC	U18EA210	EAA* : Sports/Yoga/NSS	-	-	2	-	100	-	100	-	100
			Total	**14**	**3**	**12**	**22**	**310**	**150**	**460**	**540**	**1000**

L - Lectures; T – Tutorials; P – Practicals & Credits
EAA – Extra Academic Activity
*** indicates mandatory non-credit course**

Contact hours per Week : 29
Total Credits : 22

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION
III SEMESTER OF 4-YEAR B.TECH ECE DEGREE PROGRAM

URR18-R22

III - Semester [Second year **[6Th+2P+1M]**

Sl.No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH301	Engineering Mathematics - III	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP302	Soft and Interpersonal Skills	-	-	2	1	100	-	100	-	100
3	OE	U18OE303	Open Elective-I	3	-	-	3	10	30	40	60	100
4	PCC	U18EC304	Signals & Systems	3	-	-	3	10	30	40	60	100
5	PCC	U18EC305	Analog Circuits – I	3	-	-	3	10	30	40	60	100
6	PCC	U18EC306	Switching Theory & Logic Design	3	-	-	3	10	30	40	60	100
7	ESC	U18EE312	Network Analysis	3	-	-	2	10	30	40	60	100
8	PCC	U18EC308	Analog Circuits - I Laboratory	-	-	2	1	40	-	40	60	100
9	OE	U18OE311	Open Elective-I based Laboratory	-	-	2	1	40	-	40	60	100
			Total:	**18**	**1**	**6**	**21**	**240**	**180**	**420**	**480**	**900**

L= Lecture, T = Tutorials, P = Practicals & C = Credits

Open Elective-I:	**Open Elective-I based Laboratory**
U18OE303A: Object Oriented Programming (CSE)	U18OE311A: Object Oriented Programming Lab (CSE)
U18OE303B: Fluid Mechanics & Hydraulic Machines (CE)	U18OE311B: Fluid Mechanics & Hydraulic Machines Lab (CE)
U18OE303C: Fundamentals of Mechatronics (ME)	U18OE311C: Mechatronics Lab (ME)
U18OE303D: Web Programming (IT)	U18OE311D: Web Programming Lab (IT)
U18OE303F: Strength of Materials (CE)	U18OE311F: Strength of Materials Lab (CE)

Student Contact Hours / Week (periods/week) : 25
Total Credits (C) : 21

U18MH301 ENGINEERING MATHEMATICS- III

Class: B. Tech. III-Semester **Branch:** Common to all branches

Teaching Scheme : **Examination Scheme :**

L	T	P	C
3	1	-	4

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: *Laplace transform and its use to find the solutions of certain initial and boundary value problems in engineering*

LO2: *Fourier series and its application to solve engineering problems*

LO3: *functions of complex variables, the property of analyticity of a function of complex variable and their applications*

LO4: *integration of a function of complex variable, evaluation of certain real integrals using complex analysis*

UNIT-I (9+3)

Laplace Transforms: Integral transforms, Kernel of a transform, Laplace transform of a function, Inverse Transform-Existence and uniqueness of Laplace Transforms, S- plane and region of convergence (ROC), Laplace Transform of some commonly used signals- Dirac-delta (impulse) function $[\delta(t)]$,step $[u(t)]$,ramp $[tu(t)]$,parabolic $[t^2u(t)]$,real exponential $[e^{at}u(t)]$, complex exponential $[e^{j\Omega t}u(t)]$, sine and cosine functions, damped sine and cosine functions, hyperbolic sine and cosine functions, damped hyperbolic sine and cosine functions, rectangular pulse and triangle. Properties of Laplace Transforms- Linearity, First shifting theorem (Frequency shift property), Laplace transforms of derivatives and integrals, time scaling property, time reversal property, Laplace Transform of Heaviside unit step function, Second shifting theorem (time shift property), Initial value and final value theorems, Laplace transform of periodic functions- Convolution theorem.

Operational Calculus: Transfer functions, Solution of ordinary differential equations with constant coefficients and system of ordinary differential equations with constant coefficients using Laplace Transforms. Application of Laplace transforms to the first order and second order system subjected to impulse, step, periodic, rectangular, square, ramp, triangular and sinusoidal functions.

UNIT-II (9+3)

Fourier Series: Periodic functions, orthogonal and orthonormal functions and systems of orthogonal functions, representation of a function as Trigonometric Fourier series (FS) in a range of length 2π, Euler formulae, Conditions for the existence of Fourier series (Dirichlet's conditions), FS for typical wave forms- square wave, pulse train, impulse train(comb function), periodic rectangular wave, triangle, saw tooth, half wave rectified signal, full wave rectified signal, plotting FS coefficients - line spectrum (magnitude and Phase spectra), Fourier series on an arbitrary period, effects of symmetry of function on FS coefficients, half range series – half range cosine and sine series expansions, exponential FS .

UNIT-III (9+3)

Complex Variables: Functions of complex variables, Limit, Continuity, Differentiability, Analytic Functions, Cauchy-Riemann Equations in Cartesian and Polar coordinates. Elementary functions, Harmonic Functions, Construction of Analytic functions. Applications to find velocity potential and stream function of a flow, conformal mapping and bilinear transformation.

UNIT-IV (9+3)

Complex Integration: Line integration in complex plane, integral of a non analytic function, dependence on path of integration, *ML*-Inequality, Cauchy's integral theorem, Cauchy's integral formula, series expansion of complex functions: Taylor's series and Laurent's series, zeros and singularities, residues, Residue Theorem- Applications of Residue theorem to the properly chosen integrals around a unit circle and semi circle.

Text Books:

[1] Grewal, B.S., *Higher Engineering Mathematics*, Khanna Publishers, Delhi: 43/e, 2014.

Reference Books:

[1] Kreyszig E., *Advanced Engineering Mathematics*, John Wiley & Sons, Inc., U.K, 9/e, 2013.
[2] Churchill R.V., *Complex Variable and its Applications*, McGraw Hill, New York, 9/e, 2013.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: apply Laplace transform to solve certain differential equations whose solutions cannot be computed using classical methods

CO2: describe a given function as Fourier series in an interval

CO3: construct analytic function; find velocity potential and stream function of a fluid flow using complex analytical methods

CO4: represent a given function in Taylor's and Laurent's series, evaluate certain real integrals using integral theorems

Course Articulation Matrix (CAM): U18 MH301 ENGINEERING MATHEMATICS- III														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18MH301.1	2	2	-	--	--	--	--	--	--	--	--	1	2	--
CO2	U18MH301.2	2	2	--	--	--	--	--	--	--	--	--	1	2	--
CO3	U18MH301.3	2	2	--	--	--	--	--	--	--	--	--	1	2	--
CO4	U18MH301.4	2	1	--	--	--	--	--	--	--	--	--	1	2	--
U18MH301		**2**	**1.75**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**--**

U18TP302 SOFT AND INTERPERSONAL SKILLS

Class: B.Tech III semester

Branch: Common to all branches

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on….

LO1: analyzing self and learning to overcome possible threats

LO2: group dynamics to demonstrate respect for the opinions and beliefs of group

LO3: effective presentations using visual aids and analyzing the videos

LO4: communicating professionally, making resume in line with industry expectations

LIST OF ACTIVITIES

Introduction

Activity 1	Team interaction
Activity 2	SWOT analysis
Activity 3	Debate
Activity 4	Group Discussion

Activity 5	Presentations through PPTs
Activity 6	Video Synthesis
Activity 7	Resume Writing
Activity 8	Email Etiquette

Activity 9 : My interview Plan: Self Introduction & FAQs
Activity 10 : "My Career Plan" Oral presentation
} Comprehensive Presentation

Text Books:

[1] Mohan & Meera Benerji, *Developing Communications Skills* – Krishna, New Delhi: Mcmillan Publications., 2005.

[2] Alex.K, *Soft Skills* , New Delhi: S. Chand Publications, 2010.

[3] Raman & Meenakshi, *Soft Skills Cornerstone of Professional Success*, New Delhi: Jain Brothers Publications., 2009.

References:

[1] https://onlinecourses.nptel.ac.in/noc19_hs20/preview

[2] https://onlinecourses.nptel.ac.in/noc18_hs30/preview

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: introspect to convert strengths into opportunities, identify weaknesses, bypass threats

CO2: present views on various issues confidently in a group

CO3: make effective PPT presentations, synthesize videos

CO4: prepare a professional resume, communicate effectively to attain better opportunities

Course Articulation Matrix (CAM): U18TP302 SOFT AND INTERPERSONAL SKILLS															
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18TP302.1	-	-	-	-	-	-	-	-	2	3	-	-	1	-
CO2	U18TP302.2	-	-	-	-	-	-	-	2	3	3	-	-	1	-
CO3	U18TP302.3	-	-	-	-	-	-	-	-	2	3	-	-	1	-
CO4	U18TP302.4	-	-	-	-	-	-	-	1	2	3	-	-	1	-
U18TP302		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**2.25**	**3**	**-**	**-**	**1**	**-**

U18OE303A OBJECT ORIENTED PROGRAMMING

Class: B. Tech III-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):

This course will develop students' knowledge in/on…

LO1: fundamentals of object oriented and java programming.

LO2: classes, objects and inheritance for implementing object oriented concepts.

LO3: polymorphism, interfaces and packages for realizing object oriented programming.

LO4: manage Exceptional and I/O operations in application developments.

UNIT- I (9)

Fundamentals of Object Oriented Programming: Programming paradigms, Basic concepts of Object Oriented paradigm (OOP), benefits and applications of OOP.

Basics of Java Language: Java language Features, Java Programming Structure, Java Tokens, JVM, Constants, Variables, Data types, Scope of variable, Type Casting, Operators and Expressions, Branching and looping statements, Arrays.

UNIT – II (9)

Classes and Objects: Defining a class, Field declaration, Method declaration, Creating object, Accessing Class Members, Constructors, garbage collection, Static members, Nested and inner classes, Command line arguments, Wrapper classes.

Inheritance: Extending a class, Defining subclasses, Subclass constructor, Multilevel inheritance, Hierarchical inheritance, Access controls, *this* and *super* keywords.

UNIT-III (9)

Polymorphism: Overloading methods, Overloading constructors, Overriding Methods, Dynamic method dispatch, Abstract classes, Final Keyword.

Interfaces: Defining an interface, Implementing interfaces, Nested Interfaces, Variables in interfaces, Extending interfaces

Packages: Packages, java API packages, Using System Packages, Naming Conventions, Creating Packages, Accessing Packages, Adding a class to package, Hiding classes, Static Import.

UNIT – IV (9)

Exception handling: Fundamentals, Exception types, Uncaught exceptions, Using try and catch, Multiple catch clauses, Explicit exceptions with *throw, throws* and *finally* keywords.

String Handling: String constructors, String length, String operations, Character extraction, String comparison, Searching string, Modifying string, Changing string cases, Joining strings**.**

Using I/O: I/O Basics, Reading console Input, Writing console output, Reading and writing files.

Text Books:

[1] Herbert Schildt, *JAVA The Complete Reference*, 9th ed. McGraw-Hill Education India Pvt.Ltd , ISBN: 9781259002465, 2014.
[2] E.Balgurusamy, *Programming with JAVA a primer*, 5e ed. McGraw-Hill Publication Ltd, ISBN: 9351343200, 2014.

References Books:

[1] P Radha Krishna, *Object Oriented Programming through JAV*, Universities Press: ISBN: 9788173715723,2011.
[2] Herbert Schildt,*JAVA The Complete Reference*, 9th ed. McGraw-Hill Education India Pvt.Ltd , ISBN: 9781259002465, 2011.
[3] Kathy Sierra, Bert Bates, *Head First Java*, 2nd ed. ,O'Reilly Publictions: ISBN-13: 978-0596009205.
[4] Uttam K.Roy, *Advanced JAVA Programming*, 1st ed. Oxford Publications: ISBN-13: 978-0199455508.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: demonstrate object oriented concepts and java programming features.
CO2: solve computing problems using object orientation and inheritance concepts
CO3: use polymorphism, interfaces and Packages for effective object oriented programming
CO4: handle Exceptions and I/O operations in application development.

Course Articulation Matrix (CAM): U18OE303A OBJECT ORIENTED PROGRAMMING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE303A.1	2	2	2	1	2	1	-	1	2	1	2	1	2	1
CO2	U18OE303A.2	2	2	2	1	2	1	-	-	2	1	2	1	2	1
CO3	U18OE303A.3	2	2	2	1	2	1	-	-	2	1	2	1	2	1
CO4	U18OE303A.4	2	2	2	1	2	1	1	1	2	1	2	1	2	1
U18OE303A		**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**

U18OE303B FLUID MECHANICS AND HYDRAULIC MACHINES

Class: B.Tech. III -Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: various Properties of fluids and fluid statics
LO2: application of Bernoulli's equation and dimensional analysis
LO3: flow through pipes and working principles of hydraulic turbines
LO4: performance of reciprocating and centrifugal pumps

UNIT-I (9)

Fluid fundamentals: Classification of fluids, fluid properties - density, specific weight, specific gravity, specific volume, viscosity, capillarity, vapor pressure, compressibility, surface tension, cohesion and adhesion.

Fluid statics: Pascal's Law, hydrostatic Law, measurement of pressure, manometers, Piezometer, U-tube differential manometer, inverted differential manometer, hydrostatic forces on submerged plane and curved surfaces, buoyancy, metacenter, stability of floating and submerged bodies

UNIT-II (9)

Fluid dynamics: Classification of fluid flow, continuity equation in one, two and three dimensional flow, velocity potential and stream function, forces causing motion, Euler's equation of motion, Bernoulli's Equation, applications of Bernoulli's equation, venturi meter, orifice meter, pitot tube, linear momentum equation ,application of linear momentum equation to forces on pipe bend.

Dimensional analysis: Dimensional analysis by Rayleigh's method and Buckingham π's theorem, dimensionless numbers and model laws, Reynolds law and Froude's law.

UNIT-III (9)

Flow through pipes: Loss of head in pipes, expression for head loss due to major and minor losses in pipes, HGL and TEL lines, pipes in series and parallel, equivalent pipe.

Hydraulic turbines: Concept of impact jets, classification, head, losses and various efficiencies, Pelton turbines, components, velocity triangles, power and efficiencies, reaction turbines, Francis and Kaplan turbines, efficiencies and characteristics, unit quantities, specific speed, draft tube theory.

UNIT-IV (9)

Reciprocating pumps: Working of single and double acting pumps, work done and efficiencies, slip, negative slip, performance characteristics of pumps, air vessel.

Centrifugal pumps: Principle, components, work done and efficiency, pumps in series and in parallel, multi stage pumps, characteristics, cavitation and priming.

Text Books:

[1] P.N.Modi and S.M. Seth, *Hydraulics and Fluid Mechanics Including Hydraulic Machines*, 21th ed. Standard Book House, Rajsons Publications Private Limited, 2017.

Reference Books:

[1] R.K.Bansal, *Fluid Mechanics and Hydraulic Machines*, Periodicals Private Ltd.,2018.
[2] Victor Streeter and E. Benjamin Wylie, *Fluid Mechanics*, , *9*th ed. McGraw Hill, Singapore2017.
[3] Frank M. White, *Fluid Mechanics*, Special Indian ed. New Delhi: Tata McGraw Hill, 2011.
[4] A.K. Jain, *Fluid Mechanics Including Hydraulic Machines*, *12*th ed. Khanna Publications, 2018.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: summarize fluid properties using fundamental laws of fluid statics
CO2: analyse fluid flows using Bernoulli's equation and model laws
CO3: estimate losses in pipes and characterize hydraulic turbines
CO4: discuss the working principle and characteristics of pumps

Course Articulation Matrix (CAM): U18OE303B FLUID MECHANICS AND HYDRAULIC MACHINES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18CE303B.1	2	1	-	-	-	-	-	-	1	1	-	1	2	-
CO2	U18CE303B.2	2	1	-	1	-	-	-	-	1	1	-	1	2	-
CO3	U18CE303B.3	2	1	-	1	-	-	-	-	1	1	-	1	2	-
CO4	U18CE303B.4	2	1	-	1	-	1	-	-	1	1	-	1	2	-
U18CE303B		**2**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**1**	**1**	**-**	**1**	**2**	**-**

U18OE303C FUNDAMENTALS OF MECHATRONICS

Class: B.Tech. III-Semester **Branch:** Common to all branches

Teaching Scheme : **Examination Scheme :**

L	T	P	C
3	-	-	3

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Outcomes (LOs):
This course will develop students' knowledge in / on
LO1: *role of mechatronics based technology, sensors and transducers used in industry*
LO2: various types of actuation systems, working principles and their applications
LO3: mathematical models for various types of systems
LO4: various transfer functions and control modes

UNIT-I (9)

Introduction to Mechatronics: Measuring system, Control systems, Microprocessor based controllers. Mechatronics approach.

Sensors and Transducers: Performance, terminology. displacement, position, proximity, velocity and motion.

UNIT-II (9)

Actuation Systems: working principles of pneumatic and hydraulic systems, directional control valves, pressure control valves, process control valves and rotary actuators.

Electrical Actuation Systems: working principles of electrical system, mechanical switches, solid-state switches solenoids, DC motors, AC motors and stepper motors.

UNIT-III (9)

Basic Models: Mathematical models, mechanical system building blocks, electrical system building blocks, fluid system building blocks and thermal system building blocks.

System Models: Engineering system, rotational-translational system and electro- mechanical systems and hydraulic-mechanical system.

UNIT-IV (9)

System Transfer functions: Transfer function, first order system, second order system, system in series and systems with feedback loops.

Closed Loop Controllers: Continuous and discrete processes. Control modes. Two step mode and proportional mode. Derivative control, integral control, PID controller, digital controllers, velocity controllers and adaptive control.

Text Book:

[1] Bolton W., *Mechatronics* , 6th ed *Pearson Publications*, ISBN: 9788131732533, 2015.

Reference Books:

[1] Nitaigour Premchand Mahalik, *Mechatronics*: *Principles Concepts and Applications*, 2nd ed. Tata McGraw *Hill,* ISBN-13: 978-0070483743, 2017.
[2] Tata McGraw-Hill, *HMT*, *Mechatronics*, *ISBN*9788415700272 New Delhi: 2000.

[3] Devdas Shetty, Richard and Kilk, *Mechatronics System and Design*, Inc. 2nd ed., Cenage Learning, ISBN-13: 978-1439061985, 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: apply the mechatronics approach ad select suitable sensors and transducers for a given application

CO2: explain working principles of mechanical, hydraulic, pneumatic and electrical actuators and their applications

CO3: develop basic building blocks for mechanical, electrical, fluid and thermal systems and build mathematical models and analyze.

CO4: explain various system transfer functions and select an appropriate closed loop controller for a given application

Course Articulation Matrix (CAM): U18OE303C FUNDAMENTALS OF MECHATRONICS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE303C.1	2	2	1	-	2	2	-	-	-	1	-	1	2	1
CO2	U18OE303C.2	2	2	1	-	2	-	-	-	-	1	-	1	2	1
CO3	U18OE303C.3	2	2	1	3	2	-	-	-	-	1	-	1	2	1
CO4	U18OE303C.4	2	2	1	1	2	-	-	-	-	1	-	1	2	1
U18OE303C		**2**	**2**	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**1**

U18OE303D WEB PROGRAMMING

Class: B.Tech. III-Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: designing static webpage using HTML Tags, CSS properties, interactivity with JavaScript
LO2: creating dynamic webpage using JSP.
LO3: developing server-side scripts for web applications using PHP.
LO4: building databases applications using PHP, MYSQL and XML.

UNIT-I (9)

HTML: Document Structure, Basic Tags, Creating Headings, Working with Links, Creating Paragraph, Working with Images, Tables, Frames. Introduction to Forms and Controls: Creating HTML Form, Specifying Action URL and Method to Send the Form, Using HTML Controls.

CSS: *CSS* (Cascading style sheet) rules and properties, Types: Inline, External and Internal Style Sheets, Style Classes, Multiple Styles.

JAVASCRIPT: JavaScript syntax, Embedding JavaScript in HTML Page. Usage of variables, Working with Operators, Control-Flow Statements, Functions and Array, Creating Objects, Handling Events.

UNIT-II (9)

JSP: Syntax and Semantics, JSP Development Model, Components of JSP page: Directives, Comments, Expressions, Scriptlets, Declarations, Implicit Objects, Standard Actions, Tag Extensions, A Complete JSP Example. Session and Thread Management: Session Tracking, Session API, Thread Management. Application Event Listeners.

JDBC: Database access with JDBC, Overview, JDBC drivers, connecting to database with Driver Manager, Statement Interfaces: Statement, Prepared statement, Callable statement, Result Sets.

UNIT-III (9)

Introduction to PHP: Overview of PHP, Advantages of PHP over scripting languages, Creating and running a PHP script, handling errors. Working with Variables and Constants: Variables, Data Types and Operators. Controlling Program Flow: Conditional Statements, Looping Statements, Break, Continue and Exit Statements. Working with Functions, Arrays, Files and Directories.

Working with Forms: Web Forms and Form Elements, Processing a Web Form, Validating a Web Form.

UNIT-IV (9)

Database using PHP: Exploring Relational Database Model, Records and Primary Keys. Working with SQL Statements. Using PHP and MySql: Checking Configuration, Connecting to Database, Selecting a Database, Adding and Altering a Table in a Database, Inserting and modifying Data in a Table, Retrieving Data from a Table.

XML: Introduction to XML, XML Basics: Syntax, Declaration, Elements, Attributes, Valid XML Documents, Viewing XML, XML Parser, XML Technologies, Document Object Model(DOM).

Text Books:

[1] Kogent, *Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML,* 1st ed., Dreamtech Press (Black Book), ISBN: 13:9789351192510, 2013.

[2] Phil Hanna, *The Complete Reference*, 2nd ed. JSP: McGraw-Hill, ISBN: 007-212768-6, 2001.

Reference Books:

[1] Ivan Bayross, *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP*, 4th Ed. BPB Publications,ISBN-13: 978-8183330084, 2009.

[2] UttamK.Roy, *Web Technologies*, 7th ed. Oxford Higher Education, ISBN:10: 0-19-806622-8, ISBN-13: 978-0-19-806622-4, 2010.

[3] Luke Welling, Laura Thomson, *PHP and MySQL Web Development*, 3rd ed. Sams Publications, ISBN: 0-672-32672-8, 2005.

[4] Jayson Falkner, Kevin Jones, *Servlets and Java Server Pages* , 1st ed. Pearson, ISBN: 0-321-13649-7, 2003.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: create static web pages using HTML Tags, CSS properties and Java scripts

CO2: create dynamic web pages using java server page concepts.

CO3: develop web server side applications using PHP concepts

CO4: develop enterprise databases for web-based applications using PHP and MySQL.

Course Articulation Matrix (CAM): U18OE303D WEB PROGRAMMING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE303D.1	2	2	2	1	2	1	-	1	2	1	2	1	2	1
CO2	U18OE303D.2	2	2	2	1	2	1	-	1	2	1	2	1	2	1
CO3	U18OE303D.3	2	2	2	1	2	1	-	1	2	1	2	1	2	1
CO4	U18OE303D.4	2	2	2	1	2	1	1	1	2	1	2	1	2	1
U18OE303D		**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**

U18OE303F STRENGTH OF MATERIALS

Class: B.Tech. III -Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: behaviour of bodies subjected to various types of stresses and strains
LO2: shear force and bending moment for determinate beams
LO3: bending and shearing stresses for beams in flexure
LO4: behaviour of circular shafts, springs and thin cylinders

UNIT-I(9)

Simple stresses and strains: Types of stresses, strains, stress–strain diagram, elastic limit, Hooke's law, bars of varying sections, uniformly tapering circular and rectangular sections, elongation of bars due to self weight, temperature stresses in uniform bars.

Elastic modulii: Elastic constants, longitudinal strain, lateral strain, Poisson's ratio, complimentary shear stress, state of simple shear, modulus of elasticity (E), modulus of rigidity (N), bulk modulus (K), relation between E, N & K, strain energy, resilience, impact loading.

UNIT-II (9)

Principal stresses: Definition, normal and shear stress, principal stresses, principal planes and their graphical representation by Mohr's circle.

Shear force and bending moment: Types of supports, classification of beams, concept of shear force and bending moment, shear force diagram and bending moment diagram for simply supported, cantilever and overhanging beams, loading from shear force and bending moment diagram, principle of superposition.

UNIT-III(9)

Bending stresses in beams: Assumptions, theory of simple bending, application of bending equation and calculation of bending stresses in beams of homogeneous and flitched beam material, beams of uniform strength.

Shearing stresses in beams: Shearing stress due to bending, variation of flexural shear stress distribution across rectangular, triangular, circular, flanged section, shear resilience.

UNIT-IV (9)

Circular shafts and springs: Theory of pure torsion in solid and hollow circular shafts, shear stresses, angle of twist, power transmitted by shaft, close-coiled and open-coiled helical spring subjected to axial load and axial twist, springs in series and parallel.

Thin cylinders: Analysis of thin walled pressure vessels, hoop stress, longitudinal stress.

Text Books:

[1] Rajput R.K., *Strength of Materials*, 7th ed. S Chand and Company.

[2] Gunneswara Rao T. D.and MudimbyAndal, *Strength of Materials,* 1st ed. Cambridge University Press, 2018.

Reference Books:

[1] Timoshenko and Gere, *Mechanics of Materials,* 1st ed. Mc Graw Hill International.
[2] Punmia B.C., Arun K. Jain, Ashok K. Jain, *Mechanics of Materials, 2nd Edition,* Laxmi Publications, New Delhi.
[3] Subramanian R., *Strength of Materials*, 3rd ed., Oxford University Press.
[4] Ramamrutham S., *Strength of Materials,* 2nd ed. New Delhi: Dhanpat Rai & Sons.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: estimate various types of stresses and strains

CO2: construct Mohr's circle, shear force and bending moment diagrams for determinate beams

CO3: determine the bending and shearing stresses for beams subjected to pure bending

CO4: analyze stresses in thin cylinders, circular shafts and springs by theory of pure torsion

Course Articulation Matrix (CAM): U18OE303F STRENGTH OF MATERIALS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18CE303F.1	2	2	1	1	-	-	-	-	-	1	-	2	2	-
CO2	U18CE303F.2	2	2	1	-	-	-	-	-	-	1	-	1	2	-
CO3	U18CE303F.3	2	2	1	1	-	-	-	-	-	-	-	1	2	-
CO4	U18CE303F.4	2	2	1	2	-	-	-	-	-	1	-	1	2	-
U18CE303F		**2**	**2**	**1**	**1.33**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1.25**	**2**	**-**

U18EC304 SIGNALS AND SYSTEMS

Class: B.Tech., III-Semester **Branch:** Electronics & Communication Engineering(ECE)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop student's knowledge on/in…

LO1: *continuous-time (CT) and discrete-Time (DT) signals and systems and convolution*
LO2: *continuous-time Fourier transform (CTFT) and analysis of LTI systems.*
LO3: *discrete-time Fourier series(DTFS) and discrete-time Fourier transform (DTFT) and its applications*
LO4: *z-Transform, stability of LTI systems and realizations of IIR systems*

UNIT – I (9)

Signals and Systems: Continuous-time (CT) and Discrete-Time (DT) signals, Sampling theorem (statement only), Transformations of independent variable, Exponential and sinusoidal signals, Singularity functions, CT & DT Systems, Basic system properties.

Linear Time–Invariant (LTI) Systems: DT-LTI systems, Convolution sum, CT-LTI systems, Convolution integral, Properties of LTI systems, LTI systems described by differential and difference equations, FIR and IIR systems.

UNIT – II (9)

Continuous-Time Fourier Transform (CTFT): CTFT for representation of aperiodic signals, CTFT for periodic signals; Properties of the CTFT - Convolution property, Multiplication property; Systems characterized by linear constant–coefficient differential equations (LCCDE).

UNIT – III (9)

Discrete-Time Fourier Series (DTFS): Fourier series representation of DT periodic signals, Properties of DTFS, Fourier series and LTI systems, Filtering, Examples of DT filters described by difference equations

Discrete-Time Fourier Transform (DTFT): DTFT for aperiodic signals, DTFT for periodic signal, properties for the DTFT, Convolution property, Multiplication property, Systems characterized by linear constant-coefficient difference equations (LCCDE).

UNIT – IV (9)

***z*-Transform:** Representing signals by using DT complex exponentials, *z*-transform, Region of convergence (ROC), Inverse *z*-transform, Properties of *z*-transform, *z*-transform of some common signals, Analysis and characterization of LTI system using *z*-transform.

Block Diagram Representations: Structures for IIR systems - Direct, cascade and parallel form realizations of IIR systems.

Text Book:

[1] Alan V. Oppenheim and Alan S.Willsky with S. Hamid Nawab, *Signals & Systems*,*PHI*, 2nd ed. 2010. *(Chapters 1, 2, 3, 4, 5, 10)*

Reference Books:

[1] Simon Haykin and Barry Van Veen, *Signals & Systems*, Wiley India, 2nd ed. 2008.
[2] Mrinal Mandal and Amir Asif, *Continuous and Discrete Time Signals and Systems*, Cambridge University Press, 1st ed., 2008.
[3] M.J.Roberts and Govind Sharma, *Fundamentals of Signals and Systems*, 2nd ed. McGraw Hill, , 2010.
[4] H.P. Hsu, *Signals & Systems*, 2nd ed. Schaum's Outlines (McGraw Hill), 2009.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: classify CT and DT signals and systems and perform convolution for finding response of an LTI system to any arbitrary signal

CO2: evaluate CTFT of standard signals, use properties of CTFT for solving LCCDE

CO3: compute DTFT of standard signals, derive properties of DTFT and use them for solving LCCDE and find DTFS of periodic signals.

CO4: determine the z-transform of standard DT signals with ROC, use properties of z-transform to solve difference equations, evaluate stability of an LTI system and realize the DT systems in direct, cascade and parallel forms

Course Articulation Matrix (CAM): U18EC304 SIGNALS AND SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC304.1	2	2	1	1	--	--	--	--	--	1	--	--	2	1
CO2	U18EC304.2	2	2	1	1	--	--	--	--	--	1	--	--	2	1
CO3	U18EC304.3	2	2	1	1	--	--	--	--	--	1	--	--	2	1
CO4	U18EC304.4	2	2	1	1	--	--	--	--	--	1	--	1	2	1
U18EC304		**2**	**2**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**2**	**1**

U18EC305 ANALOG CIRCUITS- I

Class: B.Tech. III-Semester **Branch:** Electronics & Communication Engineering(ECE)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: *semiconductors, working of a various diodes.*
LO2: *half and full wave rectifiers.*
LO3: *transistor characteristics, it's biasing.*
LO4: *FET Characterstics, its operation, Biasing and operation of special devices.*

UNIT-I (9)

Conduction in Semiconductors: Conductivity of a Semiconductor, Carrier Concentrations in an Intrinsic Semiconductor, Donor and Acceptor Impurities, Charge densities in a semiconductor, Fermi level in a Semiconductor having Impurities, Diffusion, Carrier life time, Continuity equation, The Hall effect.

Semiconductor Diode Characteristics: Qualitative theory of P-N junction, p-n Junction as a Diode, Band Structure of an Open Circuited p-n Junction, Quantitative theory of P-N diode currents, The Volt-. Ampere Characteristics, The temperature dependence of P-N Characteristics, Diode Resistance, Space Charge or Transition Capacitance, Diffusion capacitance, Breakdown Diodes, The Tunnel Diode, Characteristics of a Tunnel Diode.

UNIT-II (9)

Rectifiers: A Half Wave Rectifier, Ripple Factor, A Full wave Rectifier, Harmonic Components in Rectifier Circuits, Inductor Filters, Capacitor Filters, Approximate Analysis of Capacitor Filters, L - Section Filter, Multiple L - Section Filter, π - Section Filter.

UNIT-III (9)

Transistor Characteristics: The Junction Transistor, Transistor Current Components, the Transistor as an Amplifier, The Common Base Configuration, The Common Emitter Configuration, The Common Collector Configuration.

Transistor Biasing & Thermal Stabilization: The Operating Point, Transistor as a switch, Bias Stability, Collector to Base Bias, Self-Bias, Stabilization against variations in VBE and β for the Self Bias Circuit, Bias Compensation, Thermistor & Sensistor Compensation, Thermal Runaway and Thermal Stability.

UNIT- IV (9)

Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion-type MOSFET and Enhancement-type MOSFET.

FET Biasing: Fixed Bias Configuration, Self-Bias Configuration, Voltage Divider Biasing, Common Gate Configuration, Common Drain Configuration, Depletion-type MOSFETs, Enhancement- type MOSFETs.

Special Devices: Silicon Controlled Rectifier, Basic Silicon Controlled Rectifier Operation, SCR Characteristics & Ratings, Silicon Controlled Switch, DIAC, TRIAC, Uni-Junction Transistor, LED, photo Diode, Photo Transistor.

Text Books:

[1] L.K.Maheshwari, *Analog Electronics*, 1st ed. Laxmi Publications.

Reference Books:

[1] Anil.K. Maini, *Analog Electronics*, 1st ed. Khanna Publishing House.
[2] Robert L Boylested and Louis Nashelsky *Electronic Devices and Circuit Theory*, 10th ed., Pearson India, 2009.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: describe band diagrams, conduction mechanism in Semiconductors and explain the operation of diode with its V-I characteristics

CO2: analyze performance of diode rectifiers with and without filters

CO3: explain the Characteristics of Bipolar Junction Transistor in CB, CE, CC

CO4: explain the operation of different types of FETs and discuss the characteristics of special devices such as SCR, UJT, DIAC, TRIAC.

Course Articulation Matrix (CAM): U18EC305 ANALOG CIRCUITS-1

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC305.1	1	1	1	-	-	-	-	-	1	-	-	1	1	1
CO2	U18EC305.2	1	1	1	-	-	-	-	-	1	-	-	1	1	1
CO3	U18EC305.3	1	1	1	-	-	-	-	-	1	-	-	1	1	1
CO4	U18EC305.4	1	1	1	-	-	-	-	-	1	-	-	1	1	1
U18EC305		**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**1**	**1**

U18EC306 SWITCHING THEORY AND LOGIC DESIGN

Class: B.Tech. III-Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: *number system, binary codes and minimization of switching functions.*

LO2: *combinational circuits design and implementation using logic gates, adders/subtractors, multiplexer and decoders.*

LO3: implementation *of sequential circuits, counters, registers using flip flops and logic gates.*

LO4: finite *state machines and its minimization; algorithmic state machines.*

UNIT – I (9)

Number Systems: Review of number systems, binary weighted and non-weighted codes binary arithmetic, 1's &2's complement subtraction, error detecting and error correcting codes.

Boolean Algebra: Postulates and theorems, logic gates and truth tables, representation of switching functions using SOP & POS forms, Karnaugh map representation, minimization using K-Map and Quine Mc'Clusky method.

UNIT – II (9)

Design of Combinational Circuits: Adders– half Adder, full Adder; subtractors-half subtractor, full Subtractor; parallel adder, carry look ahead adder, BCD adder, multiplexers, decoders - BCD to 7 segment, BCD to decimal decoders. Encoders-priority encoders, demultiplexers, realization of switching functions using multiplexers and decoders.

UNIT – III (9)

Sequential Circuits: Flip Flops – SR flip flop, JK flip flop, D flip flop, T flip flop and master-slave flip flop. Design of synchronous counters, asynchronous counters, shift registers, bidirectional shift registers, ring counter and Johnson counter; state table, state diagram, state assignment, state minimization, synthesis of synchronous, sequential circuits – sequence detectors.

UNIT – IV (9)

Finite State Machines: Mealy and Moore machines – capabilities and limitations of finite state machine, state equivalence and machine minimization- Merger graph and Merger table.

Algorithmic State Machines: Salient features of the ASM charts, design example- ASM chart- timing sequence – Data path design, ASM design examples using flip-flops.

Text Books:

[1] Moris Mano, *Digital Design,* 4th ed. New Delhi: Prentice Hall of India, 2006.

[2] Zvi. Kohavi, *Switching and Finite Automata Theory*, 3rd ed. Cambridge University Press, 2010.

Reference Books:

[1] G.K. Kharate, *Digital Electronics,* 1st ed. Hyderabad, India: Oxford University Press, 2012.
[2] R.P. Jain, *Modern Digital Electronics*, 4th ed. India: Tata McGraw-Hill, 2010.
[3] A.Anand Kumar, *Switching Theory & Logic Design,* 1st ed. New Delhi: Prentice Hall of India, 2014.
[4] Samuel. C. Lee & B.S. Sonde, *Digital Circuits & Logic Design,* 1st ed. New Delhi: Prentice Hall of India, 1976.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: explain number systems, binary codes; prove the given Boolean identity and apply minimization techniques to obtain minimal SOP/POS forms of logic functions.

CO2: design switching functions using combinational circuits for given application

CO3: develop a sequential circuit using flip flops and logic gates for given specifications

CO4: develop finite state machine with optimum states for given specifications; draw an ASM chart and state diagram for a specific application and build corresponding control unit.

Course Articulation Matrix (CAM): U18EC306 SWITCHING THEORY AND LOGIC DESIGN

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC306.1	3	2	1	-	-	1	1	-	-	-	-	1	1	1
CO2	U18EC306.2	3	2	1	-	-	1	1	-	-	-	-	1	2	1
CO3	U18EC306.3	3	2	2	1	-	2	2	-	-	-	-	1	2	1
CO4	U18EC306.4	3	2	3	3	-	3	3	-	-	-	-	1	3	1
U18EC306		**3**	**2**	**1.75**	**1**	**-**	**1.75**	**1.75**	**-**	**-**	**-**	**-**	**1**	**2**	**1**

U18EE312 NETWORK ANALYSIS

Class: B.Tech, III-Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
2	-	-	2

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: steady state analysis and resonance of electrical networks
LO2: network theorems and their application for network analysis
LO3: time response analysis of networks
LO4: two port networks and their equivalent circuit representation

UNIT – I (9)

Circuit Elements and Relations: Introduction, Kirchhoff's laws; Types of sources and source transformations; Network reduction by star–delta transformation

Steady State Analysis of Circuits for Sinusoidal Excitations: Analysis of single-phase series, parallel and series-parallel circuits; Resonance - series and parallel resonance, bandwidth, Q-factor; Mesh and nodal analysis

UNIT – II (9)

Network Theorems and Applications: Introduction, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Tellegen's theorem, Millman's theorem, reciprocity theorem

UNIT – III (9)

Time response analysis of networks: Transient analysis of RL, RC, RLC series and parallel networks with step, impulse, sinusoidal and pulse excitation, initial conditions, Analysis with special signal waveforms - ramp, triangular, train of pulses, delayed input

UNIT – IV (9)

Two port networks : Characterizations of linear time invariant two port networks - open circuit impedance parameters, short circuit admittance parameters, transmission parameters, inverse-transmission parameters, hybrid parameters, inverse-hybrid parameters, symmetry and reciprocity conditions in terms of two-port parameters, inter-relationship between parameters, inter connections of two-port networks

Text Books:

[1] M.E. Van Valken Burg, *Network Analysis*, 3rd ed. Pearson Education, 2006.
[2] W.H. Hayt and Jr. Kemmerly, *Engineering Circuit Analysis*, 7th ed., McGraw-Hill Higher Education, 2006.
[3] D. Roy Choudhary, *Network analysis and Synthesis*, 1st ed. New age Publishers, 2006.

References:

[1] K. A. Gangadhar, *Circuit Theory*, 2nd ed. Khanna Publishers, 2006.
[2] Parker Smith, *Problems in Electrical Engineering*, 1st ed. CBS Publishers, 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under

the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: determine voltage, current, power by performing steady state analysis; calculate bandwidth, Q-factor of resonant circuits

CO2: analyse the electrical network using network theorems to determine current, voltage & power

CO3: evaluate transient and steady state response of RLC circuits with step, sinusoidal and other special signals

CO4: find two port network parameters and draw equivalent circuit of given two-port network

Course Articulation Matrix (CAM): U18EE312 NETWORK ANALYSIS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE312.1	2	2	-	2	-	-	-	-	-	-	-	2	1	2
CO2	U18EE312.2	2	2	-	2	-	-	-	-	-	-	-	2	1	2
CO3	U18EE312.3	2	2	-	2	-	-	-	-	-	-	-	2	1	2
CO4	U18EE312.4	2	2	-	2	-	-	-	-	-	-	-	2	1	2
U18EE312		**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**2**

U18EC308 ANALOG CIRCUITS-I LABORATORY

Class: B.Tech III-Semester **Branch:** Electronics and Communication Engineering

Teaching Scheme : **Examination Scheme :**

L	T	P	C
-	-	2	1

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop student's knowledge in/on

LO1: characteristics of diode and Zener diode.
LO2: BJT amplifiers.
LO3: JFET amplifiers.
LO4: characteristics of SCR, Diac.

LIST OF EXPERIMENTS

(Based on theory course U18EC305)

1. Study of CRO.
2. Characteristics of PN Junction diode.
3. Characteristics of Zener diode.
4. Half wave and Full wave rectifier with and without filters.
5. Bridge rectifier with and without filters.
6. Characteristics of Transistor in Common Base Configuration.
7. Characteristics of Transistor in Common Emitter Configuration.
8. Design of BJT in Fixed bias And Self Bias.
9. JFET in common source Configuration.
10. Characteristics of SCR.
11. Characteristics of DIAC.
12. Characteristics of Photo Diode and Photo transistor.

Laboratory Manual:

1. Manual for *Analog Circuit-1* prepared by faculty of department of ECE.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: implement the circuits based on diode
CO2: analyze the transistor amplifiers
CO3: design circuits related to JFET
CO4: implement circuits based on SCR and Diac

Course Articulation Matrix (CAM): U18EC308 ANALOG CIRCUITS-I LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC308.1	2	2	1	-	-	-	-	-	-	-	-	1	2	2
CO2	U18EC308.2	2	1	2	-	-	-	-	-	-	-	-	1	2	1
CO3	U18EC308.3	2	2	2	-	2	-	-	-	-	1	1	1	2	2
CO4	U18EC308.4	2	1	2	-	2	-	-	-	-	1	1	1	2	1
U18EC308		**2**	**1.5**	**1.75**	**-**	**1**	**-**	**-**	**-**	**-**	**0.5**	**0.5**	**1**	**2**	**1.5**

U18OE311A OBJECT ORIENTED PROGRAMMING LABORATORY

Class: B. Tech III-Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on…

LO1: implementing concepts of object oriented programming
LO2: debug and test java applications effectively
LO3: effective use of exception handling, interfaces and packages during applications development
LO4: I/O and applet programming in java

List of Experiments

Experiment-I

1. Write a program to demonstrate operators of java.
2. Write a program to demonstrate type casting and operator precedence.
3. Write a program to demonstrate different types of if-statements.
4. Write a program to demonstrate switch-case.

Experiment-II

1. Write a program to demonstrating loop control statements.
2. Write a program to demonstrate for-each control loop.
3. Implement programs using single dimensional arrays.
4. Write a program to define a two dimensional array where each row contains different number of columns.

Experiment -III

1. Write a program to demonstrate creating object to a class for accessing variables and methods.
2. Write a program to demonstrate creating multiple object.
3. Write a program to demonstrate passing objects to methods.
4. Write a program to demonstrate constructors and garbage collector by invoking it explicitly.

Experiment -IV

1. Write a program to demonstrate static members.
2. Write a program to demonstrate command line argument.
3. Write a program to demonstrate variable length argument.
4. Write a program to demonstrate wrapper classes.

Experiment -V

1. Write a program to demonstrate inheritance using extends keyword.
2. Write a program to demonstrate multilevel inheritance.
3. Write a program to demonstrate hierarchical inheritance.
4. Write a program to demonstrate access controls.

Experiment -VI

1. Write program to demonstrate *this* and *supper* keywords.
2. Write program to demonstrate dynamic method dispatch.

3. Write a program to demonstrate final variable and methods.
4. Write a program to demonstrate use of abstract class.

Experiment -VII

1. Write a program to define an Interface and implement it into a class.
2. Write a program to implement multiple interfaces into single class.
3. Write a program to extend interfaces.
4. Write a program to implement nested interfaces.

Experiment -VIII

1. Write a program to create a package, and demonstrate to import a package to a class.
2. Write a program to demonstrate access protection of packages.
3. Write a program to demonstrate static import of package.

Experiment-IX

1. Write a program to demonstrate *try* and *catch* statement for exception handling
2. Handle *Array Index of Bounds Exception*, *Number Format Exception* and *Divide by Zero Exception* using multiple catch blocks.
3. Write a program to demonstrate user defined exception with *throw keyword*
4. Write a program to demonstrate *finally* block.

Experiment-X

1. Write a program to demonstrate string handling functions.
2. Write a program to demonstrate string searching functions.
3. Write a program to demonstrate string comparison functions.
4. Write a program to demonstrate string modification functions.

Experiment-XI

1. Write a program to demonstrate reading and writing input using byte stream classes
2. Write a program to demonstrate reading and writing input using character stream classes
3. Write a program to demonstrate data input and output streams
4. Write a program to demonstrate array input and output streams

Experiment-XII

1. Write a program to create a file using byte stream classes
2. Write a program to create a file using character stream classes
3. Write a program to open the specific file
4. Write a program to copy the content of one file to another.

Laboratory Manual:

1. *Java Programming laboratory manual,* prepared by faculty of Dept. of CSE.

Text Book:

1. Herbert Schildt, *JAVA The Complete Reference* , 9th ed. McGraw-Hill Education India Pvt.Ltd, ISBN: 9781259002465, 2014.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: implement OOP concepts using Java

CO2: use the concepts like inheritance, polymorphism, packages and interfaces in application development

CO3: handle runtime exceptions in object oriented programming

CO4: build effective I/O interfaces for software applications

Course Articulation Matrix (CAM): : U18OE311A OBJECT ORIENTED PROGRAMMING LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE311A.1	2	2	2	1	2	1	-	1	2	1	2	1	1	1
CO2	U18OE311A.2	2	2	2	1	2	1	1	-	2	1	2	1	1	1
CO3	U18OE311A.3	2	2	2	1	2	1	-	-	2	1	2	1	1	1
CO4	U18OE311A.4	2	2	2	1	2	1	1	1	2	1	2	1	1	1
U18OE311A		**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**

U18OE311B FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

Class: B.Tech. III -Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: determining the hydraulic coefficient for various flow measuring devices

LO2: implementing Bernoulli's equation and application of Bernoulli's theorem in estimating various losses in pipe

LO3: studying the various parameters which effects the impact of jet

LO4: studying the characteristics of hydraulic machines

LIST OF EXPERIMENTS

1. Determination of Coefficient of Discharge for given Orifice meter and Venturi meter.
1. Determination of Coefficient of Discharge for given notches (triangular/rectangular)
2. Determination of Coefficient of Discharge for given orifice and mouth piece.
3. Verification of Bernoulli's theorem.
4. Estimation of coefficients of various head losses in pipes due to major and minor losses (sudden enlargement, sudden contraction and bend).
5. Determine of Reynolds's number using Reynolds's apparatus.
6. Determination of coefficient of impact for a jet on given vane.
7. Determination of performance characteristics of Francis Turbine
8. Determination of performance characteristics of Pelton Wheel.
9. Determination of performance characteristics of Centrifugal Pump.
10. Determination of performance characteristics of Submersible Pump.
11. Determination of performance characteristics of Reciprocating Pump.

Laboratory Manual:

[1] *Fluid Mechanics Laboratory Manual*, prepared by the faculty of Department of Civil Engineering.

Reference Books:

[1] N. Kumara Swamy, *Fluid Mechanics and Machinery Laboratory Manual,* 1st edn.Charotar Publishing House Pvt., Ltd., 2008.

[2] Sarbjit Singh, *Experiments in Fluid Mechanics*, PHI Learning Private Limited, New Delhi: 2009.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: determine the hydraulic coefficient for various flow measuring devices

CO2: apply bernoulli's equation in estimating head lossin pipes

CO3: apply the principles of impact of jet on different vanes

CO4: demonstrate the characteristics of hydraulic machines

Course Articulation Matrix (CAM): U18OE311B FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE311B.1	2	1	-	1	-	-	-	-	1	-	-	1	1	1
CO2	U18OE311B.2	2	1	-	1	-	-	-	-	1	-	-	1	1	1
CO3	U18OE311B.3	2	1	-	1	-	-	-	-	1	-	-	1	1	1
CO4	U18OE311B.4	2	1	-	1	-	-	-	-	1	1	-	1	1	1
U18OE311B		**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**1**

U18OE311C MECHATRONICS LABORATORY

Class: B.Tech. III- Semester **Branch:** Mechanical Engineering

Teaching Scheme : **Examination Scheme :**

L	T	P	C
-	-	2	1

Continuous Internal Evaluation	:	40 marks
End Semester Examination	:	60 marks

Course Learning Outcomes (LOs):

This course will develop students' knowledge in /on

LO1: *basic elements underlying mechatronic systems: analog electronics, digital electronics, sensors, transducers, actuators, microcontrollers and embedded software.*

LO2: interface of various systems to a PLC.

LO3: integration of various systems through programming.

LO4: design and simulation of hydraulic and pneumatic circuits.

LIST OF EXPERIMENTS

1. Controlling A.C. Non servomotor clockwise and anti-clockwise with time delay.
2. Controlling A.C. Non servo motor using digital inputs proximity sensors.
3. Controlling of Single acting Pneumatic Cylinder with time delay
4. Controlling of double acting Pneumatic Cylinder with time delay and sequencing
5. Control of D.C servomotor (rotating table clockwise and counter clockwise)
6. Integration of AC Non servo motors, single acting pneumatic cylinder and double acting pneumatic cylinder.
7. Integration of AC Non- servomotor and pneumatic cylinders with digital inputs.
8. Controlling of X table and Y table.
9. Controlling of various systems using manual inputs.
10. Controlling of traffic lights with time delay.
11. Controlling of lift operations with time delay.
12. Hydraulic and Pneumatic simulation.

Laboratory Manual:

[1] Mechatronics Lab Manual, prepared by faculty of Mechanical Engineering, KITSW

Reference Books:

[1] ATS Manual of L.S. *Mechatronics,* 2000.

[2] Bolton W., Mechatronics, *Pearson Publications,* 5th ed. ISBN-13: 978-0273742869, 2011.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: develop PLC program to control AC non servomotors, single acting and double acting pneumatic cylinders with different operation conditions

CO2: develop PLC program to control various systems.

CO3: integrate various mechanical and electrical systems and operate them.

CO4: design and simulate the hydraulic and pneumatic circuits.

Course Articulation Matrix (CAM): U18OE311C MECHATRONICS LABORATORY														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE311C.1	1	2	1	2	-	-	-	-	-	1	-	1	1	1
CO2	U18OE311C.2	1	2	1	2	2	-	-	-	-	1	-	1	1	1
CO3	U18OE311C.3	1	2	1	2	2	-	-	-	-	1	-	1	1	1
CO4	U18OE311C.4	1	2	1	2	2	-	-	-	-	1	-	1	1	1
U18OE311C		**1**	**2**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**1**

U18OE311D WEB PROGRAMMING LABORATORY

Class: III Semester

Branch: Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Examination :	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: implementing HTML Tags, CSS and java scripts for creating static web pages.
LO2: usage of JSP in designing dynamic web pages.
LO3: usage of PHP in designing a web base application.
LO4: accessing different web data servers using JSP and PHP

Experiment-1

1. Design the following static web pages with the following attributes:
- **a.** Basic Tags.
- **b.** Heading Tags.
- **c.** List (Ordered and Un-Ordered).
- **d.** Textbox, Buttons.

Experiment-2

2. HTML

AIM: Design the following static web pages required for an online book store web site.
- **a. HOME PAGE:**
- **b. LOGIN PAGE**
- **c. CATALOGE PAGE**

DESCRIPTION:

a. HOME PAGE

The static home page must contain three **frames**.

- ***Top frame*:** Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
- ***Left frame*:** At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link **"CSE"** the catalogue for **CSE** Books should be displayed in the Right frame.
- ***Right frame*:** The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

b. LOGIN PAGE: This page looks like below:

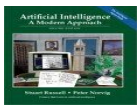
Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : Password: Submi Reset			

Experiment-3

c. CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

- Snap shot of Cover Page.
- Author Name and Publisher.
- Price and Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
ECE		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
EEE		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
CIVIL		Book : HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

Experiment-4

3. VALIDATION

AIM: To do validation for registration page using JavaScript.

DESCRIPTION: Write *JavaScript* to validate the following fields of the above registration page.

a. Name (Name should contains alphabets and the length should not be less than 6 characters).
b. Password (Password should not be less than 6 characters length).
c. E-mail id (should not contain any invalid and must follow the standard pattern ***(name@domain.com)***
d. Phone number (Phone number should contain 10 digits only).

Note: You can also validate the login page with these parameters.

4. CSS

AIM: Write a program illustrating various methods in cascading style sheets.

a. Use different font, styles and set a background image
b. Control the repetition of the image
c. Define styles for links
d. Work with layers and add a customized cursor

DESCRIPTION: Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following:

a. Use different font, styles: In the style definition you define how each selector should work (font, color etc.).Then, in the body of your pages, you refer to these selectors to activate the styles.
b. Set a background image for both the page and single elements on the page. You can define the background image for the page like this:
c. Control the repetition of the image with the background-repeat property. As background-repeat: repeat
d. Define styles for links
e. Work with layers:
f. Add a customized cursor:

```
Selector {cursor:value}
    .xlink {cursor:crosshair}
    .hlink{cursor:help}
```

5. Embedding JavaScript in HTML pages.
6. Design a registration form and validate its field by using JavaScript.

Experiment-5

7. To design the scientific calculator and make event for each button using JavaScript.
8. WAP to create popup boxes in JavaScript.
9. Program to create a class calculator that contains an overloaded method called "add" to calculate the sum of two integers, two float numbers and, one integer and one float.

Experiment-6

10. Print current date & time
11. JSP Program to auto refresh a page
12. JSP Program to count no. of visitors on website
13. JSP program for error handling
14. Demonstrate expression tag
15. Detect locale, language settings & local specific time
16. Demonstrate JSP implicit object
17. JSP Program to display given number in words

Experiment-7

18. Display the contents of Employee table in a neat format.
19. Insert ***N***, no. of records into Employee table using ***Prepared Statement.***
20. Enhance the salaries of Employee by 10% who are earning salary greater than 5000 using ***Callable Statement.***
21. Delete all students whose marks are below 50% and also display the count.

Experiment-8

22. Write a HTML file to create a simple form with 5 input fields ***(Name, Password, Email, Pin code, Phone No. and a Submit button)*** and demonstrate required field validations to validate that all input fields are required and display error messages if the above validations do not hold.
23. Create a JSP Page with and run in JSP Engines.
24. Demonstrate Session Tracking in JSP.
25. JSP Program to validate username and password

Experiment-9

26. Create Database Connectivity with JSP page with different JDBC Drivers.
27. JSP Program to Select record from database
28. JSP Program to Insert a record into the database
29. Create a CRUD operation for JSP Page using MySQL
30. JSP Program to upload file into server

Experiment-10

31. Create a form for your college library entering student details for each student in the college. Validate the form using PHP valuators and display error messages.
32. Write a PHP which does the following job:
Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the UserName and Password from the database (instead of cookies).

Experiment-11

33. Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page in such a way

that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP.

34. Create and delete MYSQL database using PHP.

Experiment-12

35. Create a PHP program to demonstrate opening and closing a file.

36. Create a PHP program to demonstrate reading a file and writing in a file.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: create the static web pages using HTML Tags and CSS and Java Scripts

CO2: design dynamic web page for web applications using JSP

CO3: develop server side scripts for web base applications using PHP

CO4: design web applications for effective storage and retrieval of data in MySQL using PHP

Course Articulation Matrix (CAM): U18OE311D WEB PROGRAMMING LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE311D.1	2	2	2	1	2	1	-	1	2	1	2	1	1	1
CO2	U18OE311D.2	2	2	2	1	2	1	-	1	2	1	2	1	1	1
CO3	U18OE311D.3	2	2	2	1	2	1	-	1	2	1	2	1	1	1
CO4	U18OE311D.4	2	2	2	1	2	1	1	1	2	1	2	1	1	1
U18OE311D		**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**

U18OE311F STRENGTH OF MATERIALS LABORATORY

Class: B.Tech. III -Semester

Branch: Common to all branches

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: testing of civil engineering materials
LO2: mechanical properties of civil engineering materials
LO3: behavior of civil engineering materials when tested
LO4: codal specifications of various engineering materials

LIST OF EXPERIMENTS

1. Determination of Stress–Strain characteristics of (a) Mild steel and (b) TOR steel.
2. Determination of the compressive strength of wood and punching shear strength.
3. Determination of the Brinell's hardness numbers for steel, brass and aluminum.
4. Determination of the modulus of rigidity by conducting torsion test on solid shaft or hollow shaft.
5. Determination of the modulus of rigidity by conducting compression test on spring.
6. Determination of the Young's modulus of the given material by conducting flexural test on simply supported beam.
7. Determination of the Young's modulus of the given material by conducting flexural test on continuous beam.
8. Determination of the Young's modulus of the given material by measuring conducting flexural test on propped cantilever beam.
9. Bend and rebend test on steel specimen.
10. Shear test for Mild steel specimen.
11. Impact test on Metal Specimens using Izod test.
12. Impact test on Metal Specimens using Charpy test.
13. Demonstration of measuring strains using strain gauges, LVDTs

Laboratory Manual:

[1] *Strength of Materials Laboratory Manual*, prepared by faculty of Civil Engineering, KITSW

Reference Books:

[1] Harmer E. Davis and George Earl Troxell, *Testing and Inspection of Engineering Materials,* 2nd edn. McGraw-Hill book company, 1955.
[2] A.V.K. Suryanarayana, *Testing of Metallic Materials,* 2nd edn. Prentice-Hall of India, 2007.
[3] *High strength deformed steel bars and wires for concrete reinforcement-specification.* Bureau of Indian standards, New Delhi: IS 1786:2008.
[4] *Specification for mild steel and medium tensile steel bars and Hard drawn steel wires for concrete reinforcement.* Bureau of Indian standards, New Delhi: (Part-I):1982, IS 432, 1992.
[5] *Specification for mild steel and medium tensile steel bars and Hard drawn steel wires for concrete reinforcement.* Bureau of Indian standards, New Delhi: IS 432(Part-II):1982, 2004.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: correlate theory with the testing of engineering materials for quality assessment

CO2: evaluate the mechanical properties of civil engineering materials

CO3: appraise the behavior of civil engineering materials when tested under loads.

CO4: realize the specifications recommended by codes to civil engineering materials

Course Articulation Matrix (CAM): U18OE311F STRENGTH OF MATERIALS LABORATORY														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE311F.1	1	-	-	1	-	1	-	-	2	1	1	1	1	1
CO2	U18OE311F.2	1	-	-	1	-	1	-	-	2	-	-	1	1	1
CO3	U18OE311F.3	1	-	-	1	-	1	-	-	2	-	-	1	1	1
CO4	U18OE311F.4	1	-	-	1	-	1	-	2	1	1	1	1	1	1
U18OE311F		**1**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**1.75**	**1**	**1**	**1**	**1**	**1**

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE:: WARANGAL – 15
(*An Autonomous Institute under Kakatiya University, Warangal)*
SCHEME OF INSTRUCTION & EVALUATION

URR18-R22

IV SEMESTER OF 4-YEAR B.TECH ECE DEGREE PROGRAM

IV - Semester [Second year] **[6Th+2P+2M]**

Sl.No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE401	Open Elective-II	3	1	-	4	10	30	40	60	100
2	HSMC	U18MH402	Professional English	-	-	2	1	100	-	100	-	100
3	PCC	U18EC403	Electro Magnetic Waves and Transmission Lines	3	-	-	3	10	30	40	60	100
4	PCC	U18EC404	Analog Circuits - II	3	-	-	3	10	30	40	60	100
5	PCC	U18EC405	Pulse and Digital Circuits	3	-	-	3	10	30	40	60	100
6	PCC	U18EC406	Probability and Random Processes	3	-	-	3	10	30	40	60	100
7	PCC	U18EC407	Digital Design	3	-	-	3	10	30	40	60	100
8	MC	U18MH415	Essence of Indian Traditional Knowledge	2	-	-	-	10	30	40	60	100
9	PCC	U18EC408	Analog Circuits - II Laboratory	-	-	2	1	40	-	40	60	100
10	PCC	U18EC409	Pulse and Digital Circuits Laboratory	-	-	2	1	40	-	40	60	100
			Total	**20**	**1**	**6**	**22**	**250**	**210**	**460**	**540**	**1000**
11	MC	U18CH416	Environmental Studies *	2	-	-	0	10	30	40	60	100

L= Lecture, T = Tutorials, P = Practicals & C = Credits

*** indicates Mandatory Non-Credit course for Lateral Entry Students Only**

Contact hours per week : 27 **Total Credits : 22**

Open Elective-II

U18OE401A: Applicable Mathematics (M&H)
U18OE401C: Elements of Mech. Engg. (ME)
U18OE401E: Computers Networks (IT)
U18OE401F: Renewable Energy Resources (EEE)

U18OE401A APPLICABLE MATHEMATICS

Class: B.Tech. IV-Semester **Branch:** Common to all branches

Teaching Scheme : **Examination Scheme :**

L	T	P	C
3	1	-	4

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: application of Fourier series to solve wave equation, heat conduction equation and Laplace equation

LO2: the methods of fitting curves by the method of least squares, statistical methods and probability distributions with applications to engineering disciplines

LO3: finite difference operators; the concept of interpolation and numerical integration

LO4: numerical methods and application to find numerical solutions of differential equations

UNIT-I (9+3)

Applications of Partial Differential Equations: Basic concepts of partial differential equations, classification of second order partial differential equations, solution of a partial differential equation, solution through the method of separation of variables.

Vibrating String: Wave equation and its solution by the method of separation of variables, D'Alembert's solution of wave equation, solutions of various boundary value problems based on vibrating string.

One Dimensional Heat Flow: Transient heat flow equation, heat flow through a bar of finite length with homogeneous and non homogeneous boundary conditions, heat flow through a bar with insulated ends.

Two Dimensional Heat Flow: Equation of two dimensional heat flow (Laplace's equation) under steady state / the electrostatic potential of electrical charges in any region that is free of these charges (problems based on Trigonometric FS only),solution of Laplace's equation in Cartesian and polar form, heat flow through infinite rectangular plates, finite square plate and semicircular and circular plates.

UNIT-II (9+3)

Statistics: Statistical data: Review of measures of central tendency and measures of dispersion, correlation coefficient, rank correlation, regression – Linear regression equations.

Curve Fitting: Method of least squares –fitting of (i) Straight line (ii) Second degree parabola

(iii) Exponential curves, most plausible solution of a system of linear algebraic equations.

Probability: Review of the concepts of probability, random variables, Discrete and continuous probability distributions, mean and variance of a distribution, Binomial distribution, Poisson distribution, and Normal distribution, fitting of these probability distributions to the given data.

UNIT-III (9+3)

Numerical Analysis: Finite differences and difference operators.

Interpolation: Newton's forward and backward interpolation formulae. Lagrange interpolation

Numerical Differentiation: First and second derivatives using forward and backward interpolation polynomials at the tabulated points.

Numerical Integration: Gaussian quadrature formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.

UNIT-IV (9+3)

Solution to System of Linear Equations: Gaussian elimination method, Jacobi Method and Guass-Siedel Iteration Method.

Numerical Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method and Newton Raphson's method.

Numerical Solution of Ordinary Differential Equations: Taylor's method, Picard's method, Euler's method and Runge - Kutta methods of second and fourth order**.**

Text Books:

[1] Grewal, B.S., *Higher Engineering Mathematics*, 43th ed. New Delhi: Khanna Publishers, 2014.

Reference Books:

[1] Gupta and Kapoor, *Fundamentals of Mathematical Statistics*, 11th ed. New Delhi: Sulthan Chand and & sons, 2010.
[2] Kreyszig E., *Advanced Engineering Mathematics*, 9th ed. John wiely & sons, Inc.,U.K., 2013.
[3] Sastry S.S, *Introduction to numerical Analysis*, 4th ed. New Delhi: Prentice Hall of India Private Limited, 2005.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: solve wave equation, heat conduction equation and Laplace equation using Fourier series
CO2: find correlation regression coefficients, fit curves using method of least squares for given data and apply theoretical probability distributions in decision making
CO3: estimate value of a function by applying interpolation formulae
CO4: apply numerical methods to solve simultaneous algebraic equations, differential equations, find roots of algebraic and transcendental equations

Course Articulation Matrix (CAM): U18OE401A APPLICABLE MATHEMATICS														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE401A.1	2	2	--	--	--	--	--	--	--	--	--	1	1	--
CO2	U18OE401A.2	2	2	--	--	--	--	--	--	--	--	--	1	1	--
CO3	U18OE401A.3	2	2	--	--	--	--	--	--	--	--	--	1	1	--
CO4	U18OE401A.4	2	2	--	--	--	--	--	--	--	--	--	1	1	--
U18OE401A		**2**	**2**	**-**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	1	**-**

U18OE401C ELEMENTS OF MECHANICAL ENGINEERING

Class: B.Tech., IV-Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation	:	40 marks
End Semester Examination	:	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: types of materials, design methodology and elements of power transmission

LO2: different manufacturing processes and their applications.

LO3: laws of thermodynamics and types of systems

LO4: principle and applications of SI &CI engines.

UNIT- I (9)

Engineering Materials: Classification, properties and applications

Design Criterion: Discrete steps in engineering design process

Power Transmission: Classification; flat belt drives - length of open and cross belts, belt tensions and power transmitted; Gears-types and applications; spur gear-nomenclature

Bearings: Types – sliding& rolling contact bearings and applications;

UNIT- II (9)

Manufacturing Processes: Classification; Foundry- steps in sand casting process; pattern-types, materials and allowances, mould cross section, moulding sand-composition and properties; Machining: lathe machine-line diagram and operations; Welding-classification; principle of arc welding- AC and DC welding, principle of gas welding, principle of brazing and soldering;

Metal forming process: forging, rolling, extrusion.

UNIT- III (9)

Thermodynamics: System-types, state, property, process and cycle; Energy-property; Zeroth law, thermodynamic equilibrium, laws of perfect gases.

Law of Thermodynamics: First law- applied to a cycle, change of state, Internal energy, Enthalpy; Work and Heat in closed systems- Isobaric, Isochoric, Isothermal, Adiabatic and Polytropic; PMM-I, limitations of first law of thermodynamics.

UNIT- IV (9)

Second Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their equivalence; Carnot cycle, Carnot theorem, heat engine, heat pump and refrigerator; working principle of domestic air conditioner-line diagram.

IC Engines: Classification; working principle of four and two stroke SI and CI engines.

Text Book:

[1] Mathur, Mehta and Tiwari, *Elements of Mechanical Engineering*, New Delhi: Jain Brothers, 2017.

Reference Books:

[1] Hazra Chowdary. S. K and Bose, *Basic Mechanical Engineering*, Media Promoters and Publishers Pvt. Ltd, India, 2010.
[2] P. K. Nag, *Engineering Thermodynamics*, New Delhi: Tata McGraw Hill.
[3] Hazra Chowdary. S. K and Bose, *Workshop Technology,* Vol. I & II , Media Promoters and publishers Pvt Ltd, India.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: explain mechanical properties of an engineering material and learn the steps in design methodology

CO2: describe the principles of manufacturing processes

CO3: apply first law of thermodynamics to various processes to calculate work and heat for a closed system.

CO4: define second law of thermodynamics and demonstrate the working principle of IC engines.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Articulation Matrix (CAM): U18OE401C ELEMENTS OF MECHANICAL ENGINEERING														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE401C.1	2	2	-	-	-	-	-	-	-	-	-	-	1	1
CO2	U18OE401C.2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO3	U18OE401C.3	2	2	-	-	-	-	-	-	-	-	-	-	1	1
CO4	U18OE401C.4	2	2	-	-	-	-	-	-	-	-	-	-	1	1
U18OE401C		2	2	-	-	-	-	-	-	-	-	-	-	1	1

U18OE401E COMPUTER NETWORKS

Class: B.Tech. IV- Semester

Branch: Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs) :

This course will develop students' knowledge in/on

LO1: network topologies, network reference models, network architecture and data transmission

LO2: design issues and protocols of data link layer, error detection and correction, MAC protocols and ethernet standards

LO3: principles and design issues of network layer and internet protocols

LO4: transport layer design issues, protocols and application layer services

UNIT - I (9)

Introduction: History of Computer Networks and the Internet, Principles of Computer Network Design, Network Architecture, Network Types.

Physical Layer: Factors Affecting Data Transmission, Data Transmission, Data Transmission Codes: Non-return to Zero, Manchester Encoding, Digital modulation & Modems, Transmission Media.

UNIT- II (9)

Data Link Layer: Functions of Data Link Layer, Framing Techniques, Error Detection and Correction, Elementary Data Link Layer Protocols for Flow Control.

Local Area Networks: Medium Access Protocols, LAN Protocol Stack, Ethernet Protocols, IEEE 802.11 LAN Standard: IEEE 802.11 Protocol Stack, Wireless LAN Topologies, Frames in IEEE 802.11.

UNIT - III (9)

The Network Layer: Network Layer Services, Packet Switching Networks, The Internet Protocol(IP): IP Header in IPv4, IP Addressing in IPv4, Subnet addressing and Classless Inter-Domain Routing (CIDR), Address Resolution Protocol, Dynamic Host Configuration Protocol, Internet Layer Protocols, Fragmentation and Reassembly, IP Version 6: Motivation for IPv6 Development, Features of IPv6, IPv6 Address Representation.

Routing Protocols: Elements of Routing Protocol Performance, Flooding, Distance-Vector and Link State Routing Protocols, Hierarchical Routing.

UNIT - IV (9)

The Transport Layer: User Datagram Protocol, Transmission Control Protocol, TCP State Transition Diagram, Other TCP Timers, TCP Congestion Control.

The Application Layer: World Wide Web, Domain Name System, Electronic Mail.
Network Security: Threats and Vulnerabilities in Computer Networks, Cryptographic Algorithms, Data Encryption Standard.

Text Books:

[1] Mayank Dave, *Computer Networks*, 2nd ed., Cengage Learning, ISBN-13:978-81-315-0986-9, 2014.

Reference Books:

[1] Forouzan, *Data Communication and Networking*, Fifth Edition, *TMH*, *ISBN*978-0-07-296775-3, 2012.
[2] William Stallings, *Data and Computer Communications*, Ninth Edition, *Prentice-Hall India*, ISBN-81-203-1240-6, 2011.
[3] Andrew S.Tanenbaum , David J. Wetherall, *Computer Networks*, Fifth Edition, Pearson Education, ISBN-13: 978-0-13-212695-3, 2011.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under

the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: describe various network topologies, architecture and techniques for data transmission modes

CO2: outline various design issues in data link layer and develop protocols to handle data link layer operation

CO3: describe various design issues and develop protocols for network Layer

CO4: explain various design issues, protocols of transport layer & application layer services

Course Articulation Matrix (CAM): U18OE401E Computer Networks

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE401E.1	2	1	-	1	-	1	-	-	-	-	-	1	1	1
CO2	U18OE401E.2	3	3	2	1	1	1	-	-	-	-	-	1	1	1
CO3	U18OE401E.3	3	3	2	2	1	1	-	-	-	-	-	1	1	1
CO4	U18OE401E.4	3	3	2	2	1	1	-	-	-	-	-	1	1	1
U18OE401E		**2.75**	**2.5**	**2**	**1.5**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**

U18OE401F RENEWABLE ENERGY RESOURCES

Class: B.Tech, IV Semester

Branch: Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs) :

This course will develop student's knowledge in/on

LO1: different renewable energy sources and principle of solar energy systems

LO2: wind energy, geothermal energy and MHD power generation systems

LO3: harnessing energy from oceans and biomass

LO4: working of fuel cells and different energy storage systems

UNIT-I (9)

Introduction: Conventional and non-conventional sources of energy – Brief Description of different Renewable energy sources

Solar Energy: Introduction to prospects of solar photovoltaic (SPV) systems, principle of a PV cell, large scale SPV systems, economic considerations of SPV systems, PV cell technology, merits and limits of SPV systems, applications of SPV systems-street lighting, domestic lighting, Battery charging, SPV pumping systems

UNIT-II (9)

Wind Energy: Principles of wind power- Operation of a wind turbine- Site Characteristics.

Geothermal Energy: Origin and types of geothermal energy- Operational Difficulties- Vapor dominated systems- Liquid dominated systems- Petro- thermal systems.

Magneto-Hydro Dynamic (Mhd) Power Generation: MHD system- Open and Closed systems- Advantages of MHD systems.

UNIT-III (9)

Energy from Oceans: Ocean temperature differences, ocean waves-Wave motions and tides-Energy from the waves; Introduction of tidal power, basic principle of tidal power, components of tidal power plants, advantages and disadvantages

Bio-Energy: Introduction-bio-mass conversion, technologies-wet process, dry process, photo synthesis; Biogas generation- biogas from power plant wastes, methods of maintaining biogas production, utilization of biogas, biogas gasification, applications of gasifiers

UNIT-IV (9)

Chemical Energy Sources: Introduction of fuel cells, Principle of Operation of fuel cell, Classification of Fuel cells, Advantages and disadvantages of fuel cells.

Types of Energy Storage Systems: Introduction, Different types of Batteries, Ultra Capacitors, Flywheels, Super Conducting Magnetic storage

Text Books:

[1] Rai G.D *Non-Conventional Energy Sources*, New Delhi: Khanna Publishers.

[2] Felix A. Farret, M. Godoy Simoes, —Integration of Alternative Sources of Energy, John Wiley & Sons, 2006.

[3] Bansal N.K, Kaleeman and M.Miller, *Renewable Energy Sources and Conversion Technology*, New Delhi: TATA Mc Graw-Hill.

Reference Books:

[1] EL-Wakil M.M, Power Plant Technology, Mc Graw-Hill, New York.

[2] Duffie and Beckman, Solar Energy Thermal Process, John Wiley & Sons, New York.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: compare conventional and non-conventional energy resources; explain the working principle of solar energy harnessing and its applications

CO2: explain the working principles of wind energy, geothermal energy and MHD power generation systems

CO3: describe the harnessing of electric power from oceans and biomass

CO4: explain the principle of operation of fuel cells and different types of energy storage systems

Course Articulation Matrix (CAM): U18OE401F RENEWABLE ENERGY RESOURCES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE401F.1	3	-	-	-	-	-	1	-	-	-	-	-	1	1
CO2	U18OE401F.2	3	-	-	-	-	-	1	-	-	-	-	-	1	1
CO3	U18OE401F.3	3	-	-	-	-	-	1	-	-	-	-	-	1	1
CO4	U18OE401F.4	3	-	-	-	-	-	1	-	-	-	-	-	1	1
U18OE401F		**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

U18MH402 PROFESSIONAL ENGLISH

Class: B.Tech IV Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation :	100 marks
End Semester Examination :	-

Course Learning Objectives (LOs):

This course will develop the student's knowledge in/on

LO1: reading skill and sub skills to comprehend the text
LO2: vocabulary and using it appropriately to describe situations
LO3: using phrasal verbs in speech and writing
LO4: grammar and improve language ability to write effectively

Week	Topic Name
I	**I. Reading Comprehension-** Significance of Reading Skimming **II. Verbal Ability-** Synonyms **III. Grammar-** Articles
II	**I. Reading Comprehension-** Scanning **II. Verbal Ability-** Antonyms **III. Grammar-** Articles
III	**I. Reading Comprehension-** Critical Reading **II. Verbal Ability-** Sentence completion with correct alternative word/group **III. Grammar-** Prepositions
IV	**I. Reading Comprehension-** Intensive Reading **II. Verbal Ability-** Sentence completion with correct alternative word/group **III. Grammar-** Reported Speech
V	**I. Reading Comprehension-** Intensive Reading **II. Verbal Ability-** Jumbled Sentences **III. Grammar-** Error Detection
VI	**I. Reading Comprehension-** Inferential Reading **II. Verbal Ability-** Jumbled Sentences **III. Grammar-** Error Detection
VII	**I. Reading Comprehension-** Lexical Reading **II. Verbal Ability-** Phrasal Verbs **III. Grammar-** Tenses, Structures
VIII	**I. Reading Comprehension-** Read to Interpret **II. Verbal Ability-** Single Word Substitutes **III. Grammar-** Tenses, Uses
IX	**I. Reading Comprehension-** Read to Analyze **II. Verbal Ability-** Collocations **III. Grammar-** Tenses, Uses
X	**I. Reading Comprehension-** Read to Summarize **II. Verbal Ability-** Spellings **III. Grammar,** Agreement between Subject & verb (concord)

Text Books:

[1] Professional English *Manual prepared by the faculty of English, KITSW*

[2] Arun Sharma & Meenakshi Upadhyay, Verbal Ability and Reading Comprehension for CAT & Other Management Examinations, 8th Edition *McGraw Hill Education (India) Private Ltd*, Chennai, 2018

Reference Books:

[1] Nishit K. Sinha, *Verbal Ability and Reading Comprehension* for the CAT, 3rd ed. Pearson India Education Services Pvt. Ltd., Chennai.

[2] Harper Collins, *Collins COBUILD English Grammar,* 3rd ed. Harper Collins Publishers Ltd.

[3] Rosemary & Courtney, Longman-English-Chinese Dictionary of Phrasal Verbs.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: analyze the passage using skill and sub skill to solve different types of questions related to reading comprehension

CO2: identify grammatical errors in the given sentences and correct them

CO3: select correct synonyms/antonyms/phrasal verbs and complete sentences with suitable words or phrases

CO4: keep the given jumbled sentences in proper sequence to make a coherent paragraph

Course Articulation Matrix (CAM): U18MH402 PROFESSIONAL ENGLISH

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH402.1	-	-	-	-	-	-	-	-	1	2	-	1	1	-
CO2	U18MH402.2	-	-	-	-	-	-	-	-	1	2	-	1	1	-
CO3	U18MH402.3	-	-	-	-	-	-	-	-	1	2	-	1	1	-
CO4	U18MH402.4	-	-	-	-	-	-	-	-	1	2	-	1	1	-
U18MH402		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**1**	**1**	**-**

U18EC403 ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Class: B.Tech. IV-Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: *electric field due to various charge distributions, energy stored in electrostatic field.*

LO2: *magnetic field due to various current distributions, wave propagation in different medium.*

LO3: p*oynting theorem and field components in parallel plate & rectangular waveguides.*

LO4: *transmission line equations, distortion-less transmission line, Smith chart and Stub-matching.*

UNIT-I (9)

Review of Vector calculus, Co-ordinate systems - Cartesian, Cylindrical and Spherical, Statements of Stoke's theorem and Divergence theorem.

Electrostatics: Coulomb's law, Electric field intensity, Electric field due to Point charge, Line charge and Sheet charge, Electric flux density, Gauss's law and its applications, Relation between E & V, Poisson's and Laplace's Equations, Capacitance – Parallel plate, Coaxial and Spherical Capacitances, Energy stored in Electrostatic field, Boundary conditions.

UNIT-II (9)

Magnetostatics: Biot–Savart's law, Magnetic field intensity, Magnetic flux density, Ampere's circuit law, Magnetic potential, Energy stored in magnetic field, Magnetic boundary conditions. **Time-varying fields:** Faraday's law of Electromagnetic Induction, Continuity of current equation, Inconsistency of Ampere's circuit law, Maxwell's Equations in differential & integral forms. **Electromagnetic waves:** Wave propagation in lossy dielectric, loss-less dielectric, free space and good conductor, Skin effect, Polarization, Reflection of EM waves.

UNIT-III (9)

Poynting vector, Poynting theorem, Instantaneous, Average & Complex Poynting vectors and Power loss in a plane conductor.

Waveguides: Parallel plate Waveguide – Field components in TE, TM & TEM mode propagation, Characteristics of parallel plate waveguide, Rectangular waveguides – Field components in TE & TM mode propagation, Impossibility of TEM mode in rectangular waveguides, Characteristics of Rectangular waveguide, Introduction to circular wave guides.

UNIT-IV (9)

Transmission Lines: Primary & Secondary constants, Transmission Line Equations, Infinite length transmission line, Phase velocity & Group velocity, Loss-less transmission line, Condition for distortion-less transmission line, Input impedance of a transmission line, Short-circuit & Open-circuit transmission lines, Quarter wave transformer, Smith chart – Construction, Properties and Applications, Single-stub matching.

Text Books:

[1] Mathew N.O. Sadiku, *Principles of Electromagnetics*, 4th ed. Oxford University Press, 2014.

[2] Umesh Sinha, *Transmission Lines and Networks*, Satya Prakashan Publication, 2nd ed. 1999.

Reference Books:

[1] Nathan Ida, *Engineering Electromagnetics*, Springer, 3rd ed.

[2] Edward C. Jordan, Keith G. Balmain, Electromagnetic Waves and Radiating Systems, *Prentice Hall of India*, 2nd ed. 2001.

[3] W H Hayt, J A Buck, *Engineering Electromagnetics*, The McGraw-Hill Companies.

[4] G.S.N. Raju, *Electromagnetic Field Theory and Transmission Lines*, Pearson Education.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: determine the electric field at any given point due to various charge distributions and measure the energy stored in a given electrostatic field.

CO2: apply biot-savart's law for determining magnetic field intensity and analyze the wave propagation in different medium

CO3: prove poynting theorem and derive the field components in parallel plate and rectangular waveguides

CO4: find voltage and current in a given transmission line and evaluate the impedance using smith chart.

Course Articulation Matrix (CAM): U18EC403 ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC403.1	2	2	1	1	-	-	-	-	-	1	-	-	1	2
CO2	U18EC403.2	2	2	1	1	-	-	-	-	-	1	-	-	1	2
CO3	U18EC403.3	2	2	1	1	-	-	-	-	-	1	-	-	1	2
CO4	U18EC403.4	2	2	1	1	-	-	-	-	-	1	-	-	1	2
U18EC403		**2**	**2**	**1**	**1**	**--**	-	-	-	-	-	**-**	-	-	**2**

U18EC404: ANALOG CIRCUITS - II

Class: B.Tech. IV-Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: *familiarize the Biasing and Operating Point, analysis of transistor at low and high frequency.*
LO2: *analysis of multistage amplifiers and FET at low frequencies.*
LO3: *concept of Positive and Negative feedback and their applications.*
LO4: *fundamentals of Large signal amplifiers and tuned amplifiers.*

UNIT-I (9)

Small Signal Low Frequency Transistor Amplifier Circuits: Review of BJT biasing and operating point, BJT small signal low frequency h-parameter model, Analysis of Single Stage transistor amplifier circuits using h-parameter CE, CB and CC configurations, Simplified analysis of these configurations.

High Frequency Transistor Amplifier Circuits: The Hybrid-π (pi) Common Emitter Transistor model, Hybrid-π Conductances, CE short Circuit Current gain, High frequency model of a transistor α and β cut-off frequencies, Frequency response analysis of single stage amplifier at mid band gain, Gains at low and high frequency, Calculation of Gain-bandwidth product.

UNIT-II(9)

Multistage Amplifiers: Classification of Multistage Amplifiers based on Coupling, RC coupled Amplifier, Direct and Transformer Coupled Amplifiers, cut-off frequencies for n^{th} Stage, Effect of cascading on gain and bandwidth, Darlington Pair, Cascode amplifier, Differential amplifiers, Bootstrap amplifier.

FET Amplifiers: Review - Biasing of FET, FET low frequency models, Low frequency response of amplifier circuits, Analysis of single stage amplifier.

UNIT-III(9)

Feedback Amplifiers: Concept of Feedback, Classification of Feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of negative feedback on amplifier characteristics, Analysis of Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback amplifiers.

Oscillators: Conditions for oscillations, RC and LC oscillators, generalized analysis of LC oscillators, Crystal Oscillator, Frequency and Amplitude stability of oscillations.

UNIT-IV(9)

Large Signal Amplifiers: Classification, Series fed and Transformer coupled Class A, Class-Bpower amplifier, Push-Pull amplifiers and Complementary Symmetry, Class-AB power amplifiers, Cross over and Harmonic distortion, Heat sinks.

Tuned Amplifiers: Introduction, Q-factor, Class C tuned amplifiers, Single tuned, Double tuned and Stagger tuned Voltage amplifier, Effect of Cascading Double tuned amplifiers on Bandwidth, Stability of Tuned amplifiers.

Text Books:

1. Jacob Millman and C.C.Halkias, *Integrated Electronics*, 2nd ed., New Delhi: TMH, 1991.
2. Donald A Neamen, *Electronic Circuits Analysis and Design*, 3rd ed. Tata McGraw-Hill, 2009.

Reference Books:

1. Robert L.Boylestad, Louis Nashelsky, *Electronic Devices and Circuit Theory*, 9th ed., Pearson Education, 2008.
2. Sedra, Kenneth, Smith, *Microelectric circuits*, 5th ed. Oxford University Press, 2011.
3. Mohammad H. Rashid, *Electronic Circuit and Applications*, CENGAGE Learning.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: analyse the given circuit by drawing relevant h-parameter, hybrid-π equivalents and design singlestage BJT amplifier for given specification

CO2: analyse the frequency response of multistage transistor amplifiers and FET amplifiers at low frequencies.

CO3: design the negative feedback amplifiers and oscillator circuits

CO4: evaluate the efficiencies of large signal amplifiers and calculate the Q-factor various tuned amplifiers

Course Articulation Matrix (CAM): U18EC404 ANALOG CIRCUITS - II

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC404.1	3	2	2	--	--	--	--	--	--	--	2	1	3	2
CO2	U18EC404.2	2	3	3	--	--	--	--	--	1	--	2	1	3	2
CO3	U18EC404.3	2	2	3	--	--	--	--	--	1	--	2	1	3	2
CO4	U18EC404.4	2	3	3	--	--	--	--	--	1	--	2	1	3	2
U18EC404		**2.25**	**2.50**	**2.75**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**1**	**3**	**2**

U18EC405 PULSE AND DIGITAL CIRCUITS

Class: B.Tech. IV-Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme : **Examination Scheme :**

L	T	P	C
3	-	-	3

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1:various wave shaping circuits and their applications

LO2: negative resistance switching circuits and methods of generating various sweep waveforms

LO3: analysis and design of multivibrators using BJTs

LO4: diodes and transistors based sampling gates, synchronization and frequency division

UNIT-I (9)

Linear Wave Shaping Circuits: Introduction**,** High pass RC and Low pass RC circuits - Response to sine, step, pulse, square, exponential and ramp inputs with different time constants, High pass RC circuit as a differentiator and Low pass RC circuit as an Integrator.

Non-Linear Wave Shaping Circuits: Introduction, Switching characteristics of diode; Clipping Circuits - Diode Clippers, Shunt Clippers, Series Clippers, Clipping at two Independent Levels; The Clamping Operation, Clamping Circuits with source and diode Resistances, Clamping Circuit Theorem and Practical Clamping Circuits.

UNIT-II (9)

Negative Resistance Switching Circuits: Introduction, Voltage Controlled and Current Controlled negative resistance circuits, its application to switching (using Tunnel diode and UJT).

Time Base Generators: General features of a time base signal; Errors in sweep generators-Sweep error, Transmission error and Displacement error, Methods of generating a time base waveform - Exponential sweep circuits, Sweep circuit using UJT, Miller sweep circuit and Bootstrap sweep circuit.

UNIT-III (9)

Multivibrators: Introduction; Analysis and Design of **Bistable Multivibrator** - Fixed bias and Self bias, Triggering of Bistable Multi; **Monostable multivibrator** - Collector coupled, Triggering of Monostable multivibrator and Voltage to Time converter; **Astable multivibrator** - Collector coupled, Voltage to frequency converter and Schmitt Trigger - UTP, LTP, Hysteresis and applications of Schmitt Trigger;

UNIT-IV (9)

Sampling Gates: Basic operating principle of sampling gates, Unidirectional diode gate, Other forms of the unidirectional diode gate, Bidirectional gates using transistors, Reduction of pedestal in gate circuit, Bidirectional diode gate, Balanced Condition in a Bidirectional diode gate, Four diode Gate, Applications of sampling gates - Chopper amplifier and Sampling scope.

Synchronization and Frequency Division: Introduction, Pulse synchronization of relaxation devices (using UJT), Synchronization with Frequency division, Synchronization of a sweep circuit with symmetrical signals - Sinusoidal synchronization signals, Phase Delay and Phase Jitter.

Text Books:

[1] Jacob Millman and Herbert Taub, *Pulse, Digital and Switching Waveforms*, 2nd ed. McGraw Hill, 2007.

Reference Books:

[1] A.Anand kumar, *Pulse and digital circuits*, PHI, 2nd ed. 2008.

[2] B.N. Yoganarasimha, *Pulse and Digital Circuits*, Dhanpat Rai Publications , 2006.

[3] VenkataRao, Rama Sudha and ManmadhaRao ,*Pulse and digital circuits*, Pearson India Education Services Pvt Ltd, 1st ed. 2016.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: analyze the responses of linear and nonlinear wave shaping circuits for standard input signals

CO2: describe the need and working of various negative resistance switching circuits, voltage sweep circuits and their applications

CO3: analyze and design multivibrators using Bipolar Junction Transistors (BJTs) for various applications

CO4: explain working of different sampling gates and discuss the different methods to achieve frequency synchronization and division in UniJunction Transistor (UJT) relaxation oscillator

Course Articulation Matrix (CAM): U18EC405 PULSE AND DIGITAL CIRCUITS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC405.1	3	2	1	1	1	--	--	--	--	--	--	--	3	2
CO2	U18EC405.2	3	1	1	1	1	--	--	--	--	--	--	--	2	3
CO3	U18EC405.3	3	3	3	1	2	--	--	--	--	--	--	--	3	2
CO4	U18EC405.4	3	1	1	1	2	--	--	--	--	--	--	--	2	3
U18EC405		**3**	**1.75**	**1.5**	**1.5**	**1.5**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2.5**	**2.5**

U18EC406 PROBABILITY AND RANDOM PROCESSES

Class: B.Tech., IV-Semester **Branch:** Electronics and Communication Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation:	40 marks
End Semester Examination:	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on…

LO1: *distribution function, density function and statistical parameters of a random variable*

LO2: *operations of multiple random variables.*

LO3: *spectral characteristics of random processes.*

LO4: *response of linear system with random inputs.*

UNIT-I(9)

Random Variable: Introduction; Random variable concept - Discrete and Continuous random variables; Cumulative Distribution function, Probability Density function and their Properties; Binomial, Poisson, Uniform and Gaussian Distribution functions; Conditional Distribution function, Conditional Density function and their properties.

Operations on One Random Variable– Expectation: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Conditional expected value; Moments- Moments about the Origin, Central Moments, Variance and Skew; Characteristic Function, Moment Generating Function; Transformations of a Random Variable - Monotonic and Non monotonic Transformation of continuous random variable and transformation of discrete random variable.

UNIT-II(9)

Multiple Random Variables: Vector Random Variables; Joint Distribution Function – Properties; Marginal Distribution Function; Joint Density Function – Properties; Marginal Density Functions, Conditional Distribution and Density Function, Statistical Independence, Distribution and Density of a sum of Random Variables, Central Limit Theorem**.**

Operations on Multiple Random Variables: Expected value of a function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions; Jointly Gaussian Random Variables- Two Random Variables case, N Random Variables, Properties of Gaussian Random Variables; Transformations of Multiple Random Variables and Linear Transformations of Gaussian Random Variables.

UNIT-III(9)

Random Processes – Temporal Characteristics: Random Process Concept - Classification; Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order and N-order Stationarity, Wide-Sense and Strict-Sense Stationarity, Time Averages and Ergodicity, Ergodic Processes, Autocorrelation Function, Cross-Correlation Function and their Properties, Covariance.

Random Processes-Spectral Characteristics: Power Density Spectrum - Properties; Relationship between Power Spectrum and Autocorrelation function; Cross-Power Density Spectrum - Properties; Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT-IV(9)

Linear System with Random Inputs: Introduction, Linear System Fundamentals; Random signal response of Linear systems- Convolution, Mean and Mean-square value, Autocorrelation function of response, Cross-Correlation functions of input and output; System evaluation using random noise; Spectral Characteristics of system response- Power Density Spectrum of response, Cross-Power Density Spectrums of input and output; Noise Bandwidth; Band pass, Band Limited and Narrowband Processes.

Text Book:

[1] Peyton Z. Peebles, Probability, *Random Variables and Random Signal Principles*, 4th ed., *TMH*, 2001.(Chapters 2,3,4,5,6,7,8)

Reference Books:

[1] R.P. Singh and S.D. Sapre, *Communication Systems Analog and Digita*l, 2nded. *TMH*, 2008.
[2] Henry Stark and John W. Woods, *Probability and Random Processes with Application to Signal Processing*, *Prentice Hall*, 3rdEdition, 2002.
[3] Athanasios Papoulis and S. Unnikrishna Pillai, *Probability, Random Variables and Stochastic Processes*, *PHI*, 4thEdition, 2002.
[4] S.P. Eugene Xavier, *Statistical Theory of Communication*, New Age Publications, 1997.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: evaluate various statistical parameters of a random variable
CO2: perform various operations on multiple random variables.
CO3: describe the spectral characteristics of random processes.
CO4: evaluate the response of linear system for different inputs

Course Articulation Matrix (CAM): U18EC406 PROBABILITY AND RANDOM PROCESSES														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18EC406.1	2	2	1	1	--	--	--	--	--	1	--	--	2	2
CO2	U18EC406.2	2	2	1	1	--	--	--	--	--	1	--	--	2	2
CO3	U18EC406.3	2	2	1	1	--	--	--	--	--	1	--	--	2	2
CO4	U18EC406.4	2	2	1	1	--	--	--	--	--	1	--	1	2	2
U18EC406		**2**	**2**	**1**	**1**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**1**	**2**	**2**

U18EC407 DIGITAL DESIGN

Class: B.Tech. **IV**-Semester

Branch: Electronics and Communication Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation:	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on

LO1: *logic families such as RTL, DTL, CMOS, TTL etc.*
LO2: *memory devices, PLD, CPLD and FPGA.*
LO3: *VHDL programming using behavioral modeling.*
LO4: *VHDL programming using dataflow and structural modeling.*

UNIT- I(9)

Logic Families: Introduction to logic families, Characteristics –Fan-in, Fan-out, Noise margin, Figure of Merit, Propagation delay, Study of Logic Families- RTL, DCTL, I^2L, DTL, HTL, TTL-open collector, Totem pole and Tristate output, ECL, MOS, CMOS, comparison.

UNIT- II(9)

Memory: Memory hierarchy, RAM, ROM, Memory Address Mapping, Auxiliary Memory - Manage tic tapes & Disks, Associative memories: Match logic, Read and write logics, Cache memory: Mapping techniques, R/W operations, Virtual memory: Paging, segmentation and Interleaved memories.

Programmable logic devices: Introduction to PLDs, PROM, PLA, PAL, SPLD, CPLD, FPGA

UNIT -III(9)

VHDL Programming: Introduction to EDA Tools, Introduction VHDL, Basic elements of VHDL- Identifiers, Data objects, Data types, Operators, Primary Constructs of VHDL - Entity declaration, Architecture description, various modeling styles of VHDL.

Behavioral Modelling: Different types of Process assignment statements - Design examples.

UNIT -IV(9)

Data Flow Modelling: Concurrent signal assignment statement, Comparison of concurrent and sequential signal assignment statements, Conditional and Selected signal assignment statements, Design examples.

Structural Modelling: Component declaration, Component instantiation, Design examples, Generics and Configurations**.**

Text Books:

[1] M. Moris Mano, M.D.Cilletti, *Digital Design,* 6th Edition, Pearson, India, 2019

[2] J. Bhaskar, *VHDL Primer*, PHI Learning, India, 3rd Edition, 1992.

Reference Books:

[1] Taub & Schiling, Digital Integrated Electronics, *McGraw Hill Education (India) Pvt. Ltd.*, India, 1997.

[2] Richard S Sandige, Michael L Sandige, Fundamentals of Digital and Computer Design with VHDL, 1st ed. McGraw Hill Education (India) Pvt. Ltd., 2014.

[3] R. Ananda Natarajan, *Digital Design,* 1st ed., PHI learning, India, 2015.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1:explain and compare the characteristics of different logic families based on various parameters like propagation delay, power dissipation, fan-in, fan-out, figure of merit and noise margin

CO2: describe different memory devices, PLDs and FPGA

CO3: write VHDL code using behavioral style of modeling for a given design

CO4: write the VHDL code using dataflow and structural modeling for a given schematic

Course Articulation Matrix (CAM): U18EC407 DIGITAL DESIGN

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC407.1	2	2	2	1	--	--	--	--	--	1	--	--	1	2
CO2	U18EC407.2	2	2	2	1	--	--	--	--	--	1	--	--	1	2
CO3	U18EC407.3	2	2	2	1	1	--	--	--	--	1	--	--	1	2
CO4	U18EC407.4	2	2	2	1	1	--	--	--	--	1	--	--	1	2
U18EC407		**2**	**2**	**2**	**1**	**1**	**--**	**--**	**--**	**--**	**1**	**--**	**--**	**1**	**2**

U18MH415 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Class : B.Tech. IV Semester

Branch: Common to all branches

Teaching Scheme:

L	T	P	C
2	-	-	-

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop the student's knowledge in/on

LO1: basic structure of Indian knowledge system
LO2: Indian perspective of modern science
LO3: basic principles of yoga and holistic health care
LO4: benefits of yoga practice

Unit – I (6)

Basic Structure of Indian Knowledge System: Introduction, Vedas – Origin, Classification, Structure, Rig Veda, Sama Veda, Yajur Veda, Atharva Veda; Upavedas – Dhanurveda, Sthapatveda, Gandharvaveda, Ayurveda; Vedang – Shiksha, Chanda, Vyakarna, Nirukta, Kalpa, Jyothisha; Upanga – Dharmashastra, Mimamsa, Tarkashastra, Purvana.

Unit – II (6)

Modern Science and Indian Knowledge System: Introduction – Vedas as Basis for Modern Science – Architectural Developments – Medicine and its relevance – Mathematical Sciences in Vedas – Space and Military related developments – Chemical Sciences

Unit – III (6)

Yoga and Holistic Health Care: Healthy mind in healthy body – Yoga: Definition, types; Yoga to keep fit: Diet, Yoga Asanas – Fundamentals; Breathing techniques in Patanjali Yoga tradition – Pranayama; chakras; meditation; Benefits of Yoga – Physical Health, Emotional Health, Prevention of Disease, Reducing or Alleviating Symptoms of Problems

Unit – IV (6)

Case studies – Yoga Practice: Yoga as an effective tool for management of human crisis – Depression, Self – Concept & Mental health, Yoga for stress management; Yoga : A way to cure for Insomnia.

Requisite:

Yoga practice sessions are to be conducted for all the students taking this course by the time they complete Unit 1 and Unit 2.

Text Books:

[1] Sathish Chandra Chaterjee, Dhirendramohan Datta, *An Introduction to Indian Philosophy*, New Delhi: Rupa Publications Pvt. Ltd. (Chapter 2, 3)

[2] Priyadaranjan Ray, S.N. Sen, *The Cultural Heritage of India,* Vol. 6, Science and Technology, The Ramakrishna Mission Institute of Culture, Calcutta.

[3] Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.

[4] RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham Delhi, 2016. (Chapter 4, 5, 6, 7, 8)

Reference Books:

[1] Swami Jitatmananda, *Holistic Science and Vedanta*, Bharatiya Vidya Bhavan Bombay. (Chapter 2, 3)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: summarize the basic structure of Vedas, Upavedas, Vedanga, Upanga

CO2: explain Vedas as principal source of knowledge for scientific inventions

CO3: describe different yogasanas, breathing techniques, chakras, meditation and their benefits

CO4: discuss the benefits of yoga as an effective tool for management of human crisis

Course Articulation Matrix (CAM): U18MH415 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH415.1	-	-	-	-	-	1	-	2	1	1	-	-	-	-
CO2	U18MH415.2	-	-	-	-	-	1	1	2	1	1	-	-	-	1
CO3	U18MH415.3	-	-	-	-	-	1	-	2	2	1	-	2	-	-
CO4	U18MH415.4	-	-	-	-	-	1	1	2	2	1	-	2	-	-
U18MH415		**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**1.5**	**1**	**-**	**2**	**-**	**1**

U18EC408 ANALOG CIRCUITS- II LABORATORY

Class: B.Tech. IV – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme: **Examination Scheme:**

L	T	P	C
-	–	2	1

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: electronic amplifier circuits (Single & Multistage).
LO2: feedback (Positive and Negative) amplifier circuits.
LO3: single tuned amplifier
LO4: various power amplifiers

LIST OF EXPERIMENTS

I. Hardware Experiments.

1. Common Emitter Amplifier
2. Two Stage RC Coupled Amplifier
3. Voltage Series Feedback Amplifier
4. RC Phase Shift Oscillator
5. Hartley Oscillator
6. Colpit's Oscillator
7. Single Tuned Voltage Amplifier
8. Class A Power Amplifier (with transformer load)
9. Class B Complementary Symmetry Amplifier

II. Simulation Based Experiments

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Two Stage RC Coupled Amplifier
4. Voltage Series Feedback Amplifier
5. RC Phase Shift Oscillator
6. Hartley and Colpit's Oscillators
7. Single Tuned Voltage Amplifier
8. Class A Power Amplifier (transformer less)
9. Class B Complementary Symmetry Amplifier

Laboratory Manual:

[1] Manual for *"Analog Circuits-II Laboratory"* prepared by the faculty of ECE department

Text Books:

[1] Jacob Millman and C.C.Halkias, *Integrated Electronics*, 2nd ed., New Delhi: TMH, 1991.

[2] Donald A Neamen, *Electronic Circuits Analysis and Design*, 3rd ed. Tata McGraw-Hill, 2009.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1. analysis of electronic amplifier circuits (Single & Multistage).
CO2. construct the feedback (Positive and Negative) amplifier circuits.
CO3. design Single tuned amplifier.
CO4. analyze efficiency and distortions present in power amplifiers

Course Articulation Matrix (CAM): U18EC408 ANALOG CIRCUITS – II LABORATORY														
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18EC408.1	3	2	2	--	--	--	--	--	--	--	2	1	3	2
CO2	U18EC408.2	2	3	3	--	--	--	--	--	1	--	2	1	3	2
CO3	U18EC408.3	2	2	3	--	--	--	--	--	1	--	2	1	3	2
CO4	U18EC408.4	2	3	3	--	--	--	--	--	1	--	2	1	3	2
U18EC408		**2.25**	**2.50**	**2.75**	**--**	**--**	**--**	**--**	**--**	**1**	**--**	**2**	**1**	**3**	**2**

U18EC409 PULSE AND DIGITAL CIRCUITS LABORATORY

Class: B.Tech.IV – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	–	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: response of linear and non-linear wave shaping circuits.
LO2: practical bootstrap and Miller sweep circuits.
LO3: various types of multivibrators
LO4: sampling and logic gates.

LIST OF EXPERIMENTS

1 Response of a High pass RC circuit for a square wave input.

2 Response of a Low pass RC circuit for a square wave input.

3 Non-Linear Wave Shaping – Clippers.

4 Non-Linear Wave Shaping – Clampers.

5 Design of UJT as Relaxation Oscillator.

6 Design of Boot Strap Sweep Circuit to observe the linear sweep and to measure the sweep time.

7 Design of Miller Sweep circuits using BJTs to observe the linear sweep and to measure the sweep time.

8 Design of Transistor as a switch using BJT for 1KHz square wave input.

9 Design and measure the stable stage output voltages of Bistable Multivibrator using BJTs.

10 Design and verify the clock pulse of given pulse width using Monostable Multivibrator using BJTs.

11 Design Astable Multivibrator using BJTs to generate a squre wave of 1KHz frequency and also measure the quasi-stable state output voltages.

12 Design of Schmitt Trigger for 1KHz sinusoidal input signal.

13 Observe the output of bidirectional Sampling gate.

14 Realization of Logic gates using discrete components.

Laboratory Manual:

[1] Manual for *"Pulse and Digital Circuits Laboratory"* prepared by the faculty of ECE department

Text Books:

[1] Jacob Millman and Herbert Taub, *Pulse, Digital and Switching Waveforms*, 2nd ed. McGraw Hill, 2007.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: analyze the responses of linear and non-linear wave shaping circuits.
CO2: design various practical sweep circuits
CO3: design multivibrators for various applications
CO4: demonstrate sampling gates and logic gates.

Course Articulation Matrix (CAM): U18EC409 PULSE AND DIGITAL CIRCUITS LABORATORY														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC409.1	2	2	1	1	1	--	--	--	--	--	--	--	2	2
CO2	U18EC409.2	2	1	1	1	1	--	--	--	--	--	--	--	2	2
CO3	U18EC409.3	2	3	3	1	2	--	--	--	--	--	--	--	2	2
CO4	U18EC409.4	2	1	1	1	2	--	--	--	--	--	--	--	2	2
U18EC405		**2**	**1.75**	**1.5**	**1.5**	**1.5**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**

U18CH416 ENVIRONMENTAL STUDIES

Class: B. Tech. IV -Semester

Branch: Common to all branches

Teaching Scheme :

L	T	P	C
2	-	-	2

Examination Scheme :

Continuous Internal Evaluation	:	40 marks
End Semester Examination	:	60 marks

Course Learning objectives (LOs):

This course will develop students' knowledge in/on

LO1: *necessity to use natural resources more equitably*
LO2 : *concepts of ecosystem and the importance of biodiversity conservation*
LO3 : *causes, effects and control measures of various environmental issues*
LO4 : *issues involved in enforcement of environmental legislation*

UNIT-I (6)

Introduction - The multidisciplinary nature of environmental studies - definition, scope and importance.

Natural Resources: Forest Resources - Use and over–exploitation of forests, deforestation, timber extraction, mining, dams - their effects on forests and tribal people; **Water Resources -** Use and over-utilization of surface and ground water, floods, drought, conflicts over water; **Mineral Resources -** Environmental effects of extracting and using mineral resources; **Agricultural Land -** Land as a resource, land degradation, soil erosion and desertification; **Food Resources** - World food problems, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity; **Energy Resources -** Renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II (6)

Ecosystem and Biodiversity: Ecosystem - Concepts of an ecosystem, food chain, food webs, ecological pyramids, energy flow in the ecosystem and ecological succession;

Biodiversity and its Conservation – Introduction, definition, genetic, species and ecosystem diversity, value of biodiversity, biodiversity in India, hot spots of biodiversity, man-wildlife conflicts, endangered and endemic species of India, in-situ and ex-situ conservation.

UNIT-III (6)

Environmental Pollution: Global climatic change, greenhouse gases, effects of global warming, ozone layer depletion; International conventions/protocols - Earth summit, Kyoto protocol and Montreal protocol; causes and effects of air, water, soil, marine and noise pollution with case studies; solid and hazardous waste management, effects of urban industrial and nuclear waste; natural disaster management - flood, earthquake, cyclone and landslides.

UNIT-IV (6)

Social Issues and the Environment: **Role of Individual and Society** - Role of individual in prevention of pollution, water conservation, Rain water harvesting and watershed management; **Environmental Protection / Control Acts** - Air (Prevention and control of Pollution) Act- 1981, water (Prevention and Control of Pollution) Act-1974, water Pollution Cess Act-1977, Forest conservation Act (1980 and 1992), wildlife Protection Act 1972 and environment protection Act 1986, issues involved in enforcement of environmental legislations; **Human Population and Environment** - Population growth, family welfare programmes, women and child welfare programmes, role of information technology in environment and human health.

Text Books:

[1] Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Courses,* 2nd ed. Universities Press (India) Private Limited, 2013.

Reference Books:

[1] Y. Anjaneyulu, *Introduction to Environmental Science*, B.S. Publications, 2004.
[2] Gilbert M. Masters, *Introduction to Environmental Engineering & Science*, Prentice Hall of India, 3rd. 1991.
[3] Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, 4/e, New Age International Publishers, 2014.
[4] R.Rajagopalan, *Environmental Studies from crisis to cure*, Oxford University Press, Second Edition, 2011.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: investigate any environmental issue using an interdisciplinary framework
CO2: formulate an action plan for sustainable alternatives and conserving biodiversity that integrates science, humanist, social and economic perspective
CO3: identify and explain the complexity of issues and processes which contribute to an environmental problem
CO4: participate effectively in analysis and problem-solving through knowledge in environmental legislations

Course Articulation Matrix (CAM): U18CH416 ENVIRONMENTAL STUDIES

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18CH416.1	2	1	2	1	-	2	1	-	1	-	-	-	1	-
CO2	U18CH416.2	-	-	2	-	-	1	2	-	1	-	-	-	1	-
CO3	U18CH416.3	1	2	1	-	-	1	2	1	1	-	-	-	1	-
CO4	U18CH416.4	-	-	1	-	-	1	2	-	1	-	-	-	1	-
U18CH416		**1.5**	**1.5**	**1.5**	**1**	**-**	**1.25**	**1.75**	**1**	**1**	**-**	**-**	**-**	**1**	**-**

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE:: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION
V SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAM

URR18-R22

[6Th+2P+1MC]

Sl.No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
								CIE			ESE	Total Marks
				L	T	P		TA	MSE	Total		
1	MC	U18MH501	Universal Human Values - II	2	-	-	-	10	30	40	60	100
2	PE	U18EC502	Professional Elective - I / MOOCs - I	3	-	-	3	10	30	40	60	100
3	PCC	U18EC503	Communication Systems	3	-	-	3	10	30	40	60	100
4	PCC	U18EC504	Antennas and Wave Propagation	3	-	-	3	10	30	40	60	100
5	PCC	U18EC505	Linear Integrated Circuits and Applications	3	-	-	3	10	30	40	60	100
6	PCC	U18EC506	Microprocessors and Microcontrollers	3	-	-	3	10	30	40	60	100
7	ESC	U18EE511	Linear Control Systems	3	-	-	3	10	30	40	60	100
8	PCC	U18EC507	Communication Systems Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18EC508	IC Applications Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18EC510	Seminar	-	-	2	1	100	-	100	-	100
			Total:	**20**	**-**	**6**	**21**	**250**	**210**	**460**	**540**	**1000**

L= Lecture, T = Tutorials, P = Practicals & C = Credits

Professional Elective-I / MOOCs - I:
U18EC502AR22: Artificial Intelligence and Machine Learning with Python
U18EC502B: Pervasive Computing
U18EC502C: Electronic Measurements and Instrumentation
U18EC502M: MOOC Course

Contact hours per week : 26
Total Credits : 21

U18MH501 UNIVERSAL HUMAN VALUES - II

Class: B.Tech. V – Semester
Branch: Common to all branches

Teaching Scheme:

L	T	P	C
2	-	-	-

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

* Pre-requisite: U18MH111 Universal Human Values - I (*Induction Programme)*

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: self-exploration, happiness and prosperity as the process of value education
LO2: harmony in the human being - self & family
LO3: co-existence of human being with society & nature
LO4: professional ethics, commitment and courage to act

UNIT – I (6)

Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, Recapitulation from Universal Human Values - I (*Induction programme*)

Self-Exploration: Its content and process, Natural acceptance and experiential validation – As the process for self-exploration

Continuous Happiness and Prosperity: A look at basic human aspirations, Right understanding, Relationship and physical facility - The basic requirement for fulfillment of aspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly: A critical appraisal of the current scenario, Method to fulfill the above human aspirations - Understanding and living in harmony at various levels

UNIT – II (6)

Understanding Harmony in the Human Being- Harmony in Myself & Family:

Harmony in Myself: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Happiness and physical facility; Understanding the 'Body' as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the 'Body' - Sanyam and Health; Correct appraisal of physical needs, Meaning of prosperity in detail, Programs to ensure Sanyam and Health

Harmony in Family: Understanding values in human - Human relationship; Meaning of justice (Nine universal values in relationships), Program for its fulfillment to ensure mutual happiness, Trust and respect as the foundational values of relationship, Understanding the meaning of trust, Difference between intention and competence; Understanding the meaning of respect, Difference between respect and differentiation, The other salient values in relationship

UNIT – III (6)

Understanding Harmony with Society, Nature & Existence:
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, Fearlessness (trust) and Co-existence as comprehensive human goals, Visualizing a universal harmonious order in society – Undivided society; Universal order - From family to world family

Understanding the harmony in the nature: Interconnectedness and mutual fulfillment among the four orders of nature - Recyclability and self-regulation in nature

Whole Existence as Co-existence: Understanding existence as co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

UNIT – IV (6)

Implications of Holistic Understanding of Harmony on Professional Ethics:
Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for Humanistic education, Humanistic constitution and Humanistic universal order
Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems and c) Ability to identify and develop appropriate technologies and management patterns for above production systems

Case studies: Case studies of typical holistic technologies, Management models and production systems, Strategy for transition from the present state to Universal human order **–** a) At the level of individual: As socially and ecologically responsible engineers, technologists and managers b) At the level of society: As mutually enriching institutions and organizations

Text Book:

[1] R .R. Gaur, R. Sangal and G. P. Bagaria, *Human Values and Professional Ethics*, New Delhi: Excel Books, 2010.

Reference Books:

[1] A. Nagaraj, *JeevanVidya: Ek Parichaya*, Raipur: Jeevan Vidya Prakashan, Amarkantak, 2018.
[2] A.N. Tripathi, *Human Values*, 3rd ed. New Delhi: New Age International Publisher, 2019.
[3] M. Govindrajran, S. Natrajan & V.S. Senthil Kumar, *Engineering Ethics (includes Human Values)*, 12th ed. Haryana: PHI Learning Pvt. Ltd., 2011.
[4] Jayshree Suresh, B. S. Raghavan, *Human Values & Professional Ethics*, 4th ed. New Delhi: S. Chand & Co. Ltd., 2012.

Additional Resources:

[1] R.R Gaur, R Sangal, G P Bagaria, *A foundation course in Human Values and professional Ethics (Teacher's Manual)*, New Delhi: Excel books, 2010.
[2] A set of DVDs containing - Video of Teachers' Orientation Program - PPTs of Lectures and Practice Sessions (*Audio-visual material for use in the practice sessions*)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: interpret the importance of continuous happiness & prosperity through self-exploration and imbibe skills to examine harmony

CO2: appraise the concept of sentience, distinguish between intention & competence and prioritize human values in relationships

CO3: *build fearlessness & co-existence as comprehensive human goal and agree upon interconnectedness & mutual fulfillment*

CO4: *assess the understanding of harmony, adapt professional ethics and take part in augmenting universal human order*

Course Articulation Matrix (CAM): U18MH501 UNIVERSAL HUMAN VALUES - II

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH501.1	-	-	-	-	-	1	-	2	1	1	-	2	1	-
CO2	U18MH501.2	-	-	-	-	-	1	-	2	1	1	-	2	1	-
CO3	U18MH501.3	-	-	-	-	-	1	-	2	1	1	-	2	1	-
CO4	U18MH501.4	-	-	-	-	-	1	-	2	1	1	-	2	1	-
U18MH501		**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**1**	**1**	**-**	**2**	**1**	**-**

U18EC502AR22 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING WITH PYTHON

Class: B.Tech. V – Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: artificial intelligence and machine learning
LO2: python fundamentals
LO3: python programming for machine learning algorithms
LO4: deep learning and optimization algorithms

UNIT-I (9)

AIML fundamentals: Artificial intelligence-definition, applications, advantages and disadvantages; machine learning – definition, application and types of learning – supervised learning, unsupervised learning, reinforcement learning, supervised and unsupervised machine learning algorithms; artificial neural network – perceptron, feed forward back propagation architecture, deep neural network and Python IDEs

UNIT-II (9)

Python fundamentals: Variables, data types – numeric, string, list, dictionary, tuple and set; arrays, indentation, operators, conditional statements, loops, functions, numpy, arrays and data frames using pandas, data visualization using matplotlib – plot, histogram, bar graphs and scatter diagram; data visualization using sea borne library and waveform generation-sine, cosine and sinc functions

UNIT-III (9)

Machine learning algorithms and Python programming: Scikit learn, regression-simple linear regression, multiple linear regression, polynomial regression and importance of R^2 value in regression; clustering –hierarchial, k-means, density based and fuzzy clustering; classification - logistic regression, support vector machine, naïve bayes algorithm, decision tree and random forest algorithm

UNIT-IV (9)

Deep learning: Convolutional neural network, recurrent neural network, natural language processing (NLP) – components, applications and NLTK library; open cv library for image processing and chat bots

Optimization algorithms: Genetic algorithm and particle swarm optimization algorithm

Text Books:

[1] Manaranjan Pradhan and U Dinesh Kumar, *Machine Learning using python*, New Delhi: John Wiley & Sons, 2019

[2] Reema Thareja, *Python programming using problem solving approach*, New Delhi: Oxford university press, 2017

Reference Books:

[1] John V. Guttag, *Introduction to Computation and Programming Using Python*, Cambridge: The MIT Press, 2013

[2] Mehryrar Mohri, Afshin Rostamizadeh, Ammet Talwakar, *Foundations of Machine Learning*, Cambridge: The MIT Press, 2012

[3] Tom Mitchel, *Machine Learning*, 3rd ed., New Delhi: Mcgraw Hill, 1997

[4] B.Yegnarayana, *artificial neural network*, New Delhi: PHI, 2005

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

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

CO1: *elaborate various types of artificial intelligence and machine learning techniques*

CO2: *Develop python programming with data types and other python fundamentals*

CO3: *Develop python programming for machine learning algorithms*

CO4: *Examine deep learning and optimization algorithms*

Course Articulation Matrix (CAM): U18EC502AR22: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING USING PYTHON

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC502AR22.1	2	2	2	2	2	-	-	-	-	-	1.5	1.5	2	2
CO2	U18EC502AR22.2	2	2	2	2	2	-	-	-	-	-	1.5	1.5	2	2
CO3	U18EC502AR22.3	2	2	2	2	2	-	-	-	-	-	1.5	1.5	2	2
CO4	U18EC502AR22.4	2	2	2	2	2	-	-	-	-	-	1.5	1.5	2	2
U18EC502AR22		**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1.5**	**1.5**	**2**	**2**

U18EC502B PERVASIVE COMPUTING

Class: B.Tech. V-Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: pervasive computing, architectural design for UbiCom systems and applications

LO2: service architectures, smart mobile devices, and device networks

LO3: pervasive applications for human computer interaction and tagging the physical world

LO4: pervasive audio, video, data networks, smart devices interaction and its challenges

UNIT-I (9)

Pervasive Computing Basics and Vision: Living in a Digital world, Modeling the key Pervasive Computing properties, Ubiquitous System Environment interaction and Architectural Design for UbiCom systems-Smart DEI model

Application and Requirements: Early UbiCom Research projects, Smart devices-CCI, CPI, HCI and HPI , Smart Environments-CPI and CCI, Everyday application in the Virtual, Human and Physical world, Human Computer Interaction, Human to Human Interaction (HHI) applications, Human Physical World Computer Interaction (HPI) and (CPI)

UNIT-II (9)

Smart Devices and Services: Service Architecture models, Partitioning and Distribution of Service Components, Multi tier Client Service Models, Middleware, Service Oriented Computing (SOC), Service Provision life cycle, Service Invocation, Service Composition, Virtual machine and Operating systems

Smart Mobiles, Card and Device Networks: Smart Mobile Devices, Users, Resources and Code, Mobile Service Design, Mobile code, Mobile Devices and Mobile Users, Operating Systems for Mobile Computers and Communicator devices, Smart card Device and Device Networks

UNIT-III (9)

Human Computer Interaction: User Interfaces and Interaction for four widely used devices, Hidden UI via basic Smart devices, Multi Modal Visual interface, Gesture Interface, Wearable and Implanted devices, Virtual reality and Augmented reality, Wearable Computer Interaction, Human Centred Design, User models-Acquisition and Representation

Tagging, Sensing and Controlling: Tagging the physical world, Sensors and sensor networks, Micro Actuation and Sensing-MEMS, Embedded systems and Real time systems

UNIT-IV (9)

Pervasive Communication: Audio Networks, Data Networks, Wireless data networks, Universal and transparent audio, Video and alphanumeric data network access, Ubiquitous networks and Network design issues.

Ubiquitous system : Challenges and Outlook-Smart Devices, Smart Interaction, Smart Physical Environment Device Interaction, Human Intelligence versus Machine Intelligence

Text Books:

[1.] Stefan Poslad, *Ubiquitous Computing: Smart Devices, Environments and Interactions,* London: John Wiley & sons, 2009.*(chapters 1 to 6 & 11 &13)*

Reference Books:

[1.] Mohammad S. Obaidat, Mieso Denko and Isaac Woungang, *Pervasive Computing and Networking*, United Kingdom (UK): John Wiley & Sons, 2011.

[2.] Guruduth S. Banavar, Norman H. Cohen and Chandra Narayana swami, *Pervasive Computing: An Application Based Approach*, United Kingdom (London): John Wiley Interscience, 2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (Cos):

On completion of this course, students will be able to

CO1: elaborate pervasive computing, architectural design for UbiCom systems and its applications
CO2: distinguish service architecture models, service oriented computing, smart mobile devices & device networks
CO3: interpret human computer interaction, tagging, sensing & controlling
CO4: examine pervasive audio, video & data networks & smart devices interaction & Ubiquitous system

Course Articulation Matrix (CAM): U18EC502B PERVASIVE COMPUTING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC502B.1	2	1	2	1	1	-	-	-	-	-	-	1	2	2
CO2	U18EC502B.2	2	1	2	1	1	-	-	-	-	-	-	1	2	2
CO3	U18EC502B.3	2	1	2	1	1	-	-	-	-	-	-	1	2	2
CO4	U18EC502B.4	2	1	2	1	1	-	-	-	-	-	-	1	2	2
U18EC502B		**2**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**

U18EC502C ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Class: B.Tech. V – Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: block diagram of measurement system and principle of operation of analog and digital meters

LO2: DC and AC bridge circuits and working principle of CRO, DSO, wave analyzer and spectrum analyzer

LO3: types of transducers and sensing principles of various electrical transducers

LO4: measurement of process variables using electrical transducers and block diagram of DAQ system

UNIT – I (9)

Measurement System: Block diagram, Definitions of static & dynamic characteristics, Types of errors

Analog Meters (*Schematic approach*)**:** PMMC type meters – Principle of operation, Extension of range of ammeter, Multi–range ammeter, Conversion of ammeter to voltmeter, Multi–range voltmeter, Shunt type ohmmeter; Electrodynamics type wattmeter, Q-meter

Digital Meters (*Block diagram approach*)**:** Digital voltmeters (DVMs) – SAR type & Dual slope type DVMs; Digital multimeter (DMM)

UNIT – II (9)

Bridges: General bridge balance equation, DC Wheatstone bridge, AC bridges – Maxwell bridge, Schering bridge & Wien's bridge

Oscilloscopes (*Block diagram approach*)**:** Cathode ray oscilloscope (CRO) – Principle of operation, Attenuators & probes, Dual trace oscilloscope, Measurement of phase and frequency using lissajous patterns; Digital storage oscilloscope (DSO)

Analyzers (*Block diagram approach*)**:** Frequency selective wave analyzer, Spectrum analyzer

UNIT – III (9)

Transducers (*Schematic approach*)**:** Definition & ideal requirements of transducer, Transducer classification, Resistive transducers – Potentiometric type, Strain gauge type; Inductive transducers – Proximity type, LVDT type; Capacitive transducers – Variable gap type, Variable area type, Variable dielectric type; Piezoelectric transducer, Photo electric transducers – Photo conductive cell (LDR), Photo diode, Photo transistor, Photo emissive cell

UNIT – IV (9)

Transducer Applications (*Schematic approach*)**:** Temperature measurement using RTD, Thermistor & Thermocouple sensors; Pressure measurement using Differential capacitive type pressure transducer (DP cell), Flow measurement using Electromagnetic flow meter & Hot wire anemometer, Level measurement using Capacitive level gauge & Ultrasonic level gauge, Acceleration measurement using Piezoelectric accelerometer, Block diagram & importance of Data acquisition (DAQ) system

Text Books:

[1] Helfrick. A.D and Cooper W.D., *Modern Electronic Instrumentation and Measurement Techniques*, 2nd ed. New Delhi: Prentice Hall of India, 1994. (*Chapters 4,5,6,7 & 9*)

[2] B.C. Nakra and K.K Choudhary, *Instrumentation Measurement and Analysis*, 2nd ed. New Delhi: Tata McGraw Hill, 2006.(*Chapters 10 to 13*)

Reference Books:

[1] P. Pruthviraj, B. Bhudaditya, S. Das and K. Chiranjib, *Electrical and Electronic Measurement and Instrumentation*, 2nd ed. NY: McGraw Hill Education, 2011.

[2] Arun K. Ghosh, *Introduction to Transducers,* 4th ed. New Delhi: Prentice Hall of India, 2015.

[3] Sawhney A.K, *Electrical and Electronic Measurement and Instrumentation*, 10th ed. New Delhi: Dhanpat Rai & Sons, 1994.

[4] B.G. Liptak, *Instrument Engineers Hand Book Vol. I & Vol. II*, 4th ed. PA: Chilton Book Co., 2006.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: identify measurement system, PMMC based meters, electrodynamic wattmeter, Q–meter, DVMs & DMM for typical applications

CO2: solve problems on measurement of R,L,C & frequency using bridge circuits and distinguish significant features of CRO, DSO, Wave analyzer & Spectrum analyzer

CO3: categorize the resistive, inductive, capacitive, piezoelectric & photoelectric transducers based on sensing principles

CO4: utilize electrical transducers & data acquisition system for measurement of temperature, pressure, flow, level & acceleration

Course Articulation Matrix (CAM): U18EC502C ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC502C.1	1	1	1	1	-	-	-	-	-	-	-	1	2	2
CO2	U18EC502C.2	1	1	1	1	-	-	-	-	-	-	-	1	2	2
CO3	U18EC502C.3	1	1	1	1	-	-	-	-	-	-	-	1	1	1
CO4	U18EC502C.4	1	1	1	1	-	-	-	-	-	-	-	1	1	1
U18EC502C		**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1.5**	**1.5**

U18EC503 COMMUNICATION SYSTEMS

Class: B.Tech. V – Semester

Branch: Electronics and Communication Engineering(ECE)

Teaching Scheme:

L	T	P	C
3	-	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: linear modulation strategies that constitute the amplitude modulation
LO2: angle modulation & pulse modulation
LO3: source coding, digital modulation techniques & baseband data transmission systems
LO4: bandpass data transmission systems & channel coding techniques

UNIT–I (9)

Amplitude Modulation: Introduction, Elements of Communication System, Amplitude Modulation, Double Sideband-Suppressed Carrier Modulation, Costas Receiver, Single-Sideband Modulation, Vestigial Sideband Modulation, Noise in Communication Systems-Sources of Noise-Shot noise, White noise, Band-Pass Receiver Structures-Super Heterodyne Receiver-Intermediate frequency-AGC, Noise in AM, Noise in DSB-SC, Noise in SSB-SC.

UNIT–II (9)

Angle Modulation: Basic Definitions-Frequency Modulation-Phase Modulation, Relationship between PM and FM Waves, Narrow-Band Frequency Modulation, Wide-Band Frequency Modulation, Transmission Bandwidth of FM Waves, Generation of FM Waves, Demodulation of FM Signals-Phase discriminator, Phase Locked Loop, Noise in FM, Pre-emphasis and De-emphasis.

Pulse Modulation: Transition from Analog to Digital Communications**,** Sampling Process, Pulse-Amplitude Modulation, Pulse-Position Modulation.

UNIT–III (9)

Digital Modulation: Elements of Digital communication system, Source coding, Discrete Memoryless Source (DMS), Measure of Information, Entropy, Information Rate, Source coding- Shannon Fano, Huffman Coding, Gaussian Channel capacity – Shannon bound, Pulse-Code Modulation (PCM), Quantization, Quantization error, Signal to quantization noise ratio, Delta modulation (DM), Adaptive Delta Modulation (ADM), Comparison of PCM and DM

Baseband Data Transmission(Introduction): Inter Symbol Interference, Pulse shaping, Eye Pattern, Equalization

UNIT – IV (9)

Band-pass Data Transmission: Coherent Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Coherent Binary Frequency shift keying (BFSK), Quadrature Phase Shift Keying (QPSK), Minimum Shift Keying (MSK)

Introduction to Error Control Coding: Linear Block Codes - Error detection & Error correction capabilities, Hamming Codes, Convolution Codes – Encoding, Tree and Trellis diagram, Decoding using Viterbi algorithm.

Text Books:

[1.] Simon Haykin and Michael Moher *Introduction to Analog and Digital Communications*, 2nd ed. United States of America: John Wiley & sons, inc., 2007. *(Chapters: 3,4,5,6,7)*

[2.] K. Sam Shanmugam, *Digital and Analog Communication Systems*, New *Delhi: John Wiley* & Sons, 2008. *(Chapters: 4,5,8,9,10)*

Reference Books:

[1] Herbart Taub, Donald L Schilling, *Principles of Communication Systems*, McGraw-Hill,3rd ed, 2007

[2] John G. Proakis, *Digital Communications*, McGraw-Hill Education, 4th ed, 2001

[3] Bhattacharya, *Digital Communication*, Tata McGraHill Education, 2014.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: estimate the performance of AM systems in the presence of noise

CO2: evaluate the performance of FM system in the presence of noise and discuss pulse modulation techniques

CO3: determine code efficiency of source coding algorithms and design the duo-binary filtering methods to reduce the effect of Inter Symbol Interference

CO4: examine the performance of coherent bandpass data transmission system and design channel encoders & decoders

Course Articulation Matrix (CAM): U18EC503 COMMUNICATION SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC503.1	2	2	1	1	-	-	-	-	-	-	-	1	1	2
CO2	U18EC503.2	2	2	1	1	-	-	-	-	-	-	-	1	1	2
CO3	U18EC503.3	2	2	1	1	-	-	-	-	-	-	-	1	1	2
CO4	U18EC503.4	2	2	1	1	-	-	-	-	-	-	-	1	1	2

U18EC504 ANTENNAS AND WAVE PROPAGATION

Class: B.Tech. V-Semester
Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (Los):

This course will develop students' knowledge in/on

LO1: radiation mechanism & antenna properties
LO2: linear antenna arrays & its radiation patterns
LO3: antennas used at different frequencies- UHF, VHF, Microwave frequencies
LO4: wave propagations-surface, space & sky wave

UNIT-I (9)

Linear Wire Antennas : Introduction to antennas and radiation mechanism, Retarded Potentials, Radiation from Small Dipole, Half wave Dipole and Quarter wave Monopole, Current Distribution, Electric and Magnetic field components, Radiated Power, Radiation Resistance

Antenna Properties: Radiation pattern, beam width, Radiation intensity, gain and directivity, bandwidth, Polarization, Antenna impedance, effective length, aperture concepts and types, efficiency, front to back ratio, Reciprocity theorem applied to antennas, Friis Transmission equation

UNIT-II (9)

Linear Antenna Arrays: Two-element arrays –different cases; N-element Uniform Linear Array- Broadside and End fire arrays, Characteristics -Directivity and BWFN, comparison, Principle of pattern Multiplication, Binomial Array, Concept of phased array

Non-Resonant Radiators: Introduction, Travelling wave radiators - Basic concepts, V and Inverted V- antennas, Rhombic antenna- Construction details & design considerations

UNIT-III (9)

VHF, UHF and Microwave Antennas: Yagi-Uda antenna- Parasitic elements & Folded Dipole, Plane sheet and Corner Reflectors, Paraboloidal Reflectors - Characteristics, Types of feeds- Offset feed and Cassegrain Feeds, Horn Antennas- Types, Design considerations, Optimum Horns, Helical Antenna, Concept of Microstrip antenna-Introduction to Rectangular Microstrip antenna, advantages, disadvantages and applications

UNIT-IV (9)

Wave Propagation: Introduction, Factors involved in Wave Propagation, Ground Wave Propagation-Characteristics, Wave tilt, Flat earth considerations, Ionosphere Formation of layers and mechanism of propagation, Reflection and Refraction mechanisms, Critical Frequency, Maximum Usable Frequency, Optimum working frequency, Skip distance, Virtual Height, Space wave propagation- M Curves and Duct Propagation, Tropospheric Scattering

Text Books:

[1] E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems*, 2nd ed., New Delhi: Prentice Hall of India(PHI), 2001.*(Chapters 10,11,12)*

[2] John D Kraus, Ronald J Marhefka and Ahmad Khan. Kraus, *Antennas and Wave Propagation*, 4th ed., New Delhi: Tata McGraw Hill Education, 2011.(*Chapters 2,4 to 9,14,22,23,24,25)*

Reference Books:

[1] Constantine A.Balanis, *Antenna Theory,* 2nd ed., New York: John Wiley & Sons, 1997.

[2] G.S.N.Raju, *Antennas and Wave Propagation*,1st ed. New Delhi: Pearson, 2004.

[3] K.D.Prasad, *Antenna and Wave Propagation*, 3rd ed. New Delhi: Satya Prakashan, 1996.

[4] F.E.Terman, *Electronic and Radio Engineering*, 4th ed. New York: McGraw-Hill, 1955.

[5]R.L.Yadav, *Antennas and Wave Propagation,* 2nd ed. New Delhi: Prentice Hall of India (PHI),2013

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to….

CO1: discuss radiation mechanism & fundamental characteristics of antennas
CO2: design two element & n-element arrays
CO3: build UHF, VHF & microwave antennas
CO4: distinguish ground wave, space wave & sky wave propagation

Course Articulation Matrix (CAM): U18EC504 ANTENNA AND WAVE PROPAGATION														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC504.1	2	1	2	-	-	-	-	-	-	-	-	-	1	1
CO2	U18EC504.2	2	1	2	-	-	-	-	-	-	-	-	-	1	1
CO3	U18EC504.3	2	1	2	-	-	-	-	-	-	-	-	-	1	1
CO4	U18EC504.4	2	1	2	-	-	-	-	-	-	-	-	-	1	1
U18EC504		**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

U18EC505 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Class: B.Tech. V – Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):

This course will develop students' knowledge in/on

LO1: building blocks & characteristics of Op-Amp
LO2: linear and non-linear applications of Op-Amps
LO3: active filters using Op-Amps and operation of IC 555 timer & its applications
LO4: operation of PLL, voltage regulators and data converters

UNIT – I (9)

Integrated circuits (ICs): Introduction, Classification of ICs
Operational Amplifier (Op-Amp): Differential amplifier, Dual input balanced output differential amplifier, Dual input unbalanced output differential amplifier, Building blocks of Op-Amp, Analysis of basic inverting & non-inverting amplifier configurations and Voltage follower

DC Characteristics of Op-Amp: Input offset voltage, Input bias current, Input offset current, Total output offset voltage, Thermal drift, Supply voltage rejection ratio (SVRR), Common mode rejection ratio (CMRR)

AC Characteristics of Op-Amp: Open loop and closed loop frequency response, Stability of Op-Amp, Slew rate, Ideal and practical characteristics of IC μA741

UNIT – II (9)

Applications of Operational Amplifiers: Summing and difference amplifiers, Integrator and differentiator, Voltage to Current converter, Current to Voltage converter, Instrumentation amplifier, Sample and hold circuit
Non-linear Applications: Precision rectifiers–Half and full wave rectifiers; Log & Antilog amplifiers
Comparators and Waveform Generators: Op-Amp comparators, Regenerative comparators (Schmitt Trigger), RC phase shift and Wien's bridge oscillators

UNIT – III (9)

Active filters: Introduction, Ideal and realistic frequency responses of various filters, First & second order filters, Analysis and design of VCVS configured low pass, High pass, Band pass and band stop filters, IGMF configured narrow band pass and narrow band reject filters, Twin T-notch filter

IC 555 timer: Introduction, Functional diagram, Design of astable and monostable multivibrators using 555timer, Applications of astable multivibrator - FSK generator, Pulse-Position modulation, Schmitt trigger; Applications of monostable multivibrator - Missing pulse detector, Linear ramp generator, Pulse-width modulation

UNIT – IV (9)

Phase Locked Loops (PLLs) (*Qualitative treatment only):* Voltage controlled oscillator, Basic PLL operation, Definitions related to PLL, Transient response of PLL, Monolithic PLL and design considerations, PLL applications – FSK and AM detectors

Voltage Regulators: Basic voltage regulator using Op-Amps, General purpose IC regulator, μA723 - Functional diagram, specifications, Design of low and high voltage regulators, Three terminal voltage (fixed) regulators- General features and IC series of three terminal regulators

Data Converters: DAC types - Weighted resistor and R-2R ladder; ADC types - Flash, Successive approximation & Dual slope

Text Books:

[1] D. Roy Choudhury and Shail B. Jain, *Linear Integrated Circuits*, 4th ed., New Delhi: New Age International Pvt. Ltd., 2010. *(Chapters 1 to 10)*

Reference Books:

[1] Ramakant Gayakwad, *Op-Amps and Linear Integrated Circuits*, 4th ed. New Delhi: Pearson Education, 2015.

[2] George B. Clayton, *Linear Integrated Circuits and Applications*, London: The Macmillan Press Ltd., 1975.

[3] Rodert F.Coughlin and Frederick F.Driscoll, *Operational Amplifiers and Linear Integrated Circuits*, 6th ed. New Delhi: Pearson Education, 2000.

[4] S. Salivahanan and V S Kanchana Bhaaskaran, *Linear Integrated Circuits,* 3rd ed. Chennai: McGraw Hill Education (India) Pvt. Ltd., 2019.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes:

On completion of this course, students will be able to….

CO1: analyze characteristics of Op-Amp IC741 using fundamental concepts
CO2: design Op-amp based simple linear & non-linear circuits for the given specifications
CO3: design Op-Amp based active filters using VCVS & IGMF topologies and IC 555 timer based multivibrator circuits for the given specifications
CO4 : design IC PLL based application circuits, IC 723 based voltage regulators for the given specifications and choose suitable data converter for given design specifications

Course Articulation Matrix (CAM): U18EC505 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U18EC505.1	1	2	2	1	-	-	-	-	-	-	-	1	1	2
CO2	U18EC505.2	1	2	2	1	-	-	-	-	-	-	-	1	1	2
CO3	U18EC505.3	1	2	2	1	-	-	-	-	-	-	-	1	1	2
CO4	U18EC505.4	1	2	2	1	-	-	-	-	-	-	-	1	1	2
U18EC505		**1**	**2**	**2**	**1**	**-**	-	-	-	-	-	-	**1**	**1**	2

U18EC506 MICROPROCESSORS AND MICROCONTROLLERS

Class: B.Tech., V – Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: features of 8086 microprocessor (MP), architecture, instruction formats and addressing modes.

LO2: programming concepts, generation of delays, implementation of structures and pin configuration.

LO3: interfacing of peripheral devices to 8086 through interfacing chips 8255(PPI), 8257(DMA), 8254(PIT), 8259(PIC).

LO4: organizational features of 8051 microcontroller (MC), instruction set, programming concepts, interfacing with stepper motor, generation of real time clock.

UNIT–I (9)

8086 Microprocessor: Features, Organization of CPU, Architecture, General purpose registers, Segment registers, Concept of memory segmentation, Physical & Logical addressing, One to Six Bytes Instruction formats, Instruction set, Addressing modes-data & memory addressing modes.

UNIT – II (9)

8086 Assembly Language Programming: Assembler directives, Simple programming of 8086, Implementation of structures, Time delays, Delay Calculations , strings, procedures, macros, pin configuration, Minimum/Maximum modes, Timing diagrams for Input and Output operations

UNIT – III (9)

Interfacing with 8086: Analog to Digital Converter (ADC) & Digital to Analog Converter (DAC) interfacing, Interfacing of switches, Seven Segment LEDs, Matrix keyboard, Stepper motor; CRT interface, 8255 Programmable Peripheral Interface (PPI), 8257 Direct Memory Access (DMA), 8254 Programmable Interval Timer (PIT) and 8259 Priority interrupt controller (PIC)

UNIT – IV (9)

8051 Microcontroller: Architecture, Instruction set, Addressing modes, Assembly language programming, Timers, Input-output ports, Interrupts, Serial ports, Interfacing with LEDs, Switches, Stepper motor & Real Time Clock (RTC)

Text Books:

[1] D.V.Hall, *Microprocessors &Interfacing*, 3rd ed. New Delhi: TataMcGraw Hill, 2011. (*Chapter 3,4,5,6,7,8,9,10,11).*

[2] Muhammed Ali Mazidi, *The 8051 Microcontrollers and Embedded systems using Assembly and C*, 2nd ed. New Delhi: Pearson, 2006 *(Chapter 1,2,3,4,5,6,8,9,10,11,12,13)*

Reference Books:

[1] Kenneth J Ayala, *8086 Microprocessor: Programming & Interfacing with PC*, Noida Uttar Pradesh: Delmar/Cengage Learning India, 2007.

[2] A. K. Ray and K M Burchandi, *Advanced microprocessors and Peripherals*, 3rd ed. New Delhi: Tata McGraw Hill, 2013.

[3] Kennet Ayala, *The 8051 Microcontroller: Architecture, Programming and Applications*, 2nd ed. Mumbai: Penram Publications, 1996.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs)

On completion of this course, students will be able to…

CO1: categorize the various functional units of 8086 architecture & various registers; compare various instructions, addressing modes and memory segments of 8086 MP

CO2: distinguish Minimum/Maximum modes of 8086MP, develop assembly language programs (ALPs) on 8086 MP& analyze the implementation of structures, time delays, delay calculations, strings, procedures, macros and timing diagrams for input/output operations

CO3: design 8086 interfacing circuits with ADC,DAC, switches, LEDs, keyboard and construct interfacing circuits for 8255 PPI, 8259, 8257 and stepper motor

CO4: categorize various functional units of 8051 MC, instruction set and addressing modes, develop ALPs & build interfacing circuits for interfacing LEDs, stepper motor& real time clock

Course Articulation Matrix (CAM):U18EC506 MICROPROCESSORS AND MICROCONTROLLERS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC506.1	1	1	1	1	-	-	-	-	-	-	-	1	2	1
CO2	U18EC506.2	1	2	2	1	1	-	-	-	-	-	-	1	2	1
CO3	U18EC506.3	1	2	2	1	-	-	-	-	-	-	-	1	2	1
CO4	U18EC506.4	1	2	2	1	1	-	-	-	-	-	-	2	2	1
U18EC506		**1**	**1.75**	**1.75**	**1**	**1**	-	-	-	-	-	-	**1.25**	**2**	**1**

U18EE511 LINEAR CONTROL SYSTEMS

Class: B.Tech, V Semester

Branch: Electronics and Communication Engineering

Teaching Scheme:

L	T	P	C
3		-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student"s knowledge in/on

LO1: transfer function representation of physical systems

LO2: assessing the system performance using time domain analysis and methods for improving it

LO3: assessing the system's stability and performance using time and frequency domain analysis

LO4: state space modeling of physical systems and the compensation techniques

UNIT-I (9)

Introduction: Concepts of Control Systems- Classification of control systems, open loop and closed loop control systems, Effects of feedback, Mathematical modeling – Linear differential equations- Translational and Rotational mechanical systems, Analogous Systems, Electrical Systems; Block diagram reduction technique – Signal flow graph method.

UNIT-II (9)

Time Response Analysis: Introduction, Standard test signals – Type & Order, Time response of first order systems, Classification of second order systems, Transient response of second order systems – Time domain specifications – Steady state response – Steady state errors and error constants; Controllers - P, I, D, PI, PD & PID.

UNIT-III (9)

Stability Analysis: Introduction, Routh-Hurwitz stability criteria – qualitative stability and conditional stability. Root Locus Technique– construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Frequency Response Analysis: Introduction, Frequency domain specifications -Correlation between frequency and time domain specifications- Bode plots- transfer function from the Bode plot- Phase margin and Gain margin-Stability Analysis from Bode Plots, Stability analysis through polar plots, Nyquist stability criteria.

UNIT-IV (9)

Control System Analysis using State Variable Method: Introduction- State variable representation- Conversion of state models to transfer functions- Conversion of transfer functions to state models- Deriving state models from physical systems, State transition matrix, Solution of state equations- Concepts of Controllability and Observability.

Compensation: Introduction, Elementary treatment of Lag, Lead, Lead-Lag Compensation.

Textbooks:

[1] I.J. Nagrath & M. Gopal, *Control Systems Engineering*, 4th ed., New Delhi: New Age International Pvt. Ltd., 2012.

Reference books:

[1] S. Palani, *Control Systems Engineering*, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt. Ltd., 2010.
[2] A. Anand Kumar, *Control Systems*, 2nd ed., New Delhi: Prentice Hall of India, 2014.
[3] K. Alice Mary, P. Ramana, *Control Systems*, 1st ed., Hyderabad: Universities Press, 2016.
[4] Benjamin C. Kuo, *Automatic Control Systems*, 7th ed., New Delhi: Prentice Hall of India, 1995.
[5] A. Nagoorkani, *Control Systems*,2nd ed., New Delhi: RBA Publications.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

Upon completion of this course, the student will be able to…

CO1: develop transfer function models for different physical systems
CO2: compute time domain specifications of first & second order systems; compare the performance of different controllers
CO3: examine stability of systems in time and frequency domains
CO4: develop state space model of a given physical system; develop the transfer functions of compensators

Course Articulation Matrix: U18EE511 LINEAR CONTROL SYSTEMS

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EE511.1	2	2	-	-	-	-	-	-	-	-	-	1	1	1
CO2	U18EE511.2	2	2	-	1	-	-	-	-	-	-	-	1	1	1
CO3	U18EE511.3	2	2	-	1	1	-	-	-	1	-	-	1	1	2
CO4	U18EE511.4	2	2	-	1	-	-	-	-	1	-	-	1	1	2
U18EE511		**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**1**	**1.5**

U18EC507 COMMUNICATION SYSTEMS LABORATORY

Class: B.Tech. V – Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	–	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: calculating the modulation index in AM & frequency deviation in FM practically
LO2: generation of digital signals using pulse modulation techniques and digital modulation techniques
LO3: experimental method for observing & measuring ISI in baseband PAM system and different techniques for transmission of digital signal over the channel
LO4: efficiency of source coding techniques and error detection & correction capability of channel coding techniques

LIST OF EXPERIMENTS

1. Generation of AM Signal, find the modulation index and percentage of modulation with different modulation signals
2. Study of Modulation and demodulation of DSB-SC signal
3. Calculate the modulation index, frequency deviation of FM signal
4. Observe the effects of Pre-emphasis and De-emphasis on given input signal
5. Study the characteristics of PLL
6. Generation and demodulation of Analog Pulse Modulation Signals
   - 6.1 Pulse Amplitude Modulation
   - 6.2 Pulse Width modulation
   - 6.3 Pulse Position Modulation
7. Interpretation of modulated and demodulated waveforms of a PCM system for different sampling frequencies
8. Study of Delta Modulation & Demodulation and observe the effect of slope overload
   - 8.1 Adaptive Delta modulation and demodulation
   - 8.2 Sigma Delta modulation and demodulation
9. Study and Analysis of baseband binary PAM system using Eye Pattern
10. Study of Digital modulation techniques
    - 10.1 Amplitude Shift Keying
    - 10.2 Phase Shift Keying
    - 10.3 Frequency Shift Keying
11. Modulation and demodulation of Differential Phase Shift Keying (DPSK) signal
12. Study of QPSK modulation and demodulation for different data rates
13. Generation and evaluation of variable length source code using Huffman coding
14. Study of error detection and correction using
    - 14.1 Linear Block Codes
    - 14.2 Convolution Codes

Experiments beyond the Syllabus:

15. Study of M-ary Quadrature Amplitude Modulation(QAM)
16. Matlab and Simulink implementations of amplitude modulation
17. Matlab and Simulink implementations of frequency modulation

Laboratory Manual:

[1] *Communication Systems laboratory Manual,* Dept. of ECE,KITSW

Text book:

[1.] Simon Haykin, *Communications Systems*, 4th ed. Singapore: John Wiley & Sons, Inc. 2004.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: *determine the modulation index and percentage modulation of an AM carrier from the time domain curve plot and also measure the frequency deviation of an FM signal*

CO2: *test sampling theorem & observe the quantization process of the input analog signal in PCM, DM and analyze the effect of sampling rate on Quantization noise & step-size*

CO3: *Estimate the baseband binary PAM system in the presence of ISI and different techniques for transmission of digital signal over the channel*

CO4: determine the code efficiency of source coding & error detection & correction capability of channel coding techniques

Course Articulation Matrix (CAM): U18EC507 COMMUNICATION SYSTEMS LABORATORY															
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PSO 2**
CO1	U18EC507.1	2	1	1	1	-	-	-	-	1	-	-	1	1	2
CO2	U18EC507.2	2	1	1	1	-	-	-	-	1	-	-	1	2	2
CO3	U18EC507.3	2	1	1	1	-	-	-	-	1	-	-	1	1	2
CO4	U18EC507.4	2	1	1	1	-	-	-	-	1	-	-	1	1	1
U18EC507		**2**	**1**	1	**1**	**-**	**-**	**-**	**-**	1	-	-	1	1.25	**1.75**

U18EC508 IC APPLICATIONS LABORATORY

Class: B.Tech. V-Semester **Branch:** Electronics and Communication Engineering(ECE)

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):

This laboratory course will develop students' knowledge in/on

LO1: static & dynamic parameters of operational amplifier
LO2: operational amplifier applications
LO3: logic gates & Combinational circuits.
LO4: flip flops & sequential circuits

LIST OF EXPERIMENTS ON LINEAR ICS

1. Measurement of static and dynamic parameters of Op-Amp IC 741
2. Design and testing of differentiator and integrator using Op-Amp IC 741
3. Design and testing of Instrumentation Amplifier using Op-Amp IC 741
4. Design and testing of log amplifier and precision rectifier using Op-Amp IC 741
5. Design and testing of second order active low pass filter using Op-Amp IC 741
6. Design of a Wien's bridge oscillator for specified frequency using Op-Amp IC 741
7. Design and testing of Astable and Monostable multivibrators using IC 555

LIST OF EXPERIMENTS ON DIGITAL ICs

8. Functional verification of logic gates.
9. Implementation and functional verification of adders and subtractors using logic gates.
10. Functional verification of BCD to Excess-3 and Binary to Gray code converter.
11. Functional verification of 4x1 Multiplexer and 1x4 Demultiplexer.
12. Functional verification of Flip-flops
13. Implementation and functional verification of shift registers.
14. Implementation and functional verification of Ring counter and Johnson Counter.

Laboratory Manual:

[1.] *Linear and Digital Integrated circuits laboratory manual,* Department of ECE, KITSW.

Text books:

[1.] D. Roy Choudhury and Shail B Jain, *Linear Integrated Circuits*, 4th ed. New Delhi: New Age International, 2010.

[2.] Moris Mano, M.D. Cillett, Digital *Design,* 4th ed. New Delhi: Prentice Hall of India, 2006.

Course Learning Outcomes (COs):

On completion of this laboratory course, students will be able to..

CO1: determine AC & DC characteristics of operational amplifier

CO2: design application circuits using IC741 OP-AMP and test their functionality

CO3: test the functionality of logic gates & combinational circuits

CO4: test the functionality of flip flops & implement sequential circuits

Course Articulation Matrix (CAM): U18EC508 LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC508.1	2	2	1	1	-	-	-	-	-	-	1	-	1	2
CO2	U18EC508.2	2	2	1	1	-	-	-	-	-	-	1	-	1	2
CO3	U18EC508.3	2	2	1	1	-	-	-	-	-	-	1	-	1	2
CO4	U18EC508.4	2	2	1	1	-	-	-	-	-	-	1	-	1	2
U18EC508		**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**2**

U18EC510 SEMINAR

Class: B.Tech. V - Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: selecting topic, referring to peer reviewed journals / technical magazines / conference proceedings
LO2: literature review and well-documented report writing
LO3: creating PPTs and effective technical presentation
LO4: preparing a technical paper in scientific journal style & format

Student has to give independent seminar on the state-of-the-art technical topics relevant to their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

The HoD shall constitute a Department Seminar Evaluation Committee (DSEC)

1. DSEC shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective seminar presentation
2. There shall be only Continuous Internal Evaluation (CIE) for seminar
3. The CIE for seminar is as follows:

Assessment	Weightage
Seminar Supervisor Assessment	20%
Seminar Report	30%
Seminar Paper	20%
DSEC Assessment: *Oral presentation with PPT and viva-voce*	30%
Total Weightage:	100%

Note: It is mandatory for the student to appear for oral presentation and viva-voce to qualify for course evaluation

(a) **Seminar Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals / Technical Magazines on the topics of potential interest

(b) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DSEC.*

(c) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.

(d) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *DSEC* as per the schedule notified by the department

(e) The student has to register for the Seminar as supplementary examination in the following cases:
   i) he/she is absent for oral presentation and viva-voce
   ii) he/she fails to submit the report in prescribed format
   iii) he/she fails to fulfill the requirements of seminar evaluation as per specified guidelines

(f) i) The CoE shall send a list of students registered for supplementary to the HoD concerned
   ii) The DSEC, duly constituted by the HoD, shall conduct seminar evaluation and send the

award list to the CoE within the stipulated time

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: select current topics in their engineering discipline & allied areas from peer reviewed journals / technical magazines/ conference proceedings

CO2: demonstrate the skills for performing literature survey, identify gaps, analyze the technical content and prepare a well-documented seminar report

CO3: create informative PPT and demonstrate communication skills through effective oral presentation showing knowledge on the subject & sensitivity towards social impact of the seminar topic

CO4: write a "seminar paper" in scientific journal style & format from the prepared seminar report

Course Articulation Matrix (CAM): U18EC510 SEMINAR

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC510.1	1	1	-	1	1	-	1	2	2	2	1	2	-	2
CO2	U18EC510.2	1	1	-	-	-	-	-	2	2	2	-	2	1	2
CO3	U18EC510.3	-	-	-	-	-	-	1	2	2	2	-	2	2	2
CO4	U18 **EC**510.4	-	-	-	-	-	-	-	2	2	2	-	2	-	1
U18EC510		**1**	**1**	**-**	**1**	**1**	**-**	**1**	**2**	**2**	**2**	**1**	**2**	**1.5**	**1.75**

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL – 15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTION & EVALUATION

URR18-R22

VI SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAM

[5Th+3P+2MC]

Sl. No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	HSMC	U18TP601	Quantitative Aptitude & Logical Reasoning	2	-	-	1	10	30	40	60	100
2	PE	U18EC603	Professional Elective -II / MOOCs-II	3	-	-	3	10	30	40	60	100
3	PCC	U18EC604	Digital Signal Processing and Applications	3	-	-	3	10	30	40	60	100
4	PCC	U18EC605	VLSI Circuits and Systems	3	-	-	3	10	30	40	60	100
5	PCC	U18EC606	Embedded Systems with ARM Processor and Applications	3	-	-	3	10	30	40	60	100
6	ESC	U18CS611	Advanced Data Structures	3	-	-	3	10	30	40	60	100
7	PCC	U18EC608	Digital Signal Processing Laboratory	-	-	2	1	40	-	40	60	100
8	ESC	U18CS612	Advanced Data Structures laboratory	-	-	2	1	40	-	40	60	100
9	PROJ	U18EC610	Mini Project	-	-	2	1	100	-	100	-	100
10	PCC	U18EC613	Microprocessor and Embedded Systems laboratory	-	-	2	1	40	-	40	60	100
			Total:	**17**	**-**	**8**	**20**	**280**	**180**	**460**	**540**	**1000**

L= Lecture, T = Tutorials, P = Practicals & C = Credits

U18CS611 & U18CS612 will be offered for the batch 2020-24, as per BoS-ECE order dated 16.05.2022
U18CS613 will be offered for the batch 2020-24, as per BoS-ECE order dated 16.05.2022

Professional Elective-II / MOOCs -II:
U18EC603A: Industrial Internet of Things
U18EC603B: Wireless Sensor Networks
U18EC603C: Biomedical Instrumentation
U18EC603M: MOOC Course

Contact hours per week : 25
Total Credits : 20

U18TP601 QUANTITATIVE APTITUDE AND LOGICAL REASONING

Class: B.Tech VI -Semester **Branch**: Common to all branches

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: quantitative aptitude & problem solving skills

LO2: computing abstract quantitative information

LO3: application of basic mathematics skills & critical thinking to draw conclusions

LO4: evaluating the validity & possible biases in arguments presented in authentic contexts

UNIT - I (6)

Quantitative Aptitude-I: Number system, Averages, Percentages, Ratios & proportions, Time, Speed & distance, Time and work, Data interpretation

UNIT - II (6)

Quantitative Aptitude-II: Simple Interest, Compound Interest, Profit & loss, Ages, Permutations & Combinations, Probability

UNIT - III (6)

Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements

UNIT - IV (6)

Logical Reasoning-II: Data sufficiency, Logical Venn diagram, Syllogisms, Statement & Arguments, Statement & Assumptions, Direction sense test

Text Books:

[1] R S Agarwal, *Quantitative Aptitude for Competitive Examinations*, 3rd ed. New Delhi: S. Chand Publications, 2019. *(Chapters 1,6,7,8,10,11,12,15,17,21,22,30,31)*

[2] R S Agarwal, *A Modern Approach to Verbal and Non-Verbal Reasoning*, 3rd ed. New Delhi: S. Chand Publications, 2019. *(Chapters Section I: 1,3,4,5,6,8,16, Section II: 2,3)*

Reference Books:

[1] Dinesh Khattar, *Quantitative Aptitude for Competitive Examinations*, New Delhi: Pearson India, 2019.

[2] Nishit K Sinha, *Reasoning for Competitive Examinations*, New Delhi: Pearson India, 2019.

[3] R.N.Thakur , *General Intelligence and Reasoning*, New Delhi: McGraw Hill Education, 2017.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under

the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: solve arithmetic relationships and interpret data using mathematical models

CO2: compute abstract quantitative information

CO3: apply basic mathematics & critical thinking skills to draw conclusions and solve problems

CO4: evaluate the validity & possible biases in arguments presented in authentic contexts logically & sensibly

Course Articulation Matrix (CAM): U18TP601 QUANTITATIVE APTITUDE AND LOGICAL REASONING														
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	U18TP601.1	1	2	-	1	-	-	-	-	-	-	-	1	-	2
CO2	U18TP601.2	1	2	-	1	-	-	-	-	-	-	-	1	-	1
CO3	U18TP601.3	-	1	-	2	-	2	-	-	-	-	-	1	1	2
CO4	U18TP601.4	-	1	-	2	-	2	-	-	-	-	-	1	-	1
U18TP601		**1**	**1.5**	**-**	**1.5**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1.5**

U18EC603A INDUSTRIAL INTERNET OF THINGS

Class: B.Tech.VI-Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: logical design and network & communication aspects of IoT
LO2; IoT software application platforms and its protocols
LO3: IoT devices and its interfacing with Raspberry Pi
LO4: advance IoT device applications and IoT wireless network and devices

UNIT–I (9)

Basics of Internet of Things: Introduction to Internet of Things (IoT), Characteristics of IoT, Logical Design of IoT, Functional Blocks, Communication Models, Communication APIs, Deployment of Templates, IoT Enabling Technologies

Network & Communication aspects: IoT Levels & Deployment Templates, Software Defining Network, Network Functions, Virtualization

UNIT – II (9)

Design and Architecture: Design Methodology, IoT Project Architecture, Enabling agility, Attribute Driven Design, Python Data types, Modules, Protocols, Software Platforms: Open Source Platforms, IBM Watson Lo, Middleware, Principles: Sensing and Sensors, Medium Access Control Protocols, Routing and Data Gathering, Domain Specific IoT's: Home Automation, Industrial Automation, Building Smart Cities

UNIT – III (9)

Building Blocks of IoT Devices: IoT devices, Raspberry Pi, Raspberry Pi interfaces: Programming Raspberry Pi with C/C++/ Python, Controlling LED, Interfacing Sensors, Inter-Integrated Circuits, Serial Peripheral Interface, Analog Temperature Sensor, Programming & Debugging with Keil MDK, IoT Interfacing - Actuators, Connecting Raspberry Pi to IoT cloud Platform

UNIT – IV (9)

Advance IoT Device Applications: ARM architecture overview, STM32 ARM Cortex M4 controllers and interfacing using communication Protocols, Data exchange Protocol: Hypertext Transfer Protocols, Message Queuing Telemetry Transport, Constrained Application Protocols and APL's, IoT Wireless Network and Device: Wi-Fi, Bluetooth, SubGHz, LoRa, ZigBee, IoT Gateways, IoT Edge Computing, IoT Fog Computing

Text Books:

[1] Arshdeep Bahga and Vijay Madisetti, *Internet of Things - Hands - On Approach,* New Delhi: University Press, 2006. (*Chapters 1,2,3,5,6,7,9,10,11*)

Reference Books:

[1] Srinivasa K.G, Siddesh G.M and Hanmantha Raju R, *Internet of Things*, New Delhi: Cengage Learning India, 2018

[2] David Etter, *IoT (Internet of Things) Programming -A Simple and fast way of learning, 2016*

Additional Resources:

[1] Datasheet –STMicroelectronics: STM32F401xB STM32F401xC
https://www.st.com/resource/en/datasheet/stm32f401cb.pdf.

[2] Material/Material Prepared by ECE Department – Lecture Notes, PPTs, Videos and Practice Sessions (*Audio-visual material for use in the practice sessions*)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: examine the various categories of IoT enabling technologies

CO2: design IoT based solutions for home automation, industrial applications and building smart cities

CO3: implement basic IoT applications on embedded platform using C/C++/Python

CO4: build and control IoT applications using advanced IoT devices

Course Articulation Matrix (CAM): U18EC603A INDUSTRIALINTERNET OF THINGS														
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18EC603A.1	1	-	1	-	-	1	1	--	--	--	--	--	1	1
CO2	U18EC603A.2	-	-	2	-	-	2	2	--	--	--	--	--	1	1
CO3	U18EC603A.3	2	2	2	-	-	1	1	--	--	--	--	--	1	1
CO4	U18EC603A.4	1	1	2	-	-	2	2	--	--	--	--	--	1	1
U18EC603A		**1.33**	**1.5**	**1.75**	**-**	**-**	**1.5**	**1.5**	**--**	**--**	**--**	**--**	**--**	**1**	**1**

U18EC603B WIRELESS SENSOR NETWORKS

Class:B.Tech .VI – Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: wireless sensor networks, its challenges & applications

LO2: different types of Medium Access Control (MAC) protocols in WSNs

LO3: routing & transport protocols in Wireless Sensor Networks (WSNs)

LO4: performance metrics & security issues in WSNs

UNIT–I (9)

Introduction to Wireless Sensor Networks: Background, Components of wireless sensor node, Classification of sensor networks, characteristics of wireless sensor networks, Challenges of wireless sensor networks, Comparison between wireless sensor networks and wireless mesh networks, Limitations in wireless sensor networks, Applications: Environmental, Health care, manufacturing process control, Intelligent and smart home, homeland security, underwater, Agriculture and military.

UNIT – II (9)

Medium Access Control in wireless sensor networks: S-MAC, L-MAC, Dynamic scheduling MAC protocol, Energy efficient QoS aware medium access (Q-MAC) protocol, Energy efficient application aware medium access protocol, Local aware access control protocol, An Energy efficient MAC approach for mobile wireless sensor networks, O-MAC, P-MAC, T-MAC and BMAC protocol, MAC issues in wireless sensor networks.

UNIT – III (9)

Routing in wireless sensor networks: Fundamentals of routing and challenges in WSNs, Network architecture based routing protocols for wireless sensor networks, Multi-hop flat routing, Hierarchical/cluster based routing schemes, Location based routing schemes, WSN routing protocols based on the nature of operation, Query based routing approach, Multipath routing schemes, Coherent and non-coherent processing, QoS based routing schemes, Negotiation based routing schemes

Transport protocols for Wireless sensor networks: Transport protocol requirements for WSNs, Internet transport protocols and their suitably for use in WSNs, Existing transport protocols for WSNs, Classification, Congestion flow control-centric protocols, Reliability centric protocols, Other protocols

UNIT – IV (9)

Performance evaluation of wireless sensor networks: Background information, Wireless sensor networks modelling, Simulation models, Modelling the behaviour of sensors and sensor networks-self organization, Cooperative algorithms, security mechanisms, Energy-aware requirements; Simulation tools for wireless networks, Performance metrics, Fundamental models-Traffic and Energy model

Security issues in wireless sensor networks: Background, Limitations in WSNs, Security requirements in WSNs, Vulnerabilities and attacks specific to WSNs, Physical attacks on WSNs, Recent security issues in WSNs, Secure protocols for WSNs- SPINS, TinySec, LEAP, Denial of Service (DoS) in WSNs and related defences.

Text Books:

[1] Mohammad S. Obaidat and SudipMisra, *Principles of Wireless Sensor Networks*, United Kingdom: Cambridge press, 2014. *(Chapters 1, 3, 4, 5, 6, 9, 10)*

[2] Waltenegus Dargie and Christian Poellabauer, *Fundamentals of Wireless Sensor Networks: Theory and Practice,* United Kingdom (London), John Wiley & sons, 2010. *(Chapters 1, 6, 7, 11)*

References Books:

[1] Ian F. Akyildiz, Mehmet Can Vuran, *Wireless Sensor Networks*, John Wiley& sons, 2010.

[2] C. S. Raghavendra, Krishna, M. Sivalingam, *Wireless Sensor Networks*, Springer, 2010.

[3] Kazem Sohraby, Daniel Minoli, & Taieb Znati, *Wireless Sensor Networks- Technology, Protocols, and Applications*, John Wiley & sons, 2007.

[4] Feng Zhao & Leonidas J. Guibas, *Wireless Sensor Networks- An Information Processing Approach*, Elsevier, 2007.

[5] S Anandamurugan, *Wireless Sensor Networks-Research Monograph*, Lakshmi Publications, 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: elaborate the applications of WSNs for healthcare, weather monitoring, smart home & security, under water, agriculture & military applications.

CO2: discuss different types of MAC protocols of WSNs

CO3: identify different routing protocols &transport protocols for WSNs

CO4: determine the performance metrics and discuss security issues of WSNs

Course Articulation Matrix (CAM):U18EC603B: WIRELESS SENSOR NETWORKS														
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	U18EC603B.1	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CO2	U18EC603B.2	2	1	1	1	-	-	-	-	-	-	-	1	1	2
CO3	U18EC603B.3	2	1	1	1	-	-	-	-	-	-	-	1	1	2
CO4	U18EC603B.4	2	1	1	-	-	-	-	-	-	-	-	1	1	2
U18EC603B		2	1	1	1	**-**	**-**	**-**	**-**	**-**	**-**	-	**1**	**1**	2

U18EC603C BIOMEDICAL INSTRUMENTATION

Class: B.Tech.VI – Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: medical instrumentation system and origin of bio-potentials

LO2: recording and analysis of ECG& EEG waveforms

LO3: bioelectric amplifiers and measurement of blood flow& pressure

LO4: respiratory instruments and electrical safety in the medical environment

UNIT - I (9)

Introduction: The human body overview; Generalized medical instrumentation system, Medical measurement constraints

Origin of Bio-Potentials: Electrical activity of cells, volume conductor fields, Functional organization of the peripheral nervous system, Electroneurogram (ENG), Electromyogram (EMG), Electroretinogram (ERG), Electrodes for biophysical sensing surface electrodes, Micro electrodes

UNIT- II (9)

Electrocardiography: Physiology of heart and circulatory system, Electro conduction system of the heart, ECG waveform, Standard lead system, Block diagram of electrocardiograph, ECG preamplifier, Problems frequently encountered in ECG design, Common mode and other interference reduction circuits, Abnormal ECG waveforms

Electroencephalography: Anatomy and function of brain, EEG 10-20 electrode system, EEG amplitude and frequency bands, EEG recording modes, EEG diagnostic uses and sleep patterns.

UNIT - III (9)

Bio-Electric amplifiers: Isolation amplifier need, Types; Chopper stabilized Amplifier and Physiological signals input guarding

Blood pressure measurement: Spygmomanometry, Ultrasonic method, Oscillometric method, Direct methods, Systolic, Diastolic and Mean detector circuits, Practical problems in pressure monitoring

Blood flow measurement: Cardiac output measurement using dilution methods, Electromagnetic flow meter, Ultrasonic flow meter, Plethysmography.

UNIT - IV (9)

Respiratory measurements: Mechanics of breathing, Respiratory system measurements, Impedance pneumograph, Spirometer, Pulse oximetry, Blood glucose sensors.

Electrical safety: Physiological effects of electricity, Macro shock hazards, Micro shock hazards, Protection in Distribution and Equipment

Text Books:

[1] John G. Webster, *Medical Instrumentation: Application and Design,* 3rd ed. New Delhi: Wiley India (P) Ltd., 2008. *(Chapters 1,4,5,6,7,8,9,14)*

[2] Joseph J. Carr and John M. Brown, *Introduction to Biomedical Equipment Technology*, 4th ed. New Delhi: Pearson Education India, 2000. *(Chapters1,2,6,7,8,9,10,13)*

Reference Books:

[1] Leslie Cromwell, Fred J Weibell and Erich A Pfeiffer, *Biomedical Instrumentation and measurements,* 2nd ed., New Delhi: Prentice-Hall of India, 2014.

[2] Mandeep Singh, *Introduction to Biomedical Instrumentation*, New Delhi: Prentice-Hall of India, 2010.

[3] Raghbir Singh Khandpur, *Handbook of Biomedical Instrumentation,* 3rd ed. New Delhi: McGraw Hill Education (India), 2014.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: discuss the origin of bio-potentials and choose suitable bio-potential electrodes

CO2: distinguish signal characteristics of ECG & EEG s and identify the frequently encountered problems in design of ECG recorders

CO3: analyze the operation of bioelectric amplifiers, and contrast measurement principles for blood flow, pressure and volume

CO4: judge patient safety issues related to biomedical instrumentation and outline the design of pneumograph, spirometer & pulse oximeter

Course Articulation Matrix (CAM):U18EC603C BIOMEDICAL INSTRUMENTATION

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	U18EC603C.1	2	1	1	-	-	-	-	-	-	-	-	1	2	2
CO2	U18EC603C.2	2	1	2	-	-	-	-	-	-	-	-	1	2	2
CO3	U18EC603C.3	2	1	2	-	-	-	-	-	-	-	-	1	2	2
CO4	U18EC603C.4	2	1	2	-	-	-	-	-	-	-	-	1	2	2
U18EC603C		**2**	**1**	**1.75**	**-**	**-**	-	-	-	-	-	-	**1**	**2**	**2**

U18EC604 DIGITAL SIGNAL PROCESSING AND APPLICATIONS

Class: B.Tech. VI-Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on/in…

LO1: computation of discrete Fourier transform (DFT), computational complexity of DFT & efficient implementation of DFT using fast Fourier transform (FFT)

LO2: characteristics of frequency selective filters & design of linear-phase FIR filters

LO3: design of analog Butterworth & Chebyshev filters, converting analog filter into equivalent digital filter using different mapping techniques

LO4: correlation, basic theory of adaptive signal processing & its applications

UNIT-I (9)

Discrete Fourier Transform (DFT): Frequency domain sampling and reconstruction of discrete-time signals, DFT, properties of DFT, Circular convolution, Inverse DFT (IDFT), Frequency analysis of signals using DFT, Relation between DFT, DTFT and Z-Transform, Discrete cosine transform (DCT)

Fast Fourier Transform (FFT): Computational complexity of DFT, Introduction to FFT, Radix-2 FFT algorithms, Decimation-in-time FFT algorithm, Decimation-in-frequency FFT algorithm, Inverse DFT using FFT

UNIT-II (9)

Filter concepts: Causality and its implications, Paley-Wiener theorem, Magnitude characteristics of physically realizable filters, Phase delay, Group delay, Zero phase filter, Linear phase filters, Desirability of linear phase, Filter specifications

Finite Impulse Response (FIR) filters*:* Introduction to FIR filters, Inherent stability, Symmetric and anti-symmetric filters , Design of linear phase FIR filters - Windowing method (rectangular window, triangular window, hamming window & Hanning window) and frequency sampling method; Design of FIR differentiators, Design of Hilbert transformers

UNIT-III (9)

Infinite Impulse Response (IIR) Filters: Reliability of ideal filter, Introduction to IIR filters, Design of IIR digital filters from analog filter specifications, Mapping techniques - Impulse invariance and bilinear transformation; IIR digital filter design using Butterworth and Chebyshev approximations, Frequency transformations, Comparison of Butterworth and Chebyshev filters, Comparison of IIR & FIR filters

UNIT-IV (9)

Correlation: Correlation of discrete time signals, Auto correlation, Properties of auto correlation function, Cross correlation, Matrix form representation, Example problems for computation of correlation functions
Adaptive Filters: Concepts of adaptive filtering, configurations, Basic wiener filter theory, Cost function, Error performance surface, Basic LMS algorithm & its implementation, Practical limitations of basic LMS algorithm, RLS algorithm, Limitations of RLS algorithm

Applications of Adaptive filters: Fetal monitoring - Cancelling of maternal ECG during labour; Adaptive telephone echo cancellation

Text Book:

[1] John G. Proakis and D.G. Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, 4th ed., New Delhi: Pearson education, 2007. *(Chapters 1,2, 7, 8, 10)*

[2] Ifeachor, *Digital Signal Processing-A practical Approach*, 4th ed., New Delhi: Pearson Education India, 2013. *(Chapter 10)*

Reference Books:

[1] A. V. Oppenheim & R. W. Schafer, *Discrete-Time Signal Processing*, 2nd ed., PHI, 1999.

[2] Sanjit K. Mitra, *Digital Signal Processing – A Computer Based Approach*, 2nd ed., TMH, 2002.

[3] Johnny R. Johnson, *Introduction to Digital Signal Processing*, 1st ed., PHI, 2001.

[4] Adreas Antanio, *Digital filter Analysis and Design*, 4th ed., TMH, 1988.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

After completion of this course, students will be able to

CO1: solve problems on DFT of a DT sequence, circular convolution using DFT & IDFT, 2, 4 & 8-point FFT of a sequence using radix-2 DIT & DIF algorithms

CO2: design a linear-phase FIR filter with a prescribed magnitude response using windowing & frequency sampling methods

CO3: design an IIR Butterworth & Chebyshev digital filter meeting the required specifications by performing impulse invariance/bilinear transformation

CO4: analyze the performance of LMS & RLS algorithms for updating weight vectors and utilize adaptive filters for noise cancellation

Course Articulation Matrix (CAM): U18EC604 DIGITAL SIGNAL PROCESSING AND APPLICATIONS														
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	U18EC604.1	2	2	1	1	-	-	-	-	-	-	-	2	2	1
CO2	U18EC604.2	2	2	1	1	-	-	-	-	-	-	-	2	2	2
CO3	U18EC604.3	1	1	1	1	1	-	-	-	-	-	-	2	2	2
CO4	U18EC604.4	1	1	1	1	1	-	-	-	-	-	-	2	2	2
U18EC604		**1.5**	**1.5**	**1**	**1**	**1**	**-**		**-**	**-**	**-**	**-**	**2**	**2**	**1.75**

U18EC605 VLSI CIRCUITS AND SYSTEMS

Class: B.Tech.VI – Semester **Branch:** Electronics and Communication Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LOs):

This course will develop studentsn knowledge in/on…

LO1: fabrication process and electrical properties of MOS transistors
LO2: stick diagrams, design rules, layout diagrams and basic circuit concepts of MOS transistors
LO3: data path subsystems using structured design principles
LO4: basic concepts of Verilog and description of various levels of abstraction

UNIT–I (9)

Introduction to MOS Technology: Introduction to VLSI, Basic MOS transistor, Process steps in fabricating MOSFET, Fabrication process of nMOS, CMOS and BiCMOS transistors

Basic Electrical Properties of MOS Transistor: Drain to source current and voltage relation, Threshold voltage, Transconductance, Pass transistor, nMOS inverter, Pull up/Pull down ratios, Alternate forms of pull up, CMOS inverter, BiCMOS inverter, Latch-up in CMOS circuits

UNIT – II (9)

MOS Circuit Design Processes: MOS layers, Stick diagrams - nMOS design style and CMOS design style, Lambda based design rules and Layout diagrams

Basic Circuit Concepts: Sheet resistance, Area capacitances of layers, Delay unit, Inverter delays, Rise time and Fall time estimation

UNIT – III (9)

Data path Subsystems: Introduction, Addition/Subtraction, One/Zero Detectors, Comparators, Counters, Boolean logical operations, Coding, Shifters, Multiplication, Division and Parallel-prefix computations

Subsystem Design and Layout: Architectural Issues, Switch Logic, Gate Logic, Examples of Structured Design, Clocked Sequential Circuits and System Considerations

UNIT – IV (9)

Verilog HDL: Hierarchical Modeling Concepts, Basic concepts - Data types, Modules and ports, Gate level modeling, Dataflow modeling, Behavioral modeling, Design examples of Combinational and Sequential circuits, Switch level modeling, Tasks and Functions

Text Books:

[1] Neil H. E. Weste, David Harris and Ayan Banerjee, *CMOS VLSI Design – A Circuits and Systems Perspective*, 3rd ed., New Delhi: Pearson Education, 2005. (Chapters 1 to 4, 8,9)

[2] Douglas A Pucknell and Kamran Eshraghian, *Basic VLSI Design*, 3rd ed., New Delhi: PHI, 2008. (Chapters 1 to 6)

[3] Samir Palnitkar, Peter Flake, *Verilog HDL –Guide to Digital Design and Synthesis*, Pearson Education,3rd Edition, 2003. (PART-I: Chapters 2 to 8)

Reference Books:

[1] John P Uyemura, *Chip Design for Submicron VLSI: CMOS Layout and Simulation*, 2nd ed., Thomson /Nelson, 2010

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: discuss the concepts of oxidation, photolithography & deposition techniques used in the fabrication process and assess the basic electrical properties of MOS transistors

CO2: construct the stick diagrams & mask layouts using design rules and estimate the sheet resistance, area capacitances of layers & time delays of MOS transistors

CO3: build the data path subsystems using structured design principles

CO4: develop Verilog programs for digital circuits using behavioral, dataflow, gate and switch levels of abstraction

Course Articulation Matrix (CAM):U18EC605 VLSI CIRCUITS AND SYSTEMS															
CO		**PO1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1	U18EC605.1	2	2	1	1	--	1	1	1	1	1		1	2	2
CO2	U18EC605.2	2	2	1	1	--	1	1	1	1	1		1	2	2
CO3	U18EC605.3	2	2	1	1	--	1	1	1	1	1		1	2	2
CO4	U18EC605.4	2	1	1	1	1	1	1	1	1	1		1	2	2
U18EC605		**2**	**1.75**	1	1	1	1	1	1	1	1		**1**	**2**	**2**

U18EC606 EMBEDDED SYSTEMS WITH ARM PROCESSOR AND APPLICATIONS

Class: B.Tech.VI-Semester **Branch:** Electronics and Communication Engineering (ECE)

TeachingScheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students‟ knowledge in /on

LO1: structure of embedded systems and ARM controllers

LO2: instruction set and assembly language programming of ARM processor

LO3: ARM7 based microcontrollers, interfacing and programming

LO4: memory management in ARM

UNIT-I (9)

ARM Embedded Systems: Overview of Embedded System, Processor Embedded into a System, Classification of embedded systems. Embedded system hardware, embedded system software, the Acorn RISC Machine, RISC Design philosophy, ARM Design Philosophy, ARM processor families, Core extensions, Architecture revisions.

The ARM Architecture and Programmers Model: ARM Core data flow model, Architectural inheritance, The ARM7TDMI programmer's model: registers, CPSR, SPSR, The memory system, Pipeline, Exceptions, Interrupts and the vector table, load and store architecture, ARM development tools.

UNIT-II (9)

ARM Instruction set: Data processing instructions, Branch instructions, Load and store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution Thumb instruction set: Thumb Register usage, Thumb Register Usage, ARM-Thumb Interworking and other Branch Instructions. Data Processing Instructions, Single-Register Load-Store Instructions, Multiple-Register Load- Store Instructions, Stack Instructions, Software Interrupt Instructions; advantage of thumb instructions, assembler rules and directives, Assembly language programs for shifting of data, factorial calculation, swapping register contents.

UNIT-III (9)

ARM7 Based Microcontroller LPC2148: Features, Applications, Block Diagram, memory mapping, Functional features of Interrupt controller, RTC, USB, UART, I2C, SPI, SSP controllers, watchdog timers and other system control units; Peripherals: Pin Connect Block- Features, Register description with example. GPIO-Features, Applications, Pin description, Register description with examples PLL-Features, block diagram, bit structure of PLLCON, PLLCFG, & PLLSTAT, and PLLFEED. PLL frequency Calculation- procedure for determining PLL settings, examples for PLL Configuration Timers-Features, applications, Architecture of timer module, register description.

Programming of LPC2148: C programs for General purpose I/O, interfacing with LED, LCD, KEYPAD, general purpose timer, PWM Modulator, UART, I2C Interface, SPI Interface, ADC, DAC.

UNIT-IV(9)

Memory management units: Moving from memory protection unit (MPU) to memory management unit (MMU), Working of virtual memory, Multitasking, Memory organization in virtual memory system, Page tables, Translation look aside buffer, Caches and write buffer, Fast context switch extension, Advanced Microprocessor Bus Architecture (AMBA) Bus System, User peripherals, Exception's handling in ARM. CORTEX A8 ARM Processor based Beagle Bone: Beagle Bone Black Overview, Beagle Bone Black High Level Specification; Sitara AM3358BZCZ100 Processor.

Text Books:

[1] Sloss, Andrew, Dominic Symes, and Chris Wright. ARM system developer's guide: designing and optimizing system software. Elsevier,2004.

[2] LPC2148 User manual

[3] BeagleBone Black System Reference Manual

Reference Books:

[1] Rajkamal, "Embedded Systems: Architecture, Programming and Design", TMH Publications, Second Edition,2008.

[2] Furber, Stephen Bo. ARM system-on-chip architecture, New Delhi: Pearson Education,2000.

[3] Mazidi, Muhammad Ali, et al. ARM Assembly Language Programming & Architecture (Volume 1). MicroDigital Ed. com,2016.

[4] Das, Lyla B. Embedded Systems: An Integrated Approach. Pearson Education India,2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

After completion of this course, the students will be able to…

CO1: examine the structure of embedded systems and ARM controllers
CO2: utilize the Instruction set for assembly language programming of ARM
CO3: develop interfacing of various components/devices with ARM7 based microcontrollers
CO4: classify the memory management units in ARM

Course Articulation Matrix (CAM): U18EC606 EMBEDDED SYSTEMS WITH ARM PROCESSOR AND APPLICATIONS

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18EC606.1	2	2	1	2	2	-	-	-	-	-	1	2	1	2
CO2	U18EC606.2	2	2	2	2	2	-	-	-	-	-	1	1	1	2
CO3	U18EC606.3	2	2	2	2	2	-	-	-	-	-	1	2	1	2
CO4	U18EC606.4	2	2	2	2	2	-	-	-	-	-	1	1	2	2
U18EC606		**2**	**2**	**1.75**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1.5**	**1.25**	**2**

U18CS611 ADVANCED DATA STRUCTURES

Class: B. Tech VI-Semester

Branch: Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1: organizing and retrieving the data using binary tree, binary search trees.
LO2: organizing and retrieving the data using AVL trees, B-Trees, Red black trees and Splay trees.
LO3: organizing and retrieving the data using Interval tree, Hash tree, Tries, sorting and searching.
LO4: organizing and retrieving the data using graphs and spanning trees.

UNIT – I (9)

Trees: Introduction, types of trees.
Binary Tree: Creating a binary tree, traversing a binary tree: preorder, inorder, postorder and spiral order recursive traversals.
Binary Search Tree: Operations- Insertion, deletion, search, recursive and non-recursive traversal. Threaded binary trees.

UNIT – II (9)

AVL Trees: AVL trees operations– Insertion, Deletion and Traversal.
Multiway Search Trees: Introduction to m-way search trees. Operations on B-Trees- Insertion, deletion, search. B+-trees.
Red-Black Trees: Properties, operations, applications. splay trees.

UNIT - III (9)

Interval Tree, Hash tree.
Tries: Trie structure. Operations on Tries, Applications of Tree indexing.
Searching and Internal Sorting: Fibonacci search, quick sort, merge sort, heap sort, bitonic generator sort; time complexities of above searching and sorting techniques.

UNIT – IV (9)

Graphs: Introduction, graph terminology, representation of graphs.
Application of Graph Structures: Topological sorting. Minimum Spanning Trees**:** Prim's algorithm, Kruskal's algorithm. Graphs traversal methods- breadth first search, depth first search. Kosaraju's algorithm.
String manipulations, String compression -Run Length Encoding.
String Matching Algorithms-Naive Algorithm, (Knuth Morris Pratt) Algorithm, Boyer Moore Algorithm, Rabin Karp Algorithm.

Text Books:

[1] Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009. (*Chapters 3 to 8*)

Reference Books:

[1] Reema Thareja, *Data Structures Using C,* 2nd ed., New Delhi: Oxford University Press, 2014.

[2] E Balagurusamy, *Data Structure Using C,* 1st ed., New Delhi: McGraw Hill Education, 2017.

[3] Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudo code Approach with C*, 2nd ed., New Delhi: Cengage Learning 2007.

Course Research Paper (CRP): Research papers (Indexed journal/conference papers) relevant to the course content by the course faculty in Course Web page. Students have to write a two page summary on CRP and submit as part of special assignment.

Course Patent (CP): Patents relevant to the course content will be posted by the course faculty in Course Web page. Students have to write a two page summary on CP and submit as part of special assignment.

Course Projects: Course project is an independent project carried out by the student during the course period, the supervision of course faculty. Course faculty will post few course projects titles in Course Webpage. Students are encouraged to come up and experiment with the ideas that interest them

Course Learning Outcomes (COs):

On completion of this course, students' will be able to

CO1: develop programs using binary trees, binary search trees to optimize database queries.

CO2: utilize balanced search trees such as B-trees, B+-trees, Red black and Splay trees in solving the problems on Database management.

CO3: organize and retrieve the data using Interval tree, Hash tree, Tries, sorting and searching in solving the problems like auto-complete.

CO4: organize and retrieve the data using Graphs and different types of spanning trees used for GPS navigation.

Course Articulation Matrix (CAM): U18CS611 ADVANCED DATA STRUCTURES

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS611.1	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO2	U18CS611.2	2	2	2	2	1	1	-	1	1	1	-	1	2	2	2
CO3	U18CS611.3	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
CO4	U18CS611.4	2	2	2	2	1	1	-	1	1	1	-	2	2	2	2
U18CS611		2	2	2	2	1	1	-	1	1	1	-	1.5	2	2	2

U18EC608 DIGITAL SIGNAL PROCESSING LABORATORY

Class: B.Tech. VI-Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This laboratory course will develop students' knowledge in/on

LO1: MATLAB Programming
LO2: implementation of DFT& FFT algorithms
LO3: implementation of Digital Filters
LO4: DSP starter kits

LIST OF EXPERIMENTS

A. Write a MATLAB Program to

1. Generate - Unit step, Ramp, Impulse, Exponential and Sinusoidal Signals. And
   a. Perform mathematical operations on signals.
   b. Perform scaling, shifting and delay operations on the sequences.
2. Perform the following Modulation techniques
   a. AMDSB and AMDSB-SC b. FM.
3. Perform the Correlation and Convolution of two sequences.
4. Compute DFT and 4-pt FFT. (with and without using the command 'fft')
5. Observe the spectrum of a given signal.
6. Perform decimation and sampling rate conversions.
7. Study the given system. (impulse response, poles and zeros, frequency response and linear phase characteristics)
8. Design all types of Butterworth IIR Filters to meet the given specifications.
9. Design all types of Chebyshev IIR filters to meet the given specifications.
10. Study the types of FIR filters.
11. Design FIR Filters using windows.

B. MATLAB_Simulink & DSK6711

12. Implement convolution and FFT algorithms on Digital Signal Processor(DSK 6711) board using Code Composer Studio (CCS)
13. Perform mathematical operations on signals and real time Audio Filtering on DSK 6711using MATLAB Simulink and CCS

C. Real time applications

14. Real time case studies and applications

Laboratory Manual:

[1] *Laboratory Manual for Digital Signal Processing Laboratory*, prepared by the department of ECE

Text Books:

[1] Rudra Pratap, *Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers*, Oxford University Press, 2002.

[2] Ifeachor, *Digital Signal Processing-A practical Approach*, 2/E, Pearson Education. India, 01-Sep-2002.

[3] Proakis, *Digital Signal Processing using MATLAB*, Cangage Learning, 3/E

Course Learning Outcomes(Cos):

On completion of this laboratory course, students' will be able to

CO1: examine various operations & signals using MATLAB
CO2: estimate spectral information from a signal using DFT/FFT in MATLAB
CO3: design FIR, IIR filter in MATLAB with required specifications and infer designing complications
CO4: build MATLAB Simulink models on DSK boards

Course Articulation Matrix (CAM): U18EC608 DIGITAL SIGNAL PROCESSING LABORATORY

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC608.1	2	2	1	2	2	-	-	-	-	-	1	2	1	2
CO2	U18EC608.2	2	2	2	2	2	-	-	-	-	-	1	1	1	2
CO3	U18EC608.3	2	2	2	2	2	-	-	-	-	-	1	2	1	2
CO4	U18EC608.4	2	2	2	2	2	-	-	-	-	-	1	1	2	2
U18EC608		**2**	**2**	**1.75**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1.5**	**1..25**	**2**

U18CS612 ADVANCED DATA STRUCTURES LABORATORY

Class: B. Tech VI-Semester

Branch: Common to all branches

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1: organizing and retrieving the data using binary tree, binary search trees
LO2: organizing and retrieving the data using AVL trees, B-Trees, Red black trees and Splay trees.
LO3: organizing and retrieving the data using Interval tree, Hash tree, Tries, sorting and searching.
LO4: organizing and retrieving the data using graphs and spanning trees

List of Experiments

Experiment-I

1. Program to perform following binary tree operations.
   i) creation ii) insertion of a node iii) traversal using recursion.

Experiment-II

2. Program to perform following binary search tree operations.
   i) creation ii) deletion of a node iii) traversal using recursion.

Experiment III

3. Program to perform following binary search tree traversal operations without recursion.
   i) Inorder ii) Preorder iii) Postorder iv) Spiral order

Experiment-IV

4. Program to implement AVL tree construction.

Experiment-V

5. Program to implement B-tree construction.

Experiment-VI

6. Program to implement search and insert operations on Trie.
7. Program to implement Fibonacci search.

Experiment-VII

8. Program to implement Quick sort.
9. Program to implement Merge sort.

Experiment-VIII

10. Program to implement heap sort.
11. Program to implement Bitonic generator sort.

Experiment-IX

12. Program to implement Topological sort.
13. Program to implement the following graph traversal techniques.
14. a) Prim's algorithm b) Kruskal's algorithm

Experiment-X

15. Program to implement the following graph traversal techniques.
    a) Depth first search b) Breadth first search.

16. Program to implement Kosaraju's algorithm.

Experiment-XI

17. Program to implement Naive Algorithm.

18. Program to implement Knuth - Morris - Pratt (KMP) Algorithm ,

Experiment-XII

19. Program to implement Boyer Moore Algorithm

20. Program to implement Rabin Karp Algorithm:

Laboratory Manual:

1. 'Advanced Data Structures' laboratory manual, *prepared by faculty of Dept. of Computer Science &Engineering.*

Reference Books:

[1] Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009.
[2] Reema Thareja, *Data Structures Using C,* 2nd ed., New Delhi: Oxford University Press, 2014
[3] E Balagurusamy, "Data Structure Using C", *McGraw Hill Education*, 1st Edn., ISBN-13: 978-125-902-9547, 2017.

Course Learning Outcomes(COs):

Upon completion of this course, students will be able to

CO1: develop programs using binary trees, binary search trees.
CO2: utilize balanced search trees such as B-trees, B+-trees, Red black and Splay trees in solving the problems.
CO3: organize and retrieve the data using Interval tree, Hash tree, Tries , sorting and searching .
CO4: organize and retrieve the data using Graphs and different types of spanning trees.

Mapping of the Course Learning Outcomes with Program Outcomes:

U18CS612 ADVANCED DATA STRUCTURES LABORATORY																
Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	U18CS612.1	1	1	3	1	1	1	1	1	1	1	0	2	1	1	3
CO2	U18CS612.2	1	1	2	2	1	1	1	1	-	1	-	2	1	1	2
CO3	U18CS612.3	1	1	3	3	2	1	1	1	-	1	-	3	1	1	3
CO4	U18CS612.4	1	1	3	2	3	2	2	2	-	2	-	3	1	1	3
U18CS612		2	1	1	2.75	2	1.75	1.25	1.25	1.25	1	1.25	0	2.5	1	1

U18EC610 MINI PROJECT

Class: B.Tech. VI - Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: implementing a project independently by applying knowledge to practice
LO2: literature review and well-documented report writing
LO3: creating PPTs and effective technical presentation skills
LO4: writing technical paper in scientific journal style & format and creating video pitch

Student has to take up independent mini project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

4. The HoD shall constitute a *Department Mini Project Evaluation Committee (DMPEC)*
5. DMPEC shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective mini project oral presentation
6. There shall be only Continuous Internal Evaluation (CIE) for mini project
7. The CIE for seminar is as follows:

Assessment	Weightage
Mini Project Supervisor Assessment	20%
Working model / process / software package / system developed	20%
Mini Project report	20%
Mini Project paper	10%
Video pitch	10%
DMPEC Assessment: *Oral presentation with PPT and viva-voce*	20%
Total Weightage:	100%

Note: It is mandatory for the student to appear for oral presentation and viva-voce to qualify for course evaluation

(g) **Mini Project Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals / Technical Magazines on the topics of potential interest

(h) **Working Model**: Each student is requested to develop a working model / process / system on the chosen work and demonstrate before the *DMPEC* as per the dates specified by *DMPEC*

(i) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DMPEC*

(j) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(k) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *DMPEC* as per the schedule notified by the department

(l) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her mini project. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his / her business idea / plan (*if any*) and social impact

(m) The student has to register for the Mini project as supplementary examination in the following cases:
   iv) he/she is absent for oral presentation and viva-voce
   v) he/she fails to submit the report in prescribed format
   vi) he/she fails to fulfill the requirements of Mini project evaluation as per specified guidelines

(n) i) The CoE shall send a list of students registered for supplementary to the HoD concerned
   ii) The DSEC, duly constituted by the HoD, shall conduct Mini project evaluation and send the award list to the CoE within the stipulated time

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: apply knowledge to practice to design & conduct experiments and utilize modern tools for developing working models / process / system leading to innovation & entrepreneurship

CO2: demonstrate the competencies to perform literature survey, identify gaps, analyze the problem and prepare a well-documented Mini project report

CO3: make an effective oral presentation through informative PPTs, showing knowledge on the subject & sensitivity towards social impact of the Mini project

CO4: write a "Mini project paper" in scientific journal style & format from the prepared Mini project report and create a video pitch on Mini project

Course Articulation Matrix (CAM): U18EC609 MINI PROJECT

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18EC610.1	1	1	2	2	1	1	1	2	2	2	1	2	2	-
CO2	U18EC610.2	1	1	-	2	-	-	-	2	2	2	-	2	1	2
CO3	U18EC610.3	-	-	-	-	-	-	1	2	2	2	-	2	2	2
CO4	U18EC610.4	-	-	-	-	-	-	-	2	2	2	-	2	-	1
U18EC610		**1**	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1.66**	**1.66**

U18EC613 MICROPROCESSORS AND EMBEDDED SYSTEMS LABORATORY

Class: B.Tech. VI - Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on/in…

LO1: microprocessor/microcontroller-based computer systems and integrated development environments (IDEs) used for system development

LO2: implementation of simple arithmetic, logical & data processing algorithms using assembly language programs (ALPs) for 8086 and ALPs for 8051

LO3: ARM based assembly language programs (ALPs for arithmetic, logical & data processing operations

LO4: Embedded C Programs for interfacing data converters,PWM and motors with LPC2148 microcontroller

LIST OF EXPERIMENTS

1. 8086 based ALPs (Assembly language programs) for simple Arithmetic operations (Addition, Subtraction, Multiplication and Division) on Single and Double Precision data
2. ALPs for String manipulation
3. To sort given series of bytes in ascending/descending order
4. Code Conversion Programs
   i) BCD to Binary
   ii) Binary to BCD
5. 8051 based ALPs for
   a. Finding Largest / Smallest Number
   b. Arranging in Ascending/ Descending order
6. Study of ARM evaluation system
7. ARM based ALPs (Assembly language programs) for simple Arithmetic operations (Addition, Subtraction, Multiplication and Division)
8. Flashing of LEDS.
9. Interfacing LED and PWM
10. Interfacing ADC and DAC
11. Interfacing stepper motor and temperature sensor
12. Interfacing keyboard and LCD

Laboratory Manual:

[1.] *Microprocessors And Embedded Systems Laboratory,* Department of ECE, KITSW.

Text Books:

[1.] D.V.Hall, *Microprocessors & Interfacing,* 3rd ed.,New Delhi:Tata McGraw Hill, 2012.

[2.] Manish K Patel, The 8051 Microcontroller Based Embedded Systems, New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2014.

[3.] LP 2148 User manual

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: utilize development boards and integrated development environments (IDEs) for implementation of ALPs for 8086MP8051MC

CO2: develop arithmetic, logical & data processing algorithms using assembly language programs (ALPs) for 8086 and8051ALPs& embedded C programs (ECPs) for LPC2148

CO2: develop ECPs for interfacing input output devices with LPC2148MC

CO3: develop ALPs & ECPs for interfacing data converters & motors with LPC2148MC

Course Articulation Matrix (CAM): U18EC613 MICROPROCESSORS AND EMBEDDED SYSTEMS LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC613	2	2	1	1	1	-	-	1	1	1	-	1	1	2
CO2	U18EC613	2	2	2	1	1	-	-	1	1	1	-	1	1	1
CO3	U18EC613	2	2	2	1	1	-	-	1	1	1	-	1	2	2
CO4	U18EC613	2	2	2	1	1	-	-	1	1	1	-	1	1	2
U18EC613		**2**	**2**	**1.75**	**1**	**1**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**1.25**	**1.75**

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE:: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

URR18-R22

SCHEME OF INSTRUCTION & EVALUATION
VII SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAM

[4Th+2P+2MC]

Sl. No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE701	Open Elective- III	3	-	-	3	10	30	40	60	100
2	PE	U18EC702	Professional Elective - III /MOOCs-III	3	-	-	3	10	30	40	60	100
3	PE	U18EC703	Professional Elective - IV / MOOCs-IV	3	-	-	3	10	30	40	60	100
4	PCC	U18EC706	VLSI Lab	-	-	2	1	40	-	40	60	100
5	PROJ	U18EC707	Major Project Phase – I	-	-	6	3	100	-	100	-	100
6	MC	U18EC708	Internship Evaluation	-	-	2	-	100	-	100	-	100
7	PCC	U18EC709	Microwave and Optical Fiber Communication	3	-	-	3	10	30	40	60	100
8	PCC	U18EC710	Python Programming & IoT Lab	-	-	2	1	40	-	40	60	100
9	**HSMC**	**U18MH711**	**Management Economics & Accountancy**	**3**	**-**	**-**	**3**	**10**	**30**	**40**	**60**	**100**
			Total:	**12**	**-**	**12**	**17**	**320**	**120**	**440**	**360**	**800**

L= Lecture, T = Tutorials, P = Practicals & C = Credits

U18EC709 will be offered for the batch 2019-23 only, as per BoS-ECE order dated 16.05.2022
U18EC710 will be offered for the batch 2019-23 onwards, as per BoS-ECE order dated 16.05.2022
U18MH711 will be offered for the batch 2020-24 onwards, as per BoS-ECE order dated 16.05.2022

Open Elective-III:	**Professional Elective-III / MOOCs-III:**	**Professional Elective-IV / MOOCs-IV:**
U18OE701A: Disaster Management	U18EC702AR22: Data Science Engineering	U18EC703A: Electronic System Design and Manufacturing
U18OE701B: Project Management	U18EC702B: Real-Time Embedded Systems	U18EC703B: VLSI Physical Design
U18OE701C: Professional Ethics in Engineering	U18EC702D: Digital System Design	U18EC703C: Digital Image Processing
U18OE701D: Rural Technology and Community Development	U18EC702M: MOOC course	U18EC703M: MOOC course

Contact hours per week : 24
Total Credits : 17

U18OE701A DISASTER MANAGEMENT

Class:B.Tech. VII – Semester **Branch(s)**: Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40
End Semester Examination	60

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on

LO1: disaster types, its impacts & national policy on disaster management
LO2: prevention, preparedness and mitigation measures for different disasters, emergency support functions and relief camps
LO3: different types of vulnerability, macroeconomic, financial management of disaster and its related losses
LO4: disaster management for infrastructure, treatment of plants, geo spatial information inagriculture, multimedia technology in disaster risk management and training

UNIT – I (9)

Introduction & Principles of Disaster Management: Nature - development, hazards and disasters; natural disasters - earth quakes, floods, fire, landslides, cyclones, tsunamis, nuclear; chemical dimensions and typology of disasters - public health disasters, national policy on disaster management

UNIT –II (9)

Prevention Preparedness and Mitigation Measures: Prevention, preparedness & mitigation measures for various disasters, post disaster reliefs and logistics management, emergency support functions and their coordination mechanism, resources and material management, management of relief camp

UNIT– III (9)

Risk and Vulnerability: Building codes and land use planning, social vulnerability, environmental vulnerability, macroeconomic management and sustainable development, climate change, risk rendition, financial management of disaster and related losses

UNIT - IV (9)

Role of Technology in Disaster Management: Disaster management for infrastructures, taxonomy of infrastructure, treatment plants and process facilities, electrical sub stations, roads and bridges, geo spatial information in agriculture, drought assessment, multimedia technology in disaster risk management and training

Text Book:

[1] Rajib shah and R.R Krishnamurthy, *Disaster management – Global Challenges and local solutions,* Hyderabad: Universities Press (India) Pvt. Ltd., 2009.

Reference Book:

[1] SatishModh, *Introduction to Disaster management,* Bengaluru: Macmillan India Ltd., 2010.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1. *classify the disasters and discuss natural & non-natural disasters, their implications, the institutional & legal framework for national policy on disaster management in India*

CO2. *identify mitigation strategies, preparedness & prevention measures and prioritizes the rescue & relief operations to reduce the impact of a disaster*

CO3. *list the vulnerable groups in disaster; examine the concepts of macroeconomic & sustainability & impact of disaster on development*

CO4. discuss disaster management for infrastructure, utilize geospatial information in agriculture and apply multimedia technology for disaster risk management & training

Course Articulation Matrix (CAM): U18OE701A DISASTER MANAGEMENT

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE701A.1	-	-	-	-	-	2	2	1	-	-	1	1	-	-
CO2	U18OE701A.2	-	-	-	-	-	2	2	1	-	-	1	1	1	1
CO3	U18OE701A.3	-	-	-	-	-	2	2	1	-	-	1	1	-	-
CO4	U18OE701A.4	-	-	-	-	-	2	2	1	-	-	1	1	1	1
U18OE701A		**-**	**-**	-	-	-	**2**	**2**	**1**	**-**	**-**	**1**	**1**	**1**	1

U18OE701B PROJECT MANAGEMENT

Class: B.Tech. VII – Semester

Branch(s): Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40
End Semester Examination	60

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on…

LO1: role of project manager, organization and management functions

LO2: effective time &conflict management, ethics & professional responsibilities

LO3: project planning, scheduling and budgeting

LO4: *cost control, risk management and quality control techniques*

UNIT – I (9)

Project Management: Understanding project management, role of project manager, classification of projects, project management growth, definitions and concepts, organizational structures - organizing and staffing the project management office and team; management functions

UNIT – II (9)

Time and Conflict Management: Understanding time management, time management forms, effective time management, stress and burnout, conflict environment, conflict resolution, management of conflicts, performance measurement, financial compensation and rewards, morality, ethics, corporate culture, professional responsibilities, success variables, working with executives

UNIT – III (9)

Project planning: General planning, Life-cycle phases, proposal preparation, project planning, the statement of work, project specifications, milestone schedules, work breakdown structure, executive role in planning, the planning cycle, handling project phase outs and transfers, stopping projects, scheduling techniques - cpm and pert, pricing and estimating

UNIT – IV (9)

Cost and quality control: Understanding cost control, earned value measurement system, cost control problems, methodology for trade-off analysis, risk management process, risk analysis, risk responses, monitoring and control of risks, contract management, quality management concepts, cost of quality, quality control techniques

Text Book:

[1] Harold Kerzner, P*roject Management: A Systems Approach to Planning, Scheduling and Controlling*, 10th ed. Hoboken, NJ: John Wiley & Sons Inc., 2009.

Reference Books:

[1] Jack R Meredith & Samuel J mantel Jr., *Project Management: A Managerial Approach*, 8th ed. Hoboken, NJ: John Wiley & Sons Inc., 2012.

[2] John M Nicholas & Herman Steyn, *Project Management for Business, Engineering and Technology*, 4th ed. Abingdon, UK: Taylor & Francis, 2012.

[3] Adedeji B. Badiru, *Project Management: Systems, Principles and Applications*, Florida, USA: CRC Press, 2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of the course, the student will be able to…

CO1: evaluate the desirable characteristics of effective project managers

CO2: plan to resolve issues in conflicting environments

CO3: apply appropriate approaches to plan a new project in-line with project schedule & suitable budget

CO4: estimate the risks to be encountered in a new project and apply appropriate techniques to assess & improve ongoing project performance

Course Articulation Matrix (CAM):U18OE701B PROJECT MANAGEMENT														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U18OE701B.1	-	-	-	-	-	1	-	-	-	1	1	-	1	1
CO2	U18OE701B.2	-	-	-	-	-	1	-	2	-	1	1	-	1	1
CO3	U18OE701B.3	1	1	-	-	-	1	-	-	-	1	1	-	1	1
CO4	U18OE701B.4	1	1	-	-	-	1	-	-	-	1	1	-	1	1
U18OE701B		**1**	**1**	**-**	**-**	**-**	**1**	**-**	**2**	**-**	**1**	**1**	**-**	**1**	**1**

U18OE701C PROFESSIONAL ETHICS IN ENGINEERING

Class:B.Tech. VII – Semester **Branch(s)**: Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40
End Semester Examination	60

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on …

LO1: human values and engineering ethics

LO2: professionalism, theory of virtues and code of ethics

LO3: safety & risk benefit analysis, professional and intellectual property rights

LO4: environmental & computer ethics and various roles of engineers in a company

UNIT – I (9)

Human Values: Morals, values & ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, co- operation, commitment, empathy, self-confidence, character, spirituality

Engineering Ethics: Senses of "Engineering Ethics", variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, kohlberg's theory, gilligan's theory - consensus and controversy

UNIT – II (9)

Profession and professionalism: Profession and its attributes, models of professional roles

Theory of Virtues: Definition of virtue and theories of virtues, self-respect, responsibility and senses, modern theories of virtues, uses of ethical theories

Engineering as social experimentation: Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study

UNIT –III (9)

Safety, Responsibilities and Rights: Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk - three mile island and chernobyl case studies; collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, professional rights, employee rights, Intellectual Property Rights (IPR), discrimination

UNIT – IV (9)

Global Issues: Multinational corporations - environmental ethics, computer ethics, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of ethics (*Specific to a particular engineering discipline*)

Text Book:

[1] D.R. Kiran, *Professional Ethics and Human Values*, New York: McGraw Hill, 2013.

Reference Books:

[1] Govindarajan. M, Natarajan. S, Senthil Kumar. V.S, *Professional Ethics and Human Value*s, New Delhi: Prentice Hall of India, 2013.
[2] Mike Martin and Roland Schinzinger, *Ethics in Engineering*, 4th ed. New York: McGraw Hill, 2014.
[3] Charles D. Fleddermann, *Engineering Ethic*s, 4th ed. New Delhi: Prentice Hall, 2004.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: identify the need for human values, morals & ethics and apply Gilligan's & Kohlberg's theories for morale development

CO2: identify the desired characteristics of a professional & the need for code of ethics & balanced outlook on law

CO3: estimate the safety margin & threshold level and describe the procedure for obtaining a patent

CO4: analyze the role of engineer in multinational companies as an advisor, consultant & manager

Course Articulation Matrix (CAM): U18OE701CPROFESSIONAL ETHICS IN ENGINEERING															
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	U18OE701C.1	-	-	-	-	-	1	-	2	1	-	-	1	-	-
CO2	U18OE701C.2	-	-	-	-	-	1	-	2	1	-	-	1	-	-
CO3	U18OE701C.3	-	-	-	-	-	1	-	2	1	-	-	1	1	1
CO4	U18OE701C.4	-	-	-	-	-	1	-	2	1	-	-	1	1	1
U18OE701C		**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**1**	**-**	**-**	**1**	**1**	**1**

U18OE701D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT

Class: B.Tech.VII – Semester

Branch (s): Common to all branches

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1: building technologies, modern agricultural implements and food processing methods

LO2: medicinal & aromatic plants to fulfill the needs of pharmaceutical industries and rural energy for eradication of drudgery

LO3: purification of drinking water, rain water harvesting and employment generating technologies in rural areas

LO4: objectives & characteristics of community development, need for community mobilization and approaches for community organization

UNIT – I (9)

Technologies and Process: Building materials and components - micro concrete roofing tiles, water & fire proof mud walls and thatch, red mud/rice husk cement, types of bricks, ferro-cement water tanks and other products, cement blocks, preservation of mud walls, agricultural implements - naveen sickle, animal drawn digger, grubber weeder, self-propelled reaper, seed drill, improved bakhar

Food Processing: Fruit and vegetable preservation - process flow sheet, scale of operation, economic feasibility, source of technology; soya milk - process, economics; dehydration of fruits and vegetables, cultivation of oyster mushroom - preparation of beds, spawning, removal of bags for production of mushrooms, harvesting and marketing, economics, process flow sheet, source of technology

UNIT – II (9)

Medicinal and Aromatic plants: Plants and its use, aromatic plants, cymbopogons, geranium, manufacturing of juice, gel and powder, rural energy - cultivation ofjatrophacurcus and production of biodiesel, low cost briquetted fuel, solar cookers and oven, solar drier, bio-mass gasifier

Bio-fertilizers: Introduction, Vermicompost, improvement over traditional technology/process, techno economics, cost of production, utilization of fly ash for wasteland development and agriculture

UNIT – III (9)

Purification of Drinking water: Slow sand filtration unit, iron removal plant connected to hand pump, chlorine tablets, pot chlorination of wells, solar still, fluoride removal, rain water harvesting through roof top, rain water harvesting through percolation tank, check dams, recharging of dug wells. **Employment Generating Technologies:** Detergent powder and cake - process, process for liquid detergent, carcass utilization - improvement over traditional technology, flow chart, process, capital investment; indigo blue - dye, organic plant production, dye extraction techniques, aspects of indigo market, economics; modernization of bamboo based industries - process for bamboo mat making, machinery, products, agarbatti manufacturing; vegetable tanning of leathers - raw material, soaking, liming, reliming, deliming, pretanning, malani, setting, yield

UNIT – IV (9)

Community Development: Community organization - definition, need, functions, principles, stages; community development - definition, need, objectives, characteristics, elements, indicators; differences between community organization and community development

Community Mobilization: Need, benefits, preparing, initial contact with community, coordinating, functions of the community, challenges, techniques for mobilizing community, community contributions, leadership and capacity building, community participation, role of community worker in community mobilization, models of community organization practice - local development model, social planning model, social action model, approaches to community organization

Text Books:

[1] M.S. Virdi, *Sustainable Rural Technology*, New Delhi: Daya Publishing House, 2009.

[2] AshaRamagondaPatil, *Community Organization and Development: An Indian Perspective*, New Delhi: Prentice Hall of India, 2013.

Reference Books:

[1] Punia Rd Roy, *Rural Technology*, New Delhi: SatyaPrakashan Publishers, 2009.

[2] S.B. Verma, S.K. Jiloka, Kannaki Das, *Rural Education and Technology*, New Delhi: Deep & Deep Publications Pvt. Ltd., 2006.

[3] Edwards, Allen David and Dorothy G.Jones, *Community and Community Development*, The Hague, Netherlands: Mouton, 1976.

[4] Lean, Mary, *Bread, Bricks and Belief: Communities in Charge of Their Future*, West Hartford, US: Kumarian Press, 1995.

[5] Heskin, Allen David, *The Struggle for Community*, Colorado, US: West View Press, 1991

[6] Clinard, Marshall Barron, *Slums and Community Development: Experiments in Self- Help*, Mumbai: Free Press, 1970.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1. discuss various building technologies, modern agricultural implements and food processing methods which can be implemented in rural areas

CO2. identify major medicinal plants that are required for pharmaceutical companies & alternative fuel that meets substantial oil need in the country and the need and usage of bio- fertilizers

CO3. analyze several cost effective technologies for purification of water, rain water harvesting techniques for collection & storage of rain water and examine the employment generating technologies in tribal/ rural areas

CO4. distinguish between community organization and community development and identify techniques for community mobilization & approaches to community organization for social change

Course Articulation Matrix (CAM): U18OE701D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE701D.1	-	-	1	-	-	1	2	-	-	-	-	1	1	1
CO2	U18OE701D.2	-	-	1	-	-	1	2	-	-	-	-	1	1	1
CO3	U18OE701D.3	-	-	1	-	-	1	2	-	-	-	-	1	1	1
CO4	U18OE701D.4	-	-	-	-	-	1	2	-	-	-	-	-	-	-
U18OE701D		-	-	**1**	-	-	**1**	**2**	-	-	-	-	**1**	1	1

U18EC702AR22 DATA SCIENCE AND ENGINEERING

(Professional Elective – III)

Class: B.Tech.VII – Semester

Branch: Electronics and Communication Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: Relating the probabilistic views for analyzing data by using statistical principles.
LO2: Understanding the basic terminology and syntaxes using Python-NumPy
LO3: Applications of statistical principles for data handling, manipulation and visualization.
LO4: Development of Machine learning algorithms for various applications

UNIT – I(9)

Introduction to Data Science- Basic Probability Theory, Random Variables, Expectation, Random Processes, Descriptive statistics, Need for Data Science, Life Cycle Phases of Data Analytics.

UNIT – II (9)

Introduction to NumPy-Understanding Data Types in Python, NumPy Arrays, Computation on NumPy Arrays, Aggregations, Computation on Arrays, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data

UNIT – III (9)

Data Manipulation with Pandas- Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas

Visualization with Matplotlib- General Matplotlib, Two Interfaces for the Price of One, Simple Line Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Matplotlib, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn.

UNIT – IV (9)

Machine Learning- Introduction, Introducing Scikit-Learn, Hyper parameters and Model Validation, Feature Engineering, Naive Bayes Classification, Linear Regression, Support Vector Machine, Decision Tree and Random forest, Principal Component Analysis, Manifold Learning, k-Means Clustering

Case study: Powerful Data Collection Tools in Healthcare open link, A Face Detection Pipeline.

Textbook:

[1]. Carlos Fernandez-Granda, *Probability and Statistics for Data Science*, NYU, New York, August 2017.

[2]. Jake VanderPlas, *Phyton Data Science Handook-Essential Tools For Working With Data O'Reilly Media*, First Edition, 2017.

[3]. Michael Mitzenmacher and Eli Upfal; *Probability and Computing*, 2ed ,Cambridge University

Reference Books:

[1]. Alan Agresti, Christine A. Franklin and Bernhard Klingenberg; *Statistics: The Art and Science of Learning from Data*, 4ed, Pearson, 2017
[2]. Sheldon M Ross; *A First Course in Probability*, 10ed, Pearson, 2018
[3]. Robert V Hogg, Joseph W McKean and Allen T Cralg; *Introduction to Mathematical Statistics*, 8ed, Pearson, 2018

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, the students will be able to…

CO1: Relating the probabilistic and statistics for data science.
CO2: Understand the python-Numpy arrays and structured data.
CO3: Apply the statistical principles on data manipulation with pandas and visualization with matplotlib.
CO4: Develop the machine learning algorithms for various applications.

Course Articulation Matrix: **U18EC702AR22 DATA SCIENCE AND ENGINEERING**

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC702AR22.1	2	2	**1**	2	-	-	**1**	**1**	**1**	**1**	-	1	2	**1**
CO2	U18EC702AR22.2	2	2	**1**	2	-	-	**1**	**1**	**1**	**1**	-	1	2	**1**
CO3	U18EC702AR22.3	2	2	**1**	2	-	-	**1**	**1**	**1**	**1**	-	1	2	**1**
CO4	U18EC702AR22.4	2	2	**1**	2	-	-	**1**	**1**	**1**	**1**	-	1	2	**1**
U18EC702AR22		**2**	2	1	**2**	-	-	1	**1**	**1**	**1**	-	1	**2**	**1**

U18EC702B REAL-TIME EMBEDDED SYSTEMS

(Professional Elective-III)

Class: B.Tech.VII – Semester

Branch: Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: resource analysis, real-time service utility and dynamic priority policies
LO2: execution efficiency, physical hierarchy and mixed hard and soft real-time services
LO3: firmware components, kernel scheduler traces and application-level debugging
LO4: fundamental optimizations and hierarchical applications for fail-safe design

UNIT – I (9)

Introduction to Real-Time Embedded Systems: Brief history of real time systems, a brief history of embedded systems

System Resources: Resource analysis, real-time service utility, scheduling classes, the cyclic executive, scheduler concepts, preemptive fixed priority scheduling policies, real-time OS, thread safe reentrant functions

Processing: Preemptive fixed-priority policy, feasibility, rate monotonic least upper bound, necessary& sufficient feasibility, deadline – monotonic policy, dynamic priority policies

UNIT – II (9)

I/O Resources: Worst-case execution time, intermediate I/O, execution efficiency, I/O architecture.

Memory: Physical hierarchy, capacity and allocation, shared memory, ECC memory, flash file systems.

Multisource Services: Blocking, deadlock and livestock, critical sections to protect shared resources, priority inversion, power management and processor clock modulation.

Soft Real-Time Services: Missed deadlines, quality of service, alternatives to rate monotonic policy, mixed hard and soft real-time services.

UNIT – III (9)

Embedded System Components: Hardware components, firmware components, RTOS system software mechanisms, software application components.

Debugging Components: Exceptions, assert, checking return codes, single-step debugging, kernel scheduler traces, test access ports, trace ports, power-on self-test and diagnostics, external test equipment, application-level debugging.

UNIT – IV (9)

Performance Tuning: Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, path length, efficiency, and call frequency, fundamental optimizations.

High availability and Reliability Design: Reliability and availability, similarities and differences, reliability, reliable software, available software, design tradeoffs, hierarchical approaches for fail-safe design.

Design of RTOS – PIC microcontroller.

Textbook:

[1] Sam Siewert, *Real-Time Embedded Components andSystems,*1st ed., USA: Charles River Media, 2007.
[2] MykePredko, *Programming and Customizing the PIC Microcontroller*, 3rd ed., New Delhi: TMH, 2008.

Reference Books:

[1] Raj Kamal, *Embedded System- Architecture, programming and Design*, 2nd ed., New Delhi: Tata McGraw-Hill Education Pvt. Ltd., 2008.
[2] Dreamtech Software Team, *Programming for Embedded Systems*, Delhi: John Wiley, India Pvt. Ltd., 2008.
[3] C.M. Krishna, Kang G Shin, *Real Time Systems*, New Delhi: McGraw-Hill, 1997.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, the students will be able to…

CO1: select the required priority policy & dynamic priority policies based on the application
CO2: classify the physical hierarchy of memory and identify mixed hard and soft real-time services
CO3: identify suitable software application components and summarize the application-level debugging
CO4: identify the building performance monitoring into software and design of RTOS

Course Articulation Matrix: U18EC702B Real Time Embedded Systems

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC702B.1	1	1	1	1	1	-	-	1	1	1	-	1	2	1
CO2	U18EC702B.2	1	2	2	1	1	-	-	1	1	1	-	1	2	1
CO3	U18EC702B.3	1	2	2	1	1	-	-	1	1	1	-	1	2	1
CO4	U18EC702B.4	1	2	2	1	1	-	-	1	1	1	-	1	2	1
U18EC702B		**1**	**1.75**	**1.75**	**1**	**1**	**-**	-	**1**	1	1	-	1	**2**	**1**

U18EC702D DIGITAL SYSTEM DESIGN

(Professional Elective – III)

Class: B.Tech. VII – Semester
Branch: Electronics & Communication Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on …

LO1: *computer aided minimization procedure (CAMP).*
LO2: *fault classes & models and fault detection techniques in combinational and sequential circuits.*
LO3: *pla minimization and folding.*
LO4: *combinational sequential circuits design using verilog.*

UNIT – I (9)

Computer Aided Minimization Procedure: Degree of adjacency and Essential Prime Cubes, CAMP algorithm, Introduction to cube based Algorithms, Cubical operations. **Logic Synthesis:** Multiplexers, Read-Only Memories, Programmable Logic Arrays, System Level Logic Synthesis - Semicustom Design Approach.
Fundamental-mode sequential machines: stable and unstable states, output specifications, cycles and races, race-free assignments, hazards.

UNIT –II (9)

Fault Diagnosis in Combinational Circuits: Fault Classes and Models, Fault Diagnosis and Testing, Test Generation Methods - Fault Table Method, Path Sensitization Method, Boolean Difference Method and Kohavi algorithm; Fault Tolerance Techniques; Fault-Tolerant VLSI Processor Arrays.
Fault Diagnosis in Sequential Circuits: Circuit Test Approach, Transition Check Approach – State identification and fault detection experiment, Machine identification, Design of fault detection experiment

UNIT– III (9)

Programmable Logic arrays: PLA minimization, Essential Prime Cube Theorem and PLA folding, Foldable Compatibility Matrix, Practical PLAs, Faults in PLAs, DFT Schemes, Built in Self Test.

UNIT - IV (9)

Design of Combinational and sequential circuits: BCD to 7 segment display decoder, BCD adder, 32 bit adder, traffic light controller, state graphs for control circuits, scoreboard and controller, synchronization and debouncing, shift and add multiplier, array multiplier, signed integer/fraction multiplier, keypad scanner, binary dividers.

Text Book(s):

[1] N. N. Biswas, "*Logic Design Theory*", PHI Learning Private Limited, 1st Edition,1993. (Chapters 4,5,6,7,8,12)

[2] Samuel C. Lee, "*Digital Circuits and Logic Design*", PHI Learning Private Limited, 1st Edition,1976. (Chapter 8)

[3] Charles Roth,Lizy Kurian Jhon, Byeong Kil Lee, " *Digital System Design using Verilog*", cengage learning, 2017. (Chapter 4)

Reference Book(s):

[1] Zvi. Kohavi, "*Switching and Finite Automata Theory*", Cambridge University Press 3rd Edition, 2009.
[2] M. Morris Mano, Michael D.Ciletti,"*Digital Design*",Prentice Hall Series, 4th Edition,2009.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: describe computer aided minimization procedure (CAMP) to minimize boolean functions.

CO2: explain fault classes and fault detection techniques for combinational and sequential circuits.

CO3: construct area efficient PLAs using PLA minimization and folding techniques

CO4: design small digital systems using verilog

Course Articulation Matrix (CAM): U18EC702D DIGITAL SYSTEM DESIGN															
CO		**PO1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1	U18EC702D.1	2	2	1	1	--	--	--	1	1	1	--	1	2	2
CO2	U18EC702D.2	2	2	1	1	--	--	--	1	1	1	--	1	2	2
CO3	U18EC702D.3	2	2	1	1	--	--	--	1	1	1	--	1	2	2
CO4	U18EC702D.4	2	1	1	1	1	--	--	1	1	1	--	1	2	2
U18EC702D		**2**	**1.75**	1	1	1	--	--	1	1	1	**--**	**1**	**2**	**2**

U18EC703A ELECTRONIC SYSTEM DESIGN AND MANUFACTURING

(Professional Elective-IV)

Class: B.Tech.VII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: electronic market, electronic manufacturing company stricture and electronic component interconnecting methods
LO2: product design process, circuit design, layout and types of semiconductor device manufacturing
LO3: different types of manufacturing PCB's
LO4: printed circuit board assembly and surface mount component assembly

UNIT – I (9)

Introduction to the Electronics Industry: A history of the electronics industry, the electronics market, electronics manufacturing company structure, test engineering and quality assurance

Electronic components: Component interconnection methods, electronic components, component packaging, cabling, component quality assurance

UNIT – II (9)

Electronic Design: Quality and reliability assessment, the product design process, circuit design, integrated circuit design, circuit layout

Semiconductor Device Manufacture: Semiconductor materials, clean room requirements, silicon wafer manufacture, photolithography, layer fabrication processes, bipolar junction transistor fabrication, field effect transistor fabrication, integrated circuit packaging and testing

UNIT – III (9)

Printed Circuit Board Manufacture: Printed circuit board types, printed circuit board substrate materials, printed circuit board substrate manufacture, printed circuit board fabrication procedures, single-sided printed circuit board manufacture, double-sided printed circuit board manufacture, multilayer printed circuit board manufacture

UNIT – IV (9)

Printed Circuit Board Assembly: Hand assembly, automatic component insertion, assembly-related faults, and soldering techniques, solder joint inspection and common soldering faults, cleaning, testing and reworking

Surface Mount Component Assembly: Advantages of surface mount components, surface mount component assembly, adhesive application, solder paste application, component insertion, soldering techniques, mixing surface mount with leaded components, soldering quality, testing, reworking

Textbook:

[1]. Phillip R .Edwards, *Manufacturing Technology in the Electronics Industry*, Springer -science business-media, B.V.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: identify the electronics market ,electronics manufacturing company structure and methods of electronic component interconnection

CO2: analyze the product design process, circuit design, layout and types of semiconductor device manufacturing

CO3: demonstrate the different types of manufacturing PCB's

CO4: apply the printed circuit board assembly and surface mount component assembly

Course Articulation Matrix: U18EC703A Electronic System Design and Manufacturing

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC703A.1	2	1	1	1	1	-	-	1	1	1	-	1	2	1
CO2	U18EC703A.2	2	1	1	1	1	-	-	1	1	1	-	1	2	1
CO3	U18EC703A.3	2	1	1	1	1	-	-	1	1	1	-	1	2	1
CO4	U18EC703A.4	2	1	1	1	1	-	-	1	1	1	-	1	2	1
	U18EC703A	**2**	**1**	1	1	1	-	-	**1**	1	1	-	1	**2**	**1**

U18EC703B VLSI PHYSICAL DESIGN

(Professional Elective-IV)

Class: B.Tech.VII – Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: physical design optimizations, graph theory and common EDA terminology, partitioning algorithms and framework for multilevel partitioning
LO2: floor planning algorithms, routing, global and detailed placement
LO3: representations of routing regions and channel routing algorithms
LO4: net ordering in area routing, non-manhattan routing and timing-driven placement & routing

UNIT – I(9)

Introduction to Electronic Design Automation: VLSI design flow, VLSI design styles, layout layers and design rules, physical design optimizations, algorithms and complexity, graph theory terminology and common EDA terminology

Netlist and System Partitioning: Introduction, terminology, optimization goals, partitioning algorithms, a framework for multilevel partitioning, system partitioning onto multiple FPGAs

UNIT – II (9)

Chip Planning: Introduction to floor planning, optimization goals in floor planning, terminology, floor plan representations, floor planning algorithms, pin assignment, power and ground routing

Global and Detailed Placement: Introduction, optimization objectives, global placement, legalization and detailed placement

UNIT – III (9)

Global Routing: Introduction, terminology and definitions, optimization goals, representations of routing regions, the global routing flow, single-net routing, full-netlist routing and modern global routing

Detailed Routing: Terminology, horizontal and vertical constraint graphs, channel routing algorithms, switchbox routing, over-the-cell routing algorithms and modern challenges in detailed routing

UNIT – IV (9)

Specialized Routing: Introduction to area routing, net ordering in area routing, non-manhattan routing, basic concepts in clock networks and modern clock tree synthesis

Timing Closure: Introduction, timing analysis and performance constraints, timing-driven placement, timing-driven routing, physical synthesis and performance-driven design flow

Textbook:

[1]. Andrew B.Kahng, Jens Lienig, Igor L. Markov and Jin Hu, *VLSI Physical Design: From Graph Partitioning to Timing Disclosure,* New York: Springer, 2011.

Reference Books:

[1]. Sarrafzadeh, Majid, and C K. Wong, *An Introduction to VLSI Physical Design*, New York: McGraw Hill, 1996.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: interpret physical design optimizations, graph theory and common EDA terminology, partitioning algorithms and framework for multilevel partitioning

CO2: identify the suitable floor planning algorithms for global and detailed placement

CO3: examine the routing algorithms to address the modern challenges in detailed routing

CO4:formulate the timing analysis and performance constraints for placement and routing

Course Articulation Matrix: U18EC703B VLSI Physical Design

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC703B.1	2	2	1	1	1	-	-	1	1	1	1	1	2	2
CO2	U18EC703B.2	2	2	1	1	1	-	-	1	1	1	1	1	2	2
CO3	U18EC703B.3	2	2	1	1	1	-	-	1	1	1	1	1	2	2
CO4	U18EC703B.4	2	2	1	1	1	-	-	1	1	1	1	1	2	2
U18EC703B		**2**	**2**	**1**	**1**	**1**	**-**	**-**	**1**	1	1	**1**	**1**	**2**	**2**

U18EC703C DIGITAL IMAGE PROCESSING

(Professional Elective-IV)

Class: B.Tech.VII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: *fundamentals and importance of various image transformations*

LO2: *enhancement, filtering and restoration techniques for various imaging applications*

LO3: *various image compression algorithms.*

LO4: *segmentation techniques and morphological operators for various imaging applications*

UNIT-I (9)

Introduction: Fundamental steps and components of digital image processing, image sensing and acquisition, sampling and quantization, representation of digital images, relationships between pixels-neighborhood of a pixel, distance measures, arithmetic and logical operations on images, spatial transformations.

Digital Image Transforms: Two dimensional DFT and its properties, DCT, unitary Transforms, walsh transform, Hadamard Transform, slant transform and KL transform.

UNIT-II (9)

Image Enhancement: Simple intensity transforms, Piecewise linear transforms and histogram processing.

Spatial Domain Filtering: Correlation and convolution, linear and nonlinear filters-smoothing and sharpening filters

Frequency Domain Filtering: Image smoothing and sharpening - ideal, butterworth, gaussian filters, unsharp masking and high-boost filtering, homomorphic filtering, selective filtering- band reject and band pass filters

Image Restoration and Degradation: Image restoration and degradation model, noise models, restoration in the presence of noise only- spatial filtering, inverse filtering, wiener filtering, constrained least square filtering.

UNIT-III (9)

Image Compression for Storage Optimization: Types of redundancy – coding redundancy, interpixel redundancy, psychovisual redundancy, fidelity criteria, image compression system model, lossless and lossy coding, huffman coding, LZW coding, arithmetic coding, run length coding, bit-plane coding, constant area coding, lossless and lossy predictive coding, JPEG 2000,

UNIT-IV (9)

Image Segmentation: Point, line and edge detection, image gradient and gradient operators, edge linking and boundary detection – local, regional and global processing; thresholding- global, multiple, variable and multi variable thresholding, region based segmentation- region growing, region splitting and merging.

Morphological Image Processing: Structuring element, erosion and dilation, opening and closing, hit-or-miss transformation, basic morphological algorithms and grey-scale morphology.

Text Books:

[1]. R.C. Gonzalez and R.E. Woods, *Digital Image processing*,3rd ed., New Delhi: Pearson Education, 2009.

Reference Books:

[1]. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, *Digital image processing using MATLAB*, 1st ed., New Delhi: Pearson Education, 2004.
[2]. William K. Pratt, *Digital Image Processing*, 4th ed., New York: John Wiley and Sons, 2002
[3]. Sridhar, *Digital image processing*, 1st ed., New Delhi: Oxford University press, 2013.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

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

CO1: discuss fundamental properties of an image & analyze relationships between pixels and transforms on image

CO2: apply different filtering techniques in spatial domain and frequency domain to enhance digital images.

CO3: analyze various image compression algorithms

CO4: formulate solutions to real world issues in image processing using segmentation techniques & morphological operations.

Course Articulation Matrix: U18EC703C Digital Image Processing

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC703C.1	2	1	2	1	1	-	-	1	1	1	-	1	2	1
CO2	U18EC703C.2	2	1	2	2	2	-	-	1	1	1	-	2	2	2
CO3	U18EC703C.3	2	1	2	2	2	-	-	1	1	1	-	2	2	2
CO4	U18EC703C.4	2	1	2	2	2	-	-	1	1	1	-	2	2	2
U18EC703C		**2**	**1**	**2**	**1.75**	**1.75**	**-**	**-**	**1**	1	1	**-**	**1.75**	**2**	**2**

U18EC706 VLSI LABORATORY

Class: B. Tech., VII-Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation:	40 marks
End Semester Examination :	60 marks

Course Learning Objectives:

This laboratory course will develop students' knowledge in/on

LO1: electronic computer aided design (ECAD) tools, FPGA boards and design flow of Xilinx ISE.

LO2: modeling and simulation of combinational and sequential circuits using VHDL.

LO3: implementation of synthesized VHDL designs on FPGA boards

LO4: Implementation of analog circuit designs using EDA tools

LIST OF EXPERIMENTS

Part - 1: Combinational Logic:

[1] Design of all logic gates using VHDL (basic gates (NOT, AND, OR, NAND, NOR, XOR, XNOR)

[2] Write a VHDL program for the following circuits, check the wave forms and the hardware generated

a) Half adder b). Full adder Adders/Subtractors

[3] Write a VHDL program for the following circuits, check the wave forms and the hardware generated.

a). Multiplexer b). Demultiplxer

[4] Write a VHDL program for 3-bit decoder/encoder, check the wave forms and the hardware generated.

[5] Write a VHDL program for Parity generator, check the wave forms and the hardware generated.

[6] Write a VHDL program to model 4- bit ALU, check the wave forms and the hardware generated.

Part – II Sequential Logic:

[7] Develop the VHDL code for the following flip-flops: SR, D, JK and T Flip Flops.

[8] Design and verify 4 bit Synchronous/ Asynchronous Counters using VHDL, check the wave forms as well as hardware generated.

[9] Write a VHDL program to model 4-bit Shift Registers and check the wave forms and the hardware generated.

[10] Write a VHDL program to model 4-bit Johnson Counter & Ring Counter and check the wave forms and the hardware generated.

Part-III Layout Design

[11] Layout Design of PMOS, NMOS using Micro wind tool.

[12] Layout Design of NAND & NOR using Micro wind tool.

Part-IV VHDL Code generation using MATLAB

[13] FPGA Implementation of Digital FIR Filter.

[14] FPGA Implementation of Digital IIR Filter

Laboratory Manual:

[1]. Laboratory Manual for, ECAD Laboratory, prepared *by the department of ECE faculty.*

Reference Book:

[1]. M. Morris Mano, Michael D. Ciletti, Digital Design, New Delhi: Prentice Hall Series, 4th edition, 2009.

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

After completion of this laboratory course, students' will be able to

CO1: demonstrate the various phases of Electronic Computer Aided Design (ECAD) tools, FPGA Boardsand design Flow of Xilinx ISE.

CO2: design and develop the combinational and sequential circuits using various VHDL modeling styles.

CO3: analyze the process of synthesizing the combinational and sequential descriptions.

CO4: design, simulate and extract the layouts of analog IC blocks using EDA tools.

Course Articulation Matrix (CAM): U18EC706 VLSI LABORATORY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC706.1	2	2	1	1	1	-	-	1	1	1	-	1	1	2
CO2	U18EC706.2	2	2	2	1	1	-	-	1	1	1	-	1	2	2
CO3	U18EC706.3	2	2	2	1	2	-	-	1	1	1	-	1	2	2
CO4	U18EC706.4	2	2	2	1	2	-	-	1	1	1	-	1	2	2
U18EC706		**2**	**2**	**1.75**	**1**	**1.5**	**-**	-	1	**1**	1	-	1	**1.75**	**2**

U18EC707 MAJOR PROJECT WORK PHASE-I

Class: B. Tech., VII-Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	6	3

Examination Scheme:

Continuous Internal Evaluation:	100 marks
End Semester Examination :	-

Course Learning Objectives (LOs):

The major project work will develop students' knowledge on /in…

LO1: real-world complex engineering problems, literature review, problem formulation; and experimental and data analysis techniques

LO2: design/development of solutions to real-world engineering problems; conduct of investigations of complex problems; modern tool usage to design, build and test a prototype; impact of solution in society, environment and sustainability contexts

LO3: ethics, team work and project management skills such as budgeting, scheduling

LO4: oral, written and multimedia communication skills; self-directed independent learning and life-long learning

1. Final Year Major Project work represents the culmination of study towards the B. Tech degree. ***Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems.*** The **student learning assessment process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creating video pitch on the complete project work.
2. Activities of major project SLAP shall be planned in such a way to ensure that the students acquire the essential knowledge, skills and qualities (KSQ) of a professional engineer.
3. **Team work:** Major project work is a team work.
   (i) The students of a project team shall work together to achieve a common objective.
   (ii) Every student of a project team is expected to function effectively as an individual, and also with others as a team member in an ecosystem of team having knowledge diversity, gender diversity, social and cultural diversity among its members.
4. **Two phases:** Major project work shall be carried out in two phases. Nearly 50 - 75% of the proposed work to be completed in 7th semester as *Phase-I* and the remaining work to be continued and completed in 8th semester as *Phase-II.*
5. Every student is expected to put approximately **72 hours of work** into the major project *phase-I* course over the 12 weeks of 7th semester.
6. **Major project work *Phase-I*: 7th semester**
   (i) The HoD shall constitute the ***department project evaluation committee (DPEC)*** with following composition

Department project evaluation committee (DPEC)	
HoD	Chairman
Senior Faculty	Convener
Coordinator(s)	Section - wise coordinator(s) *One coordinator for each section*
Three Faculty members	Section-wise faculty members *Three faculty members for each section representing various socializations.* *(Five specializations will be covered including the coordinator's and Convener's)*

(ii) Major project allotment to students during last working week of 6th semester:

(a) **First / Second week of 6th Semester**: The process shall be initiated during the first / second week of 6th semester by collecting project titles from the department faculty research groups, on offering innovative ideas/solutions for engineering problems.

(b) **MSE-I period of 6th Semester – Notifying project titles**: The finalized project titles shall be notified to students during the MSE-I period of 6th semester and student teams shall be allowed to exercise their options on titles that interest them.

(c) **Last working week of 6th Semester – Allotment of titles and supervisors to project teams**: The project title allotment to major project teams shall be completed before the last day of instruction of 6th semester

(d) **6th semester summer break - Literature review**: This 6th semester schedule enables students to complete literature review, preliminary simulations / investigations / experimentation during 6th semester summer break and *start the work from day-one in 7th semester*

(e) **Registration Presentation - Notifying the tentative dates:** The major project teams are expected to give registration presentation during second / third week from the commencement of 7th semester. The tentative dates for conducting the registration presentation shall be notified at the time of releasing the circular on allotted project title and project supervisors, as indicated in (c) above. This enables student teams to plan the work accordingly during summer break, to complete the literature review, preliminary simulations / investigations and get ready for informative, confident and comfortable presentations on their project work.

(iii) The convener DPEC shall notify, during MSE-I period of 6th semester, the list of implementable project titles offered by the faculty of different research groups of the department

(a) Project titles shall come with the following details to be made available to students on dept webpage and notice boards, facilitating students to select problems that interest them.

i. abstract
ii. deliverables / outcomes
iii. knowledge and skills required to complete the project
iv. resources required
v. one of the deliverables shall be writing a technical paper out of the major project work done for submission to a reputed non-predatory conference/non-paid peer reviewed journal

(iv) The major project teams, finalized by the convener DPEC, shall be allowed to exercise their options on the titles that interest them from the notified list

(v) Project supervisor allotment: The convener DPEC shall allot, during the last week of 6th semester, the faculty supervisors to all project teams

(a) **The project supervisors shall**

i. define project objectives and expected deliverables
ii. **help the students plan their project work and timeline**
iii. **provide enough resources for successful project completion**

(vi) The faculty supervisors are expected to provide guidance to project teams on

(a) *Knowledge, skills and qualities (KSQ) to be acquired* to propose solutions to the identified real-world problems

(b) *Problem analysis* - to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(c) *Applying engineering knowledge* - to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

(d) *Design/development of solutions* - to 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

(e) *Conduct investigations of complex problems* - to 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

(f) *Modern tool usage* – to 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

(g) *Engineering and society* – to 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

(h) *Environment and sustainability* – to understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development

(i) *Ethics* – to apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice

(j) *Individual and team work* – to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

(k) *Communication* – to 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

(l) *Project management and finance* – to 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

(m) *Life-long learning* – to 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

(vii) The project supervisors are also expected to continuously emphasize and guide students on

(a) **Meeting Cadence:**

i. **Regular meetings with supervisor:** Short and frequent meetings increase a team's work momentum. Regular meetings with supervisor to review the status of project are very essential. All students of the team shall participate in discussions and take notes.

ii. **Meeting Frequency: Semi-weekly cadence,** i.e., the meeting frequency shall be **twice a week.** Due weightage will be given to meeting cadence and considered for evaluation during presentations, i.e., number of planned meetings and number attended by students

(b) **Project Log Book:** The activity journaling in project log book is very important for a successful project.

i. Project log book is a written record showing the daily project activity on project

goals from the very first thing like starting the project (an introduction statement what the project is all about), to the completion of the work (including the final results, and whether project met the core objectives / outcomes, etc.).

ii. In project log book, the activities like regular meetings with project supervisor, and work carried out on daily/weekly basis are to be recorded. This ensures that the student progress is being monitored well.

iii. The project supervisor shall regularly check the log book of every student of project team and endorse each and every activity by affixing his signature with date. With this, the number of planned meetings and number attended by the students will be also monitored.

iv. Log books are to be shown during all presentations and will be graded along with the project.

v. At the conclusion of the project work *phase-I*, the supervisor shall specifically comment, in the project log book, on whether the project team met each of the project work *phase-I* goals and to give evidence which describes the quality of work. For project teams, this also serves as self-assessment.

(c) **Following project timeline**: completing the tasks as planned in project timeline

(d) The relevant knowledge, skills and qualities (**KSQ**) an engineering graduate should possess, which can be specially acquired by participating in major project work

(e) **Writing down whatever is done and making notes of whatever is read**. Writing down the procedures/models followed, designs made, experiments conducted, simulations carried out, intermediate results obtained, ***difficulties faced and how they were fixed*** are very important. This kind of documenting the whole process as we go with project implementation is a very effective way and will help preparing a well-documented report having original content. Note down and include information about all the resources that you used, magazines, Journals, patents, books, and so on.

This information will be needed for the bibliography in your project report. On the other hand, documenting a report ***on the spur of the moment*** would end up copying things from other sources resulting in a plagiarized document.

(f) **Good and sufficient literature review**: Literature review is a description and analysis of information related to the topic of project work. Reading good number of review articles, research articles published in recent issues of peer reviewed journals, technical magazines, patents, reference books on the topics of potential interest, will help one understand what has already been discovered and what questions remain to identify gaps in the literature.

(g) Completing nearly 50 - 75% of the proposed work during phase-I

(h) Right conduct of research to promote academic integrity, honesty and time management

(i) Preparing a well-documented report in proper format, covering the progress made during Phase-I

(j) Consequences of plagiarism and use of anti-plagiarism software to detect plagiarism in documents

(k) Submission of major project phase-I report within acceptable plagiarism levels, as per the ***Anti-plagiarism policy-2020 of our institute***.

(l) **Video pitch:** Capturing short videos, photos, screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed during course of project execution, photos showing interaction with supervisor for creating a short video pitch on the work done during *phase-I.*

(m) **Project Paper**: Writing a technical paper at the end of *phase-II* based on the solution(s) proposed, results obtained and prototype / working model / process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal.

(n) **Project poster**: At the end of phase-II, the project teams shall have to present their project in the form of posters, at the time of demonstration of complete porotype / working model / software package / system developed.

(viii) Phase – I evaluation: There shall be only Continuous Internal Evaluation (CIE) for major project work *phase-I* with following components

(a) **Registration Presentation** *(during second / third week of 7th semester):* The Registration Presentation shall include a brief report and presentation focusing the identified problem, objective(s), literature review, identifying research gap in the literature, implementation of existing methods, proposed solution, and expected outcome(s).

i. The registration presentation shall invariably include the **project plan timeline** with actual start and finish dates– monthly/weekly project milestones/ timeline prepared in MS Excel or any other project management tool.
ii. **Project timeline** – *Weekly project milestones*: It's a compact and creative way to present a project plan. Identify the project intermediate goals and related tasks for completing each of those goals. Categorize tasks for each week. In the project timeline use different colors to the tasks for each week. Horizontal timeline layouts shall be preferred or any other layout of team's choice.
iii. Project teams shall create and present the following during registration presentation
    1. *Complete project timeline*
    2. *Phase-I project timeline*
    3. *Phase-II project timeline*
iv. During every presentation, project teams shall compulsorily show the following as part of their presentation
    1. *The slides on project timeline and*
    2. *A table showing targeted tasks as per timeline and status – whether tasks accomplished?*
v. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (*with due signatures of project supervisor*) during presentations

(b) **Progress Presentation-I** *(during penultimate week of 7th semester):* At the end of first stage (7th semester), student teams shall be required present, before the DPEC, the progress made during phase-I and submit a well-documented report of work done for evaluation to the project coordinator

i. **Following project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.
ii. Project teams shall compulsorily show the following as part of their progress presentation-I
    1. *The slides on project timeline and*
    2. *A table showing targeted tasks as per timeline and whether tasks accomplished?*
iii. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (*with due signatures of project supervisor*)

(c) **CIE schedule**: The convener DPEC shall release complete schedule of CIE before start of 7th semester well in advance, so that student teams will complete the scheduled works and get ready with informative, confident and comfortable presentation for registration and progress presentations.

(ix) CIE for the Major project work phase-I shall be as given below:

Major project work Phase-I Assessment *(7th semester)*	**Weightage**
A. Supervisor Assessment	**20%**
B. DPEC Assessment *(i) Registration Presentation (10%)* *(ii) Progress Presentation-I (20%)* *(iii) Project progress*: Part of working model/ process/software package/system developed (30%)* *(iii) Well-documented Progress Report on Phase-I work (10%)* *(iv) Video pitch on Phase-I (10%)*	**80%**
Total Weightage	**100 %**

* *Students are advised to complete major part of the project in phase-I only*

(a) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The progress made in this shall be demonstrated during progress presentation-I at the end of *phase-I* and the completed working model/ process/software package/system before the DPEC as per the dates specified by DPEC at the end of *phase-II*.

(b) **Progress Report on *phase-I*:** Every project team shall be required to submit a well-documented progress report on dissertation phase-I as per format specified by DPEC.

a. **Tangible outcomes of *phase-I* in Conclusions - Chapter:** These are the lessons learnt from doing a project work. The students have to describe in their own words what they learnt from the *phase-I* project work experience. They have to describe what specific KSQs are acquired by them, with reference to the expected COs, after successful completion of *phase-I* work. Finally, a table depicting systematic mapping of what they have learnt and the expected major project work COs, is to be presented in the conclusions chapter of *phase-I* report

(c) **Video pitch on *phase-I*:** Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I*. The project team shall present the produced video pitch during progress presentation-I. The produced video pitch should

a. be 3 to 5-minute-long video (no longer than 5 minutes)
b. be concise and to the point, on the problem and proposed solution
c. show project timeline and sample page of log book
d. highlight the progress made at various stages during *phase-I* project implementation with the help of short videos / photos / screenshots on experiments conducted, simulations carried out, part of prototype / working model / process / software package / system being under development as part of proposed solution and also photos showing team interactions with supervisor and the team working in the lab on project
e. Discuss the impact of proposed solution in *ethical*, *environmental*, *societal and sustainable development contexts*.
f. emphasize key points about *business idea, potential market for the proposed solution*

(x) It is mandatory for

(a) every student of the team to *appear for oral presentation and viva-voce*, as part of progress presentation -I to qualify for course evaluation

(b) every project team *to submit a well-documented progress report on major project work phase-I*, as part of progress presentation -I to qualify for course evaluation

(c) every project team to create and present a good video pitch on major project work *phase-I*, as part of progress presentation -I to qualify for course evaluation

(xi) A student shall register for supplementary examination for the Major project work *phase-I* in the following cases:

(a) He/she is absent for oral presentation and viva-voce as part of progress presentation-I
(b) The project team fails to submit the progress report on *phase-I* in prescribed format
(c) The project team fails to submit the video pitch on the progress made during the *phase-I* period.
(e) he/she fails to fulfill the requirements of Major project work *phase-I* evaluation as per specified guidelines

(xi) Supplementary examination for Major project work *phase-I*

(a) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned

(b) The DPEC, duly constituted by the HoD, shall conduct Major project phase-I supplementary exam and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of major project work, students will be able to…

CO1: review research literature, identify gaps in the literature, formulate problem, apply knowledge of mathematics, sciences, engineering fundamentals, experimental and data analysis techniques; synthesize technical knowledge and innovative approaches to generate suitable solutions for real-world complex engineering problems (**Technical skills**)

CO2: *design a system or product based on product/customer specifications; develop, analyze, and critically evaluate the design alternatives in order to justify the solutions to a real-world problem guided by ethical, environmental, societal and sustainable development considerations; use modern engineering and IT tools to design, build and test a prototype within specified project timeline and budget* (**Problem solving and critical thinking skills**)

CO3: apply project management and organizational skills; demonstrate integrity, leadership, creativity, professional and ethical responsibilities as an individual and as a member or leader to produce time-sensitive deliverables in a multi-disciplinary team (**Ethics and teamwork**)

CO4: *collate the results, compare performance of prototype to design specifications and present clearly and effectively the proposed solution, conclusions and/or recommendations in written (report, poster, technical paper), oral (presentations) and multimedia formats (video pitch) and engage in self-directed independent learning and life-long learning demonstrating the KSQ of a professional engineer* (**Communication skills and life-long learning**)

Course Articulation Matrix (CAM) : U18EC707 MAJOR PROJECT WORK PHASE-I

CO	CO Code	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**U18EC707.1**	2	2	2	2	-	-	-	3	-	2	-	3	2	2
CO2	**U18EC707.2**	2	2	2	-	2	2	2	3	-	-	-	3	2	2
CO3	**U18EC707.3**	-	-	-	-	-	-	-	3	2	-	2	3	2	2
CO4	**U18EC707.4**	-	-	2	2	-	-	-	3	-	2	-	3	2	2
	U18EC707	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**

U18EC708 INTERNSHIP EVALUATION

Class: B.Tech. VII–Semester **Branch: Electronics & Communication Engineering (ECE)**

Teaching Scheme:

L	T	P	C
6 - 8 weeks internship			

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	--

Course Learning Objectives (LOs):

The internships will develop student interns' knowledge in real-world or industry environment in/on

LO1: pre-employment training opportunities, career information and employability-enhancement skills

LO2: communication and personal development skills

LO3: critical thinking and problem-solving skills

LO4: professionalism / work ethics and teamwork / collaboration in real organizational setting

Mandatory Internships:

1. The internships provide exposure to the real-world, get a feel for the work environment and how a professional workplace operates.
2. During the internship, students will experience a real-life engineering workplace and understand how their engineering and professional knowledge, skills and qualities (KSQs) can be utilized in industry.
3. Students can learn, more importantly, how to apply the KSQs they have acquired during an internship to their future workplaces.
4. Students will also be able to demonstrate functioning engineering knowledge, both new & existing, and identify areas of further development for their future careers.
5. Internships give the student an opportunity to bridge theory and practice
6. Internships also provide students with the soft skills needed at workplace and leadership positions.
7. The internship guidelines are governed by the rules stipulated in the Institute's Internship policy-2020 document.
8. The students shall have to undergo 6-8 weeks of mandatory internship during summer/winter vacation at industry/R&D organization / Academic Institutes like IITs, IIITs& NITs.
9. HoD, along with Prof i/c internships, shall address students (*of 2nd, 4th and 6th semesters*) during last week of even semester of every academic year on the following
   a. creating awareness on mandatory 6-8 weeks internship by every student
   b. creating awareness on COs of internships
   c. KSQs the students would acquire doing internships
   d. expected internship outcomes
   e. available internship options, and organizations offering internships
   f. progressively completing 6-8 weeks internship by the end of 6th semester summer, starting from 2nd semester summer break.
   g. internship evaluation in 7th semester
   h. internship report submission and oral presentation (through PPT) by student
10. Students undergoing the internship shall be required to submit their details to the department internship coordinators of the respective branches. He will coordinate all the internship activities of the students of that department.
11. Students have to submit a signed undertaking to the department internship coordinator for demonstrating honesty, integrity, professionalism and regular attendance at work place to add value to the organization where the internship is allotted. Students also have to uphold the professional image of our institute.

12. In case, a student is found to violate the internship rules and regulations, the student will have to produce a valid reason for the violation of internship rules. Without a valid reason, the student will be debarred from taking part in subsequent placement activities of the institute.
13. The students preferably shall undergo internship at one organization only. In case of any difficulty, the stipulated period of internship shall be completed at different organizations with minimum of one week internship at every stage.
14. The internship evaluation shall be done in the VII semester of study and hence the students shall complete the prescribed period of internship before start of VII semester (from end of II semester to commencement of VII semester).
15. The student learning assessment process (SLAP): The SLAP in internships shall include feedback from internship supervisor, submission of internship report on the complete internship and PPT presentation.
16. Internship Log Book: The activity journaling in a log book is very important for a successful internship.
    a. The internship supervisor identifies the work goals at the beginning of the internship
    b. Student has to maintain internship log book, where in the activities undertaken during internship and timely submission at periodic intervals are to be documented.
    c. At the conclusion of the internship, the supervisor shall specifically comment, in the internship log book, on whether the student met each of the work goals and to give evidence which describes the quality of work. For student, this also serves as a self-assessment.
    d. Internship log book *(with due signatures of the internship supervisor)* shall be considered for evaluation during presentation, i.e., number of planned meetings with internship supervisor and number attended by student
17. **Meeting Cadence:**
    i. **Regular meetings with internship supervisor:** Regular meetings with the internship supervisor to discuss work goals and review the status of activities undertaken are very essential. Student shall participate in discussions and take notes.
    ii. **Meeting Frequency:** The meeting cadence, *i.e., meeting frequency* shall be fixed in consultation with the internship supervisor and accordingly student has to participate in discussions and take notes. Take signatures of internship supervisor as per the planned cadence in the internship log book.
18. The internship evaluation shall be done by ***department internship evaluation committee*** **(DIEC)** based on the submitted report by student and oral presentation.
19. There shall be only Continuous Internal Evaluation (CIE) for internship evaluation.
20. CIE for the Internship evaluation in VII semester shall be as below:

Internship evaluation	Weightage
A. **Internship Supervisor's Assessment** *(i) Feedback from the internship supervisor* *- on completion of internship assignment / work (20%)* *(ii) Feedback from the internship supervisor* *- on quality of work in internship assignment / work (10%)* *(iii) Feedback from the internship supervisor* *- internship log book (10%)* *(iv) Feedback from the internship supervisor* *- on attendance, punctuality and work hours (10%)* (For the case of 6-8 weeks internship done in more than one spell, it will be average of all the internship supervisors' assessment)	**50%**
B. DIEC Assessment *(i) Internship duration (8 /6 weeks) (15% / 10%)*	**50%**

(ii) Internship Report (20%) *(iii) Oral Presentation (with PPT) and viva voce (15%)*	
Total Weightage:	**100%**

Note: *It is mandatory for the student to appear for oral presentation (with PPT) and viva voce to qualify for course evaluation*

(a) Internship Report: Each student is required to submit a well-documented internship report (both *soft copy and softbound hard copy*) as per format specified by DIEC. In case of completing the 6-8 weeks internship in more than one organization, the student shall be required to prepare separate softbound internship reports signed by the internship supervisor(s)along with the seal(s) of the organization(s). The student shall submit two final softbound internship reports along with a soft copy, keeping all the certificate(s) issued by the internship supervisor(s) and all the individual internship reports cleared by respective internship supervisor. The Chapter-1 of the final internship report shall clearly describe the following indicating overall summary.

(i) **Internship(s) attended**: A table with name & address of organization, organization's vision and mission, internship weeks attended, internship period (exact dates attended), internship supervisor, head of the section and head of the organization

(ii) **Duties/tasks during internship(s)**: Table describing name & address of organization, and the duties / tasks undertaken during internships. This indicates what opportunities and learning experiences the interns got to get hands-on experience on a wide range of KSQs of a professional engineer.

(iii) **Tangible outcomes of internship:** These are the lessons learnt from internship experience. The students have to describe in their own words what they learnt from the internship experience. The student has to describe what specific KSQs are acquired by him, with reference to the expected internship COs, after successful completion of internship(s). Finally, a table depicting systematic mapping of what they have learnt and the expected internship COs, is to be shown

(iv) **Student feedback on internship:** To gather information on whether internship was useful and gave practical experience on chosen field of interest, and other learning, a well-defined feedback questionnaire (*made available by the dept*)with closed and open questions shall be kept in the report.

(v) **Pictures at the worksite**: Student has to keep, in the report, his working pictures at the worksite, discussing with the internship supervisor, the creative project he is working on, or an event he is attending for work, group photo of the team/section/department he worked with.

(b) Anti-Plagiarism Check: The internship report should clear plagiarism check as per the Anti-Plagiarism policy-2020 of the institute.

(c) Presentation: Each student should prepare PPT with informative slides and make an effective oral presentation before the DIEC as per the schedule notified by the department. The presentation shall compulsorily have slides on the points mentioned in (a)(i)-(v)

(d) It is mandatory for every student to *appear for oral presentation(with PPT) and viva-voce*, to qualify for internship evaluation

(e) A student shall register for supplementary examination for the internship evaluation in the following cases:

(i) absent for oral presentation and viva-voce
(ii) fails to submit the internship report in prescribed format
(iii) fails to fulfill the requirements of internship evaluation as per specified guidelines

(f) Supplementary examination for internship evaluation

(i) The CoE shall send the list of students, registered for supplementary examination, to the HoD concerned

(ii) The DIEC, duly constituted by the HoD, shall conduct internship evaluation supplementary exam and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of the internship, student interns will be able to…

CO1: *gain career awareness, company/industry/workspace related knowledge, skills and work experience to add to resume, employer expectations for workplace behaviours; explore career alternatives prior to graduation; initiate and build a professional network and acquire employment contacts leading directly to a full-time job following graduation from institute; apply practice-oriented 'hands-on' interdisciplinary working experience in the real world or industry to solve real life challenges in the workplace by integrating academic theory and practice and analysing work environment and conditions; commitment to quality and continuous improvement; integrate internship experience with academic plan and articulate career options* ***(Career information and employability-enhancement skills)***

CO2: *receive and interpret messages in the communication; present thoughts and ideas clearly and effectively in oral, written, computer-based, graphical forms as required for particular workplace settings; collaborate effectively and appropriately with different professionals in the work environment; demonstrate time management, planning, independence, professional judgement and positive attitudes (self-reliance & self-confidence, openness, respect, proactive attitude, conscientiousness)* **(Communication and personal development skills)**

CO3: *review research literature, apply the knowledge of science, mathematics, and engineering with higher order cognitive skills to solve real-world problems and impact of solutions in society, environment and sustainability contexts; integrate existing and new technologies for industrial application; conduct investigations of problems; demonstrate analytical skills, including the ability to understand information and interpret data; exhibit foresight, independent thinking, resourcefulness, and the ability to make decisions; design systems, devices and components as needed and use the right tool (e.g., strategy, system, technology, etc.) for the right task* **(Critical thinking and problem solving skills)**

CO4: *demonstrate effective leadership with work ethics including time management, punctuality, honesty, integrity, personal accountability, adaptability; work effectively in teams and real multidisciplinary organizational settings; interact respectfully with all people and understand individuals' differences; build professional relationships with interpersonal skills; maintain a sense of commitment to professional, ethical and social responsibilities; engage on life-long learning of technologies through critical reflection of internship experiences and the KSQ of a professional engineer* **(Professionalism / Work ethic and Teamwork / Collaboration)**

Course Articulation Matrix (CAM) :U18EC708 INTERNSHIP EVALUATION

CO	CO code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC708.1	3	-	-	-	-	3	-	3	-	-	3	3	3	2
CO2	U18 EC708.2	-	-	-	-	-	-	-	3	-	3	3	3	3	2
CO3	U18 EC 708.3	3	3	3	3	3	3	3	3	-	-	3	3	3	2
CO4	U18 EC 708.4	-	-	-	-	-	-	-	3	3	-	3	3	3	2
U18 EC708		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

U18EC709 MICROWAVE AND OPTICAL FIBER COMMUNICATION

Class: B.Tech.VII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on

LO1: applications of microwaves and microwave tubes which are useful in modern communication.
LO2: wave guide components and various measurements which can be done at microwave frequency.
LO3: optical fiber structures, fiber splicing, optical sources and detectors.
LO4: optical receivers, analog links and network concepts.

UNIT-I (9)

Introduction: Microwave region and bands, applications, high frequency limitations of conventional tubes

Microwave tubes: Classification of micro wave tubes, Two cavity klystron amplifier – operation with applegate diagram, mathematical theory of bunching, principle of working, output power and efficiency; reflex klystron oscillator – operation with applegate diagram, mathematical theory of bunching, and output power; cylindrical magnetron – construction , operation and hull's cut-off conditions, Gunn diode

UNIT-II (9)

Waveguide Components: Scattering matrix – significance, properties; microwave hybrid circuits: E-plane tee, H-plane tee and magic tee, directional coupler, ferrites – composition and characteristics, Faraday rotation, gyrator, isolator and circulator

Microwave Measurements: Description of microwave bench, frequency measurement, attenuation measurement, VSWR measurement, impedance measurement and power measurement (Bolometer method)

UNIT-III (9)

Optical Fibers – structure and wave guiding: Major elements of an optical fiber link, nature of light, basic optical laws and definitions, fiber modes and configurations, single mode and multi-mode fibers, step index fiber and graded index fiber

Fiber Splicing, Optical Sources and Detectors: Splicing techniques, optical fiber connectors - connector types and connector return loss; light emitting diode, LASER diode, PIN photo detector and avalanche photodiode

UNIT-IV (9)

Optical Receiver: Fundamental receiver operation, digital signal transmission, error sources, digital receiver performance, probability of error, receiver sensitivity, quantum limit, eye diagrams, eye pattern features, BER, Q factor measurements and coherent detection

Analog links and Network concepts: Carrier to noise ratio, carrier power, relative intensity noise, limiting conditions of RIN, WDM and dense WDM, network topology, network categories, network layers, optical layers, SONET and WDM network

Text Books:

[1]. M. Kulkarni, *Microwave and Radar Engineering,* 4th ed., New Delhi: Umesh publications, 2009.
[2]. Gerd Keiser, *Optical Fiber Communications*, 5th ed., New Delhi: McGraw Hill, 2017.

Reference Books:

[1]. Samuel Y. Liao, *Micro wave devices and circuits*, 3rd ed., New Delhi: Pearson, 2003.
[2]. Annapurna Das and S. K. Das, *Microwave Engineering,* 3rd ed., New Delhi: McGraw Hill Education, 2017.
[3]. John M. Senior, *Optical Fiber Communications - Principles and practice,* 3rd ed., New Delhi: Pearson, 2010.
[4]. P. Chakrabarti, *Optical Fiber Communications,* New Delhi: McGraw Hill, 2015.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in Course Web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

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

CO1: *describe the applications of microwaves and microwave tubes which are useful in modern communication.*
CO2: *demonstrate wave guide components and various measurements which can be done at microwave frequency.*
CO3: *elaborate optical fiber structures, fiber splicing, optical sources and detectors.*
CO4: *examine optical receivers, analog links and network concepts.*

Course Articulation Matrix: U18EC709 Microwave and Optical Fiber Communication

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC709.1	2	2	1	1	1	-	-	1	1	1	-	1.5	1	1
CO2	U18EC709.2	2	2	1	1	1	-	-	1	1	1	-	1.5	1	1
CO3	U18EC709.3	2	2	2	1	1	-	-	1	1	1	-	1.5	1	1
CO4	U18EC709.4	2	2	2	1	1	-	-	1	1	1	-	1.5	1	1
	U18EC709	**2**	**2**	**1.5**	**1**	**1**	**-**	**-**	**1**	1	1	-	**1.5**	**1**	**1**

U18EC710 PYTHON PROGRAMMING & IOT LAB

Class: B.Tech. VII – Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO5: To acquire core programming basics and program design with functions using Python programming language
LO6: To understand a range of Object-Oriented Programming, Built in modules and file operators
LO7: To understand and develop comprehensive approach towards building small low cost embedded IoT system.
LO8: To develop real time application in IOT solve the society Problem

PART-1

Python Programs

1. a. Python program to demonstrate the use of Data Types
   b. Python program to demonstrate the use of Arithmetic operations
   c. Python program to demonstrate the use of Logical operations
2. a. Python program to demonstrate the use of Built-in Functions
   b. Python program to print the current day, date and time
3. Python program to demonstrate the operations on a list.
4. Python program to demonstrate working with tuples in python.
5. Python program to demonstrate working with dictionaries in python.
6. Python program to demonstrate the use of Loops
7. Python program to demonstrate the use of Strings
8. Python program to demonstrate the use of Classes and Objects
9. Python program to demonstrate the use of Built-in Modules
10. Python program to demonstrate the use of Constructors and Inheritance
11. Python program to demonstrate the use of File Operators

PART-2

Internet of Things

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation)
2. Study of different operating systems for R Raspberry Pi
3. Switch Light on and Off Based on the Input of User Using Raspberry Pi

4. Interface DTH11 sensor with Raspberry pi and write a program to print Temperature and humidity readings
5. Interfacing IR sensor with Raspberry pi and write a program for the detection of Object using the IR sensor
6. Interfacing Bluetooth with Raspberry pi and to send sensor data to smart phone using Bluetooth
7. Interfacing GSM module with Raspberry pi
8. To understand the connectivity of Raspberry-Pi with camera
9. Fingerprint Sensor interfacing with Raspberry Pi.
10. Write an application using Raspberry-pi to control the operation of the Hardware Simulated traffic signal.
11. To Create a simple Web interface for Raspberry-Pi/Beagle board

Course Learning Outcomes (COs):

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

CO1: Explain basic principles of Python programming language
CO2: Ability to explore python especially the object-oriented concepts, and the built-in objects of Python
CO3: Understand IOT Application Development using Raspberry-Pi board & Use Various Sensor like IR, Camera, DHT-11
CO4: Understand and Develop web interface for Raspberry-pi/Beagle board to control the connected LEDs remotely through the interface.

Course Articulation Matrix: U18EC710 Python Programming & IoT Lab

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC710.1	2	2	1	1	1	-	-	1	1	1	-	1.5	1	1
CO2	U18 EC710.2	2	2	1	1	1	-	-	1	1	1	-	1.5	1	1
CO3	U18 EC710.3	2	2	2	1	1	-	-	1	1	1	-	1.5	1	1
CO4	U18 EC710.4	2	2	2	1	1	-	-	1	1	1	-	1.5	1	1
U18 EC710		**2**	**2**	**1.5**	**1**	**1**	**-**	**-**	**1**	1	1	-	**1.5**	**1**	**1**

U18MH711 MANAGEMENT ECONOMICS AND ACCOUNTANCY

Class: B.Tech VII -Semester

Branch: Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge on /in…

LO1: basic concepts of management
LO2: concepts of economics and forms of business organizations
LO3: fundamentals of accountancy and journalizing
LO4: preparation of final accounts

UNIT-I (9)

Management: Meaning and definition, Scientific Management - Definition, Characteristics, Principles of management

Functions of Management: Planning - Definition, Characteristics; Organizing - Definition, Characteristics; Staffing - Meaning, Functions of personnel management; Directing- Leadership, Nature; Motivation – Nature, Types (financial, non-financial, intrinsic and extrinsic); Communication- Process, Types; Co-ordination- Definition, Steps to achieve effective coordination; Controlling- Definition, process

UNIT-II (9)

Economics: Meaning and definition, Scope, Micro and Macro Economics, Methods of Economics, Laws of Economics

Forms of Business Organization: Sole Proprietor ship, Partnership firm - Types of Partners, Cooperative society; Joint stock company - Features, Types, Merits and demerits

UNIT-III (9)

Double Entry System and Book Keeping: Accounting concepts and conventions, Overview of accounting cycle, Journal-meaning, Journalizing, Ledger - Meaning, Ledger posting, Balancing; Cash book (Single column), Preparation of Trial balance

UNIT – IV (9)

Final Accounts: Trading Account, profit and loss account and Balance Sheet with simple adjustments

Text Books:

[1] Y. K . Bhushan, *Fundamentals of Business Organization and Management*, 20th ed. New Delhi: Sultan Chand & Sons, 2017. (*Chapters 1, 2 & 4*)

[2] T. S. Grewal, S.C. Gupta, *Introduction to Accountancy*, 8th ed. New Delhi: S. Chand Publications, 2014. (*Chapters 1, 2, 3, 4, 6 & 8*)

Reference Books:

[1] Harold Koontz and Heinz Weihrich, *Essentials of Management*, 6th ed. New Delhi: Tata Mc Graw Hill Publications, 2006.

[2] L.M. Prasad, *Principles and Practice of Management*, 9th ed. New Delhi: Sultan Chand, 2016.

[3] R.L. Gupta & V.K.Gupta, *Principles and Practice of Accountancy*, 14th ed. New Delhi: Sultan Chand and Sons, 2018.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in Course Web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: comprehend the basic concepts of management
CO2: distinguish between micro & macro economics & forms of business organizations
CO3: pass journal entries & post them into ledgers
CO4: prepare profit & loss accounts and assess the financial position through the balance sheet

Course Articulation Matrix (CAM): U18MH711 MANAGEMENT ECONOMICS AND ACCOUNTANCY

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18MH711.1	-	-	-	-	-	-	-	-	1	1	1	1	-	2
CO2	U18MH711.2	-	-	-	-	-	-	-	-	1	1	2	1	-	1
CO3	U18MH711.3	-	-	-	-	-	-	-	-			1	1	1	1
CO4	U18MH711.4	-	-	-	-	-	-	-	-	-	-	1	1	2	1
U18MH711		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1.25**	**1**	**1.5**	**1.25**

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE:: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION
VIII SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAM

URR18-R22

[3Th+0P+1MC]

Sl.No	Category	Course Code	Course Title	Hour per week			Credits	Evaluation Scheme				
								CIE			ESE	Total Marks
				L	T	P		TA	MSE	Total		
1	PE	U18EC801	Professional Elective - V / MOOCs-V	3	-	-	3	10	30	40	60	100
2	PE	U18EC802	Professional Elective - VI /MOOCs-VI	3	-	-	3	10	30	40	60	100
3	OE	U18OE803	Open Elective - IV / MOOCs-VII	3	-	-	3	10	30	40	60	100
4	PROJ	U18EC804	Major Project - Phase - II	-	-	14	7	60	-	60	40	100
			Total:	**9**	**-**	**14**	**16**	**90**	**90**	**180**	**220**	**400**

[L= Lecture, T = Tutorials, P = Practicals & C = Credits

Professional Elective-V / MOOCs-V: U18EC801A: Cognitive Radio Networks U18EC801B: FPGA-Based System Design U18EC801C: Radar and Satellite Communication U18EC801M: MOOC course	**Professional Elective-VI/ MOOCs-VI:** U18EC802A: Cellular and Mobile Communication System U18EC802B: MEMs and NEMs U18EC802C: Digital Speech Processing U18EC802M: MOOC course	**Open Elective-IV /MOOCs-VII:** U18OE803A: Operations Research U18OE803B: Management Information Systems U18OE803C: Entrepreneurship Development U18OE803D: Forex and Foreign Trade U18OE803M: MOOC course

Contact hours per week : 23
Total Credits : 16

U18EC801A COGNITIVE RADIO NETWORKS

(Professional Elective-V)

Class: B.Tech.VIII-Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives :

This course will develop students' knowledge in/on

LO1: cognitive radio, dynamic spectrum access.

LO2: spectrum sensing, cooperative spectrum sensing

LO3: routing in cognitive radio,OFDM for cognitive radio

LO4: software defined radio

UNIT –I (9)

Introduction to Cognitive Radio: Introduction ,digital dividend, need for cognitive radio, cognitive radio (CR) architecture, characteristics of cognitive radio, types of cognitive radio, underlay, overlay and interweave transmission, advantages of cognitive radio, applications of cognitive radio, challenges in cognitive radio, simulation tools of cognitive radio, dynamic spectrum (DSA), spectrum sensing, spectrum analysis and decision

UNIT - II (9)

Spectrum Sensing: Spectrum sensing in cognitive radio networks: introduction conventional methods of spectrum sensing, energy detector, matched filter, cyclo-stationary feature detector, cooperative spectrum sensing. Spectrum opportunity, spectrum opportunity detection, fundamental trade-offs: performance versus constraint, sensing accuracy versus sensing overhead

UNIT - III (9)

Cognitive Radio Networks: Cognitive radio networks (CRN) architecture, terminal architecture of CRN, diversity radio access networks, routing in CRN, control of CRN, self-organization in mobile communication networks, security in CRN, cooperative

OFDM for cognitive radio: OFDM based cognitive radio, Why OFDM is a good fit for Cognitive radio, challenges to cognitive OFDM systems, multiband OFDM, A step toward cognitive-OFDM: standards and technologies

UNIT - IV (9)

Software Defined Radio (SDR): Introduction, wireless innovation forum tiers of SDR, SDR architecture, benefits of using SDR, portability of SDR waveform ,testing of interoperability of SDR, SDR security, the software communications architecture(SCA), basis of SCA, CORBA,SCA testing and acquiescence

Text Book(s):

[1] Rajeshree Raut, RanjitSawant, Shriraghavan Madbushi, *Cognitive Radio Basic Concepts, Mathematical Modeling and Applications*, UK: CRC Press, 2020.

[2] Kwang-Cheng Chen, Ramjee Prasad, *Cognitive Radio Networks*, New Delhi: John Wiley & Sons Ltd, 2009.

Reference Book(s):

[1] Ekram Hossain, Dusit Niyato, Zhu Han, *Dynamic Spectrum Access and Management in Cognitive Radio Networks*, USA: Cambridge University Press, 2009.

[2] Alexander M. Wyglinski, MaziarNekovee, and Y. Thomas Hou, *Cognitive Radio Communications and Networks – Principles and Practice*, Elsevier Inc., 2010.

[3] Jeffrey H. Reed, Software Radio, *A Modern Approach to radio Engineering*, Pearson Education Asia.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: discuss the cognitive radio and spectrum sensing
CO2: analyze conventional methods of spectrum sensing
CO3: elaborate the routing techniques and OFDM in cognitive radio
CO4: design communication systems applications using SDR

Course Articulation Matrix: U18EC801A Cognitive Radio Networks

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC801A.1	2	2	1	1	1	-	-	1	1	1	-	1	2	2
CO2	U18EC801A.2	2	2	1	1	1	-	-	1	1	1	-	1	2	2
CO3	U18EC801A.3	2	2	1	1	1	-	-	1	1	1	-	1	2	2
CO4	U18EC801A.4	2	1	1	1	1	-	-	1	1	1	-	1	2	2
U18EC801A		**2**	**1.75**	**1**	**1**	**1**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**2**

U18EC801B FPGA-BASED SYSTEM DESIGN

(Professional Elective-V)

Class: B.Tech.VIII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: properties of FPGA based systems and manufacturing processes
LO2: architecture of FPGA fabrics and logic implementation for FPGAs
LO3: sequential machine design process and design methodologies
LO4: multi-FPGA systems and Xilinx Zynq 7000 family programmable SOC

UNIT – I (9)

FPGA-Based Systems: Introduction, basic concepts, digital design and FPGAs, FPGA-based system design

VLSI Technology: Introduction, manufacturing processes, transistor characteristics, CMOS logic gates, wires, registers and RAM, packages and pads

UNIT – II (9)

FPGA Fabrics: Introduction, FPGA architectures, SRAM-based FPGAs, permanently programmed FPGAs, chip I/O, circuit design of FPGA fabrics, architecture of FPGA fabrics

Combinational Logic: Introduction, logic design process, hardware description languages, combinational network delay, power and energy optimization, arithmetic logic, logic implementation for FPGAs, physical design for FPGAs, logic design process revisited

UNIT – III (9)

Sequential Machines: Introduction, sequential machine design process, sequential design styles, rules for clocking, performance analysis, power optimization

Architecture: Introduction, behavioural design, design methodologies, design example

UNIT – IV (9)

Large-Scale Systems: Introduction, busses, platform FPGAs, multi-FPGA systems - constraints on multi-FPGA systems, interconnecting multiple FPGAs, multi-FPGA partitioning, novel architectures - machines built from FPGAs, alternative FPGA fabrics

Xilinx Zynq 7000 family programmable SOC (system on chip), High Level Synthesis (HLS)

Textbook:

[1] Wayne Wolf, *FPGA Based System Design*, Prentices Hall Modern Semiconductor Design Series, and New Jersey: PTR Prentice Hall, 2004.

Reference Books:

[1] Stephen Brown &ZvonkoVranesic, *Digital Logic Design with Verilog HDL*, New Delhi: TATA McGraw Hill Ltd. 2nd Edition 2007.

[2] Samir Palnitkar, *Verilog HDL: A Guide to Digital Design and Synthesis*, New Delhi :Prentice Hall, Second

Edition, 2003
[3] M.J.S. Smith, *Application Specific Integrated Circuits*, Delhi: Pearson, 2000.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):
On completion of this course, the students will be able to…
CO1: select the required FPGA-based system design
CO2: classify the hardware description languages for logic implementation
CO3: identify suitable sequential design styles and summarize the rules for clocking
CO4: identify the interconnecting multiple FPGAs& analyze Xilinx zynq 7000 family programmable SOC

Course Articulation Matrix: U18EC801B FPGA-Based System Design

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC801B.1	2	2	1	1	1	-	-	1	1	1	-	1	2	1
CO2	U18EC801B.2	2	2	1	1	1	-	-	1	1	1	-	1	2	1
CO3	U18EC801B.3	2	1	1	1	1	-	-	1	1	1	-	1	2	1
CO4	U18EC801B.4	2	2	1	1	1	-	-	1	1	1	-	1	2	1
U18EC801B		**2**	**1.75**	**1**	**1**	**1**	**-**	**-**	1	1	**1**	**-**	**1**	**2**	**1**

U18EC801C RADAR AND SATELLITE COMMUNICATION

(Professional Elective-V)

Class: B.Tech.VIII – Semester **Branch:** Electronics and Communication Engineering

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: classification of radar systems and working principle of MTI, pulse Doppler radars.
LO2: target tracking with radar, basic radar measurements and phased array radar architectures.
LO3: satellite orbits and its trajectories, satellite subsystems, earth station.
LO4: multiple access techniques employed for satellite communication, satellite link design and basics of communication satellites.

UNIT – I(9)

Introduction to Radar: Different types of radar systems, radar block diagram, radar equation, detection of signals in noise, receiver noise and SNR, transmitter power, pulse repetition frequency (PRF), beam shapes

MTI and Pulse Doppler Radar: Introduction to MTI and doppler radar, delay line cancellers, staggered PRFs, digital MTI processing, moving target indicator, limitation to MTI performance, pulse doppler radar

Radar Clutter: Introduction, surface clutter radar equation, land clutter, sea clutter, weather clutter, detection of targets in clutter

UNIT – II (9)

Tracking Radar: Tracking with radar, mono-pulse tracking, conical scan and sequential lobing, limitation to tracking accuracy, tracking in range, low angle tracking

Information from Radar Signals: Basic radar measurements, theoretical accuracy of radar measurements, Ambiguity diagram, Pulse compression techniques, target recognition;

Phased Array Radar Architectures: Introduction, antenna-based architectures, bandwidth-based architectures, function-based radars, scalable radar architectures.

UNIT – III (9)

Satellite Orbits and Trajectories: Definition, basic principles, orbital parameters, injection velocity and satellite trajectory, types of satellite orbits, orbital perturbations, satellite stabilization, orbital effects on satellite's performance, eclipses, look angles: azimuth angle, elevation angle

Satellite Subsystem: Power supply subsystem, attitude and orbit control, tracking, telemetry and command subsystem, payload

Earth Station: Types of earth station, architecture, design considerations, satellite tracking

UNIT – IV (9)

Multiple Access Techniques: Introduction, FDMA, SCPC systems, MCPC systems, TDMA, CDMA, SDMA

Satellite Link Design Fundamentals: Transmission equation, satellite link parameters, propagation considerations

Communication Satellites: Introduction, related applications, frequency bands, payloads, satellite vs. terrestrial networks, satellite telephony, satellite television, satellite radio, regional satellite systems, national satellite systems

Textbook:

[1] Sklonik Merrill, *Introduction to Radar Systems*, 3rd ed., New Delhi: Tata McGraw-Hill, 2001.
[2] Tom Jeffrey, *Phased-Array Radar Design: Application of Radar Fundamentals*, SciTech Publishing, Inc. 2009, ISBN 978-1-891121-69-2.
[3] Anil K. Maini, VarshaAgrawal, *Satellite Communications*, New Delhi: Wiley India Pvt. Ltd., 2015.

Reference Books:

[1] Nagaraja N. S., *Elements of Electronics Navigation*, 2nd ed.,New Delhi:Tata McGraw-Hill, 1996.
[2] Sharma K. K.,*Radar, Sonar and Navigation Engineering*, 2nd ed., New Delhi: S K Kataria& Sons, 2006.
[3] Timothy Pratt, Charles Bostian, Jeremy Allnutt, *Satellite Communications*, 2nd ed., New Delhi: Wiley India Pvt. Ltd , 2017.
[4] Dennis Roddy, *Satellite Communications*, 4th ed., New Delhi: McGraw- Hill International edition, 2006.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: classify the radar system describe the principle of operation of MTI, Doppler radars

CO2: select the radar for target tracking, identify pulse compression techniques and understand phased array radar architecture

CO3: understand the orbital and functional principles of satellite communication systems, interpret and select appropriate technologies for implementation of specified satellite communication systems.

CO4: analyse and evaluate a satellite link and suggest enhancements to improve the link performance. Select an appropriate modulation, multiplexing, coding and multiple access schemes for a given satellite communication link.

Course Articulation Matrix: U18EC801C Radar and Satellite Communication

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC801C.1	2	2	1	2	-	-	1	1	1	1	-	1	2	1
CO2	U18EC801C.2	2	2	1	2	-	-	1	1	1	1	-	1	2	1
CO3	U18EC801C.3	2	2	1	2	-	-	1	1	1	1	-	1	2	1
CO4	U18EC801C.4	2	2	1	2	-	-	1	1	1	1	-	1	2	1
U18EC801C		**2**	**2**	**1**	**2**	**-**	**-**	**1**	**1**	**1**	**1**	**-**	**1**	**2**	**1**

U18EC802A CELLULAR AND MOBILE COMMUNICATION SYSTEM

(Professional Elective-VI)

Class: B.Tech.VIII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: basic cellular System, operation & frequency reuse.
LO2: co-channel and non-co-channel interference.
LO3: frequency management and channel assignment.
LO4: cell coverage and traffic, GSM, CDMA, 4G and 5G technology.

UNIT – I (9)

Introduction To Cellular Mobile Systems: Evolution of mobile communication, basic cellular system, operation of cellular systems, performance criteria, limitations of conventional mobile telephone system, uniqueness of mobile radio environment

Elements of Cellular Radio System Design: Concept of frequency re use channels, max, number of calls per hour, max. number of frequency reuse channels per cell, co channel interference reduction factor, cell splitting, trunking efficiency degradation factor

UNIT – II (9)

Co-Channel Interference Reduction: Co-Channel interference, exploring co-channel interference areas in a system, design of an omni directional antenna system (worst case), design of directional antenna system, reduction of co-channel interference by means of a notch in the tilted antenna pattern, effect of antenna height on channel interference

Types of Non-Co-Channel Interference: Adjacent channel interference, near-end-far-end interference, power control mechanism, interference between two cellular systems, cross-talk phenomenon, effect of cell site components

UNIT – III (9)

Frequency Management and Channel Assignment: Frequency management, set-up channels, definition of channel assignment, fixed channel assignment, non fixed channel assignment algorithms

Handoffs and Dropped Calls: Purpose of hand off, types of hand off, initiation of a hand off, delaying a handoff, forced handoffs, power-difference handoffs, mobile assisted hand off (maho) and soft hand off, cell-site handoff only, intersystem handoff. Introduction to dropped calls

UNIT – IV (9)

Cell Coverage for Signal and Traffic: Signal reflection in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, land-to-mobile transmission model, near-in and long-distance propagation

Digital Cellular Systems: GSM-functional architecture and principal interfaces, channel structure, logical and physical channels, establishing a connection and handover, services and billing. CDMA-principle,

spreading and modulation, Introduction to 4G and 5G technology

Textbook:

[1] William C.Y. Lee, *Mobile Cellular Telecommunications* (*Analog and Digital)*, 2nd ed., New Delhi: McGraw-Hill International Editions, 2015.

Reference Books:

[1] William C.Y. Lee,*Mobile Communications Design Fundamentals*, 2nd ed., New Delhi: McGraw-Hill International Edition.

[2] William C.Y. Lee, *Mobile Communications Engineering (Theory and Application*), 2nd ed., New Delhi: McGraw Hill, 2015.

[3] Theodore S. Rappaport,*Wireless Communications (Principles and Practice)*, 2nd ed., 2002.

[4] Jerry D. Gibson, *Mobile Communications Hand Book,* 3rd ed., CRC Press.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in Course web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes:

After completion of this course, students will be able to….

CO1: illustrate the operation of Basic Cellular system and frequency reuse.

CO2: Compare the co-channel and Non co-channel interference.

CO3: develop the concepts of frequency management and channel assignment.

CO4: discuss the cell coverage and traffic & GSM, CDMA, 4G and 5G technology.

Course Articulation Matrix:U18EC802A CELLULAR AND MOBILE COMMUNICATION SYSTEM

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	U18EC802A.1	1	2	-	-	-	-	-	-	1	1	-	-	2	1
CO2	U18EC802A.2	1	2	-	-	-	-	-	-	1	1	-	-	2	1
CO3	U18EC802A.3	1	2	1	-	-	-	-	-	1	1	-	1	2	1
CO4	U18EC802A.4	1	2	1	-	-	-	-	-	1	1	-	1	2	1
U18EC802A		**1**	**2**	**1**	**-**	**-**	-	-	-	1	1	**-**	**1**	**2**	**1**

U18EC802B MEMS and NEMS

(Professional Elective-VI)

Class: B.Tech.VIII – Semester **Branch:** Electronics and Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: micro and nano electromechanical devices and their applications
LO2: fabrication process of micro systems
LO3: design aspects of micro sensors and micro actuators
LO4: concepts of quantum mechanics and nano systems

UNIT–I(9)

Overview of MEMS and Microsystems: New trends in engineering and science, micro and nano scale systems, introduction to design of MEMS and NEMS, overview of nano and micro electromechanical systems, applications of micro and nano electro mechanical systems, micro electromechanical systems, devices and structures definitions, materials for MEMS, silicon, silicon compounds, polymers, metals

UNIT-II(9)

Microsystems fabrication processes: Photolithography, ion implantation, diffusion, and oxidation, thin film depositions, LPCVD, sputtering, evaporation, electroplating

Etching techniques:Dry and wet etching, electrochemical etching

Micromachining: Bulk micromachining, surface micromachining, high aspect-ratio (LIGA and LIGA-like) technology

UNIT-III(9)

MEMS Sensors: Design of acoustic wave sensors, biomedical sensors and bio sensor, chemical sensors, optical sensors, pressure sensors and thermal sensors

Micro Actuators: Design of actuators, actuation using thermal forces, actuation using shape memory alloys, actuation using piezoelectric crystals, actuation using electrostatic forces (Parallel plate, torsion bar, comb drive actuators), micromechanical motors and pumps

UNIT-IV(9)

Nano systems, Quantum Mechanics, and Mathematical Models: Atomic structures and quantum mechanics, molecular and nanostructure dynamics, Schrodinger equation and wave function theory, density functional theory, nanostructures and molecular dynamics, electromagnetic fields and their quantization, molecular wires and molecular circuits

Text Books:

[1] Tai Ran Hsu, *MEMS and Microsystems Design and Manufacture*, New Delhi: Tata Mcraw Hill, 2002.

[2] Sergey Edward Lyshevski, *MEMS and NEMS: Systems, Devices, and Structures*,UK: CRC Press, 2002.

Reference Books:

[1] Marc Madou, *Fundamentals of Micro fabrication*, CRC press
[2] Chang Liu, *Foundations of MEMS*, Pearson education India limited, 2006
[3] Stephen D. Senturia, *Micro system Design*, Kluwer Academic Publishers,2001
[4] Chang Liu, *Foundations of MEMS*, Pearson education India limited, 2006,
[5] www.tutorials point.com.(NPTEL)

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in Course Web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: interpret the physical and chemical phenomena govern miniaturized systems for various applications

CO2: analyze the use of materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA

CO3: design and analyze the micro fabrication of both basic mechanical micro structures and micro sensors for smart machines on semiconductor

CO4: apply the theoretical foundations of quantum mechanics to execute research or design projects related to practical applications of MEMS/NEMS technology

Course Articulation Matrix (CAM):U18EC802BMEMs and NEMs

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC802B.1	1	1	1	1	1	-	-	1	1	1	-	1	2	1
CO2	U18EC802B.2	1	2	2	1	1	-	-	1	1	1	-	1	2	1
CO3	U18EC802B.3	1	2	2	1	1	-	-	1	1	1	-	1	2	1
CO4	U18EC802B.4	1	2	2	1	1	-	-	1	1	1	-	2	2	1
U18EC802B		**1**	**1.75**	**1.75**	**1**	**1**	-	-	1	1	1	-	**1.25**	**2**	**1**

U18EC802C DIGITAL SPEECH PROCESSING

(Professional Elective-VI)

Class: B.Tech.VIII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in / on

LO1: *fundamentals of digital speech processing*
LO2: *basic principles of linear predictive coding and homomorphic speech processing*
LO3: *methods of speech enhancement over noisy environments*
LO4: *hidden markov model for speech recognition*

UNIT-I (9)

Fundamentals of Digital Speech Processing: Introduction – the speech signal, digital transmission and storage of speech, the process of speech production, the acoustic theory of speech production – sound propagation, vocal tract transfer functions for vowels, excitation of sound in the vocal tract, digital models for speech signals

Time Domain Models for Speech Processing: Introduction- window considerations, short time energy and average magnitude short rime average zero crossing rate , speech vs. silence discrimination using energy and zero crossing, pitch period estimation using a parallel processing approach, the short time autocorrelation function, the short time average magnitude difference function, pitch period estimation using the autocorrelation function

UNIT-II (9)

Homomorphic Speech Processing: Introduction, homomorphic systems for convolution: properties of the complex cepstrum, computational considerations, the complex cepstrum of speech, pitch detection, formant estimation, the homomorphic vocoder

Linear predictive coding (LPC) analysis: Basic principles of linear predictive analysis: the autocorrelation method, the covariance method. Solution of LPC Equations: cholesky decomposition solution for covariance method. durbin' s recursive solution for the auto-correlation equations, comparison between the methods of solution of the LPC analysis equations, application of LPC Parameters: Pitch detection using LPC parameters

UNIT-III (9)

Speech enhancement: Introduction, nature of interfering sounds, speech enhancement (SE) techniques - spectral subtraction (SS), filtering and adaptive noise cancellation (ANC), enhancement by resynthesis

Automatic speech recognition (ASR): Basic pattern recognition approach, parametric representation of speech, evaluating the similarity of speech patterns, speech recognition systems – Isolated digit recognition system, continuous digit recognition system, summary of current ASR design

UNIT-IV (9)

Hidden Markov Model (HMM) for Speech: Hidden markov model (HMM) for speech recognition, training and testing using HMMs, adapting to variability in speech, language models

Speaker Recognition: Recognition techniques, features that distinguish speakers, speaker recognition systems - speaker verification systems, speaker identification systems

Text Books:

[1] L.R Rabiner and R.W Schafer, *Digital processing of speech signals*, New Delhi: Pearson education.

[2] Douglas O'Shaughnessy, *Speech Communications: Human and Machine*, 2 nd ed., IEEE Press.

Reference Books:

[1] Ben Gold, Nelson Morgan and Dan Ellis, *Speech and Audio Signal Processing: Processing and Perception of speech and music*, 2 nd ed., New Delhi: John Wiley & sons, Inc.

[2] Randy Goldberg and lance riek, *A practical handbook of speech coders,* CRC Press LLC, 2000.

[3] Soumya sen, Anjan dutta and Niranjan dey, *Audio processing and speech recognition concepts, techniques and research overviews, springer briefs in applied sciences and technology, computational intelligence.*

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in Course Web page

Course Patents: Patents relevant to the course content will be posted by the course faculty in Course Web page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in Course Web page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to

CO1: discuss the fundamentals of digital speech processing
CO2: analyze linear predictive coding and homomorphic speech processing
CO3: implement methods of speech enhancement over noisy environments
CO4: develop hidden markov model for speech recognition

Course Articulation Matrix: U18EC802C DIGITAL SPEECH PROCESSING

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18EC802C.1	2	2	1	1	1	-	-	1	1	1	-	1.5	2	2
CO2	U18EC802C.2	2	2	1	1	1	-	-	1	1	1	-	1.5	2	2
CO3	U18EC802C.3	2	2	2	1	1	-	-	1	1	1	-	1.5	2	2
CO4	U18EC802C.4	2	2	2	1	1	-	-	1	1	1	-	1.5	2	2
U18EC802C		**2**	**2**	**1.5**	**1**	**1**	**-**	**-**	**1**	**1**	**1**	**-**	**1.5**	**2**	**2**

U18OE803A - OPEARTIONS RESEARCH

Class: B. Tech.VIII – Semester **Branch(s):** Common to all branches

Teaching Scheme: **Examination Scheme:**

L	T	P	C
3	–	–	3

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on

LO1: concepts to solve linear programming problems which arise in real life using various methods and their advantages
LO2: applications of linear programming namely transportation and assignment problems which arise in different engineering
LO3: fields.non-linearity in optimization problems, direct search techniques and iterative methods.
LO4: various queuing systems and their practical relevance.

UNIT – I(9)

Linear Programming Problem (LPP): Mathematical models and basic concepts of linear programming problem; solution of linear programming problem - graphical method, simplex method, artificial variable techniques (Big-M and Two-phase method), duality in linear programming, dual simplex method.

UNIT – II (9)

Special types of LPP: Mathematical model of transportation problem, methods of finding initial basic feasible solution, optimal solution of transportation problem, degeneracy in transportation problem; exceptional cases in transportation problem- unbalanced transportation problem, maximization transportation problem; assignment problem- mathematical formulation of the problem, hungarian method to solve an assignment problem, special cases in assignment problem- maximization assignment problem.

UNIT – III (9)

Non-linear Programming Problem (NLPP):Classical method of optimization using hessian matrix; iterative methods - random search methods-random jump method, random walk method, steepest decent method and conjugate gradient method; direct methods - lagrange's method, kuhn-tucker conditions.

UNIT – IV (9)

Queueing Theory: Queueing system- Elements and operating characteristics of a queuing system; Probability distributions in queueing systems- distribution of arrivals (Pure Birth Process); classification of queueing models; Poisson queueing systems- study of various characteristics of single server queuing model having infinite population $\{(M/M/1):(\infty/FIFO)\}$ and single server queuing model having finite population $\{(M/M/1):(N/FIFO)\}$, generalized model (Birth-Death process).

Textbook:

[1] Kantiswarup et.al, *Operations Research*, 16th ed., New Delhi:S. Chand & Sons, 2013. (Unit-I, Unit-II, Unit-IV)
[2] Singiresu S. Rao, *Engineering Optimization Theory and Practice*, 4th ed., Hoboken, New Jersey: John Wiley & Sons, Inc, 2009 (Unit-III)

Reference Books:

[1] Hamdy. A. Taha, *Operations Research*, 7th ed., New Delhi: Prentice Hall of India Ltd, 2002.
[2] J.C. Pant, *Introduction to Optimization*, 7th ed., New Delhi*: Jain* Brothers, 2012.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to…

CO1: model engineering real time problems and solve them using various LPP techniques
CO2: obtain the optimal solution of transportation, assignment problems and their real time applications
CO3: optimize the engineering problems using NLPP techniques
CO4: differentiate various queueing models and their practical relevance

Course Articulation Matrix: U18OE803A - OPEARTIONS RESEARCH

CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE803A.1	2	2	-	-	-	-	-	-	-	1	-	1	1	1
CO2	U18OE803A.2	2	2	-	-	-	-	-	-	-	1	-	1	1	1
CO3	U18OE803A.3	2	2	-	-	-	-	-	-	-	1	-	1	1	1
CO4	U18OE803A.4	2	2	-	-	-	-	-	-	-	1	--	1	1	1
U18OE803A		2	2	-	-	-	-	-	-	-	1		1	1	1

U18OE803B MANAGEMENT INFORMATION SYSTEMS

Class: B.Tech.VIII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: basic concepts and challenges of management information systems
LO2: e-business and decision support systems techniques
LO3: development process and design of management information systems
LO4: different applications of management information systems

UNIT – I (9)

Management Information Systems: Systems: An Overview : Introduction, need for management information systems, management information systems: a concept, MIS: A definition, management information system and information technology, nature and scope of MIS, MIS characteristics, structure of MIS, types of MIS, role of MIS in global business, challenges of managing information systems, IT infrastructure and emerging technology

UNIT - II (9)

Business Applications of Information Systems:

E-Commerce, E-Business and E-Governance: Introduction, E-commerce, E-commerce sales life cycle, E-commerce infrastructure, E-commerce applications, E-commerce payment systems, management challenges and opportunities, E-business, E-governance

Decision Support Systems: Introduction, decision-Making: A concept, simon's model of decision-making, types of decisions, methods for decision-making, decision support techniques, decision-making and role of MIS, decision support systems, business intelligence, knowledge management systems

UNIT - III (9)

Development process of MIS: Development of long range plans of the MIS, ascertaining the class of information, determining the information requirement, development and implementation of the MIS, management of information quality in the MIS, organisation for development of MIS, MIS: development process mode

Strategic Design of MIS : Strategic management of the business, why strategic design of MIS, balance score card, Score card and dash board, strategic design of MIS, development process steps for strategic design (SD) of MIS, Illustrating SD of MIS for big bazaar, strategic management of business and SD of MIS, business strategy determination, Business strategy implementation

UNIT - IV (9)

Management of Global Enterprise : Enterprise management system, enterprise resource planning (ERP) System, ERP model and modules, benefits of the ERP, ERP product evaluation, ERP implementation, Supply chain management (SCM), information management in SCM, customer relationship management (CRM), management of global enterprise, EMS and MIS

Applications in Manufacturing Sector: Introduction, personnel management (PM), financial management (FM), production management (PM), raw materials management (RMM), marketing management, corporate overview.

Text Books:

[1] D.P.Goyal, Vikas, *Management Information Systems–Managerial Perspective*, 4thed. Addison-Wesley, 2014. *(Unit 1)*
[2] Waman S. Jawadekar,*Management Information Systems Text and Cases: a Global Digital Enterprise Perspective,* 5th ed. McGraw Hill, 2014*(Unit 2,3,4)*

Reference Books:

[1] Kenneth C. Laudon& Jane P. Laudon, *Management Information Systems,12th ed.* Prentice Hall, 2012.
[2] S. Sadagopan, *Management Information Systems,2nd ed.,* PHI Learning, 2014.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

On completion of this course, students' will be able to…

CO1: explain the structure and importance of management information systems
CO2: analyze management information systems for decision making
CO3: explain the methodology to design and develop a management information system
CO4: describe different applications of management information systems in various manufacturing sectors

Course Articulation Matrix (CAM):U18OE803B MANAGEMENT INFORMATION SYSTEMS

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	U18OE803B.1	2	2	1	1	1	-	-	-	-	1	-	1	2	1
CO2	U18OE803B.2	2	2	2	1	1	-	-	-	-	1	-	1	2	1
CO3	U18OE803B.3	2	2	2	3	1	-	-	-	-	1	-	2	2	1
CO4	U18OE803B.4	2	2	3	3	1	-	-	-	-	1	-	2	3	1
U18OE803B		2	2	2	2	1	-	-	-	-	1	-	1.5	2.25	1

U18OE 803C ENTREPRENEURSHIP DEVELOPMENT

(Open Elective-IV)

Class: B.Tech.VII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on…..
LO1: various characteristics of entrepreneur and his role in development of the nation
LO2: creativity and business plan
LO3: functions of various managements/managers in industry
LO4: legal issues in entrepreneurship and intellectual property rights

UNIT –I (9)

Entrepreneurship: Definition, role of entrepreneurship in economic development, characteristics and types of an entrepreneur, Forms of business organizations; agencies dealing with entrepreneurship and small scale Industries; Case studies of successful entrepreneurs- identification of business opportunities in various branches of engineering

UNIT-II (9)

Creativity and Business Idea: Sources of new ideas, methods of generating ideas and creative problem solving, concepts of innovation and incubation.
Business Plan: definition, scope and value of business plan, market survey and demand survey.
Feasibility studies: Technical feasibility, financial viability and social acceptability; Preparation of preliminary and bankable project reports;

UNIT-III (9)

Project Planning: Product planning and development process, sequential steps in executing the project.
Plant layout: Principles, types and factors influencing layouts,
Material Management: Purchase procedures, Issues of Materials -LIFO, FIFO, HIFO and Base stock;.
Fundamentals of Production Management: Production Planning and Control (PPC)-Concepts and functions, long & short run problems.
Marketing Management: Definition, functions and market segmentation.

UNIT-IV (9)

Financial Management: Introduction, Sources of finance-internal and external.
Human Resource Management: Introduction, importance, selection, recruitment, training, placement, development;
Legal Issues in Entrepreneurship: Mechanisms for resolving conflicts; Industrial laws- Indian Factories Act, Workmen Compensation Act; Intellectual Property Rights (IPR) – patents, trademarks, and copyrights

Text Book:

[1] Robert D.Hisrich, Michael P. Peters, *Entrepreneurship*, 9th Ed., New Delhi: Tata McGraw-Hill, 2014 (Chapters 1,2,4,5,6,7,8,11 and13).

Reference Books:

[1].David H. Holt, "*Entrepreneurship New venture creation" Prentice Hall of India*.2004.

[2].Handbook for "New Entrepreneurs", *Entrepreneurship Development Institute of India*, Ahmadabad.

[3].T.R. Banga, "*Project Planning and Entrepreneurship Development*", New Delhi: CBS Publishers, 1984.

[4].Personnel efficiency in Entrepreneurship Development-"A Practical Guide to Industrial Entrepreneurs", *S. Chand & Co*., New Delhi.

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (COs):

Upon completion of this course, students will be able to…

CO1: *describe characteristics of entrepreneur and his role in economic development*

CO2: *apply creative problem solving methods to real time situations*

CO3: *explain the functions of production and marketing managements*

CO4: *identify the legal issues in entrepreneurship and explain intellectual property rights*

Course Articulation Matrix: U18OE 803C ENTREPRENEURSHIP DEVELOPMENT														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE803C.1	1	1	1	1	1	-	-	1	1	1	-	1	1	1
CO2	U18OE803C.2	1	1	1	1	1	-	-	1	1	1	-	1	1	1
CO3	U18OE803C.3	1	1	1	1	1	-	-	1	1	1	-	1	1	1
CO4	U18OE803C.4	1	1	1	1	1	-	-	1	1	1	-	1	1	1
U18OE803C		1	1	1	1	1	-	-	-	1	1	-	1	1	1

U18OE803D FOREX & FOREIGN TRADE

(Open Elective-IV)

Class: B.Tech.VIII – Semester **Branch:** Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
3	–	–	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):

This course will develop students' knowledge in/on…..

LO1: business, business system, objectives and types of companies
LO2: fundamentals of foreign trade and EXIM procedure
LO3: foreign exchange rate and methods of payments
LO4: foreign exchange control

UNIT–I (9)

Business: Nature and scope, Classification of business activities, Functions of commerce and trade.
Business System: Characteristics and components of business system, objectives of business, classification of business objectives; Types of Business.

UNIT-II (9)

Foreign Trade: Introduction of international trade, reasons for external trade, special problems of foreign trade; EXIM-objectives, roles of EXIM in foreign trade, stages in import procedure, stages in export procedure-bill of lading, mate's receipt, certificate of origin.
Corporations Assisting Foreign Trade: State trading corporation of india, export credit and guarantee corporation, minerals and metals trading corporation of india.

UNIT–III (9)

Foreign Exchange Rate: Meaning and importance of Foreign exchange rate, methods of foreign payments; exchange rates- spot, forward and cross rates; demand and supply of foreign exchange rate, equilibrium rate of foreign exchange, theories of determining foreign exchange rate, international parity condition - balance of payments.
Foreign Exchange Markets: Functions of exchange markets, components and players in exchange markets; fema-objectives and its role in foreign trade.

UNIT–IV (9)

Foreign Exchange Control: objectives, characteristics, advantages and disadvantages, methods: intervention, exchange restriction, multiple exchange rates,exchange clearing agreements, method of operation, exchange clearing agreements in practice, payments agreements, transfer moratoria; indirect methods.

Text Books:

[1]. C.B. Guptha, *Business Organization & Management,* 15th ed. New: Sultan Chand & Sons,2015(Units 1,5)

[2]. M.L. Seth, *Macro Economics*, 22nd ed. New Delhi; Lakshmi Narayan Agarwal Publishers, 2014.

[3]. M.C. Vaish, Ratan Prakashan Mandir, *Monetary Theory*, 16th ed. New Delhi: Vikas

Publications,2016

Reference Books:

[1]. Y.K.Bhushan, *Business Organization and Modern Management*, 15th ed., New Delhi: Sultan & Sons Publishers, 2014.

[2]. S.A. Sherlekhar "Business Organization and Management", Himalaya Publishing House, 2000.

[3]. K.P.M. Sundaram, "Money Banking, Trade & Finance ", Sultan & Sons Publishers, New Delhi.

[4]. P.N.Chopra, "Macro Economics", Kalyani Pubnlishers, 1/e, Ludhiana

Course Research Papers: Research papers (Journal/Conference papers) relevant to the course content will be posted by the course faculty in CourseWeb page

Course Patents: Patents relevant to the course content will be posted by the course faculty in CourseWeb page

Course Projects: Course project is an independent project carried out by the student during the course period, under the supervision of course faculty. Course faculty will post few course projects titles in CourseWeb page. Students are encouraged to come up and experiment with the ideas that interest them.

Course Learning Outcomes (CO):

Upon completion of the course, the student will be able to…

CO1: evaluate the objectives and types of industries and companies.

CO2: assess the procedure in imports and exports

CO3: analyse the foreign exchange rate and methods of foreign payments

CO4: adapt the methods of exchange control

Course Articulation Matrix: U18OE803D Forex and Foreign Trade														
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	U18OE803D.1	-	-	-	-	-	-	-	-	-	2	2	-	1	1
CO2	U18OE803D.2	-	-	-	-	-	-	-	-	-	2	2	-	1	1
CO3	U18OE803D.3	-	-	-	-	-	-	-	-	-	2	2	-	1	1
CO4	U18OE803D.4	-	-	-	-	-	-	-	-	-	2	2	-	1	1
U18OE803D		-	-	-	-	-	-	-	-	-	2	2	-	1	1

U18CE804 MAJOR PROJECT WORK PHASE-II

Class: B.Tech. VIII - Semester
Branch: Electronics & Communication Engineering (ECE)

Teaching Scheme:

L	T	P	C
-	-	14	7

Examination Scheme:

Continuous Internal Evaluation	60 marks
End Semester Examination	40 marks

Course Learning Objectives (LOs):

The major project work will develop students' knowledge on /in…

LO1: real-world complex engineering problems, literature review, problem formulation; and experimental and data analysis techniques

LO2: design/development of solutions to real-world engineering problems; conduct of investigations of complex problems; modern tool usage to design, build and test a prototype; impact of solution in society, environment and sustainability contexts

LO3: ethics, team work and project management skills such as budgeting, scheduling

LO4: oral, written and multimedia communication skills; self-directed independent learning and life-long learning

1. **Major project work shall be continued in 8th semester as major project *phase-II*:** All the major project teams shall take the *phase -I* work forward and complete the remaining work as *Phase-II* in the 8th semester.

2. Final Year Major Project work represents the culmination of study towards the B. Tech degree. **Major project offers an opportunity to integrate the knowledge acquired from various courses and apply it to solve real-world complex engineering problems**. The **student learning assessment process** (SLAP) shall include good number of presentations, demonstration of work undertaken, submission of a project report, writing project paper in scientific journal style & format, preparing project poster and creating video pitch on the complete project

3. Activities of major project SLAP shall be planned in such a way to ensure that the students acquire the essential knowledge, skills and qualities (KSQ) of a professional engineer.

4. Team work: Major project work is a team work

(i) The students of a project team shall work together to achieve a common objective.

(ii) Every student of a project team is expected to function effectively as an individual, and also with others as a team member in an ecosystem of team having knowledge diversity, gender diversity, social and cultural diversity among its members.

5. Every student is expected to put approximately **168 hours of work** into the major project *phase-II* course over the 12 weeks of 8th semester.

6. Major project work *Phase-II*: 8th semester

(xii) The convener DPEC shall release complete schedule of *phase-II* CIE during last week of 7th semester (*well in advance before start of 8th semester*), immediately after completion of progress presentation-I, so that student teams would complete the scheduled works during inter-semester break and get ready with informative, confident and comfortable presentation for progress presentation-II.

(xiii) **The project supervisors**: The project supervisors are expected to guide the students to systematically continue the *phase-I* work, useful work during inter-semester break, meeting the deadlines as proposed in project timeline.

(xiv) The project supervisors shall ensure students focus on the project objectives and expected deliverables

(xv) The project supervisors shall ensure students have sufficient resources for successful project completion.

(xvi) The project supervisors shall continue guiding students on

(n) *Knowledge, skills and qualities (KSQ) of a professional engineer to be acquired* to propose solutions and design the systems to the identified real-world problems.

(o) *Problem analysis* - to identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(p) *Applying engineering knowledge* - to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

(q) *Design/development of solutions* - to 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

(r) *Conduct investigations of complex problems* - to 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

(s) *Modern tool usage* – to 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

(t) *Engineering and society* – to 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

(u) *Environment and sustainability* – to understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development

(v) *Ethics* – to apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice

(w) *Individual and team work* – to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

(x) *Communication* – to 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

(y) *Project management and finance* – to 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

(z) *Life-long learning* – to 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

(xvii) The project supervisors are also expected to continuously emphasize and guide the students on

(o) **Following project timeline**: completing the tasks as planned in project timeline

(p) **Meeting Cadence:**

i. **Regular meetings with supervisor:** Short and frequent meetings increase a team's work momentum. Regular meetings with supervisor to review the status of

project are very essential. All students of the team shall participate in discussions and take notes.

ii. **Meeting Frequency: Semi-weekly cadence,** i.e., the meeting frequency shall be **twice a week.** Due weightage will be given to meeting cadence and considered for evaluation during presentations, i.e., number of planned meetings and number attended by students

(q) **Project Log Book:** The activity journaling in project log book is very important for a successful project.

vi. Project log book is a written record showing the daily project activity on project goals from the very first thing like starting the project (an introduction statement what the project is all about), to the completion of the work (including the final results, and whether project met the core objectives / outcomes, etc.).

vii. In project log book, the activities like regular meetings with project supervisor, and work carried out on daily/weekly basis are to be recorded. This ensures that the student progress is being monitored well.

viii. The project supervisor shall regularly check the log book of every student of project team and endorse each and every activity by affixing his signature with date. With this, the number of planned meetings and number attended by the students will be also monitored.

ix. Log books are to be shown during all presentations and will be graded along with the project.

x. At the conclusion of the project work *phase-II*, the supervisor shall specifically comment, in the project log book, on whether the project team met each of the project work outcomes and to give evidence which describes the quality of work. For project teams, this also serves as self-assessment.

(r) **Writing down whatever is done and making notes of whatever is read**. Writing down the procedures / models followed, designs made, experiments conducted, simulations carried out, intermediate results obtained, ***difficulties faced and how they were fixed*** are very important. This kind of documenting the whole process as we go with project implementation is a very effective way and will help preparing a well- documented report having original content. Note down and include information about all the resources that you used, magazines, Journals, patents, books, and so on. This information will be needed for the bibliography in your project report. On the other hand, documenting a report ***on the spur of the moment*** would end up copying things from other sources resulting in a plagiarized document.

(s) The relevant knowledge, skills and qualities (**KSQ**) an engineering graduate should possess, which can be specially acquired by participating in major project work

(t) **Good and sufficient literature review**: Literature review is a description and analysis of information related to the topic of project work. Reading good number of review articles, research articles published in recent issues of peer reviewed journals, technical magazines, patents, reference books on the topics of potential interest, will help one understand what has already been discovered and what questions remain to identify gaps in the literature.

(u) Completing the proposed work by the end of *phase-II*

(v) Right conduct of research to promote academic integrity, honesty and time management

(w) Preparing a well-documented overall project report in proper format, covering the complete work carried out during both the phases (*phase-I and phase-II*).

(x) Consequences of plagiarism, and use of anti-plagiarism software to detect plagiarism in the report

(y) Submission of major project work report within acceptable plagiarism levels, as per the ***Anti-plagiarism policy-2020 of our institute***

(z) **Video pitch on complete project work**: Capturing short videos, photos, screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed during course of project execution, photos showing interaction with supervisor for creating a short video pitch on the complete work done during both phases (*phase-I and phase-II*).

(aa) **Project Paper**: Writing a technical paper at the end of *phase-II* based on the solution(s) proposed, results obtained and prototype / working model / process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal.

(bb) **Project poster**: At the end of phase-II, the project teams shall have to present their project in the form of posters, at the time of demonstration of complete porotype / working model / software package / system developed.

(xviii) Phase – II evaluation: There shall be only Continuous Internal Evaluation (CIE) for major project work *phase-I* with following components

Progress Presentation -II *(during third / fourth week of 8th semester):* The progress presentation-II shall include the identified problem, objective(s), literature review, expected outcome(s), results of work done as per project plan timeline.

i. **Following project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.
ii. 80-85% of work is expected to be completed
iii. Project teams shall compulsorily show the following as part of their progress presentation-II
    1. *The slides on project timeline and*
    2. *A table showing targeted tasks as per timeline and status – whether tasks accomplished?*
iv. **Project log book**: Every student of the Project team shall compulsorily show the activity journaling in the log book (with due signatures of project supervisor) during presentations

(b) **Final Presentation** *(during penultimate week of 8th semester):* **Project supervisor shall ensure that the project team has accomplished 100% of work proposed**. The project team shall

i. **Follow project timeline**: The project timeline shall be meticulously followed and the tasks shall be completed as planned in project timeline.
ii. compulsorily show the following as part of their final presentation
    1. *The slides on project timeline and*
    2. *A table showing targeted tasks as per timeline and whether all the identified tasks accomplished?*
iii. **show project log book**: Every student of the Project team shall compulsorily show the complete activity journaling in the log book (*with due signatures of project supervisor*)
iv. present complete results & analysis
v. **demonstrate the completed project**: working model / process / software package / system developed
vi. demonstrate the completed project with the **project poster presentation**

(xix) Evaluation for Major project phase-II:

There shall be continuous internal evaluation (CIE) and end semester examination (ESE). The evaluation for *phase-II* shall be as given below:

Assessment	Weightage
A. CIE **(i) Supervisor Assessment (10%)** **(ii) DPEC Assessment (50%)** *(a) Progress presentation-II (10%)* *(b) Final presentation (10%)* *(c) Working model / process / software package / system developed (20%)* *(d) Project video pitch (5%)* (e) *Project paper (5%)*	**60%**
B. ESE *(i) Well-documented project report (15%)* *(DPEC shall evaluate the project reports, as per the rubrics, well before the ESE. At the time of ESE, evaluated project report marks shall be posted in the award list, along with the ESE oral presentation marks. Students shall appear for Viva-Voce with project report)* *(ii) Oral presentation with PPTs and viva-voce (15%)* *(iii) Project poster (5%)* *(DPEC shall evaluate the project poster, as per the rubrics, well before the ESE. At the time of ESE, evaluated project poster marks shall be posted in the award list. Students shall appear for Viva-Voce with project poster)*	**40%**
Total Weightage	**100%**

(d) **Working Model:** Every project team shall be required to develop a working model/ process/software package/system, on the chosen work. The completed working model/ process/software package/system shall be demonstrated during final presentation at the end of *phase-II*.

(e) **Video pitch**: Every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*. The project team shall present the produced video pitch during Final presentation. The produced video pitch should

a. be 3 to 5-minute-long video (no longer than 5 minutes)
b. be concise and to the point, on the problem, proposed solution and its salient features.
c. show project timeline and sample page of log book
d. highlight the various stages during project implementation with the help of short videos / photos / screenshots on experiments conducted, simulations carried out, prototype / working model / process / software package / system developed as part of proposed solution and also photos showing team interactions with supervisor and the team working in the lab on project.
e. discuss the impact of proposed solution in *ethical*, *environmental*, *societal and sustainable development contexts.*
f. emphasize key points about *business idea, potential market for the proposed solution*

(f) **Project poster**: At the end, the project teams shall present their project in the form of posters (A2 size). The teams shall have to present their work during the poster presentation session scheduled at the end of the 8th semester, at the time of demonstration of complete porotype / working model / software package / system developed.

(g) **Well-documented plagiarism-cleared project report**: Every project team shall be required to submit a well-documented project report on the work carried out, as per the format specified by the DPEC. The report should clear plagiarism check as per the anti-plagiarism policy-2020 of the institute. The following shall compulsorily be included in the Results-Chapter of the project report

(i) Photos / screen shots taken at various stages during the development of working model/ process/software package/system as part of Results-Chapter

(ii) Snapshot of final working model/ process/software package/system developed

(iii) Pictures of the team working in the lab, the team discussing with the project supervisor, working on creative project, or an event they are attending for work.

(iv) All these photos / screen shots shall be properly referred in the project report by assigning figure numbers

(h) **Tangible outcomes of project work in Conclusions - Chapter:** These are the lessons learnt from doing a project work. The students have to describe in their own words what they learnt from the project work experience. They have to describe what specific KSQs are acquired by them, with reference to the expected COs, after successful completion of major project work. Finally, a table depicting systematic mapping of what they have learnt and the expected major project work COs, is to be shown in the conclusions chapter.

(i) **Student feedback on major project in Conclusions - Chapter:** To gather information on whether project work was useful and gave practical experience on chosen field of interest, and other learning, a well-defined feedback questionnaire (*made available by the dept*) with closed and open questions shall be kept in the conclusions chapter of the project report.

(xx) It is mandatory for

(d) every student of the team to appear for ESE oral presentation and viva-voce, to qualify for course evaluation

(e) every project team to write a technical paper based on the solution(s) proposed, results obtained and prototype / working model / process / software package / system developed, for submission to a reputed non-predatory conference/non-paid peer reviewed journal

(f) every project team shall be required to create a pitch video, which is a video presentation on their major project work *phase-I & phase-II*

(g) every project team shall present their project in the form of a poster, during the demonstration of complete porotype / working model / software package / system developed

(xi) The student has to register for the Major project work *phase-II* as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce as part of ESE presentation

(b) he/she fails to fulfill the requirements of Major project work *phase-II* evaluation as per specified guidelines

(xii) Supplementary examination for Major project work *phase-II*

(a) The CoE shall send the list of students, registered for supplementary examination, to the HoDs concerned

(b) The DPEC, duly constituted by the HoD, shall conduct Major project *phase-II* supplementary exam and send the award list to the CoE within the stipulated time

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Course Learning Outcomes (COs):

Upon completion of the major project work, students will be able to…

CO1: *review research literature, formulate problem, apply knowledge of mathematics, sciences, engineering fundamentals, experimental and data analysis techniques; synthesize technical knowledge and innovative approaches to generate suitable solutions for real-world complex engineering problems* **(Technical skills)**

CO2: *design a system or product based on product/customer specifications; develop, analyze, and critically evaluate the design alternatives in order to justify the solutions to a real-world problem guided by ethical, environmental, societal and sustainable development considerations; use modern engineering and IT tools to design, build and test a prototype within specified project timeline and budget* **(Problem solving and critical thinking skills)**

CO3: *apply project management and organizational skills; demonstrate integrity, leadership, creativity, professional and ethical responsibilities as an individual and as a member or leader to produce time-sensitive deliverables in a multi-disciplinary team* (**Ethics and teamwork**)

CO4: *collate the results, compare performance of prototype to design specifications and present clearly and effectively the proposed solution, conclusions and/or recommendations in written (report, poster, technical paper), oral (presentations) and multimedia formats (video pitch) and engage in self-directed independent learning and life-long learning demonstrating the KSQ of a professional engineer* (**Communication skills and life-long learning**)

Course Articulation Matrix (CAM) : U18EC804 MAJOR PROJECT WORK PHASE-II															
CO	**CO Code**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**U18EC804.1**	2	2	2	2	-	-	-	3	-	2	-	3	2	2
CO2	**U18EC804.2**	1	2	2	-	2	2	2	3	-	-	-	3	2	2
CO3	**U18EC804.3**	-	-	-	-	-	-	-	3	2	-	2	3	2	2
CO4	**U18EC804.4**	-	-	2	2	-	-	-	3	-	2	-	3	2	2
U18EC804		**1.5**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**

DEPARTMENT OF ELECTRONICS &COMMUNICATION ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE:: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

SEMESTER WISE CREDITS DISTRIBUTION

SEM	No. of Credits	Contact hours
I	21	29
II	22	29
III	21	25
IV	22	27
V	21	26
VI	20	25
VII	17	24
VIII	16	23
Total	160	208

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University, Warangal)

SEMESTER Vs COURSE CATEGORY WEIGHTAGE

(in terms of Total No. of Courses / Total No. Credits)

Semester	Number of Courses / Number of Credits (*Course Category wise*)								
	BSC	**ESC**	**HSMC**	**PCC**	**OE**	**PE**	**PROJ**	**MC**	**TOTAL**
I	3/9	4/12	-	-	-	-	-	2/0	9/21
II	3/9	5/10	1/3	-	-	-	-	1/0	10/22
III	1/4	1/2	1/1	4/10	2/4	-	-	-	9/21
IV	-	-	1/1	7/17	1/4	-	-	2/0	11/22
V	-	1/3	-	6/14	-	1/3	1/1	1/0	10/21
VI	-	2/4	1/1	5/11	-	1/3	1/1	-	10/20
VII	-	-	1/3	2/2	1/3	2/6	1/3	1/0	8/17
VIII	-	-	-	-	1/3	2/6	1/7	-	4/16
Total	**7/22**	**13/31**	**5/9**	**24/54**	**5/14**	**6/18**	**4/12**	**7/0**	**71/160**
% Weightage of Course Category	13.75 % (22/160)	19.37 % (31/160)	5.625 % (9/160)	33.75 % (54/160)	8.75 % (14/160)	11.25 % (18/160)	7.5 % (12/160)	0 %	100 % (160/160)