KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
(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)
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.
काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫
website: www.kitsw.ac.in E-mail: principal@kitsw.ac.in ✆ : +91 9392055211, +91 7382564888

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech - COMPUTER SCIENCE AND ENGINEERING

URR-18

(Applicable from the Academic Year 2018-19)

SYLLABI (III to VI SEMESTERS)

DEPARTMENT OF COMPUTER SCIENCE AND 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 DEGREE PROGRAM

[6Th+3P+1MC]

S.No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	BSC	U18MH301	Engineering Mathematics - III	3	1	-	4	10	30	40	60	100
2	HSMC	U18MH302	Professional English	_	_	2	1	100	-	100	-	100
3	PCC	U18CS303	Object Oriented Programming through JAVA	3	1	-	4	10	30	40	60	100
4	BSC	U18MH304	Discrete Mathematics	3	-	-	3	10	30	40	60	100
5	PCC	U18CS305	Computer Architecture and Organization	3	-	-	3	10	30	40	60	100
6	PCC	U18CS306	Advanced Data Structures	3	-	-	3	10	30	40	60	100
7	ESC	U18EI309	Digital Electronics	3	-	-	3	10	30	40	60	100
8	PCC	U18CS310	Object Oriented Programming through Java Lab	-	-	2	1	40	-	40	60	100
9	PCC	U18CS311	Advanced Data Structures Lab	_	_	2	1	40	-	40	60	100
10	MC	U18MH315	Essence of Indian Traditional Knowledge	2	-	-	-	10	30	40	60	100
			Total:	20	2	6	23	250	210	460	540	1000

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

Total Contact Periods/Week: 28 **Total Credits: 23**

Stream-I: ME, CSE, IT, CSN, CSE(IOT) **Stream-II: CE, EIE, EEE, ECE, ECI, CSE(AI&ML)**

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 occur in engineering

LO2*: *Fourier series and its importance.

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

LO4*: *integration of a function of complex variable, and 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 Book:

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 Code: **U18MH301** Course Name: **ENGINEERING MATHEMATICS- III**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18MH301.1**	*find the Laplace transform of a given function and apply Laplace transforms to solve and certain differential equations whose solutions cannot be computed using classical methods.*
CO2	**U18MH301.2**	*describe a given function as Fourier series in an interval and understand its importance in engineering.*
CO3	**U18MH301.3**	*understand the concept of a function of complex variable and verify whether a function is analytic or not, construct analytic function when real/imaginary part of the function is known; find velocity potential and stream function of a fluid flow using complex analytical methods.*
CO4	**U18MH301.4**	*represent a given function in Taylor's and Laurent's series and evaluate certain real integrals using integral theorems.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

	Course code: **U18 MH301** Course Name: **Engineering Mathematics- III**														
CO Code	**PO1**	**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**	**PSO 3**
U18MH301.1	2	2	--	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301.2	2	2	--	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301.3	2	2	--	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301.4	2	1	--	--	--	--	--	--	--	--	--	1	1	--	1
U18MH301	**2**	**1.75**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**--**	**1**

U18MH302 PROFESSIONAL ENGLISH

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

L	T	P	C
-	-	2	1

Continuous Internal Evaluation :	100 marks
End Semester Exam :	-

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 Book:

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 Edition Pearson India Education Services Pvt. Ltd., Chennai
2. Harper Collins, "Collins COBUILD English Grammar" Third Edition, *Harper Collins Publishers Ltd.*
3. Rosemary & Courtney, "Longman-English-Chinese Dictionary of Phrasal Verbs"

Course Outcomes (COs):

Course Code: U18MH302/402 Course Name: Professional English		
CO	**CO Code**	*Up on completion of this course, the students will be able to…*
CO1	**U18MH302.1**	analyze the passage using skill and sub skill to solve different types of questions related to reading comprehension
CO2	**U18MH302.2**	identify grammatical errors in the given sentences and correct them
CO3	**U18MH302.3**	select correct synonyms/antonyms/phrasal verbs and complete sentences with suitable words or phrases
CO4	**U18MH302.4**	keep the given jumbled sentences in proper sequence to make a coherent paragraph

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: U18MH302					**Course Name: Professional English**										
Course Outcomes	**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**	**PS 3**
U18MH302.1	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302.2	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302.3	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302.4	-	-	-	-	-	-	-	-	1	2	-	1	1	1	1
U18MH302	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**1**	**1**	**1**	**1**

U18CS303 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Class: B. Tech III-Semester **Branch:** Computer Science and Engineering

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: the basic concepts of programming paradigms and java programming.

LO2: concepts of classes, methods and strings.

LO3: types of inheritance, interfaces.

LO4: concepts of packages, streams (I/O), exceptional handling and multithreading.

UNIT-I (9+3)

Programming paradigms: Procedural programming, Modular programming, Object oriented programming, Generic programming.

Java basics: History and evolution of Java, An overview of java, Data types, Variables and arrays, Operators, Control statements.

Introducing classes: Structures in C, Class fundamentals, Objects, Methods, Object reference variables.

UNIT-II (9+3)

Classes and methods: Overloading methods, *this* keyword, Passing and returning objects, Recursion, Variable length arguments, Constructors, Overloading constructors, Garbage collection, *static* variables, *static* blocks and *static* methods, Nested and inner classes, Command line arguments, Wrapper classes.

Strings: Exploring String, StringBuffer, StringBuilder, and StringTokenizer classes.

UNIT-III (9+3)

Inheritance: Inheritance basics, Types of inheritance, *super* keyword, Method overriding, Order of constructors calling, Dynamic method dispatch, Abstract classes, *final* with inheritance, Object class.

Interfaces: Defining an interface, Implementing interfaces, Nested interfaces, Interfaces can be extended.

UNIT-IV (9+3)

Packages: Packages, Access protection, Importing packages.

Using I/O: I/O basics, Reading, Writing and copying files using byte and character streams.

Exception handling: Fundamentals, Exception types, Uncaught exceptions, Using *try* and *catch*, Multiple catch clauses, Nested *try* statements, *throw*, *throws*, *finally*.

Multithreading: Creating a thread, Creating multiple threads, Thread priorities, Synchronization, and interthread communication.

Text Book:

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

Reference Books:

1. Kathy Sierra, Bert Bates, "Head First Java", *2nd Edition, O'Reilly Publications,* ISBN-13: 978-0596009205, 2013.
2. Uttam K. Roy, "Advanced JAVA Programming", *1st edition*, *Oxford Publications;* ISBN- 13: 978-0199455508, 2013.

Course Code: **U18CS303** Course Name: **Object Oriented Programming Through Java**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	U18CS303.1	*distinguish various programming paradigms and implement java fundamental programs.*
CO2	U18CS303.2	*implement classes, constructors, and strings.*
CO3	U18CS303.3	*apply reusability concepts like inheritance, dynamic method dispatch, and interfaces.*
CO4	U18CS303.4	*implement packages, apply streams (I/O), exception handling, and multithreading.*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: U18CS303 **Course Name:** Object Oriented Programming through Java

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
U18CS303.1	1	1	1	1	-	-	-	-	-	1	-	-	1	1	2
U18CS303.2	2	2	2	1	-	-	-	-	-	1	-	2	2	1	3
U18CS303.3	2	2	2	1	-	-	-	-	-	1	-	2	2	1	3
U18CS303.4	2	2	2	1	-	-	-	-	-	1	-	2	2	1	3
U18CS303	1.75	1.75	1.75	1	-	-	-	-	-	1	-	2	1.75	1	2.75

U18MH304 DISCRETE MATHEMATICS

Class: B.Tech. III-Semester **Branch:** Common to CSE &IT branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on

LO1: *necessary mathematical concepts that are prerequisite for computer related subjects namely database management systems, knowledge based systems and artificial intelligence.*

LO2 : *different types of logics namely first-order logic ,quantifier logic and predicator logic so as to gain knowledge of artificial intelligence.*

LO3: *elementary Combinations and permutations with repetitions, different methods of solving recurrence relations.*

LO4: *concepts and algorithms related various types of graphs, trees and applications to real life Problems.*

UNIT-I (9)

Foundation: Sets and operations on sets ,relations and functions, binary relations ,equivalence relations, partial order relations, Hasee diagram and lattices, transitive closure of a relation. paths and closures, digraphs, adjacency matrices of binary relations, Warshall algorithm.

UNIT-II (9)

Fundamentals of Logic: Propositions and connectives, truth tables ,propositional functions, logical inferences, first order logic, predicate calculus and quantified logic, pigeonhole principle, mathematical induction.

UNIT-III (9)

Elementary combinations and recurrence Relations: Basic concepts of permutations and combinations, enumeration with unlimited repetition and applications, enumeration with constrained repetitions and applications, principle of inclusion and exclusion.

Generating function of sequences: Coefficients of generating function, recurrence relations and its applications, solutions of recurrence relations by method of substitution, characteristic roots and generating functions, solving non-linear recurrence relations.

UNIT-IV (9)

Graphs: Basic concepts, isomorphism, sub graphs, trees and their properties, spanning trees, binary trees, planner graphs, Euler's formula, multi graphs and Eulerian circuits, Hamiltonian graphs, chromatic number, four color problem.

Text Books:

1. J.L.Mott, A.Kandel and T.P.Baker – "Discrete Mathematics for Computer Scientists",*Prentice- Hall of India,* New Delhi, 2nd Edition, 1999.*(Chapter 1, 4, 2, 3, 5).*

Reference Books:

1. J.P.Tremblay, R.Manohar,"Discrete Mathematical Structures with Applications to Computer Science", *MGH*, New York, 1977.
2. Zohar Manna, "Mathematical Theory of Computation", *MGH*, New Delhi.
3. C.L. Liu,"Elements of Discrete mathematics", *Tata Mc. Graw Hill*, 3rd edition, 2008.

Course Outcomes (COs):

Course Code: **U18MH304** Course Name: **DISCRETE MATHEMATICS**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18MH304.1**	*explain the basic concepts of sets and relations and their applications to lattice problems, to determine all the possible paths available in directed paths*
CO2	**U18MH304.2**	*analyze the different types of logic in order to establish knowledge based systems, to*
CO3	**U18MH304.3**	*solve different type of enumeration problemsand apply to real life problems .*
CO4	**U18MH304.4**	*solve different problems like Koenig's Berge seven bridges, using Euler graphs and find the chromatic number of the different graphs.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

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	PSO 3
U18MH304.1	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1
U18MH304.2	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1
U18MH304.3	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1
U18MH304.4	2	2	--	--	--	--	--	--	--	--	--	1	1	1	1
U18MH304	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**1**	**1**	**1**

U18CS305 COMPUTER ARCHITECTURE AND ORGANIZATION

Class: B.Tech. III-Semester **Branch:** Computer Science & Engineering

Teaching Scheme: **Examination Scheme:**

L	T	P	C			
3	-	-	3		Continuous Internal Examination	40 marks
					End Semester Examination	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on
LO1: basic structure of a computer, principle components and instruction set architecture.
LO2: working of processing unit and computation of arithmetic operations.
LO3: various types of memories and data transfer among memory, processor & I/O.
LO4: architecture and operation of high performance computing systems.

UNIT-I (9)

Basic structure of computers: Functional units, Basic operational concepts, Performance.
Instruction set architecture: Memory locations and addresses, Memory operations, Instructions and instruction sequencing, Instruction formats, Addressing modes, Assembly language-Assembler directives.

UNIT-II (9)

Basic processing unit: Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, Control signals, Hard-wired control, CISC-style processors.
Arithmetic: Addition and subtraction of signed numbers, Multiplication of unsigned numbers, Multiplication of signed numbers, Fast multiplication, Integer division, Floating-point numbers and operations.

UNIT-III (9)

The memory system: Basic concepts, Semiconductor RAM memories-Internal organization of memory chips, Static memories, Dynamic RAMs, Read-only memories, Memory hierarchy, Cache memories, Performance considerations, Secondary storage.
Input-output organization: Input-output interface- I/O bus and interface modules, I/O versus memory bus, Isolated versus memory-mapped I/O, Asynchronous data transfer- Strobe control, Handshaking, Asynchronous serial transfer.

UNIT-IV (9)

Modes of transfer: Modes of transfer, Priority interrupt, Direct memory access, Interconnection standards.
Pipeline and vector processing: Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline, Vector processing.
Multi processors: Characteristics of multiprocessors, Interconnection structures.

Text Books:

a. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", *McGraw-Hill Education*, 6th Edition, ISBN: 978-0- 07-338065-0, 2012.*(Chapter Nos.1,2,5,7-9)*

b. M. Morris Mano, "Computer System Architecture", Revised Third Edition, Pearson Education, ISBN: 978-93-325-8560-7, 2019. *(Chapter Nos.9,10,11,12,14)*

Reference Books:

1. B Ram, Sanjay Kumar, "Computer Fundamentals: Architecture and Organization", *New Age International Publishers*, 5th Edition, ISBN: 978-81-224-3610-5, 2018.
2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", 7th Edition, Pearson Education, ISBN 978-81-7758-993-1, 2009.

Course Code: **U18CS305** Course Name: **Computer Architecture And Organization**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	U18CS305.1	*identify functional units of a computer, explain addressing modes and instruction formats.*
CO2	U18CS305.2	*write control sequence for execution of an instruction, explain hardwired and microprogrammed control and perform arithmetic operations with signed and unsigned integers.*
CO3	U18CS305.3	*design memory organization and explain data transfer among memory, processor & I/O .*
CO4	U18CS305.4	*analyze different modes of data transfer and explain the concepts of parallel processing, pipelining for high performance computing systems.*

Course Articulation Matrix (Mapping of Cos with POs & PSOs):

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
U18CS305.1	2	2	2	1	-	1	-	-	-	-	-	1	1	2	2
U18CS305.2	2	2	2	1	-	1	-	-	-	-	-	1	1	2	2
U18CS305.3	2	2	2	1	-	1	-	-	-	-	-	1	1	2	2
U18CS305.4	2	2	1	1	-	1	-	-	-	-	-	1	1	2	2
U18CS305	**2**	**2**	**1.75**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**2**

U18CS306 ADVANCED DATA STRUCTURES

Class: B. Tech III-Semester **Branch:** Computer Science & Engineering

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Learning Objectives(LOs):

This course will develop student's knowledge in/on

LO1: representing the data with circular single linked list and double linked list.
LO2: organizing and retrieving the data using binary search trees and AVL trees.
LO3: maintaining balanced search tress with B-trees, B+-trees and Splay trees.
LO4: concepts of spanning trees, searching, sorting and hashing.

UNIT – I (9)

Stacks and Queues Extended: Multiple stacks, Deques, Priority queues.
Linked Lists: Circular linked lists, doubly linked lists, circular doubly linked list and its operations (Insertion, Deletion, Searching, and Traversal).

UNIT – II (9)

Binary Tree : Construction of binary tree using tree traversal results, Applications of trees.
Binary Search Tree: Binary search tree operations- Insertion, Deletion, Search, Recursive and Non-recursive traversals, Threaded binary trees.
AVL Trees: AVL trees operations –Insertion, Deletion and Traversal.

UNIT - III (9)

Multiway Search Trees: Introduction to m-way search trees, Operations on B-Trees (Insertion, Deletion, Search), Introduction to B+-trees.
Red-Black Trees: Properties, Operations, Applications, Splay trees.

UNIT – IV (9)

Minimum Spanning Trees: Prim's algorithm, Kruskal's algorithm.
Searching and Internal Sorting: Fibonacci search, Insertion sort, Radix sort.
External sorting: Merge sort, Heap sort.
Hashing: Introduction, Hash tables, Different hash functions, Collisions.

Text Book:

1. Debasis Samanta, "Classic Data Structures", *Prentice Hall India*, 2nd Edn., ISBN-13: 978-81- 203-3731-2, 2009.
2. Reema Thareja, "Data Structures Using C", *Oxford University Press*, 2nd Edn., ISBN-13: 978-0- 19-809930-7, 2014.

Reference Books:

1.E. Balagurusamy, "Data Structure Using C", *McGraw Hill Education*, 1st Edn., ISBN-13: 978-125-902-9547, 2017.

2.Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", *Cengage Learning*, 2nd Edn., ISBN-13: 9788131503140, 2007.

Course Code: **U18CS306** Course Name: **Advanced Data Structures**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	U18CS306.1	*implement programs using circular single linked list and double linked list.*
CO2	U18CS306.2	*represent the data with non linear data structure using binary trees, binary search trees and AVL trees.*
CO3	U18CS306.3	*analyze balanced search trees such as B-trees, B+-trees and Splay trees.*
CO4	U18CS306.4	*organize and retrieve the data using minimum spanning trees, searching, sorting and hashing techniques*

Mapping of the Course Learning Outcomes with Program Outcomes:

CO/PO	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	PSO 3
U18CS306.1	2	2	2	2	-	-	-	-	-	1	-	1	2	2	2
U18CS306.2	2	2	2	2	-	-	-	-	-	1	-	1	2	2	2
U18CS306.3	2	3	3	2	-	-	-	-	-	1	-	2	2	2	2
U18CS306.4	2	2	3	2	-	-	-	-	-	1	-	1	2	2	2
U18CS306	2	2.25	2.5	2	-	-	-	-	-	1	-	1.25	2	2	2

U18EI309 DIGITAL ELECTRONICS

Class: B.Tech. III-Semester **Branch:** Computer Science & Engineering

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on…

LO1: *switching algebra and various minimization techniques of switching functions*
LO2: *various combinational circuits and their applications*
LO3: *types of flip flops and their use in the design of sequential circuits*
LO4: *finite state machines and their minimization*

UNIT – I (9)

Number Systems and Codes: Representation of number systems, conversion of numbers from one radix to other, Binary arithmetic, r's and (r-1)'s complements, 1's and 2's complement subtraction, Binary weighted and non-weighted codes – BCD, Self complementing, Excess-3 and Gray Codes

Boolean Algebra and Minimization: Postulates and theorems; logic gates –symbols and truth tables, realization of switching functions - AOI, NAND-NAND and NOR-NOR realizations; minimization of switching functions - using theorems, standard SOP & POS forms, Karnaugh map and Quine - McClusky techniques

UNIT – II (9)

Combinational circuits: Design of combinational circuits using logic gates – Half adder, Full adder, Half subtractor, Full subtractor, Parallel adder, Serial adder, Carry look ahead adder, BCD adder and 1's & 2's complement adder/subtractors; Decoders - BCD to 7 segment, BCD to Decimal; Encoders, Priority encoders; Multiplexers, Demultiplexers, Realization of switching functions using Multiplexers and Decoders

UNIT – III (9)

Sequential circuits: NAND RS latch, NOR RS latch; Flip flops- SR, JK, D and T, preset and clear inputs, truth tables, excitation tables , race around condition, Master slave flip flop, conversion of one flip flop to other; Binary counters – ripple and synchronous counters; Shift registers – modes of operation, Ring and Johnson counters

Synchronous sequential circuits: State table, state diagram, state assignment, design of synchronous binary counters

UNIT – IV (9)

Finite State Machines: Capabilities and limitations of Finite State Machines , state equivalence, state minimization of completely specified machines using Partition technique, state minimization of incompletely specified machines using Merger graphs and Merger tables

Text Books:

1 Zvi. Kohavi, "Switching and Finite Automata Theory", *Tata McGraw-Hill,* 2nd edn., 2008, New Delhi. (Chapter 3,4,5 and 9)

2 Moris Mano," Digital Design", *PHI* , 3rd edn., 2003, New Delhi. (Chapters 2 to 6)

Reference Books:

1 R.P. Jain, "Modern Digital Electronics", *Tata McGraw-Hill,* 3rd edn., 2003, New Delhi.

2 A.Anand Kumar, "Switching Theory and Logic Design", *PHI* ,1st edn., 2013, New Delhi. (Reprint)

3 Herbert Taub and Donald Schilling, "Digital Integrated Circuits", *Tata McGraw-Hill* 2008, New Delhi.

Course Code: **U18EI309** Course Name: **Digital Electronics**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	U18CS309.1	*apply various minimization techniques to obtain minimal SOP/POS forms of switching functions*
CO2	U18CS309.2	*design different combinational circuits to implement logic functions*
CO3	U18CS309.3	*explain the operation of flip flops and design sequential circuits like counters, shift registers*
CO4	U18CS309.4	*minimize completely and incompletely specified state machines using partition and merger graph/table methods*

Mapping of the Course Learning Outcomes with Program Outcomes:

CO/PO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
U18EI309.1	2	2	-	1	1	-	-	-	-	-	-	1	1	1	1
U18EI309.2	2	2	2	1	1	-	-	-	-	-	-	1	1	1	1
U18EI309.3	2	2	2	1	1	-	-	-	-	-	-	1	1	1	1
U18EI309.4	2	2	2	1	1	-	-	-	-	-	-	1	1	1	1
U18EI309	2	2	2	1	1	-	-	-	-	-	-	1	1	1	1

U18CS310 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LABORATORY

Class: B. Tech III-Semester **Branch:** Computer Science & Engineering

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: The basic concepts of java programming and difference from procedural programming approach to object oriented programming approach.

LO2: building fundamental java programs related to classes, methods and strings.

LO3: designing java programs effectively with the help of inheritance and interfaces concepts.

LO4: packages, I/O, exceptional handling and multithread programming using java.

List of Experiments

UNIT-I

Experiment-I:

1. Write a program to demonstrate different operators in java.
2. Write a program to demonstrate control structures.
3. Write a program to demonstrate *switch* statement.

Experiment-II:

1. Write a program to read an array and display them using *for-each* control. Finally display the sum of array elements.
2. Write a program to read a matrix and display whether it is an identity matrix or not. Use *civilized form* of *break* statement.
3. Write a program to define a two dimensional (2D) array where each row contains different number of columns. Display the 2D-array using *for-each*.

UNIT-II

Experiment-III:

1. Write a program to demonstrate class concept.
2. Write a program to demonstrate object reference variable.
3. Write a program to demonstrate overloading of methods.
4. Write a program to demonstrate passing and returning objects.

Experiment-IV:

1. Write a program to demonstrate variable length argument (using array and ellipsis notation).
2. Write a program to demonstrate constructors and garbage collection.
3. Write a program to demonstrate nested and inner classes.
4. Write a program to demonstrate *static* variables, *static* methods, and *static* blocks.

Experiment-V:

1. Read at least five strings from command line argument and display them in sorted order.
2. Write a program to demonstrate wrapper class by reading N number of integers from command line and display their sum.
3. Write a program to demonstrate wrapper class by reading N floating point numbers from command line and display their average.

Experiment-VI:

1. Write a program to accept a string, count number of vowels and remove all vowels.
2. Write a program to accept a string, count number of vowels and remove all vowels using *StringBuffer* class**.**
3. Write a program to accept a line of text, tokenize the line using *StringTokenizer* class and print the tokens in reverse order.

UNIT-III

Experiment-VII:

1. Write a program to demonstrate single level-inheritance.
2. Write a program to demonstrate multilevel-inheritance using super.
3. Write a program to demonstrate method overriding.

Experiment-VIII:

1. Write program to demonstrate dynamic method dispatch.
2. Write a program to demonstrate use of abstract class.
3. Write a program to demonstrate the use of overriding *equals()* method of an Object class.

Experiment-IX:

1. Write a program to implement interfaces.
2. Write a program to demonstrate implementation of nested interfaces.

UNIT-IV

Experiment-X:

1. Write a program to create a *package*, and demonstrate to import the *package* into any java program (Consider the behavior of all access specifiers).

Experiment-XI:

1. Write a program to demonstrate *try-catch* block.
2. Write a program to demonstrate *throws* clause.
3. Write a program to demonstrate *re-throw* an exception, and *finally* block.

Experiment-XII:

1. Write a program to demonstrate read/write/copy a file using *byte stream*.
2. Write a program to demonstrate read/write/copy a file using *character stream*.
3. Write a program to create a thread (using *Thread* class or *Runnable* interface).
4. Write a program to demonstrate *synchronization* of threads.
5. Write a program to demonstrate *Interthread communication*.

Text Book:

1. Herbert Schildt, "JAVA The Complete Reference", *9th Edition*, *McGraw-Hill Education India Pvt. Ltd,* ISBN: 9781259002465, 2011.

Reference Books:

1. Kathy Sierra, Bert Bates, "Head First Java", *2nd Edition, O'Reilly Publications,* ISBN- 13: 978-0596009205, 2013.
2. Uttam K. Roy, "Advanced JAVA Programming", *1st edition*, *Oxford Publications;* ISBN- 13: 978-0199455508, 2013.

Course Code: U18CS310 Course Name: Object Oriented Programming through Java Laboratory		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	U18CS310.1	*implement java fundamental programs.*
CO2	U18CS310.2	*implement classes, constructors, and strings.*
CO3	U18CS310.3	*apply reusability concepts like inheritance, dynamic method dispatch, and interfaces.*
CO4	U18CS310.4	*implement packages, apply streams (I/O), exception handling, and multithreading.*

Mapping of the Course Learning Outcomes with Program Outcomes:

CO/PO	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	PSO 3
U18CS310.1	2	2	2	1	-	-	-	-	-	1	-	-	2	2	2
U18CS310.2	2	2	2	1	-	-	-	-	-	1	-	2	2	2	3
U18CS310.3	2	2	2	1	-	-	-	-	-	1	-	2	2	2	3
U18CS310.4	2	2	2	1	-	-	-	-	-	1	-	2	2	2	3
U18CS310	2	2	2	1	-	-	-	-	-	1	-	2	2	2	2.75

U18CS311 ADVANCED DATA STRUCTURES LABORATORY

Class: B. Tech III-Semester **Branch:** Computer Science & Engineering

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*: represent the data using multi stack, circular single linked list, double linked list, list and circular double linked list.*

LO2*: non linear data structures binary search trees and AVL trees.*

LO3*: balanced search trees like B-trees and graph traversal methods.*

LO4*: concepts of searching and sorting.*

List of Experiments

Experiment-I

1. Program to implement multi stack.

Experiment-II

1. Program to create circular single linked list and implement its operations
   i) insert ii) delete iii) traversal

Experiment-III

1. Program to create double linked list and implement its operations
   i) insert ii) delete iii) traversal

2. Program to create circular double linked list and implement its operations
   i) insert ii) delete iii) traversal

Experiment-IV

1. Program to perform following binary search tree operations.
   i) creation ii) insertion of a node iii) traversal using recursion.

Experiment-V

1. Program to perform following binary search tree operations.
   i) creation ii) deletion of a node iii) traversal using recursion.

Experiment-VI

2. Program to create a binary search tree operations
   i) creation ii) insertion of a node iii) traversal using non-recursion.

Experiment-VII

1. Program to implement AVL tree construction.

Experiment-VIII

1. Program to implement B-tree construction (degree 3).
2.

Experiment-IX

1. Program to implement the following graph traversal techniques.

a) Depth first search b) Breadth first search.

Experiment-X

1. Program to implement Fibonacci search.
2. Program to implement insertion sort.

Experiment-XI

1. Program to implement Merge sort.
2. Program to implement radix sort

Experiment-XII

1. Program to implement heap sort.

Laboratory Manual:

1. 'Advanced Data Structures' laboratory manual, *prepared by faculty of Dept. of Computer Science &Engineering.*

Reference Books:

1. Reema Thareja, "Data Structures Using C", *Oxford University Press*, 2nd Edn., ISBN-13: 978-0- 19-809930-7, 2014.
2. E Balagurusamy, "Data Structure Using C", *McGraw Hill Education*, 1st Edn., ISBN-13: 978- 125-902-9547, 2017.

Course Code: U18CS311 Course Name: **Advanced Data Structures Laboratory**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	U18CS311.1	*implement Multistack and different linked lists.*
CO2	U18CS311.2	*perform operations on binary search trees and AVL trees.*
CO3	U18CS311.3	*implement various operations on B-trees and graph traversal techniques.*
CO4	U18CS311.4	*apply the different methods on graph traversal, searching and sorting.*

Mapping of the Course Learning Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
U18CS311.1	1	1	3	1	1	1	1	1	1	1	0	2	2	2	2
U18CS311.2	1	1	2	2	1	1	1	1	-	1	-	2	2	2	2
U18CS311.3	1	1	3	3	2	1	1	1	-	1	-	3	2	2	2
U18CS311.4	1	1	3	2	3	2	2	2	-	2	-	3	2	2	2
U18CS311	**1**	**1**	**2.75**	**2**	**1.75**	**1.25**	**1.25**	**1.25**	**1**	**1.25**	**0**	**2.5**	**2**	**2**	**2**

U18MH315 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

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

Teaching Scheme :

L	T	P	C
2	-	-	-

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, Purana.

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", Rupa Publications Pvt. Ltd. New Delhi. (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 Book:

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

Course Outcomes (COs):

Course Code: **U18MH315/U18MH415** Course Name: **Essence Of Indian Traditional Knowledge**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	U18MH315.1	*summarize the basic structure of Vedas, Upavedas, Vedanga, Upanga*
CO2	U18MH315.2	*explain Vedas as principal source of knowledge for scientific inventions*
CO3	U18MH315.3	*describe different yogasanas, breathing techniques, chakras, meditation and their benefits*
CO4	U18MH315.4	*discuss the benefits of yoga as an effective tool for management of human crisis*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18MH315** Course Name: **Essence Of Indian Traditional Knowledge**															
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**	**PSO 3**
U18MH315.1	-	-	-	-	-	1	-	2	1	1	-	-	-	-	-
U18MH315.2	-	-	-	-	-	1	1	2	1	1	-	-	-	-	-
U18MH315.3	-	-	-	-	-	1	-	2	2	1	-	2	-	-	-
U18MH315.4	-	-	-	-	-	1	1	2	2	1	-	2	-	-	-
U18MH315	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**1.5**	**1**	**-**	**2**	**-**	**-**	**-**

SCHEME OF INSTRUCTION & EVALUATION

IV SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAM

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U18OE401	Open Elective-II	3	1	-	4	10	30	40	60	100
2	HSMC	U18TP402	Soft and Inter Personal Skills	-	-	2	1	100	-	100	-	100
3	OE	U18OE403	Open Elective-I	3	-	-	3	10	30	40	60	100
4	PCC	U18CS404	Theory of Computation	3	-	-	3	10	30	40	60	100
5	PCC	U18CS405	Database Management Systems	3	1	-	4	10	30	40	60	100
6	PCC	U18CS406	Operating Systems	3	-	-	3	10	30	40	60	100
7	PCC	U18CS407	Database Management Systems Lab	-	-	2	1	40	-	40	60	100
8	PCC	U18CS408	Operating Systems Lab	-	-	2	1	40	-	40	60	100
9	OE	U18OE411	Open Elective-I based lab	_	_	2	1	40	-	40	60	100
			Total:	17	2	8	21	280	180	460	540	1000
10	MC	U18CH416	Environmental Studies*	2	_	_	_	10	30	40	60	100

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

Open Elective-I: U18OE403A: Object Oriented Programming (CSE) U18OE403B: Fluid Mechanics & Hydraulic Machines (CE) U18OE403C: Mechatronics (ME) U18OE403D: Web Programming (IT) U18OE403E: Microprocessors (ECE) U18OE403F: Strength of Materials (ME)	**Open Elective-II:** U18OE401A: Applicable Mathematics (MH) U18OE401B: Basic Electronics Engineering (ECE) U18OE401C: Elements of Mechanical Engineering (ME) U18OE401D: Measurements & Instrumentation (EIE) U18OE401E: Fundamentals of Computer Networks (IT) U18OE401F: Renewable Energy Sources (EEE)	**Open Elective-I based Lab:** U18OE411A: Object Oriented Programming Lab (CSE) U18OE411B: Fluid Mechanics & Hydraulic Machines Lab (CE) U18OE411C: Mechatronics Lab (ME) U18OE411D: Web Programming Lab (IT) U18OE411E: Microprocessors Lab (ECE) U18OE411F: Strength of Materials Lab (CE)

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 Exam	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 semi circular 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 Book:

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

Reference Books:

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

Course Outcomes (COs):

Course Code: **U18OE401A** Course Name: **APPLICABLE MATHEMATICS**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401A.1**	*solve wave equation, heat conduction equation and Laplace equation using Fourier series*
CO2	**U18OE401A.2**	*find correlation regression coefficients, fit curves using method of least squares for given data and apply theoretical probability distributions in decision making*
CO3	**U18OE401A.3**	*estimate value of a function by applying interpolation formulae*
CO4	**U18OE401A.4**	*apply numerical methods to solve simultaneous algebraic equations, differential equations, find roots of algebraic and transcendental equations*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18OE401A**															
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**	**PSO 3**
U18OE401A.1	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A.2	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A.3	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A.4	2	2	--	--	--	--	--	--	--	--	--	1	2	2	2
U18OE401A	**2**	**2**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**2**	**2**	**2**

U18OE401B BASIC ELECTRONICS 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 Exam	60 Marks

Course Learning Objectives:

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

LO1: to *introduce the basic concepts of semiconductors and conductivity in semiconductors*
LO2: to *impart the knowledge on working of semiconductor diode as Rectifier*
LO3: to *make the students to understand the basic concepts of BJT &DC biasing concepts*
LO4: to *introduce the fundamental concepts and basic principles of special semiconductor devices.*

UNIT-I(9+3)

Introduction to Electronics:
Analog Signals (DC & AC), Sources (DC & AC), Digital Signals
Semiconductors:
Energy bands in solids, Concept of forbidden gap, Insulator, Metals and Semiconductors, Transport phenomenon in semiconductors: Mobility and conductivity, Intrinsic semiconductor, Donor and Acceptor impurities, Fermi level, Drift currents and Diffusion currents, Temperature dependence of conductivity, Hall Effect

UNIT-II(9+3)

Semiconductor Diode:
Junction, Band diagram, Depletion layer, V-I characteristics of P-N Diode, Diode resistance and capacitance, Avalanche and Zener breakdown mechanisms
Diode Circuits:
Rectifier circuits – Half wave, Full wave & Bridge rectifiers, Ripple factor with and without filters, Voltage regulation using Zener diode, Block diagram of DC adapter.

UNIT-III(9+3)

Bipolar Junction Transistor:
Physical structure, Transistor current components, CE, CB & CC configurations and their Input & Output characteristics
DC Analysis of BJT Circuits:
DC load line, Need for biasing, Transistor biasing techniques for CE configuration, Basic transistor applications: Switch and Amplifier.

UNIT-IV(9+3)

Field Effect Transistor:
Physical **s**tructure, Operation and Characteristics of a Junction Field Effect Transistor (JFET), MOSFET, DMOSFET, EMOSFET.
Special Semiconductor Devices:
Operation and Characteristics- Tunnel Diode, Schottky diode, Photo Diode, Photo Transistor, PIN Diode, LED, LASER, UJT.

Text Books:

1. Bhargava and Kulashresta, "Basic Electronics and Linear Circuits", *TTTI, TMH, India*.
2. S.Salivahanan and N.Suresh Kumar, "Electronic Devices and Circuits", *Tata McGraw Hill Education (India) Private* Ltd, 2nd Edition, 2009.

Reference Books:

1. Jacob Millman, Christos C Halkias, "Electronic Devices and Circuits", 3/e, *TMH,* India.
2. David.A.Bell, "Electronic Devices and Circuits", *Oxford University Press,* New Delhi, India.
3. Neil storey, "Electronics: A systems Approach", *4/e-Pearson Education Publishing company Pvt. Ltd*, India

Course Outcomes (COs)

Course Code: **U18EC401B**		Course Name: **BASIC ELECTRONICS ENGINEERING**
CO	**CO Code**	Upon completion of this course, the student will be able to..
CO1	**U18EC401B.1**	*Analyze the behavior of semiconductor devices*
CO2	**U18EC401B.2**	*Design half wave and full wave rectifier circuits with filters*
CO3	**U18EC401B.3**	*Characterize BJT configurations with input output characteristics and biasing techniques*
CO4	**U18EC401B.4**	*Acquire knowledge of new emerging areas of science and technology in differentiating semiconductor devices..*

Course Articulation Matrix (Mapping of COs with POs and PSOs)

Course Code: **U18EC401B**					Course Name: **BASIC ELECTRONICS ENGINEERING**										
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**	**PSO 3**
U18EC401B.1	2	2	1	2	-	-	-	-	-	-	-	-	2	-	1
U18EC401B.2	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-
U18EC401B.3	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-
U18EC401B.4	2	2	1	2	-	-	-	-	-	-	-	2	2	-	1
U18EC401B	**2**	**2**	**1.5**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**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 Exam :	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 (12)

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 (12)

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 (12)

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 (12)

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", *Jain Brothers*, New Delhi,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", *Tata McGraw Hill*, New Delhi.
3. Hazra Chowdary. S. K and Bose, "Workshop Technology, Vol. I & II", *Media Promoters and publishers Pvt Ltd,* India.

Course Outcomes (COs):

Course Code:**U18OE401C** Course Name: **Elements of Mechanical Engineering**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401C.1**	*explain mechanical properties of an engineering materials and learn the steps in design methodology.*
CO2	**U18OE401C.2**	*describe the principles of manufacturing processes*
CO3	**U18OE401C.3**	*apply first law of thermodynamics to various processes to calculate work and heat for a closed system.*
CO4	**U18OE401C.4**	define *second law of thermodynamics and demonstrate the working principle of IC engines.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code:**U18OE401C**Course Name: **Elements of Mechanical Engineering**															
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**	**PSO 3**
U18OE401C.1	2	2	-	-	-	-	-	-	-	-	-	-	1	1	1
U18OE401C.2	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
U18OE401C.3	2	2	-	-	-	-	-	-	-	-	-	-	1	1	-
U18OE401C.4	2	2	-	-	-	-	-	-	-	-	-	-	1	1	-
U18OE401C	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**

U18OE401D FUNDAMENTALS OF MEASUREMENTS & INSTRUMENTATION

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 on /in
LO1: working principle of DC measuring instruments; DC, AC bridge circuits and their applications
LO2: principle of operation of Q meter, DVM, DMM, CRO, DSO and display devices
LO3: working principle of various transducers and their applications
LO4: working principle of seismic transducers, piezoelectric accelerometer, sound level meter, level transducer, flow meter and data acquisition system

UNIT–I (9+3)

DC measuring instruments (principle of operation): Measurement system – block diagram and example; performance characteristics – accuracy, precision, resolution, threshold, span, % error and fidelity; DC meters (working principle) – PMMC mechanism, shunt type ammeter, series type voltmeter, shunt type ohmmeter; DC potentiometers - Crompton's DC potentiometer, calibration of meters (ammeter, voltmeter & wattmeter) using DC potentiometer

DC & AC bridges: General bridge balance equation, bridge calibration, applications of bridges, Wheatstone bridge, Maxwell bridge, Schering bridge, Wien's bridge

UNIT – II (9+3)

Electronic instruments (principle of operation): Q-meter – basic Q-meter circuit; digital meter – characteristics (resolution & count), DC & AC attenuators, block diagram of dual slope type digital voltmeter, block diagram of digital multimeter (DMM); oscilloscopes – working principle of cathode ray tube (CRT), block diagram of cathode ray oscilloscope (CRO) , block diagram of digital storage oscilloscope (DSO); display devices – working principle of LED & LCD types

UNIT – III (9+3)

Transducers (principle of operation): Transducer - classification, examples and ideal requirements; sensors – cantilever beam & proving ring types of load cells, bourdon tube & diaphragm type pressure sensors; resistive transducers – piezo-resistive effect of strain gauge (SG), gauge factor, SG type force transducer, SG type pressure transducer and RTD; thermocouple type temperature transducer, LVDT type inductive transducer, differential type capacitive transducer, piezoelectric type transducer; photoelectric type transducer

UNIT – IV (9+3)

Transducers (principle of operation): Seismic transducers – displacement transducer, velocity pickup and accelerometer, piezoelectric accelerometer, sound level meter (block diagram), capacitive microphone, capacitive type level transducer (double electrode type), ultrasonic flow meter and electromagnetic flow meter; introduction to data acquisition (DAQ) system

Text Books:

1 P. Pruthviraj, B. Bhudaditya, S. Das and K. Chiranjib, "Electrical and Electronic Measurement and Instrumentation", McGraw-Hill Education, 2nd edition, 2013, New Delhi. (*Chapters 1 to 3, 8 to 10 and 13 to 15*)

2 Arun K. Ghosh, "Introduction to Transducers", *PHI*, 4th edition, 2015, New Delhi. (*Chapters 1 to 7*)

Reference Books:

1 A.K. Sawhney, "Electrical and Electronics Measurements and Instrumentation", *Dhanpatrai* & Co., 2015, New Delhi.

2 Helfrick. A.D and Cooper W.D., "Modern Electronic Instrumentation and Measurement Techniques", *Pearson India Edn.*, 2nd edition, 2016, New Delhi.

3 B.C. Nakra, K.K Choudhry, "Instrumentation Measurement and Analysis", *TMH,* 4th edition, 2008, New Delhi.

4 D.V.S. Murthy, "Transducers and Instrumentation", *Prentice Hall of India,* 2nd edition, 2012, New Delhi.

Course Outcomes (COs):

Course Code: **U18EI401D** Course Name: **FUNDAMENTALS OF MEASUREMENTS & INSTRUMENTATION**		
CO	**CO Code**	*Upon completion of this course, students will be able to…*
CO1	**U18EI401D.1**	explain about working principle of measurement system, PMMC based meters and applications of DC & AC bridge circuits
CO2	**U18EI401D.2**	describe the principle of operation of Q-meter, DVM, DMM, CRO, DSO and display devices
CO3	**U18EI401D.3**	elaborate on the working principle of resistive, inductive, capacitive and piezoelectric transducers and their applications
CO4	**U18EI401D.4**	explain about seismic transducers, sound level meter, level transducer, flow meters and block diagram of data acquisition system

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18EI401D** Course Name: **FUNDAMENTALS OF MEASUREMENTS & INSTRUMENTATION**															
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**	**PSO 3**
U18EI401D.1	2	1	1	1	-	-	1	-	-	-	-	1	1	1	1
U18EI401D.2	2	1	1	1	-	-	1	-	-	-	-	1	1	1	-
U18EI401D.3	2	1	1	1	-	-	1	-	-	-	-	1	1	1	-
U18EI401D.4	2	1	1	1	-	-	1	-	-	-	-	1	1	1	-
U18EI401D	**2**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**

U18OE401E FUNDAMENTALS OF 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 Exam	60 marks

Course Learning Objectives (LO) :

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 Book:

1. Mayank Dave, "Computer Networks", Second Edition, 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 Outcomes (COs):

Course Code: **U18OE401E** Course Name: **Fundamentals of Computer Networks**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401E.1**	*describe various network topologies, architecture and techniques for data transmission modes*
CO2	**U18OE401E.2**	*outline various design issues in data link layer and develop protocols to handle data link layer operation*
CO3	**U18OE401E.3**	*describe various design issues and develop protocols for network Layer.*
CO4	**U18OE401E.4**	*explain various design issues , protocols of transport layer & application layer services*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18OE401E** Course Name: **Fundamentals of Computer Networks**

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	PSO 3
U18OE401E.1	2	1	-	1	-	1	-	-	-	-	-	1	2	3	1
U18OE401E.2	3	3	2	1	1	1	-	-	-	-	-	1	3	3	1
U18OE401E.3	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1
U18OE401E.4	3	3	2	2	1	1	-	-	-	-	-	1	3	3	1
U18OE401E	**2.75**	**2.5**	**2**	**1.5**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**2.75**	**3**	**1**

U18OE401F RENEWABLE ENERGY SOURCES

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*", Khanna Publishers, New Delhi
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*", TATA Mc Graw-Hill, New Delhi

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 code: **U18OE401F**		Course Name: **Renewable Energy Sources**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE401F.1**	*compare conventional and non-conventional energy resources; explain the working principle of solar energy harnessing and its applications*
CO2	**U18OE401F.2**	*explain the working principles of wind energy, geothermal energy and MHD power generation systems*
CO3	**U18OE401F.3**	*describe the harnessing of electric power from oceans and biomass*
CO4	**U18OE401F.4**	*explain the principle of operation of fuel cells and different types of energy storage systems*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18OE401F**							Course Name: **Renewable Energy Sources**								
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**	**PSO 3**
U18OE401F.1	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.2	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.3	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F.4	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
U18OE401F	**3**	-	-	-	-	-	**1**	-	-	-	-	-	**3**	-	-

U18TP402 SOFT AND INTERPERSONAL SKILLS

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 students' knowledge in/on….

LO1: logical construction of speech appropriate for the occasion and exhibiting team work

LO2: acquiring spontaneity, presence of mind for effective communication

LO3: identifying, analyzing the theme of the topic and understanding presentation skills

LO4: communicating professionally and developing strategies in selecting career objectives 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:

- Developing Communications Skills – Krishna Mohan & Meera Benerji
- Soft Skills - Alex.K
- Soft skills Cornerstone of Professional success – Raman & Meenakshi

References:

- https://onlinecourses.nptel.ac.in/noc19_hs20/preview
- https://onlinecourses.nptel.ac.in/noc18_hs30/preview

Course Outcomes (COs):

Course code: **U18TP302/ U18TP402** Course Name: **Soft and Interpersonal Skills**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18TP402.1**	*introspect to convert strengths into opportunities, identify weaknesses, bypass threats*
CO2	**U18TP402.2**	*present views on various issues confidently in a group*
CO3	**U18TP402.3**	*make effective PPT presentations, synthesize videos*
CO4	**U18TP402.4**	*prepare a professional resume, communicate effectively to attain better opportunities*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18TP402** Course Name: **Soft and Interpersonal Skills**

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	PSO 2
U18TP402.1	-	-	-	-	-	-	-	-	2	3	-	-	1	1	1
U18TP402.2	-	-	-	-	-	-	-	2	3	3	-	-	1	1	1
U18TP402.3	-	-	-	-	-	-	-	-	2	3	-	-	1	1	1
U18TP402.4	-	-	-	-	-	-	-	1	2	3	-	-	1	1	1
U18TP402	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**	**2.25**	**3**	**-**	**-**	**1**	**1**	**1**

U18OE403A Object Oriented Programming

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: 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 Edition, McGraw-Hill Education India Pvt.Ltd , ISBN: 9781259002465, 2014.
2. E.Balgurusamy, "Programming with JAVA a primer", 5e Edition, McGraw-Hill Publication Ltd, ISBN: 9351343200, 2014.

References Books:

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

Course Code: **U18OE403A** Course Name: **Object Oriented Programming**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18OE403A.1**	*demonstrate object oriented concepts and java programming features.*
CO2	**U18OE403A.2**	*solve computing problems using object orientation and inheritance concepts.*
CO3	**U18OE403A.3**	*use polymorphism, interfaces and Packages for effective object oriented programming*
CO4	**U18OE403A.4**	*handle Exceptions and I/O operations in application development.*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: **U18OE403A** Course Name: **Object Oriented Programming**															
CO/PO	**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**	**PSO 3**
U18OE403A.1	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403A.2	2	2	2	1	2	1	-	-	2	1	2	1	2	2	2
U18OE403A.3	2	2	2	1	2	1	-	-	2	1	2	1	2	2	2
U18OE403A.4	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2
U18OE403	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**

U18OE403B FLUID MECHANICS AND HYDRAULIC MACHINES

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*: 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*", Standard Book House, Rajsons Publications Private Limited, 21thedn., 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*", McGraw Hill, Singapore, 9thedn., 2017.
3. Frank M. White, "*Fluid Mechanics*", Special Indian Edition, Tata McGraw Hill, New Delhi, 2011.
4. A.K. Jain, "*Fluid Mechanics Including Hydraulic Machines*", Khanna Publications, 12thedn,2018.

Course Outcomes (COs):

Course Code:**U18OE303B** Course Name: **Fluid mechanics and hydraulic machines**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18CE403B.1**	*summarize fluid properties using fundamental laws of fluid statics.*
CO2	**U18CE403B.2**	*analyse fluid flows using Bernoulli's equation and model laws.*
CO3	**U18CE403B.3**	*estimate losses in pipes and characterize hydraulic turbines.*
CO4	**U18CE403B.4**	*discuss the working principle and characteristics of pumps.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code:**U18OE303B** Course Name: **Fluid mechanics and hydraulic machines**															
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**	**PSO 3**
U18CE403B.1	2	1	-	-	-	-	-	-	1	1	-	1	1	-	-
U18CE403B.2	2	1	-	1	-	-	-	-	1	1	-	1	1	-	-
U18CE403B.3	2	1	-	1	-	-	-	-	1	1	-	1	1	-	-
U18CE403B.4	2	1	-	1	-	1	-	-	1	1	-	1	1	-	-
U18CE403B	**2**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**-**	**-**

U18OE403C MECHATRONICS

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

Teaching Scheme : **Examination Scheme :**

L	T	P	C
3	-	-	3

Continuous Internal Evaluation	40 marks
End Semester Exam	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, *Pearson Publications,* 6/e, ISBN: 9788131732533, 2015.

REFERENCE BOOKS:

1. Nitaigour Premchand Mahalik, Mechatronics: Principles Concepts and Applications, *Tata McGraw Hill, 2/e,* ISBN-13: 978-0070483743, 2017.
2. HMT, Mechatronics, *Tata McGraw-Hill, ISBN*9788415700272 New Delhi, 2000.
3. Devdas Shetty, Richard and Kilk, Mechatronics System and Design, *Cenage Learning*, Inc. 2/e, ISBN-13: 978-1439061985, 2010.

Course Outcomes (COs):

Course Code: **U18OE403C** Course Name: **MECHATRONICS**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE403C.1**	*apply the mechatronics approach ad select suitable sensors and transducers for a given application.*
CO2	**U18OE403C.2**	*explain working principles of mechanical, hydraulic, pneumatic and electrical actuators and their applications.*
CO3	**U18OE403C.3**	*develop basic building blocks for mechanical, electrical, fluid and thermal systems and build mathematical models and analyze.*
CO4	**U18OE403C.4**	*explain various system transfer functions and select an appropriate closed loop controller for a given application*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE403C**														
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**	**PSO 3**
U18OE403C.1	2	2	1	-	2	2	-	-	-	1	-	1	1	-	1
U18OE403C.2	2	2	1	-	2	-	-	-	-	1	-	1	1	-	1
U18OE403C.3	2	2	1	3	2	-	-	-	-	1	-	1	1	-	-
U18OE403C.4	2	2	1	1	2	-	-	-	-	1	-	1	1	-	1
U18OE403C	2	2	1	2	2	2	-	-	-	1	-	1	1	-	1

U18OE403D WEB PROGRAMMING

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

Teaching Scheme : **Examination Scheme :**

L	T	P	C
3		-	3

Continuous Internal Evaluation	40 marks
End Semester Exam	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 DriverManager, 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 Edition, Dreamtech Press (Black Book),* ISBN-13:9789351192510, 2013.
2. Phil Hanna, "JSP: The Complete Reference", *2nd Edition, McGraw-Hill,* ISBN: 007-212768-6, 2001.

Reference Books:

1. Ivan Bayross, "Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP", *4th Edition,BPB Publications,*ISBN-13: 978-8183330084, 2009,
2. UttamK.Roy, "Web Technologies", *7th Edition*, *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 Edition, Sams Publications,* ISBN: 0-672-32672-8, 2005
4. Jayson Falkner, Kevin Jones, "Servlets and Java Server Pages", *1st Edition, Pearson,* ISBN: 0-321- 13649-7, 2003

Course Outcomes (COs):

Course Code: **U18OE403D**		Course Name: **Web Programming**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE403D.1**	*create static web pages using HTML Tags, CSS properties and Java scripts*
CO2	**U18OE403D.2**	*create dynamic web pages using java server page concepts.*
CO3	**U18OE403D.3**	*develop web server side applications using PHP concepts*
CO4	**U18OE403D.4**	*develop enterprise databases for web-based applications using PHP and MySQL.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE403D**							Course Name: **Web Programming**							
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**	**PSO 3**
U18OE403D.1	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403D.2	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403D.3	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE403D.4	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2
U18OE403D	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2

U18OE403E MICROPROCESSORS

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 Exam:	60 marks

Course Learning Objectives:

This course will develop students' knowledge in/on
LO1*: architectural issues of 8086 Microprocessor*
LO2*: programming concepts of 8086 Microprocessor*
LO3*: interfacing of 8086 microprocessor to various I/O subsystems.*
LO4: *serial data communication types and standards like RS232, IEEE 488 Bus.*

UNIT – I(9)

Review of 8085 MPU Architecture
8086 Family Architecture: Organization of 8086 CPU, Concept of Memory Segmentation, Segment Registers, Physical and Logical Addressing, Addressing Modes and Instruction Formats, Instruction Set**.**

UNIT – II(9)

Assembly Language Programming: Assembler Directives, Simple Programming of 8086, Arithmetic, Logical and Data Processing Programs; Implementation of Control Loops, Structures, Strings, Procedures, Macros.
Pin Configuration, Minimum / Maximum Modes, Timing Diagrams, Delay Subroutines.

UNIT – III(9)

Interfacing with 8086: 8086 Interrupts, Interrupt Service Routines, Programmable Interrupt Controller 8259, Programmable Peripheral Interface 8255, Interfacing of Switches, Keyboards, LEDs, Stepper Motor, ADCs and DACs.

UNIT – IV(9)

DMA Controller 8257, Programmable Timer/Counter 8254.
Serial Data Communication through 8086: Types of Serial Communication, Synchronous and Asynchronous Communication, Serial Data Communication through USART 8251, Serial Data Communication Standards, RS-232, IEEE 488 Bus (GPIB).

Text Books:

1. D.V.Hall, "Microprocessors and Interfacing: Programming & Hardware", 2nd Edition, *Tata McGraw Hill*, New Delhi, 1992. (Chapter 3 to 10)
2. Yuchang Liu, Glen A. Gibson," Microcomputer Systems. The 8086/8088 Family, Architecture, Programming and Design"*, 2nd Edition, PHI*, New Delhi, 1995. (Chapter 2 to 11)

Reference Books:

1. Kenneth J. Ayala, Ayala Kenneth," The 8086 Microprocessor: Programming and Interfacing The PC", *West Pub*., 1994.
2. Barry B. Brey," The Intel Microprocessors: Architecture, Programming and Interfacing", 2nd Edition, *PHI, New Delhi,* 1998.

Course Outcomes (COs):

Course Code: **U18OE 403E**		Course Name: **MICROPROCESSORS**
CO	**CO Code**	Upon completion of this course, the student will be able to…
CO1	**U18OE 403E.1**	*describe the architecture of 8086 microprocessor and explain instructions with suitable examples*
CO2	**U18OE 403E.2**	*write Assembly Language Programs (ALPs) to perform a given task*
CO3	**U18OE 403E.3**	*design 8086 microprocessor based system for given specifications with memory mapping*
CO4	**U18OE 403E.4**	*explain serial communication modes and discuss it standards*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18OE 403E**															Course Name: **MICROPROCESSORS**
CO Code	**PO 1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE 403E.1	3	3	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 403E.2	3	2	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 403E.3	3	3	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 403E.4	3	3	2	1	--	--	--	--	--	--	--	1	2	2	1
U18OE 403E	3	2.75	2	1	--	--	--	--	--	--	--	1	2	2	1

U18OE403F STRENGTH OF MATERIALS

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*: 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 Edition,* S Chand and Company.
2. Gunneswara Rao T. D., Mudimby Andal, "*Strength of Materials", 1st edn.2018*, Cambridge University Press.

Reference Books:

1. Timoshenko and Gere, "*Mechanics of Materials", 1st Edition* 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 Edition,* Oxford University Press.
4. Ramamrutham S., "*Strength of Materials", 2nd Edition,* Dhanpat Rai & Sons, New Delhi.

Course Outcomes (COs):

Course Code:**U18OE303F** Course Name:**Strength of Materials**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18CE403F.1**	*estimate various types of stresses and strains*
CO2	**U18CE403F.2**	*construct Mohr's circle, shear force and bending moment diagrams for determinate beams*
CO3	**U18CE403F.3**	*determine the bending and shearing stresses for beams subjected to pure bending*
CO4	**U18CE403F.4**	*analyze stresses in thin cylinders, circular shafts and springs by theory of pure torsion*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18OE303F** Course Name: **Strength of Materials**														
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**	**PSO 3**
U18CE403F.1	2	2	1	1	-	-	-	-	-	1	-	2	1	-	-
U18CE403F.2	2	2	1	-	-	-	-	-	-	1	-	1	1	-	-
U18CE403F.3	2	2	1	1	-	-	-	-	-	-	-	1	-	-	-
U18CE403F.4	2	2	1	2	-	-	-	-	-	1	-	1	1	-	-
U18CE403F	**2**	**2**	**1**	**1.33**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1.25**	**1**	**-**	**-**

U18CS404 THEORY OF COMPUTATION

Class:B.Tech. IV-Semester **Branch:** Computer Science & Engineering

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 student's knowledge in/on

LO1: formal notation for strings, languages and finite automata.

LO2: properties of regular languages, types of grammars and applications of Context Free Grammar(CFG).

LO3: equivalence of languages accepted by Pushdown Automata(PDA) and languages generated by Context Free Grammars(CFG)

LO4: computability & non-computability and decidability & un-decidability problems in turing machines.

UNIT – I (9)

Automata theory: Introduction to finite automata, Structural representations and the central concepts of automata theory.

Finite automata: Deterministic finite automata, Non-deterministic finite automata, Finite automata with epsilon-transitions, Finite automata with output.

Regular expressions and languages: Regular expressions, Finite automata and regular expressions, Applications of regular expressions, Regular sets and regular grammars.

UNIT – II (9)

Properties of regular languages: Proving languages not to be regular, Closure properties of regular languages, Equivalence and minimization of automata.

Context-free grammars and languages: Chomsky classification of languages, Context-free grammars, Parse trees, Applications of context-free grammars, Ambiguity in grammars and languages, Simplification of context-free grammars.

UNIT – III (9)

Properties of context-free languages: Normal forms for context-free grammars, The pumping lemma for context-free languages, Closure properties of context-free languages, Decision properties of context free languages.

Pushdown automata: Definition of the pushdown automaton, Deterministic pushdown automata, The languages of pushdown automata, Equivalence of pushdown automata and context free grammar.

UNIT – IV (9)

Introduction to turing machines: Problems that computers cannot solve, The turing machine, Programming techniques for turing machines, Extensions to the basic turing machine.

Undecidability : A language that is not recursively enumerable, An undecidable problem that is recursively enumerable, Undecidable problems about turing machines, Post's correspondence problem, The classes P & NP, An NP-complete Problem.

Text Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia, 3rd Edition, ISBN: 0-321-45536-3, 2007
2. Mishra K.L.P., Chandrasekaran N,"Theory Of Computer Science: Automata, Languages and Computation", PHI Learning Pvt. Ltd., 3rd Edition, ISBN: 978-81-203-2968-3, 2012.

Reference Books:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia, 2nd edition,ISBN: 978-0132624787, 1998
2. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing, *Books/Cole Thomson Learning*, 2nd Edition, ISBN: 8131517500, 2001.
3. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw- Hill Education Pvt. Ltd., 3rd Edition,ISBN: 9780070660489, 2007.
4. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer, 1st Edition, ISBN: 978-0-387-94907-9, 1997

Course Code: **U18CS404**		Course Name: **THEORY OF COMPUTATION**
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18CS404.1**	*write a formal notation for strings, languages and finite automata.*
CO2	**U18CS404.2**	*design context free grammars to generate strings of context free language.*
CO3	**U18CS404.3**	*determine equivalence of languages accepted by push down automata and languages generated by context free grammars.*
CO4	**U18CS404.4**	*distinguish between computability and noncomputability, decidability and undecidability in turing machines*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: **U18CS404**					Course Name: **THEORY OF COMPUTATION**										
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
U18CS404.1	2	2	2	2	-	-	-	-	-	-	-	-	2	2	2
U18CS404.2	2	2	2	-	-	-	-	-	-	-	-	-	2	2	2
U18CS404.3	2	2	2	2	-	-	-	-	-	-	-	-	2	2	2
U18CS404.4	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
U18CS404	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**2**

U18CS405 DATABASE MANAGEMENT SYSTEMS

Class: **B.Tech.** IV-Semester **Branch**: Computer Science and Engineering

Teaching Scheme :

L	T	P	C
3	1	-	4

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: diverse issues involved in the design and implementation of a database management system
LO2: study the physical and logical database designs, database modeling and different database models
LO3: distinct normalization techniques on database systems and query optimization technique
LO4: database structure and build up essential DBMS concepts like database security, data integrity and concurrency control

UNIT - I (9+3)

Databases and Database Users: Introduction, Characteristics of the database approach, Actors on the scene, Workers behind the scene, Advantages of using a DBMS, When not to use a DBMS.
Database System Concepts and Architecture: Data models, Schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment, Classification of database management systems.
The Relational Data Model, Relational Database Constraints: Relational model concepts, Relational constraints and the Relational database schemas, Update operations and dealing with constraint violations.
Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL.

UNIT - II (9+3)

Data modeling using the Entity-Relationship Model: Using high-level conceptual data models for database design, Entity types, Entity sets, Attributes and keys, Relationships types, Relationship sets, Roles and structural constraints, Weak entity types, ER diagrams.
Enhanced Entity-Relationship: Sub classes, Super classes and Inheritance, Specialization and generalization, Constraints and characteristics of specialization and generalization hierarchies, Modeling of union types using categories.
Relational Database Design by ER-and EER-to-Relational Mapping: Relational database design using ER-to-Relational mapping, Mapping EER model constructs to relations.

UNIT - III (9+3)

Database Design Theory and Normalization: Informal design guidelines for relation schemas, Functional dependencies, Normal forms based on primary keys, General definitions of second and third normal forms, Boyce-Codd normal form, Algorithms for relational database schema design, Multivalued dependency and fourth normal form , Join dependencies and fifth normal form.
The Relational Algebra and Relational Calculus: Basic relational algebra operations, Examples of queries in relational algebra, The tuple relational calculus, The domain relational calculus.
Query Processing and Optimization: Translating SQL queries into relational algebra, Using heuristics in query optimization.

UNIT - IV (9+3)

Introduction to Transaction Processing Concepts and Theory: Introduction to transaction processing, Transaction and system concepts, Desirable properties of transactions, Characterizing Schedules Based, Characterizing Schedules Based on Serializability.

Concurrency Control Techniques: Two-Phase Locking techniques for concurrency control, Concurrency control based on Timestamp Ordering.

Database Recovery Techniques: Recovery concepts, NO-UNDO/REDO Recovery Based on Deferred Update, Recovery techniques based on immediate update, Shadow paging.

Database Security and Authorization: Introduction to database security issues, Discretionary access control based on granting and revoking privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security.

Text Book:

1. Ramez Elmasri and Shamkanth B. Navathe, "Fundamentals of Database Systems", *Pearson Education*, 6th Edition, ISBN-13: 978-0-136-08620-8, 2010.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", *McGraw-Hill Education*, 3rd Edition, ISBN-13: 978-0072465631, 2002.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", *McGraw-Hill Education*, 3rd Edition, ISBN: 0-07-114810-8, 1997.
3. Thomas Connolly and Carolyn Begg, "Database Systems", *Pearson Education*, 3rd Edition, ISBN: 81-7808-861-4, 2003.

Course Outcomes (COs):

Course Code: **U18CS405** Course Name: **DATABASE MANAGEMENT SYSTEMS**

CO	CO code	*Upon completion of this course, the student will be able to…*
CO1	**U18CS405.1**	*design the database management system effectively*
CO2	**U18CS405.2**	*design the databases, which includes Enhanced Entity Relationship model*
CO3	**U18CS405.3**	*outline the database by using normalization and query optimization techniques to avoid redundancy and maintain the performance of database.*
CO4	**U18CS405.4**	*manage multi-level security, correctness of data and control over access on database*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18CS405** Course Name: **DATABASE MANAGEMENT SYSTEMS**

CO Code	PO 1	PO2	PO 3	PO 4	PO 5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO3
U18CS405.1	2	2	2	2	1	-	-	-	-	1	-	2	2	1	2
U18CS405.2	2	2	2	2	1	-	-	-	-	1	-	2	3	1	3
U18CS405.3	2	2	2	2	1	-	-	-	-	1	-	2	2	1	2
U18CS405.4	2	2	2	2	1	-	-	-	-	1	-	2	3	1	2
U18CS405	**2**	**2**	**2**	**2**	**1**	-	**-**	-	-	1	-	**2**	**2.5**	**1**	**2.25**

U18CS406 OPERATING SYSTEMS

Class: B.Tech. IV- Semester **Branch:** Computer Science and Engineering.

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives(LOs):

This course will develop students' knowledge in/on

LO1: basics of operating systems and its structure
LO2: understanding scheduling and process synchronization techniques
LO3: exploring deadlocks, memory management and virtual memory techniques
LO4: discuss the file system organization , disk management and protection techniques.

UNIT – I (9)

Introduction: What operating systems do, Computer-system architecture, Operating-system operations, Process management, Memory management, Storage management, Protection and security, Computing environments.
System Structures: Operating-system services, System calls, Types of system calls, System programs, Operating-system structure, System boot.

UNIT - II (9)

Process Concept: Process concept, Process scheduling, Interprocess communication.
Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms – First- come first serve, Shortest-job-first, Priority, Round-robin, Multilevel queue, Multilevel feedback queue.
Synchronization: Background**,** The critical-section problem, Peterson's solution, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Monitors.

UNIT - III (9)

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.
Memory Management: Background, Swapping, Contiguous memory allocation, Segmentation, Paging, Structure of page table-Hierarchical paging, Hashed page tables, Inverted page tables.
Virtual-Memory Management: Background, Demand paging, Page replacement, Allocation of frames, Thrashing.

UNIT - IV (9)

File System: File concept, Access methods, Directory structure, Implementing File-Systems - Allocation Methods, Free-space management.
Mass-Storage Structure: Overview of mass-storage structure, Disk structure, Disk scheduling, Disk management, Swap-space management.
System Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix

Text Book:

1. Abraham Silberschatz , Peter B Galvin, Gerg Gagne, "Operating System Concepts", *Wiley* , 9th Edition, ISBN-978-81-265-5427-0, 2016.

Reference Books:

1. Ekta Walia, "Operating Systems", *Khanna Publishing House*, Delhi, 2nd Edition, ISBN-10: 9789380016658, ISBN-13: 978-9380016658, 2015.

2. Dhananjay M. Dhamdhere, "Operating Systems A Concept-Based Approach", *McGraw Hill Education*, ISBN-10: 0072957697 ISBN-13: 978-0072957693, 2008
3. William Stalling, "Operating Systems", *Maxwell, McMillan International Editions*, ISBN 81-203-1187- 6, 1992.

Course Code: **U18CS406**		Course Name **Operating Systems**
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18CS406.1**	*demonstrate the architecture of an operating system, process concepts and system calls*
CO2	**U18CS406.2**	*implement the CPU scheduling and process synchronization algorithms*
CO3	**U18CS406.3**	*solve the deadlock related problems and memory management issues*
CO4	**U18CS406.4**	*explain the file, disk and system protection techniques*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: **U18CS406**							Course Name **Operating Systems**								
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
U18CS406.1	2	1	2	1	-	-	-	-	1	-	-	2	2	2	2
U18CS406.2	3	2	2	2	-	-	-	-	-	-	-	2	2	2	2
U18CS406.3	3	2	2	2	2	-	-	-	-	-	1	2	2	2	2
U18CS406.4	2	2	2	1	2	1	-	-	1	-	1	1	2	2	2
U18CS406	2.5	1.75	2	1.5	2	1	-	-	1	-	1	1.75	2	2	2

U18CS407 DATABASE MANAGEMENT SYSTEMS LABORATORY

Class: B.Tech. IV-Semester **Branch:** Computer Science and Engineering

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: Data Definition Language (DDL) commands, Data Manipulation Language (DML) commands, Transaction Control Languages (TCL) and Data Control Languages (DCL)
LO2: Structured Query Language (SQL) functions, sub queries, indexes, user defined data types, views and sequences
LO3: basic Procedural Structured Query Language (PL/SQL) programs and Cursors
LO4: stored procedures/functions, exception handling, packages and triggers

List of Experiments

Structured Query Language (SQL):

Experiment-I
1. Queries on DDL and DML statements.
2. Queries on TCL and DCL commands.
3. Queries on column level and table level constraints.

Experiment -II
4. Queries using built-in functions of NUMBER, CHARACTER, DATE Data types.
5. Queries on Data type conversion functions.

Experiment -III
6. Queries on single row functions and operators.

Experiment -IV
7. Queries on aggregate functions.

Experiment -V
8. Queries on joins and nested queries.

Experiment -VI
9. Write SQL statements to create simple, composite indexes, user-defined data types, views, sequences.

PL/SQL Programs:
Experiment –VII
10. Write sample PL/SQL programs using conditional and iterative statements.

Experiment -VIII
11. Write PL/SQL programs using cursors.

Experiment -IX

12. Write PL/SQL programs using parameterized cursors.

Experiment-X

13. Write PL/SQL programs to handle exceptions.
14. Write PL/SQL programs using stored procedures and functions.

Experiment –XI

15. Write PL/SQL programs for creating packages.

Experiment -XII

16. Write PL/SQL programs for creating triggers.

Laboratory Manual:

1. Database Management Systems Laboratory Manual, *Prepared by the faculty of Department of CSE.*

Reference Books:

1. Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", *BPB publications*, 4th Edition, ISBN: 978-8176569644, 2010.
2. SQL and PL/SQL for Oracle 11g Black Book 1st Edition by P S Deshpande

Course Outcomes (COs):

Course Code: **U18CS407**		Course Name: **Database Management Systems Laboratory**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18CS407.1**	*evaluate SQL queries using DDL/DML/TCL/DCL commands to create and manipulate data in database by enforcing constraints*
CO2	**U18CS407.2**	*demonstrate various database objects using SQL queries*
CO3	**U18CS407.3**	*implement block structured programming with cursors to enable traversal over the records of the database*
CO4	**U18CS407.4**	*implement pre-compiled stored programs, run-time errors checking, database objects collection in PL/SQL packages and high-level security using triggers*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18CS407**	Course Name: **DATABASE MANAGEMENT SYSTEMS LABORATORY**														
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**	**PS O1**	**PS O 2**	**PS O3**
U18CS407.1	2	2	2	2	2	-	-	-	1	1	-	2	2	1	2
U18CS407.2	2	2	2	2	2	-	-	-	1	1	-	2	2	1	2
U18CS407.3	2	2	2	2	2	-	-	-	1	1	-	2	2	1	3
U18CS407.4	2	2	2	2	2	-	-	-	1	1	-	2	3	1	3
U18CS407	2	2	2	2	2	-	-	-	1	1	-	2	2.25	1	2.5

U18CS408 OPERATING SYSTEMS LABORATORY

Class: B.Tech. IV Semester **Branch:** Computer Science and Engg.

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives (LOs):
This Lab course will develop students' knowledge in/on
LO1: understanding and familiarizing the UNIX environment.
LO2: fundamental concepts of shell programming.
LO3: different CPU scheduling algorithms and Dead Lock Avoidance algorithm.
LO4: understanding different page replacement algorithms and file organization techniques.

List of Experiments

Experiment-I

1. Practicing basic UNIX commands:
   a) General Utility Commands: login, cal, date, who, uname, echo, passwd, pwd, exit.
   b) File and Directory Related Commands : ls, cd, mkdir, rmdir, cat, cp, rm, mv, wc, comm, diff, split, ln, touch, chmod, chown, chgrp.
2. Practice the following examples.
   a) Display the contents of file (filenames starting with 'a' and ending with X)
   b) Copy the contents of directory1 to directory2.
   c) Remove the all .C files from current directory.
   d) Merge the three different files into single one.
   e) Display the list of files in given directory.
   f) Set given file as read only.

Experiment-II

3. **Filters**: (Data Processing Commands): more, head, tail, cut, paste, sort, uniq, nl, tr.
4. **Communication Commands**: write, mail, talk, finger, news.

Experiment-III

5. a) Process Related Commands : ps, kill, nice, at & batch
   b) Pattern Searching Commands: grep, egrep, fgrep.
6. Write the programs for the following:
   a) Display the details of all users those who are working on the system.
   b) Display the details of all users in an order they logged on to system (based on time) who are working on the system.

Experiment-IV

7. Practicing the Vi editor commands.
8. Shell Script Related Commands**:** sh, read, command line arguments ($1), $ @ & $*, set, exit, status ($?), logical operators: ||, &&, exit, if, sleep & wait, case, while & until, for, export, expr commands.

Experiment-V

9. Write programs for the following**:**
   a) Reading a character and displaying on the screen.
   b) Display the name and class of student in separate line.
   c) To check the given two characters are equal or not.

10. Write programs for the following:
    a) Display the given character in its binary form.
    b) To check given number is even or odd.
    c) Write a shell script to accept login name as command line argument and find out at how many terminals the user has logged in.

Experiment-VI

11. Write a shell script which gets executed at login time and displays a blinking message "Good morning/Good Afternoon / Good Evening" depending upon the time at which the user logs in.
12. Write a shell script to check the given character is vowel or not.
13. Write a shell script to perform all basic arithmetic operations using switch statement.
14. Write a menu driven program which has the following options:
    a) contents of a given file
    b) list of users who have currently logged in
    c) present working directory
    d) exit

Experiment-VII

15. Write the shell programs for the following:
    a) To print the Fibonacci series
    b) To check the given number is prime or not
    c) To print the following format: 1

```
1    2
1    2    3
1    2    3    4
…..
```

Experiment-VIII

16. Write a shell script to display the given string in reverse order.
17. Write a shell script to find min and max elements in the given Array of integers.
18. Write a shell script function for factorial of a number.

Experiment-IX

19. Implement the following CPU Scheduling Algorithms.
    a) FCFS b) RR c) SJF d) Priority Scheduling

Experiment-X

20. Implement the Banker's Algorithm for Deadlock Avoidance.

Experiment-XI

22. Implement the following Page Replacement Algorithms.
    a) FIFO b) LRU

Experiment-XII

23. Implement the following Directory structures.
    a) Single Level Directory b) Two Level Directory

Text Books:

1. Sumitabha Das, "Your Unix: The Ultimate Guide", *McGraw Hill,* Third Edition, ISBN 0-07-053475-6, 2005.
2. Yashavant P. Kanetkar, "Unix Shell Programming", *BPB Publications,* ISBN 81-7029-753-2, 1996.
3. Operating Systems Laboratory Manual, prepared by the faculty of Department of CSE.

Course Code: **U18CS408** Course Name: **Operating Systems Laboratory**		
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18CS408.1**	*recognize the importance of various categories of UNIX commands.*
CO2	**U18CS408.2**	*apply shell programming concepts for developing applications*
CO3	**U18CS408.3**	*implement different scheduling algorithms and compare their performance and apply the Banker's algorithm for solving the dead lock avoidance problem.*
CO4	**U18CS408.4**	*implement different scheduling algorithms and compare their performance and apply the Banker's algorithm for solving the dead lock avoidance problem.*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: **U18CS408** Course Name: **Operating Systems Laboratory**															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
U18CS408.1	2	2	-	3	1	-	-	-	-	-	1	2	2	2	2
U18CS408.2	3	3	2	2	-	-	-	-	-	-	-	2	2	2	2
U18CS408.3	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
U18CS408.4	2	2	1	-	-	-	-	-	-	-	-	1	2	2	2
U18CS408	**2.25**	**2.25**	**1.66**	**2.33**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1.75**	**2**	**2**	**2**

U18OE411A OBJECT ORIENTED PROGRAMMING LABORATORY

Class: B. Tech IV-Semester **Branch:** Open Elective Based Lab

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 *ArrayIndexOfBoundsException*, *NumberFormatException* and *DivideByZeroException* 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.*

Reference Book:

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

Course Outcomes:

Course Code: U18OE411A		Course Name: Object Oriented Programming Laboratory
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE411A.1**	*implement OOP concepts using Java*
CO2	**U18OE411A.2**	*use the concepts like inheritance, polymorphism, packages and interfaces in application development*
CO3	**U18OE411A.3**	*handle runtime exceptions in object oriented programming*
CO4	**U18OE411A.4**	*build effective I/O interfaces for software applications*

Mapping of the Course Learning Outcomes with Program Outcomes:

Course Code: U18OE411A					Course Name: Object Oriented Programming Laboratory										
CO/PO	**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**	**PSO 3**
U18OE411A.1	2	2	2	1	-	-	-	-	-	1	-	-	2	1	2
U18OE411A.2	2	2	2	1	-	-	-	-	-	1	-	2	2	1	3
U18OE411A.3	2	2	2	1	-	-	-	-	-	1	-	2	2	1	3
U18OE411A.4	2	2	2	1	-	-	-	-	-	1	-	2	2	1	3
U18OE411	2	2	2	1	-	-	-	-	-	1	-	2	2	1	2.75

U18OE411B FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

Class: B.Tech. IV -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. Determineof Reynolds's number usingReynolds'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*",Charotar Publishing House Pvt., Ltd., 1st edn., 2008.
2. Sarbjit Singh, "*Experiments in Fluid Mechanics*", PHI Learning Private Limited, New Delhi, 2009.

Course Outcomes (COs):

Course Code: **U18OE411B**		Course Name: **Fluid Mechanics and Hydraulic Machines Laboratory**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE411B.1**	*determine the hydraulic coefficient for various flow measuring devices*
CO2	**U18OE411B.2**	*apply Bernoulli's equation in estimating head lossin pipes*
CO3	**U18OE411B.3**	*apply the principles of impact of jet on different vanes*
CO4	**U18OE411B.4**	*demonstrate the characteristics of hydraulic machines.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE311B**						Course Name: **Fluid Mechanics And Hydraulic Machines Laboratory**									
CO Code	**PO 1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
U18OE411B.1	2	1	-	1	-	-	-	-	1	-	-	1	2	-	-
U18OE411B.2	2	1	-	1	-	-	-	-	1	-	-	1	2	-	-
U18OE411B.3	2	1	-	1	-	-	-	-	1	-	-	1	2	-	-
U18OE411B.4	2	1	-	1	-	-	-	-	1	1	-	1	2	-	-
U18OE311B	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**2**	**-**	**-**

U18OE411C MECHATRONICS LAB

Class: B.Tech. IV- 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*, 5/e, ISBN-13: 978-0273742869, 2011.

Course Outcomes (COs):

Course Code: **U18 OE411C** Course Name: **MECHATRONICS LAB**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18OE411C.1**	*Develop PLC program to control AC non servomotors, single acting and double acting pneumatic cylinders with different operation conditions*
CO2	**U18OE411C.2**	*Develop PLC program to control various systems.*
CO3	**U18OE411C.3**	*Integrate various mechanical and electrical systems and operate them.*
CO4	**U18OE411C.4**	*Design and simulate the hydraulic and pneumatic circuits.*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE411C** Course Name: **MECHATRONICS LAB**															
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**	**PSO 3**
U18OE411C.1	1	2	1	2						1		1			
U18OE411C.2	1	2	1	2	2	-	-	-	-	1	-	1	1	1	1
U18OE411C.3	1	2	1	2	2	-	-	-	-	1	-	1	1	1	1
U18OE411C.4	1	2	1	2	2	-	-	-	-	1	-	1	1	1	1
U18OE411C	**1**	**2**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**1**

U18OE411D WEB PROGRAMMING LABORATORY

Class: IV Semester **Branch:** Computer Science and Engineering

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

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

Course Learning Objectives:
This course will develop students' knowledge in /on

CO1: implementing HTML Tags, CSS and JavaScripts for creating static web pages.
CO2: usage of JSP in designing dynamic web pages.
CO3: usage of PHP in designing a web base application.
CO4: 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 Code: **U18OE411D** Course Name: **Web Programming Laboratory**		
CO	**CO code**	*Upon completion of this course, the student will be able to…*
CO1	**U18OE411D.1**	create the static web pages using HTML Tags and CSS and JavaScripts
CO2	**U18OE411D.2**	design dynamic web page for web applications using JSP
CO3	**U18OE411D.3**	develop server side scripts for web base applications using PHP
CO4	**U18OE411D.4**	design web applications for effective storage and retrieval of data in MySQL using PHP.

Mapping of the course outcome with program outcomes

Course outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
U18OE411D.1	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE411D.2	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE411D.3	2	2	2	1	2	1	-	1	2	1	2	1	2	2	2
U18OE411D.4	2	2	2	1	2	1	1	1	2	1	2	1	2	2	2
U18OE411D	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**

U18OE411E MICROPROCESSORS LABORATORY

Class: B.Tech. IV-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 student'sknowledge on/in
LO1*: programming using 8086 Microprocessor kit*
LO2*: basic arithmetic programs and sorting using 8086 Microprocessor kit*
LO3*: string manipulation and code conversions using MASM*
LO4*: interfacing of subsystems to 8086 microprocessor kit*

List of Experiments
(Based on theory course U18OE303E)

1. Study of 8086 Trainer Board
2. Simple Arithmetic Operations (Addition, Subtraction, Multiplication and Division)
3. Finding Sum, Average.
4. Largest/Smallest Number in a given array
5. Arranging in Ascending/ Descending order
6. Finding Factorial using recursive procedure
7. Transfer of bytes from DS to ES
8. ALPs for String Manipulation
9. ALPs for Code conversions
10. Wave form Generation using DAC modules
    i. Square wave ii. Saw tooth wave iii. Triangular wave
11. ADC interfacing
12. Stepper motor –interfacing

Laboratory Manual:
1. Microprocessors Laboratory Manual, *prepared by the faculty of department of ECE, KITSW.*

Course Learning Outcomes (COs):

Course Code: **U18OE411E**		Course Name: **MICROPROCESSORS LAB**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18OE411E.1**	*write and execute assembly language programs for given tasks on 8086 microprocessor kit*
CO2	**U18OE411E.2**	*implement code conversions and bit manipulations programs in 8086 using MASM*
CO3	**U18OE411E.3**	*write waveform generation code using DAC modules*
CO4	**U18OE411E.4**	*interface stepper motor, keyboard, memory etc. with 8086 microprocessor*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course code: **U18OE 311E**					Course Name: **MICROPROCESSORS LAB**									
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**	**PS O 1**	**PSO 2**	**PSO 3**
U18OE411E.1	3	3	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE411E.2	3	2	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE411E.3	3	2	1	1	--	--	--	--	--	--	--	--	2	2	1
U18OE411E.4	3	3	2	1	--	--	--	--	--	--	--	--	2	2	1
U18OE 411E	**3**	**2.5**	**1.75**	**1**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**2**	**2**	**1**

U18OE411F STRENGTH OF MATERIALS LABORATORY

Class: B.Tech. IV -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 MaterialsLaboratory Manual*, prepared by faculty ofCivil Engineering, KITSW

Reference Books:

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

Course Outcomes (COs):

Course Code: **U18OE411F**		Course Name: **Strength of Materials Laboratory**
CO	**U18OE411F.1**	Upon completion of this course, the student will be able to…
CO1	**U18OE411F.2**	correlate theory with the testing of engineering materials for quality assessment.
CO2	**U18OE411F.3**	evaluate the mechanical properties of civil engineering materials.
CO3	**U18OE411F.4**	appraise the behavior of civil engineering materials when tested under loads.
CO4	**U18OE411F.1**	realize the specifications recommended by codes to civil engineering materials.

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18OE411F** Course Name: **Strength of Materials Laboratory**

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	PSO 3
U18OE411F.1	1	-	-	1	-	1	-	-	2	1	1	1	1	1	1
U18OE411F.2	1	-	-	1	-	1	-	-	2	-	-	1	1	1	1
U18OE411F.3	1	-	-	1	-	1	-	-	2	-	-	1	1	1	1
U18OE411F.4	1	-	-	1	-	1	-	2	1	1	1	1	1	1	1
U18OE411F	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**2**	**1.75**	**1**	**1**	**1**	**1**	**1**	**1**

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 Exam	:	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, green house 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 BOOK:

1. Erach Bharucha, "Text Book of Environmental Studies for Under Graduate Courses(2nd edn.)", *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,* Third Edition,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 Outcomes (COs):

Course Code: **U18CH416**		Course Name: **Environmental Studies**
CO	**CO code**	Upon completion of this course, the student will be able to…
CO1	**U18CH416.1**	*investigate any environmental issue using an interdisciplinary framework*
CO2	**U18CH416.2**	*formulate an action plan for sustainable alternatives and conserving biodiversity that integrates science, humanist, social and economic perspective*
CO3	**U18CH416.3**	*identify and explain the complexity of issues and processes which contribute to an environmental problem*
CO4	**U18CH416.4**	*participate effectively in analysis and problem-solving through knowledge in environmental legislations*

Course Articulation Matrix (Mapping of COs with POs and PSOs):

Course Code: **U18CH416**					Course Name: **Environmental Studies**							
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
U18CH416.1	2	1	2	1	-	2	1	-	1	-	-	-
U18CH416.2	-	-	2	-	-	1	2	-	1	-	-	-
U18CH416.3	1	2	1	-	-	1	2	1	1	-	-	-
U18CH416.4	-	-	1	-	-	1	2	-	1	-	-	-
U18CH416	**1.5**	**1.5**	**1.5**	**1**	**-**	**1.25**	**1.75**	**1**	**1**	**-**	**-**	**-**

DEPARTMENT OF COMPUTER SCIENCE AND 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

[6Th+3P+Seminar]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	HSMC	U18TP501	Quantitative Aptitude & Logical Reasoning	2	_	_	1	10	30	40	60	100
2	PE	U18CS502	Professional Elective - I / MOOC-I	3	-	-	3	10	30	40	60	100
3	PCC	U18CS503	Computer Networks	3	1	-	4	10	30	40	60	100
4	PCC	U18CS504	Software Engineering	3	-	-	3	10	30	40	60	100
5	PCC	U18CS505	Compiler Design	3	-	-	3	10	30	40	60	100
6	PCC	U18CS506	Python Programming	3	-	-	3	10	30	40	60	100
7	PCC	U18CS507	Advanced Java Programming Lab	-	-	2	1	40	-	40	60	100
8	PCC	U18CS508	Compiler Design Lab	-	-	2	1	40	-	40	60	100
9	PCC	U18CS509	Python Programming Lab	-	-	2	1	40	-	40	60	100
10	PROJ	U18CS510	Seminar	-	-	2	1	100	-	100	-	100
Total:				17	1	8	21	280	180	460	540	1000
***Additional Learning*:** *Maximum credits allowed for Honours/Minor*				-	-	-	*7*	-	-	-	-	-
Total credits for Honours/Minor students:				-	-	-	*21+7*	-	-	-	-	-

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week : 26** Total Credits **: 21**

Professional Elective-I / MOOC-I:	**U18CS502A: Artificial Intelligence** **U18CS502B: Computer Graphics and Multimedia** **U18CS502C: Advanced Database Management System** **U18CS502M: MOOCs course**

U18TP501 QUANTITATIVE APTITUDE AND LOGICAL REASONING

Class: B.Tech V - Semester

Branch(s): Computer Science and Engineering

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	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 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): U18TP501 QUANTITATIVE APTITUDE AND LOGICAL REASONING

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	PSO 3
CO1	U18TP501.1	-	2	-	1	-	-	-	-	-	-	-	1	-	-	1
CO2	U18TP501.2	-	2	-	1	-	-	-	-	-	-	-	1	-	-	1
CO3	U18TP501.3	-	1	-	2	-	2	-	-	-	-	-	1	-	-	1
CO4	U18TP501.4	-	1	-	2	-	2	-	-	-	-	-	1	-	-	1
U18TP501		**-**	**1.5**	**-**	**1.5**	**-**	**2**	-	-	-	-	-	1	**-**	**-**	**1**

U18CS502A ARTIFICIAL INTELLIGENCE

Class: B.Tech. V-Semester **Branch:** Computer Science & 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: *fundamentals of Artificial Intelligence, agents, problem solving approaches & searching techniques*
LO2: *local search algorithms, Game playing, solution searching using min-max and CSP problems*
LO3: *prepositional logic syntax & semantics, inference procedure, first order logic, augmented grammar rules and machine translation systems*
LO4: *decision theory, making simple & complex decisions and robot hardware, software motion, and applications*

UNIT – I (9)

Introduction: Introduction to AI, The foundations &history of AI

Intelligent Agents: Agents and environments, Nature of environments, Structure of agents

Problem Solving: Problem-solving agents, Example problemssearching for solutions, Uninformed and informed search strategies, Heuristic functions

UNIT – II (9)

Classical Search: Local search algorithms &optimization problems, Local search in continuous space, searching in nondeterministic actions, Partial observations

Adversarial Search: Game playing, The Mini-max search procedure, Alpha-Beta pruning, cutoffs and Additional refinements

Constraint Satisfaction Problems(CSP): Constraint propagation, Backtracking search for CSPs

UNIT – III (9)

Logical Agents: Knowledge based agents, Wumpus world, Propositional logic

First Order Logic (FOL): Syntax & Semantics, Using FOL, Knowledge engineering

Inference in FOL, Forward chaining, Backward chaining, Resolution

Natural Language for Communication: Phrase structure grammars,Syntactic analysis, Augmented grammars, Machine translation

UNIT – IV (9)

Quantifying Uncertainty: Acting under uncertainty,Bayes' rule

Probabilistic Reasoning Over Time: Time and uncertainty, Inference in temporal models, Hidden markov models

Making Simple and Complex Decisions: Combining beliefs and desires under uncertainty, The basis of utility theory, Utility functions, Sequential decision problems, Value iteration and Policy iteration

Robotics: Robotic hardware,Perception, Planning and control, Application domains

Text Book:

Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd ed.New Delhi: Prentice Hall Series in AI, 2010

Reference Books:

[1] Elaine rich and Kevin knight, *Artificial Intelligence*, 2nded.New Delhi:Tata McGraw-Hill, 2002.
[2] :k Stefik, *Introduction to Knowledge Systems*,San Francisco: Morgan Kaufman, 1995.
[3] Winston,Patrick Henry, *Artificial Intelligence*, 3rded. California: Addison Wesley, 1995.
[4] Dan W. Patterson, *Introduction to Artificial Intelligence and Expert Systems*, 2nded.New Delhi, Prentice Hall of India, 1997.

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

CO1: *apply fundamentals of AI in various problem-solving approaches for engineering problems*
CO2: *analyze search algorithms, game playing and constraint satisfying problem &solutions*
CO3: *develop prepositional logic, Fist Order Logic and apply the augmented grammar solutions for machine translation*
CO4: *apply decision theory for simple & Complex problemsand illustrate the software & hardware used in robotics*

Course Articulation Matrix (CAM):U18CS502AARTIFICIAL INTELLIGENCE

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS0 1	PS0 2	PS0 3
CO1	U18CS502A. 1	2	2	2	2	-	1	-	1	-	1	-	2	2	2	1
CO2	U18CS502A. 2	2	2	2	2	-	1	-	1	-	1	-	2	2	2	1
CO3	U18CS502A. 3	2	2	2	2	-	1	-	1	-	1	-	2	2	2	1
CO4	U18CS502A. 4	2	2	2	2	-	1	-	1	-	1	-	2	2	2	1
U18CS502A		2	2	2	2	-	1	-	1	-	1	-	2	2	2	1

U18CS502B COMPUTER GRAPHICS AND MULTIMEDIA

Class: B.Tech. V–Semester Branch: Computer Science & Engineering (CSE)

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: computer graphics primitives algorithms by drawing line drawing algorithms and 2D transformations
LO2: algorithms of segments, clipping & 3D viewing transformations
LO3: deriving projections mathematically and identification of hidden surfaces for creating standard animations
LO4: fundamental concepts of multimedia systems

UNIT-I (9)

Geometry and line generation: Introduction, Application of computer graphics, Pixels and frame buffer, Graphics standards, Image representation, *DDA* and Bresenham line generation algorithms, Graphics primitive operations, Character generation methods, Aliasing and anti aliasing
Polygons: Polygon representation, Inside test methods, Seed filling, Scanline filling algorithms
Two dimensional transformations: Scaling, Translation and rotation transformations, Rotation about arbitrary point, Homogenous coordinates, Inverse transformations, Transformation routines, Reflection and shearing transformations, Instance transformations

UNIT-II (9)

Segments: Segment creation algorithm, Segment closing algorithm, Segment deletion and segment renaming algorithms, Image transformation
Windowing and clipping: Window and view port, Viewing transformation matrix, Implementation of viewing transformation, Multiple windowing, Cohen sutherland outcode algorithm , Sutherland hodgman algorithm, Midpoint subdivision algorithm, Generalized clipping
Three dimensions: *3D* primitives, *3D* transformations, Rotation about arbitrary axis, *3D* viewing, Viewing parameters

UNIT-III (9)

Projections: Parallel projection, Perspective projection, Derivation of parallel projection matrix, Derivation of perspective projection matrix
Hidden surface and line removal algorithms: *Z buffer* algorithm, Painters algorithm, Warnock algorithm, Franklin algorithm, Back face removal algorithm
Computer based animation: Basic concepts, Animation languages, Methods of controlling animation, Display of animation, Transmission of animation

UNIT-IV (9)

Multimedia: Media and data streams, Main properties of multimedia system, Traditional data stream characteristics - Asynchronous transfer mode, Synchronous transfer mode
Sound / Audio: Basic sound concepts - Computer representation of sound, Audio formats, Music - *MIDI* concepts, *MIDI* devices, *MIDI* messages, *MIDI* software, Speech - Speech generation, Speech analysis, Speech transmission
Multimedia applications: Media preparation, Media composition, Media integration, Media communication, Media consumption, Media entertainment

Text Books:

[1] Steven Harrington, *Computer Graphics, A Programming Approach*, 2nd ed. New York: McGraw-Hill, 1987

[2] Ralf Steinmetz, Klara Nahrstedt, Multimedia: *Computing, Communications & Applications*, New Delhi: Pearson First Impression, 2006,(Chapters 2, 3, 17)

Reference Books:

[1] James D.Foley Andries Van Dam Steven K. Fernier, John Hugs, *Computer Graphics Principles & Practice*, 2nd ed. New Delhi: Pearson Education, 2002.

[2] Donad Hearn, Pauline Baker, *Computer Graphics*, 2nd ed. New Delhi: Pearson Education, 1997.

[3] Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Marco Di Benedetto, *Introduction to computer graphics a practical learning approach*, Newyork: Chapman and Hall, 2014.

[4] Dr Rajiv chopra *Computer graphics : a practical approach, concepts, principles, case studies, experiments,* 4th ed. New Delhi: S Chand, 2011.

Course Learning Outcomes (COs):

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

CO1: design and transform a line or polygon using two dimensional transformations

CO2: apply segmentation and clipping algorithms to transform 2D to basic 3D transformations

CO3: analyze and apply projections, hidden surface algorithms to include final clipped images into animations

CO4: demonstrate knowledge on different concepts of multimedia

Course Articulation Matrix (CAM): U18CS502B COMPUTER GRAPHICS AND MULTIMEDIA

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	PSO2	PSO3
CO1	U18CS502B.1	2	2	2	1	-	-	-	-	-	1	-	2	2	2	-
CO2	U18CS502B.2	2	2	2	1	-	-	-	-	-	1	-	2	2	2	-
CO3	U18CS502B.3	2	2	1	1	-	-	-	-	-	1	-	1	2	1	-
CO4	U18CS502B.4	1	1	-	-	1	-	-	-	-	1	-	2	1	1	1
U18CS502B		**1.75**	**1.75**	**1.7**	**1.5**	**1**	1	-	-	-	1	-	**1.75**	**1.75**	**1.5**	**1**

U18CS502C ADVANCED DATABASE MANAGEMENT SYSTEMS

Class: B.Tech. V-Semester **Branch:** Computer Science and Engineering (CSE)

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1 : data storage, disk organization, tree structured indexing & hash-based indexing techniques
LO2 : parallel & distributed database architectures, organization & management
LO3 : object database systems, operators and query evaluation
LO4 : deductive databases, web databases, XQuery and spatial data management

UNIT-I (9)

Overview of Storage and Indexing: Data on external storage, File organizations and indexing, Index data structures, Indexes and performance tuning
Storing Data Disks and Files: The memory hierarchy, Redundant arrays of independent disks, Disk space management, Buffer manager, Files of records, Page formats, Record formats
Tree-Structured Indexing: Intuition for tree indexes, ISAM, B+ trees - Search, insert, delete, duplicates, B+ trees in practice;
Hash-Based Indexing: Static hashing, Extendible hashing, Linear hashing, Extendible versus linear hashing

UNIT-II (9)

Parallel Databases: **Introduction, Architectures for parallel databases, Parallel query evaluation, Parallelizing individual operations and parallel query optimization**

Distributed Databases: Introduction, Distributed DBMS architectures, Storing data in distributed DBMS, Distributed catalog management, Distributed query processing, Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed recovery

UNIT-III (9)

Object-Database Systems: *Motivating example, Structured data types, Operations on structured data, Encapsulation and ADTS, Inheritance, Objects, OIDS and reference types, Database design for an ORDBMS, ORDBMS implementation challenges, OODBMS, Comparing RDBMS, OODBMS, and ORDBMS*
Overview of Query Evaluation: The system catalog, Introduction to operator evaluation, Introduction to query optimization, What a typical optimizer does
Evaluating Relational Operators: The selection operation, General selection conditions, The projection operation, The join operation, The set operations, Aggregate operations

UNIT-IV (9)

Deductive Databases: Introduction to recursive queries, Recursive queries with negation, Data log to SQL, Evaluating recursive queries
Web Databases: Introduction to information retrieval, Indexing for text search, Web search engines, Managing text in DBMS, A data model for XML
XQuery: Querying XML data, Efficient evaluation of XML queries
Spatial Data Management: Types of spatial data and queries, Applications involving spatial data, Introduction to spatial indexes, Indexing based on space-filling curves

Text Book:

[1] Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, 4th ed. Hyderabad:Mc-Graw Hill, 2014. *(Chapters 7 to 10, 12, 13, 21, 22, 25, 26, 27)*

Reference Books

[1] Hector Garcia Molina, Jeffery D Ullman, and Jennifer Widom, *Database Systems: The Complete Book*, 2nd ed. New Jersey: Pearson, 2008.

[2] Ramez Elmasri, Shamkanth B. Navathe, *Fundamentals of Database Systems*, 7th ed. New Delhi: Pearson Education, 2017.

[3] Abraham Siberschatz, Henry F.Korth, and S.Sudarshan, *Database System Concepts*, 6th ed. New Delhi: McGraw-Hill 2011.

[4] R. P. Mahapatra,Govind Verma, *Database Management Systems*, 1st ed. New Delhi: Khanna publications, 2016.

Course Learning Outcomes (COs):

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

CO1: illustrate the way data stored & organized in external storage devices and apply various indexing techniques to efficiently access the data

CO2: illustrate the architectures, data organization and management of parallel & distributed databases

CO3: evaluate queries using various operators and features of object database systems

CO4: illustrate the data mangement in deductive databases, web databases, XQueries & spatial databases

Course Articulation Matrix (CAM): U18CS502C ADVANCED DATABASE MANAGEMENT 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	PSO1	PSO2	PSO3
CO1	U18CS502C.1	2	2	2	2	1	-	-	-	-	1	-	2	2	1	2
CO2	U18CS502C.2	2	2	2	2	1	-	-	-	-	1	-	2	2	1	2
CO3	U18CS502C.3	2	2	2	2	1	-	-	-	-	1	-	1	2	1	2
CO4	U18CS502C.4	2	2	2	2	1	-	-	-	-	1	-	2	2	1	2
U18CS502C		**2**	**2**	**2**	**2**	**1**	-	-	-	-	1	-	**1.75**	**2**	**1**	**2**

U18CS503 COMPUTER NETWORKS

Class: B. Tech. V-Semester **Branch: Computer Science and Engineering**

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 on /in…

LO1: computer networks reference models, physical layer components & network switching
LO2: data link and medium access control protocols
LO3: routing algorithms, congestion control algorithms & internetworking
LO4: transport and application layer protocols used in the networks

UNIT-I (9+3)

Introduction: Uses of computer networks, Network hardware, Network software
Reference Models:OSI reference model, TCP /IP reference model, Comparison of *OSI* and TCP/IP reference model
Physical Layer:Transmission media - Guided transmission media, Wireless transmission, Communication satellites; Digital modulation and multiplexing
Switching: Circuit and Packet switching

UNIT-II (9+3)

Data Link Layer: Data link layer design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols
Medium Access Control Sub Layer:Channel allocation problem, ALOHA, Carriers sense multiple access, Collision free protocols, Limited contention protocol, IEEE standard 802.3, Token bus, Token ring, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, Bluetooth, Data link layer switching

UNIT-III (9+3)

Network Layer: Network layer design issues, Routing algorithms - Optimality principle, Shortest path algorithm, Flooding, Distance vector routing, Link state routing, Hierarchical routing, broadcast routing, Multicast routing
Congestion Control Algorithms: Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, Load shedding
Internetworking: How networks differ, How networks can be connected, Tunneling, Internetwork routing, Packet fragmentation

UNIT-IV (9+3)

Network Layer In The Internet:*IP* version 4 protocol, *IP* addresses, *IP* version 6 protocol, Internet control protocols, *OSPF* – Interior gateway routing protocol, *BGP* – Exterior gateway routing protocol, Internet multicasting
Transport Layer: Transport services, Elements of transport protocols – Connection establishment and release, Error control and flow control, Crash recovery, Multiplexing congestion control;Internet transport protocols - UDP, TCP
Application Layer: Domain name system (DNS), Electronic mail, World Wide Web

Text Book:

[1]Andrew S.Tannenbaum, David J.Wetherall, *Computer Networks*, 5th ed.London:Pearson Education, 2011.

Reference Books:

[1]William Stallings, *Data and Computer Communications*, 10th ed.London:Pearson Education, 2014.
[2] Behrouz Forouzan, *Data Communication and Networking*, 5thed.New York: Tata Mc Graw Hill, 2012.
[3] Larry Peterson, Bruce S Davie, *Computer Networks*, 5thed.New York: Elsevier Inc., 2011.
[4] James F. Kurose and Keith W. Ross, *Computer Networking A Top-Down Approach*, 6th ed.London:Pearson Education, 2013.

Course Learning Outcomes(COs):

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

CO1: compare OSI & TCP/IP reference models
CO2: analyze different types of data link & medium access control protocols
CO3: apply routing algorithms, congestion control algorithms& internetworking
CO4: analyze the different services of transport and application layer protocols

Course Articulation Matrix (CAM) U18CS503 COMPUTER NETWORKS

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**U18CS503.1**	2	-	-	-	-	-	1	-	-	1	-	1	1	1	1
CO2	**U18CS503.2**	2	2	1	2	2	-	-	-	-	1	-	1	1	1	2
CO3	**U18CS503.3**	2	2	2	2	1	-	-	-	-	1	-	1	2	1	1
CO4	**U18CS503.4**	1	2	-	1	-	-	-	-	-	1	-	1	1	1	-
U18CS503		**1.75**	**2**	**1.5**	**1.66**	**1.5**	**-**	**1**	**-**	**-**	**1**	**-**	**1**	**1.25**	**1**	**1.33**

U18CS504 SOFTWARE ENGINEERING

Class: B. Tech. V-Semester **Branch: Computer Science and 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: fundamental concepts of software and different types of software models
LO2: different types of design concepts and patterns
LO3: software design principles and test strategies
LO4: metrics for quality analysis of software and risk management

UNIT-I (9)

Software Engineering Concepts: The changing nature of software, Software application domains, Legacy software, Software myths, Software engineering layered technology, A process framework, The capability maturity model integration (*CMMI*), Agile software

Process Models - Prescriptive process models, RAD model, Specialized process models, Unified process model, Personal and team process models

Agile Development: Agility and the cost of change, Agile process, Extreme programming, Other agile process models

Software **Engineering Practices**: Communication principles, Planning principles, Modeling principles, Construction principles, Deployment principles

UNIT-II (9)

Requirements Engineering Tasks: Requirements analysis and modeling strategies, User requirement, System requirement, Software requirements document

Design Engineering: Design within the context of software engineering, Design process, Design concepts, The design model

Architectural Design: Creating an architectural design - Software architecture, Architectural genres, Architectural styles, Architectural design, Assessing alternative architectural designs, Designing class based components, Conducting component level design, Design for WebApps, Designing traditional components

UNIT-III (9)

User Interface Design: The golden rules, User interface analysis and design, Interface analysis, Interface design steps, WebApp and mobile interface design

Testing Strategies: Software testing fundamentals, Test strategies for conventional software, Test strategies for object-oriented software, Validation testing, System testing, The art of Debugging, White box testing, Basis path testing, Control structure testing, Black box testing

Testing Web Applications: Testing concepts for webapps, The testing process, Content testing, User interface testing, Component-level testing, Navigation testing, Configuration testing, Security testing, Performance testing

UNIT-IV (9)

Product Metrics: Measures, Metrics and indicators, Metrics for the requirements model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance

Process and Project Metrics: Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software process, The *W5HH* principle

Project Scheduling: Project scheduling, Scheduling for WebApps projects, Earned value analysis

Risk Management: Reactive versus Proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, RMMM plan

Text Book:

[1] Roger S.Pressman and Bruce R.Maxim, *Software Engineering: A Practitioner's Approach,* 7th ed., NewDelhi:McGraw Hill, 2019

Reference Books:

[1] Ian Sommerville, *Software Engineering*, 10th ed., Delhi:Pearson Education, 2016

[2] Deepak Jain, *Software Engineering: Principles and Practices*, 3rd ed., Delhi:Oxford University Press, 2008

[3] Pankaj Jalote, *Software Engineering: A Precise Approach,* NewDelhi:Wiley India, 2010

[4] Waman S. Jawadekar, *Software Engineering: A Primer*, NewDelhi:Tata Mcgraw Hill, 2008

Course Learning Outcomes(COs):

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

CO1: implement the appropriate software model for a given real time application

CO2: develop different types of software designs & patterns

CO3: apply an appropriate testing method for a given software

CO4: apply metrics to assess the quality of software and analyze the risk management in project scheduling

Course Articulation Matrix (CAM): U18CS504 SOFTWARE ENGINEERING

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS504.1	1	1	1	1	-	-	-	-	1	1	2	1	2	1	2
CO2	U18CS504.2	1	1	1	1	-	-	-	-	1	1	2	1	1	1	2
CO3	U18CS504.3	2	2	1	1	-	1	1	-	1	1	2	1	2	1	2
CO4	U18CS504.4	2	2	2	2	-	1	1	-	1	1	2	1	2	1	2
U18CS504		1.5	1.5	1.25	1	-	1	1	-	1	1	2	1	1.75	1	2

U18CS505 COMPILER DESIGN

Class: B.Tech. V-Semester **Branch:** Computer Science and Engineering(CSE)

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: phases of a compiler and design of a lexical analyzer
LO2: parsing techniques using context-free grammar and construction of syntax tree
LO3: specification of a type checker, storage allocation strategies and generating intermediate form for programming statements
LO4: generating target code from the intermediate form and applying code optimization techniques

UNIT-I (9)

Introduction to Compiling: Compilers, Analysis of the source program, Phases of a compiler, Cousins of the compiler, Grouping of phases, Compiler construction tools
Lexical Analysis: Role of lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language for specifying lexical analyzers, Finite automata, Design of a lexical analyzer, Optimization of deterministic finite automata based pattern matchers

UNIT-II (9)

Syntax Analysis: Role of the parser, Writing grammars, Context free grammars, Top down parsing, Bottom up parsing, Operator precedence parsing, LR parsers, Using ambiguity grammars, Parser generators
Syntax Directed Translation: Syntax directed definitions, Construction of syntax trees, Bottom up evaluation of S-attributed definitions, L-attributed definitions, Top down translation, Bottom up evaluation of inherited attribute, Space for attribute values at compile time, Analysis of syntax directed definition

UNIT-III (9)

Type Checking: Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions
Runtime Environments: Source language issues, Storage organization, Storage allocation strategies, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques
Intermediate Code Generation: Intermediate languages, Declarations, Assignment statements, Boolean expressions, Back patching

UNIT-IV (9)

Code Generation: Issues in the design of code generator, The target machine, Runtime storage management, Basic blocks and flow graphs, Next-use information, A simple code generator, Register allocation and assignment, Directed acyclic graph representation of basic blocks, Peephole optimization, Generating code from directed acyclic graphs, Code generation algorithm

Code Optimization: Introduction, The principal sources of optimization, Optimization of basic blocks, Loops in flow graphs, Introduction to global data flow analysis, Code improving transformations

Text Book:

fred V.Aho, Ravi Sethi, Jeffrey D.Ullman, *Compilers: Principles, Techniques and Tools*, 2nd ed. Hong Kong: Pearson Education Asia, 2013.

Reference Books:

[1] Allen I. Holub, *Compiler Design in C*, 2nd ed. New Jersey: Prentice Hall of India, 2003.

[2] N. Fischer, R. J. LeBlanc, *Crafting a compiler with C*, California: Pearson Education, 2003.

[3] J.P. Bennet, *Introduction to Compiling Techniques*, 2nd ed. New York: McGraw-Hill, 2003.

[4] Henk Alblas, Albert Nymeyer, *Practice and Principles of Compiler Building with C*, London: PHI, 2001.

Course Learning Outcomes (COs):

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

CO1: design lexical analyzer using regular expressions to generate tokens from the given programming statements

CO2: construct syntax tree and parsing table for the given context-free grammar

CO3: generate intermediate code for the given programming statements

CO4: generate target code from the intermediate form and apply code optimization techniques to improve the performance of the code

Course Articulation Matrix (CAM): U18CS505 COMPILER DESIGN

Course Outcomes		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	U18CS505.1	2	2	2	2	1	1	-	-	1	1	1	1	2	2	2
CO2	U18CS505.2	2	2	2	2	1	1	-	-	1	1	1	1	2	2	2
CO3	U18CS505.3	2	2	2	2	1	1	-	-	1	1	1	1	2	2	2
CO4	U18CS505.4	2	2	2	2	1	1	-	-	1	1	1	1	2	2	2
U18CS505		2	2	2	2	1	1	-	-	1	1	1	1	2	2	2

U18CS506 PYTHON PROGRAMMING

Class: B.Tech. V-Semester **Branch:** Computer Science and Engineering(CSE)

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: basics of python programming, operators, control statements & functions in Python
LO2: namespaces, modules, string handling methods & collections
LO3: object oriented programming, inheritance, polymorphism, files & database connectivity using SQLite
LO4: Numpy, Pandas and Matplotlib libraries of Python

UNIT-I (9)

Introduction: Features of Python, The future of Python, Writing and executing Python programs
Python Preliminaries: Literal constants, Variables and identifiers, Data types, Input operation, Comments, Reserved words, Indentation, Operators, Expressions in Python, Type conversion
Decision Control Statements: Selection/Conditional branching statements, Loop structures/ iterative statements, Nested loop, The continue statement, The pass statement, The else statement used with loops
Functions: Function definition, Function call, Variable scope and lifetime, The return statement, Advances in defining in functions, Lambda functions, Recursive functions

UNIT-II (9)

Modules and Name Spaces: The from…import statement, Naming module, The dir() function, Packages in Python, Standard library modules, globals(), locals(), and reload(), Function redefinition
Python Strings: String operations, String formatting operator, Built-in string methods and functions, slice operation, ord() and chr() Functions, in and not in operators, Comparing strings, Regular expressions
Data Structures: Sequences, Lists, Tuple, Sets, Dictionaries

UNIT-III (9)

Python Object Oriented Programming: Classes and objects, Class method and self-argument, The __init__() method, Class variables and object variables, The __del__() method, Public and private data members, Private methods, Calling a class method from another class method, Built-in class attributes, Class methods, Static methods, Inheritance and polymorphism, Error and exception handling
Files: Opening and closing files, Reading and writing files, File positions, Renaming and deleting files, Directory methods
Database Connectivity: Database browser for SQLite, Creating a database table, Insert and retrieve data from database
Case-Study: Spidering Twitter using a database

UNIT-IV (9)

NumPy: The basics of NumPy arrays, Array indexing, Array slicing, Reshaping of array, Concatenation and splitting arrays, Introducing UFuncs

Data Manipulation with Pandas: Installing and using Pandas, Introducing Pandas objects, data indexing and selection, Handling missing data, Combining datasets, Merge and join, Aggregation and grouping

Visualization with Matplotlib: Importing Matplotlib, Saving figures to files, Simple line plots, Simple scatter plots, Histograms, Binnings, and density, Example-Handwritten digits, Text and annotations Example-Effects of holidays on US births, Geographic data with basemap, Plotting data on maps, Example-California cities

Text Books:

[1] Reema Thareja, *Python Programming using problem solving approach*, New Delhi: Oxford University Press, 2017.

[2] Jake VanderPlas, *Python Data Science Handbook- Essential Tools for Working with Data*,California: O'Reilly Media Inc., 2016. (*Chapter 2 to 4*)

Reference Books:

[1] Dr. Charles R. Severance, *Python for Everybody-Exploring Data Using Python*, open book, 2016.

[2] David Beazley, *Python Cookbook*, 3rd ed. California: O'Reilly Media, Inc., 2013.

[3] Caleb Hattingh, *20 Python Libraries You Aren't Using (But Should)*, 2nd ed. California: O'Reilly Media, Inc., 2016.

[4] Magnus Lie Hetland, *Beginning: From Novice to Professional*,New York City: Apress, 2005.

Course Learning Outcomes(COs):

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

CO1: make use of syntax, control statements, operators and functions for writing basic python programs

CO2: develop programs using collections, namespaces, packages & strings

CO3: explain object oriented programming principles, files & database handling mechanism for writing advanced python programs

CO4: build visualization graphs with Matplotlib and adapt packages like Numpy or Pandas for statistical analysis& data handling

Course Articulation Matrix (CAM): U18CS506 PYTHON PROGRAMMING

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	U18CS506.1	2	2	1	1	2	1	-	-	-	1	-	-	2	1	2
CO2	U18CS506.2	2	2	2	1	2	1	-	-	-	1	-	-	2	1	3
CO3	U18CS506.3	2	2	2	2	2	1	-	-	-	1	-	2	3	2	2
CO4	U18CS506.4	2	2	2	2	3	1	-	-	1	1	-	2	2	2	3
U18CS506		2	2	1.75	1.5	2.25	1	-	-	1	1	-	2	2.25	1.5	2.5

U18CS507 ADVANCED JAVA PROGRAMMING LAB

Class: B.Tech. V-Semester **Branch:** Computer Science & Engineering

L	T	P	C
-	-	2	1

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on…
LO1: developing GUI based programs using the concept of swings
LO2: the concepts of generics and collections
LO3: sorting user-defined data using Comparable interfaces and performing the unit testing with JUnit
LO4: lambda expressions and Stream API

List Of Experiments

Experiment-I
1. Create a JFrame program to display "Good Morning" if current time is between "6 AM to 12 PM" and "Good Afternoon" if the current time is between "12 PM to 6PM", and "Good Evening" if the current time is between "6PM to 12AM"
2. Create a JFrame program to perform basic arithmetic calculations on given two numbers with the help of button events

Experiment-II
1. Create a JFrame program from which you can open another frames with the help of button events
2. Design different JFrame's to demonstrate different layouts like Flow layout, Border layout, Grid layout & null layout
3. Create a JFrame program to work with window events

Experiment -III
1. Create a JFrame to add a menu bar with which you can select different options from different menus and perform some action on selection of every menu item
2. Create a JFrame program to open the text file using JFileChooser and display the selected text file content on the JTextArea
3. Design a registration form with the help of a JFrame and save the details in to the text file

Experiment -IV
1. Create a JFrame program to insert, delete & update the records of a database table
2. Create a JFrame program to select a database table using JComboBox component and display the content of the selected database table in JTable component

Experiment -V
1. Write a java program to demonstrate generic class
2. Write a java program to demonstrate methods and constructors in generics
3. Write a java program to demonstrate multiple type parameters in generic classes
4. Write a java program to demonstrate inheritances in generics

Experiment -VI

1. Write a java program to perform following operations on ArrayList, LinkedList, HashSet and LinkedHashSet
   i. Insertion
   ii. Deletion
   iii. Traversing using traditional-for, for-each, Iterator and ListIterator
   iv. Display the elements in reverse order
2. Write a program that will have a Vector which is capable of storing Employee objects. Use an Iterator and enumeration to list all the elements of the Vector

Experiment -VII

1. Write a java program to perform different operations on inbuilt Stack class
2. Write a java program to perform different operations on inbuilt Queue class
3. Write a java program to perform insertion, deletion, traversing and searching operations on HashMap and TreeMap

Experiment -VIII

1. Write a java program to store and retrieve user defined class objects from TreeSet
2. Write a java program to read a set of values and display the count of occurrences of each number using collection concept

Experiment-IX

1. Write a java program to display ArrayList values in sorted order
2. Write a java program to demonstrate Comparable interface for sorting user defined data type
3. Write a java program to demonstrate Comparator interface for sorting user defined data type

Experiment-X

1. Write a java program to test simple arithmetic operations of Calculator class using JUnit concept
2. Write a java program to demonstrate different Assert methods and annotations

Experiment-XI

1. Write a java program to demonstrate lambda expression with no parameter
2. Write a java program to demonstrate lambda expression with single and multiple parameters
3. Write a java program to iterate the List and Map using lambda expressions
4. Create two threads using lambda expressions, where one thread displays even numbers for every half second and the other thread displays odd numbers for every second

Experiment-XII

1. Write a java program to demonstrate following methods using streams on a List

   a) filter **b)** sorted **c)** distinct **d)** limit **e)** count

2. Write a java program to read a string and collect upper case characters, lower case characters & digits into each individual ArrayList using streams and display them

Laboratory Manual:

[1] Advanced Java Programming laboratory Manual, Dept. of CSE, KITSW.

Reference Books:

[1] Herbert Schildt, JAVA The Complete Reference, 10th ed. New York: McGraw-Hill Education India Pvt.Ltd, 2017.

[2] Sachin Malhotra, Saurabh Choudhary, Programming in JAVA, 2nd ed. New Delhi: Oxford University Press, 2013.

[3] Uttam K.Roy, Advanced JAVA Programming, New Delhi: Oxford University Press, 2015.

[4] Pual Deitel, Harvey Deitel, Java How to program, 10th ed. Chennai: Pearson Education, 2016.

[5] Sujoy Acharya, Mastering Unit Testing Using Mockito and JUnit, Birmingham: Packt Publishing Limited, 2014.

Course Learning Outcomes (COs):

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

CO1: design GUI programs by using the concept of swings

CO2: apply the concept of generics & collections to work on dynamic data

CO3: demonstrate correct usage of Comparable & Comparator interfaces and examine the test cases to perform unit testing using the concept of JUnit

CO4: apply the lambda expressions instead of anonymous class and effectively process collection of objects using Stream API

Course Articulation Matrix (CAM): U18CS507 ADVANCED JAVA PROGRAMMING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	U18CS507.1	2	2	2	1	2	-	-	-	2	1	-	2	3	1	3
CO2	U18CS507.2	2	2	2	1	-	-	-	-	2	1	-	2	3	1	2
CO3	U18CS507.3	2	2	2	1	2	-	-	-	2	1	-	2	3	3	3
CO4	U18CS507.4	2	2	2	1	-	-	-	-	2	1	-	2	3	1	2
U18CS507		2	2	2	1	2	-	-	-	2	1	-	2	3	1.5	2.5

U18CS508 COMPILER DESIGN LABORATORY

Class: B.Tech. V-Semester **Branch:** Computer Science and Engineering(CSE)

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: designing lexical analyzer and constructing predictive parser from the FIRST and FOLLOW of context-free grammar

LO2: constructing look ahead LR parser and generating assemble code from the intermediate representation of source code

LO3: implementing lexical analyzer based on regular expressions for the given problem

LO4: writing yet another compiler compiler program based on context-free grammar for the given problem

Experiment-I
1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines
2. Implement the lexical analyzer using LEX tool to generate tokens from the given C program

Experiment-II
1. Write a program to compute FIRST and FOLLOW for the given context-free grammar
2. Design a predictive parser for the given context-free grammar

Experiment-III
1. Design a look ahead LR bottom up parser for the given context-free grammar
2. Convert the Backus–Naur form or Backus normal form rules into yet another compiler compiler form and write code to generate abstract syntax tree

Experiment-IV
1. Write a program to generate assembly code from the intermediate representation of source code
2. Write a program to implement operator precedence parsing for the given context-free grammar

Experiment-V
Write a lexical analyzer program for the following:
1. To count the number of keywords and identifiers in the given program
2. To convert an octal number to decimal number
3. To recognize numbers in the given program

Experiment-VI
Write a lexical analyzer program for the following:
1. To count the number of vowels and consonants in the given string
2. To count the number of characters, words and lines in the given text
3. To count the number of '+'ve and '-'ve integers from the given program

Experiment-VII
Write lexical analyzer program for the following:
1. To count the number of comment lines in the given C program
2. To count the number of scanf and printf statements in the given C program

3. To illustrate no pattern and no action concept

Experiment-VIII
Write lexical analyzer program for the following:
1. To add line numbers to the given file and displays the same onto the standard output
2. To extract only comments from C program and display the same onto the standard output

Experiment-IX
Write yet another compiler compiler program for the following:
1. To identify a simple and a compound statement in the given C program
2. To construct a context-free grammar which accepts the language L={ $a^n b^n$ | n>=1}

Experiment-X
Write yet another compiler compiler program for the following:
1. To check the validity of given arithmetic expression
2. To construct a context-free grammar which accepts the language L={ $a^n b$ | n>=10}

Experiment-XI
Write yet another compiler compiler program for the following:
1. To recognize nested if control statements and display the level of nesting
2. To check the validity of given simple sentence

Experiment-XII
Write yet another compiler compiler program for the following:
1. To check the validity of given date
2. To test for balanced parentheses in the given input

Laboratory Manual:
[1] *Compiler Design Laboratory Manual*, Dept. of CSE, KITSW.
Reference Book:
[1] Alfred V.Aho, Ravi Sethi, Jeffrey D.Ullman, *Compilers: Principles, Techniques and Tools*, 2nd ed. Hong Kong: Pearson Education Asia, 2013.

Course Learning Outcomes (COs):
On completion of this course, students will be able to…
CO1: design lexical analyzer and construct predictive parser from the FIRST and FOLLOW of context-free grammar
CO2: construct look ahead LR parser and generate assemble code from the intermediate representation of source code
CO3: implement lexical analyzer based on regular expressions for the given problem
CO4: develop yet another compiler program based on context-free grammar for the given problem

Course Articulation Matrix (CAM): U18CS508 COMPILER DESIGN LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O 2	PS O 3
CO1	U18CS508.1	2	2	2	2	1	1	-	-	2	1	2	1	2	2	2
CO2	U18CS508.2	2	2	2	2	1	1	-	-	2	1	2	1	2	2	2
CO3	U18CS508.3	2	2	2	2	1	1	-	-	2	1	2	1	2	2	2
CO4	U18CS508.4	2	2	2	2	1	1	-	-	2	1	2	1	2	2	2
U18CS508		2	2	2	2	1	1	-	-	2	1	2	1	2	2	2

U18CS509 PYTHON PROGRAMMING LABORATORY

Class:B.Tech. V-Semester **Branch:**Computer Science & Engineering

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 student's knowledge in/on

LO1: fundamentals of python programming such as variables, operators, control statements & functions
LO2: namespaces, packages, string handling methods, lists&dictionaries of Python
LO3: object oriented programming, file handling & accessing database of Python
LO4: NumPy, Pandas &Matplotlib libraries in python

Experiment-I

1. Installation of Python and verifying PATH environment variable
2. Running instructions in Interactive interpreter and a python script
   (a) Executing instructions in Python Interactive Interpreter
   (b) Running python scripts in Command Prompt
   (c) Running python scripts in IDLE
3. Write a program to demonstrate importance of indentations. Purposefully raise Indentation Error and correct it.
4. Write a program to take input text as command line argument and display it on screen

Experiment-II

1. Write a program that takes 2 numbers as command line arguments and print its sum
2. Write a program to check whether the given number is even or odd
3. Write a program to calculate GCD of 2 numbers
4. Write a program to find Exponentiation (Power) of a number
5. Write a program to find given year is leap year or not
6. Write a program to develop a simple calculator

Experiment-III (Use functions concept for implementing below programs)

1. Write a program to find the Factorial of a given number
2. Write a program to evaluate the Fibonacci series for a given number 'n'
3. Write a program to find the Armstrong for a given number
4. Write a program to find sum of N numbers
5. Write a program to take a number as input, and print countdown from that number to zero (use while loop)
6. Write a program to find circulating 'n' values

Experiment-IV

1. Write a program to implement a module using import statement (Use python source file as a
2. module and implement import statement another python source file)
3. Write a program to implement from…import statement
4. Write a program to implement dir() function
5. Write a program to demonstrate packages in python

Experiment-V

Write python program on strings for the following

1. To display substring in a string
2. To update an existing string
3. To implement string concatenation
4. To implement string repetition
5. To demonstrate string formatting operator
6. To demonstrate built-in string methods

Experiment-VI

1. Write a program to demonstrate use of slicing in strings
2. Write a program to compare two strings
3. Write a program which prints the reverse of a given input string. (use a function with name reverse string and call this function for performing the operation)
4. Write a program to demonstrate list and related functions
5. Write a program to demonstrate tuple, set and related functions
6. Write a program to demonstrate dictionaries

Experiment-VII

Write python program for the following

1. To demonstrate classes and objects
2. To demonstrate class method and static method
3. To demonstrate inheritance

Experiment-VIII

Write python program on file operations for the following

1. To open and read data from a file
2. To write data into a file
3. To compute number of characters, words, lines in a file

Experiment-IX

Write python programs to implement database connectivity

1. Install and verify SQLite Connector for Python
2. To connect check SQLite Database connectivity
3. To retrieve and display data from a table
4. To insert data into a table
5. To delete rows in a table

Experiment-X

1. Install and setup NumPy environment
2. Write a program to demonstrate NumPy array
3. Write a program to demonstrate Slice operation
4. Write a program to demonstrate Reshaping of an array

Experiment-XI

1. Install and setup pandas environment
2. Write a python pandas program to create a series from an ndarray
3. Write a python pandas program to demonstrate indexing and selecting data
4. Twitter data analysis using Pandas

Experiment-XII

1. Install and setup matplotlib
2. Write a program to draw a simple line plot

3. Write a program to draw a histogram plot
4. Customize plots and experiment with different maps plots

Laboratory Manual:
1. Python Programming Laboratory Manual, Dept. of CSE, KITSW

Reference Books:
1. ReRemaThareja, *Python Programming using problem solving approach*, New Delhi: Oxford university press, 2017.

Course Learning Outcomes (COs):
On completion of this course, students will be able to

CO1: develop python programs using operators, control statements & functions
CO2: apply namespaces, packages, string handling methods, lists &dictionaries of Python for writing programs
CO3: build new classes, create objects, perform operations on files and implement database operations in Python
CO4: design visualization graphs with Matplotlib and experiment with Numpy& Pandas libraries for data analysis programs in Python

Course Articulation Matrix (CAM): U18CS509 PYTHON PROGRAMMING LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O 2	PS O 3
CO1	U18CS509.1	2	2	2	2	2	-	-	-	1	1	-	-	2	2	2
CO2	U18CS509.2	2	2	2	2	2	-	-	-	1	1	-	-	2	2	3
CO3	U18CS509.3	2	2	2	2	2	-	-	-	2	1	-	1	3	3	3
CO4	U18CS509.4	3	2	2	2	3	-	-	-	2	1	-	2	2	3	3
U18CS509		2.25	2	2	2	2.25	-	-	-	1.5	1	-	1.5	2.25	2.5	2.75

U18CS510 SEMINAR

Class: B.Tech. V - Semester **Branch:** Computer Science and Engineering

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:

1. The HoD shall constitute a Department Seminar Evaluation Committee (DSEC)
2. 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
3. There shall be only Continuous Internal Evaluation (CIE) for seminar
4. 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): U18CS510 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	PS O1	PSO 2	PSO 3
CO1	U18CS510.1	1	1	-	1	1	-	1	2	2	2	1	2	1	1	1
CO2	U18CS510.2	1	1	-	-	-	-	-	2	2	2	-	2	1	1	1
CO3	U18CS510.3	-	-	-	-	-	-	1	2	2	2	-	2	1	1	1
CO4	U18CS510.4	-	-	-	-	-	-	-	2	2	2	-	2	1	1	1
U18CS510		**1**	**1**	**-**	**1**	**1**	**-**	1	2	2	2	1	**2**	**1**	**1**	**1**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE:: WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTION & EVALUATION

VI- SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAM

[6Th+3P+1MC+Miniproject]

Sl. No	Category	Course Code	Course Title	Periods/week			Credits	Evaluation scheme				
				L	T	P	C	CIE			ESE	Total Marks
								TA	MSE	Total		
1	MC	U18MH601	Universal Human Values –II	2	1	-	-	10	30	40	60	100
2	OE	U18OE602	Open Elective – III	3	-	-	3	10	30	40	60	100
3	PE	U18CS603	Professional Elective - II / MOOC-II	3	-	-	3	10	30	40	60	100
4	PCC	U18CS604	Design and Analysis of Algorithms	3	-	-	3	10	30	40	60	100
5	PCC	U18CS605	Data Warehousing and Data Mining	3	-	-	3	10	30	40	60	100
6	PCC	U18CS606	Internet of Things	3	-	-	3	10	30	40	60	100
7	PCC	U18CS607	Design and Analysis of Algorithms Laboratory	-	-	2	1	40	-	40	60	100
8	PCC	U18CS608	Data Analytics Laboratory	-	-	2	1	40	-	40	60	100
9	PCC	U18CS609	Internet of Things Laboratory	-	-	2	1	40	-	40	60	100
10	PROJ	U18CS610	Mini Project	-	-	2	1	100	-	100	-	100
			Total:	17	-	8	19	280	180	460	540	1000
***Additional Learning*:** *Maximum credits allowed for Honours/Minor*				-	-	-	*7*	-	-	-	-	-
			Total credits for Honours/Minor students:	-	-	-	*19+7*	-	-	-	-	-

** List of courses for additional learning through **MOOCs** towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula*

[L= Lecture, T = Tutorials, P = Practicals & C = Credits] **Total Contact Periods/Week: 25** **Total Credits: 19**

Open Elective-III:	Professional Elective-II / MOOC-II:
U18OE602A: Disaster Management	U18CS603A: Cryptography and Network Security
U18OE602B: Project Management	U18CS603B: Digital Image processing
U18xOE602C: Professional Ethics in Engineering	U18CS603C: Software Testing Methodologies
U18OE602D: Rural Technology and Community Development	U18CS603M: MOOCs Course

U18MH601 UNIVERSAL HUMAN VALUES - II

Class: B.Tech. VI–Semester **Branch:** Computer Science and Engineering

Teaching Scheme:

L	T	P	C
2	1	-	3

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 + 3)

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 + 3)

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 + 3)

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 + 3)

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.

Aditional 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 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): U18MH601 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	PSO 3
CO1	U18MH601.1	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
CO2	U18MH601.2	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
CO3	U18MH601.3	-	-	-	-	-	1	-	2	1	1	-	2	-	-	1
CO4	U18MH601.4	-	-	-	-	-	1	-	2	1	1	-	2	_	-	1
U18MH601		-	-	-	-	-	**1**	-	**2**	**1**	**1**	-	**2**	_	-	**1**

U18CS603A CRYPTOGRAPHY AND NETWORK SECURITY

Class: B. Tech. VI - Semester **Branch:** Computer Science and Engineering (CSE)

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: security attacks, services, mechanisms and symmetric key cryptographic algorithms
LO2: number theory and public key cryptographic algorithms
LO3: hash techniques, message authentication techniques and key management & distribution
LO4: IP security, web security, firewalls and various malicious software

UNIT – I (9)

Overview: The OSI security architecture, Security attacks, Security services, Security mechanisms, A model for network security
Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography
Block Ciphers and the Data Encryption Standard: Traditional block cipher structure, The data encryption standard, The strength of DES, Block cipher design principles, Block cipher operation
Advanced Encryption Standard: AES structure, AES transformation functions, AES key expansion

UNIT - II (9)

Number Theory: Prime numbers, Fermat's and Euler's theorems, Discrete logarithms
Public-Key Cryptography and RSA: Principles of public-key cryptosystems, The RSA algorithm
Other Public-Key Cryptosystems: Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography

UNIT - III (9)

Cryptographic Hash functions: Applications of cryptographic hash functions, Two simple hash functions, Secure hash algorithm (SHA)
Message Authentication Codes: Message authentication requirements, Message authentication functions, Requirements for message authentication codes, Security of MACs, HMAC
Digital Signature and Authentication Protocols: Digital signatures, Schnorr digital signature scheme
Key Management and Distribution: Symmetric key distribution using symmetric encryption, Symmetric key distribution using asymmetric encryption, Distribution of public keys, X.509 certificates
Electronic Mail Security: Pretty good privacy, S/MIME

UNIT - IV (9)

IP Security: IP security overview, IP security policy, Encapsulating security payload, Combining security associations
Transport-Level Security: Web security considerations, Secure sockets layer, Transport layer security
Malicious Software: Types of malicious software, Propagation-infected content-viruses, Virus countermeasures
Firewalls: The need for firewalls, Firewall characteristics, Types of firewalls

Text Book:

1. William Stallings, *Cryptography and Network Security: Principles and Practice*, 6th ed. New Delhi: Pearson Education, 2014.

Reference Books:

1. Behrouz A. Forouzan, Debdeep Mukhopadhyay, *Cryptography and Network Security*, 2nd ed. New Delhi: McGraw Hill Education, 2010.
2. Atul Kahate, *Cryptography and Network Security,* New Delhi: McGraw Hill Education, 2003.
3. Denning. D, *Cryptography and Data Security*, United Kingdom: Addison Wesley, 1982.
4. V. K. Iain, *Cryptography and Network Security,* New Delhi: Khanna Publishing House, 2013.

Course Learning Outcomes (COs):

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

CO1: *classify different security attacks, services, mechanisms & symmetric key cryptographic algorithms*

CO2: *apply mathematical concepts in cryptographic algorithms for providing security & key exchange*

CO3: *categorize the hash and message authentication techniques and examine key management for distribution of keys*

CO4: *analyze the security issues at network layer & transport layer for protecting data from unauthorized persons, intruders and malicious software*

Course Articulation Matrix (CAM): U18CS603A CRYPTOGRAPHY AND NETWORK SECURITY

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS603A.1	1	-	-	-	-	-	-	1	-	1	-	2	-	1	-
CO2	U18CS603A.2	2	2	2	1	-	-	-	-	-	1	-	2	2	2	1
CO3	U18CS603A.3	2	2	2	1	-	1	-	-	-	1	-	2	1	2	1
CO4	U18CS603A.4	2	2	1	1	-	1	-	-	-	1	-	2	2	2	1
U18CS603A		**1.75**	**2**	**1.67**	**1**	**-**	**1**	**-**	**1**	**-**	**1**	**-**	**2**	**1.67**	**1.75**	**1**

U18CS603B DIGITAL IMAGE PROCESSING

Class: B.Tech. VI- Semester **Branch:** Computer Science and Engineering (CSE)

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives(LOs):

This course will develop students' knowledge in/on…

LO1: fundamental concepts of digital image processing such as sampling, quantization, and basic relationship between pixels

LO2: intensity transformation functions, spatial domain filters, and frequency domain filters for smoothing and sharpening of input images

LO3: morphological image processing and image segmentation techniques applied on input images to filter and segment the objects present in input image

LO4: extracting features from an object present in an input image and identify the object using classification techniques

UNIT – I (9)

Introduction: What is digital image processing, Origins of digital image processing, Examples of fields that use digital image processing, Fundamental steps in digital image processing, Components of an image processing system

Digital Image Fundamentals: Elements of visual perception, Light and the electromagnetic spectrum, Image sensing and acquisition, Image sampling and quantization, some basic relationships between pixels, Introduction to the mathematical tools used in digital image processing

UNIT - II (9)

Intensity Transformations & Spatial Filtering: The basics of intensity transformations and spatial filtering, Basic intensity transformation functions, Histogram processing, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Combining spatial enhancement methods

Filtering in the Frequency Domain: A brief history of the Fourier series and transform, Preliminary concepts, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, Some properties of the 2-D discrete Fourier transform, The basics of filtering in the frequency domain

UNIT - III (9)

Morphological Image Processing: Preliminaries, Erosion and dilation, Opening and closing, Hit-or-miss transformation, Some basic morphological algorithms

Image Segmentation-I Edge Detection, Thresholding, and Region Detection: Fundamentals, Point, Line and edge detection**,** Thresholding, Segmentation by region growing and by region splitting and merging, Region segmentation using clustering and superpixels, Segmentation using morphological watersheds

UNIT - IV (9)

Feature Extraction: Background, Boundary preprocessing, Boundary feature descriptors, Region feature descriptors, Principal components as feature descriptors, Whole-image features, Scale-invariant feature transform

Image Pattern Classification: Background, Patterns and pattern classes, Pattern classification by prototype matching, Optimum (Bayes) statistical classifiers, Neural networks and deep learning, Deep convolution neural networks

Text Book:

[1] Rafael C. Gonzalez, Richard E. Woods, *Digital Image Processing*, 4th ed. New Delhi: Pearson, 2018. *(Chapters 1 to 4, 9, 10, 12, 13)*

Reference Books:

[1] Anil K. Jain, *Fundamentals of Image Processing*, 1st ed. Chennai: Pearson, 2015.
[2] B. Chanda, D. Dutta Majunder, *Digital Image Processing and Analysis*, 2nd ed. New Delhi: Prentice Hall of India, 2011.
[3] S. Sridhar, *Digital Image Processing*, 2nd ed. Oxford: Oxford University Press, 2016.
[4] Munesh C. Trivedi, *Digital Image Processing*, 1st ed. New Delhi: Khanna Book Publishing, 2014.

Course Learning Outcomes (COs):

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

CO1: make use of the concepts of digital image processing such as sampling, quantization, and basic relationships between pixels during pre-processing stage of image processing
CO2: identify the effect of intensity transformation functions, frequency and spatial domain filters on input images for image smoothing and sharpening
CO3: identify the effect of morphological image processing techniques on objects present in input images and discover novel ways to segment the objects present in the input images
CO4: discover novel ways to extract the features to depict the shape of an object and apply classification techniques to identify the object present in an input image

Course Articulation Matrix (CAM): U18CS603B DIGITAL IMAGE PROCESSING

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	U18CS603B.1	2	2	1	1	1	-	-	-	-	1	-	1	2	1	2
CO2	U18CS603B.2	2	2	2	1	1	-	-	-	-	1	-	1	2	1	2
CO3	U18CS603B.3	2	3	2	3	1	-	-	-	-	1	-	2	2	1	2
CO4	U18CS603B.4	2	3	3	3	1	-	-	-	-	1	-	2	3	1	3
U18CS603B		2	2.5	2	2	1	-	-	-	-	1	-	1.5	2.25	1	2.25

U18CS604 DESIGN AND ANALYSIS OF ALGORITHMS

Class: B.Tech. VI-Semester **Branch:** Computer Science and 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: time and space complexity, asymptotic notations, set operations, problem solving with divide and conquer strategy

LO2: greedy and backtracking methods to solve computational problems

LO3: principle of optimality and problem solving with dynamic programming method

LO4: branch and bound method, classes of P,NP,NP-Hard and NP-Complete

UNIT-I (9)

Introduction: Algorithm analysis, Performance analysis, Space complexity and time complexity, Big 'O' notation, Omega notation, Theta notation, Different mathematical approach's for solving time complexity of algorithms

Sets and Disjoint Set Union: Introduction, Union, Find operations

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication

UNIT-II (9)

Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Single source shortest paths

Back Tracking: General method, N-Queens problem, Sum of subsets, Graph coloring problem

UNIT-III (9)

Dynamic Programming: General method, Multistage graphs, All pairs shortest paths, Single source shortest paths, Optimal binary search trees, String editing, 0/1 Knapsack problem, Reliability design problem, Travelling sales person problem

UNIT-IV (9)

Branch and Bound: General method, Least cost (LC) search, The 15-puzzle problem, Control abstractions for LC search, 0/1 Knapsack problem, Travelling sales person problem

NP Hard and NP Complete Problems: Basic concepts - Nondeterministic algorithms, The classes NP hard and NP complete; COOK's theorem, NP hard graph problems - Clique decision problem, Node cover decision problem, Traveling sales person decision problem

Text Book:

[1] E.Horowitz, S.Sahni, S.Rajasekaran, *Fundamentals of Computer Algorithms,* 2nd ed. Hyderabad: Universities Press, 2018

Reference Books:

[1] Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Cliford Stein, *Introduction to Algorithms*, 3rd ed, New Delhi: Prentice-Hall of India, 2010

[2] Gajendra Sharma,*Design and Analysis of Algorithms*, 4th ed, Khanna, Rajput: Publishing, 2019

[3] S.Sridhar, *Design and Analysis of Algorithms*,3rd ed, Oxford University Press, UK: 2015

[4] Mark Allen Weiss, *Data Structures and Algorithm Analysis in Java,* 3rd ed, New Delhi: Pearson, 2012

[5] Rajiv Chopra ,Shipra Raheja, *Design and Analysis of Algorithms*, New Delhi: New Age International Publishers, 2019

Course Learning Outcomes(COs):

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

CO1: apply divide and conquer strategy for searching and sorting techniques with performance

CO2: analyze algorithms using greedy and backtracking methods

CO3: *design of algorithms using dynamic programming approach*

CO4: evaluate the classes P, NP ,NP-Hard and NP-Complete

Course Articulation Matrix (CAM): U18CS604 DESIGN AND ANALYSIS OF ALGORITHMS

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	PSO 3
CO1	U18CS604.1	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
CO2	U18CS604.2	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
CO3	U18CS604.3	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
CO4	U18CS604.4	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
U18CS604		**1**	2	2	1	-	1	-	-	1	1	-	1	2	1	2

U18CS605 DATA WAREHOUSING AND DATA MINING

Class: B.Tech. VI-Semester **Branch:** Computer Science and Engineering

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: data warehouse architecture, multidimensional modeling & preprocessing
LO2: algorithms for mining frequent patterns & associations rules
LO3: classification models and relevant evaluation techniques
LO4: clustering techniques and data mining applications on web, finance & retail business

UNIT-I (9)

Data Warehouse: Basic concepts, Multitier architecture, Data warehouse models, ETL tools, Metadata repository

Multidimensional Data Modeling: Data cube, Star, Snowflake and Fact constellation schemas, Dimensions, Measures, *OLAP* operations, Star net query model

Data Warehouse Implementation: Efficient data cube computation, Indexing *OLAP*, Efficient processing of *OLAP* queries, *OLAP* servers

Data Preprocessing: Data cleaning, Integration, Reduction and Transformation

UNIT-II (9)

Data Mining: Introduction, Types of data and patterns can be mined, Technologies Used, Applications Targeted, Major issues in data mining

Association Rule Mining: Basic concepts, Apriori algorithm, Generating association rules from frequent item sets, Improvements of Apriori algorithm, *Patten-Growth* approach, Mining frequent Item sets using vertical data format, Mining closed frequent item sets, Correlation analysis, Patten mining in multilevel and multidimensional space, Constraint based frequent pattern mining

UNIT-III (9)

Classification: Basic Concepts, Classification by decision tree induction, Bayesian classification, Rule based classification, Model evaluation and Selection

Advanced Classification: Classification by back propagation, Associative classification, *K Nearest* Neighbor classifiers, Rough set and Fuzzy set approaches

UNIT-IV (9)

Cluster Analysis: Introduction, Types of data in cluster analysis, Partitioning methods by *K- Means and K-Medoids*, Agglomerative versus Divisive hierarchical clustering, *BIRCH* Multiphase hierarchical clustering, Density based method with *DBSCAN* algorithm, Grid based method with *STING*, Evaluation of clusters, Outlier Analysis and detection methods

Data Mining Trends: Mining sequence data, Web data mining, Data mining applications with Finance data analysis, Retail industry and Recommender systems

Text Book:

[1]Jiawei Han, Micheline Kambler, *Data Mining Concepts and Techniques*, 3rd ed., Singapore: Morgan Kaufmann Publishers, 2016.

Reference Books:

[1] Sam Anahory, Dennis Murray, *Data warehousing in the real world*, New Delhi: Pearson Education, 2003.
[2] C.S.R.Prabhu, *Data Warehousing Concepts, Techniques, Products and Applications*, 2nd ed. New Delhi: Prentice-Hall of India, 2002.
[3] Arun K.Pujari, *Data Mining Techniques*, 2nd ed. Hyderabad: Universities press, 2010.

Course Learning Outcomes (COs):

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

CO1: design multi dimensional models & preprocessing strategies for data warehouses applications
CO2: apply frequent pattern mining techniques on data sets for association rules extraction
CO3: analyze efficiency of classification algorithms
CO4: evaluate clustering techniques and design data mining applications on web & financial domains.

Course Articulation Matrix (CAM): U18CS605 DATA WAREHOUSING AND DATA MINING

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O 2	PS O 3
CO1	U18CS605.1	1	2	2	2	1	-	-	-	-	1	1	1	2	1	2
CO2	U18CS605.2	1	2	2	2	-	-	-	-	-	1	-	1	2	1	2
CO3	U18CS605.3	1	2	2	2	1	-	-	-	1	1	-	1	2	1	2
CO4	U18CS605.4	1	2	2	2	-	-	-	-	1	1	-	1	2	1	2
U18CS605		1	2	2	2	1	-	-	-	1	1	1	1	2	1	2

U18CS606 INTERNET OF THINGS

Class: B.Tech. V-Semester **Branch:** Computer Science & 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: fundamentals, Physical & logical designs of Internet of Things
LO2: standard architectures & protocols of Internet of Things
LO3: components and IP addressing optimizations of Internet of Things
LO4: Internet of Things platforms, security issues and application areas

Unit-I (9)

Introduction: What is the Internet of Things (IoT), IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities,

Physical and Logical Design of IoT: Things of IoT, IoT Protocols, Functional block, communication Model, Communication API's

IoT Enabling Technologies: WSN, cloud computing, Big data Analytics, communication Protocols, Embedded systems, IoT levels and Deployment templates

Unit-II (9)

IoT NETWORK ARCHITECTURE: The M2M IoT Standardized Architecture, The IoT World Forum (IoTWF) Standardized Architecture, A Simplified IoT Architecture,

IoT Protocol Stack: The Core IoT Functional Stack, Sensors and Actuators Layer, Communications Network Layer, Applications and Analytics Layer, IoT Data Management and Compute Stack, Fog Computing, Edge Computing, the Hierarchy of Edge, Fog, and Cloud

IoT and M2M: Introduction to M2M, Difference between IoT and M2M, software defined networking and Network function virtualization

Unit-III (9)

Smart Objects: Sensors, Actuators, Smart Objects and Sensor Networks

Connecting Smart Objects: Communications Criteria, IoT Access Technologies: IEEE 802.15.4, IEEE 802.15.4g and 802.15.4e, IEEE 1901.2a, IEEE 802.11ah, LoRaWAN

Optimizing IP for IoT: The Need for Optimization, From 6LoWPAN to 6Lo, Header Compression, Fragmentation, Mesh Addressing, Mesh-Under Versus Mesh-Over Routing, 6Lo Working Group, 6TiSCH, RPL, Authentication and Encryption on Constrained Nodes, Profiles and Compliances

Unit-IV (9)

IoT PLATFORMS: Raspberry Pi, Raspberry Pi Interfaces, Other IoT Devices: pcDuino, Beagle Bone Black, CubieBoard, ARDUINO

Securing IoT: How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures, The Phased Application of Security in an Operational Environment

IoT PHYSICAL SERVERS AND CLOUD OFFEREINGS: Introduction to cloud storage models and communication API's, WAMP- for IoT, Python web application framework, Designing a RESTful web API. AutoBahn

IoT case studies: Home Automation, Smart and connected Cities, Transportation, Public safety, Environment and Agriculture.

Text Books:

[1]. Arshdeep Bahga and Vijay Madisetti, *Internet of Things: A Hands-On Approach,* Hyderabad: University Press, 2015.

[2]. David Hanes, Gonzalo Salgueiro and Patrick Grossetete, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things,* Cisco Press, 2017. (Chapters: 2, 3, 4, 5, 8,13,15)

Reference Books:

[1]. Bassi Alessandro, *Enabling things to talk*, Berlin: Springer-Verlag, 2016.

[2]. Hersent, Olivier, David Boswarthick, and Omar Elloumi, *The internet of things: Key applications and protocols*. London: John Wiley & Sons, 2011.

[3]. Buyya, Rajkumar, and Amir Vahid Dastjerdi, *Internet of Things: Principles and paradigms*. New York: Elsevier, 2016.

Course Learning Outcomes(COs):

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

CO1: demonstrate fundamentals, Physical & logical designs of Internet of Things
CO2: analyze standard architectures & protocols of Internet of Things
CO3: select effective components and IP addressing structure to develop IoT applications
CO4: design IoT applicatons for domestic safety, transportation and agricultural applications

Course Articulation Matrix (CAM): U18CS606 INTERNET OF THINGS

Course Outcomes		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	PS O 2	PS O 3
CO1	U18CS606.1	1	2	2	2	1	-	-	-	1	1	1	1	2	2	2
CO2	U18CS606.2	1	2	2	2	-	-	-	-	1	1	-	1	2	2	2
CO3	U18CS606.3	1	2	2	2	1	-	-	-	1	1	-	1	2	2	2
CO4	U18CS606.4	1	2	2	2	-	-	-	-	1	1	1	1	2	2	2
U18CS606		1	2	2	2	1	-	-	-	1	1	1	1	2	2	2

U18CS607 DESIGN AND ANALYSIS OF ALGORITHMS LAB

Class: B.Tech. VI-Semester **Branch:** Computer Science and 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: searching and sorting techniques using divide and conquer strategy
LO2: computational problems using greedy and backtracking methods
LO3: computational problems using dynamic programming technique
LO4:computationalproblems using dynamic programming and branch and bound methods

List of Experiments

Experiment-I

1. Program to implement binary search algorithm
2. Programto implement min-max algorithm

Experiment-II

1 Program to implement merge sort algorithm
2 Program to implement quick sort algorithm

Experiment-III

1. Program to implement stassen's matrix multiplication

Experiment-IV

1. Program to implement 0/1 knapsack problem
2. Program to implement job sequencing with deadlines

Experiment-V

1. Program to implement single source shortest path applying greedy method
2. Program to implement N-Queens problem

Experiment-VI

1. Program to implement sum of subsets problem

Experiment-VII

1 Program to implement single source shortest paths problem using dynamic programming

Experiment-VIII

1 Program to implement multistage graphs problem

Experiment-IX

1. Program to implement all pairs shortest paths

Experiment-X

1. Program to implement optimal binary search trees

Experiment-XI

1. Program to implement travelling sales person problem using dynamic programming

Experiment-XII

1. Program to implement travelling salesperson problem using branch and bound

Laboratory Manual:

[1] *Design and analysisof algorithmslaboratory manual*, Dept. of CSE,KITSW.

Reference Books:

[1]E.Horowitz, S.Sahni, S.Rajasekaran, *Fundamentals of Computer Algorithms,* 2nd ed, Hyderabad: Universities Press, 2018.

[2] Mark Allen Weiss, *Data Structures and Algorithm Analysis in Java,* 3rd ed, New Delhi: Pearson, 2012.

[3] Kathy Sierra, Bert Bates, *Head First Java8*, 2nd ed, California: O'Reilly Publications, 2020

[4] Narasimha Karumanchi, *Data Structures and Algorithms Made Easy in Java*, Hyderabad: CareerMonk, 2011.

[5] Uttam K. Roy, *Advanced JAVA Programming*, Noida: Oxford Publications, 2015.

Course Learning Outcomes(COs):

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

CO1: implement programs on binary search, min-max, merge sort, quick sort &strassen's matrix multiplication problems

CO2 :develop knapsack, job sequencing with deadline & shortest path using greedy method, N-Queens & sum of subsets using backtracking method

CO3 :implement programs on single source shortest path, multistage graph &all pairs shortest path using dynamic programming technique

CO4:construct optimal binary search tree & travelling sales person using dynamic programming technique, travelling sales person problem using branch and bound method

Course Articulation Matrix (CAM):U18CS607DESIGN AND ANALYSIS OF ALGORITHMS LAB

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	U18CS607.1	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
CO2	U18CS607.2	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
CO3	U18CS607.3	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
CO4	U18CS607.4	1	2	2	1	-	1	-	-	1	1	-	1	2	1	2
U18CS607		1	2	2	1	-	1	-	-	1	1	-	1	2	1	2

U18CS608 DATA ANALYTICS LABORATORY

Class: B. Tech VI-Semester **Branch:** Computer Science & Engineering

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: designing data warehouse & OLAP operations
LO2: ETL & OLAP tools
LO3: evaluating data processing techniques using WEKA tool
LO4: programming data mining techniques

List of Experiments

Experiment-I
1. SQL queries to implement multidimensional data models (Star, snowflake and Fact constellation schemes) using SQL queries.

Experiment-II
2. SQL queries to implement Cube operations on multidimensional data models.

Experiment-III
3. SQL queries to implement Set operations on multidimensional data models.

Experiment-IV
4. Develop a data warehouse application for sales management using ETL tool

Experiment-V
5. Demonstrate OLAP operations using for sales data analytics using OLAP server

Experiment-VI
6. Demonstrate different options of handling missing values
7. Demonstrate elimination of data noise using various kinds of binning functions

Experiment-VII
8. Perform data preprocessing/analysis tasks using WEKA Tool.
9. Write a program in any programming language to create a file in ARFF format consisting of at least 10,000 transactions with at least three items.

Experiment-VIII
10. Write a program to implement Apriori algorithm for association rule mining.
11. Generate association rules using Apriori and FP-Growth methods in WEKA Tool on German credit card dataset.
12. Compare efficiency of Apriori and FP-Growth methods in WEKA Tool on German credit card dataset.

Experiment-IX
Write a program to implement ID3 classification algorithm.
13. Generate and compare different classification functions of WEKA Tool on German credit card dataset.
14. Generate the significance of attributes Foreign worker and social status of German credit card dataset in classification process using WEKA Tool.

Experiment-X

15. Generate and compare significance of Ten cross fold and Fifty cross fold options of testing data generation for classification using WEKA Tool.
16. Generate and compare significance of Cross validation and boot strapping techniques of evaluation using WEKA Tool.
17. Evaluate the significance of attributes Foreign worker and social status of German credit card dataset using cross validation techniques of WEKA Tool.

Experiment-XI

18. Write a program to implement simple K-means Clustering algorithm using WEKA Tool.
19. Generate and compare different clustering functions of WEKA Tool on German credit card dataset.
20. Generate the significance of attributes Foreign worker and social status of German credit card dataset in clustering process using WEKA Tool.

Experiment-XII

21. Perform data visualization of German credit card dataset using R-Open Tool.
22. Generate synthetic data set and evaluate different classification algorithms using R-Open Tool.
23. Evaluate on different clustering algorithms on synthetic dataset using R-Open Tool.

Laboratory Manual:

1. *Data Analytics Laboratory Manual*, Department of Computer Science and Engineering, KITSW

Text Book:

1. Jiawei Han, Micheline Kambler, *Data Mining Concepts and Techniques*, 3rd ed. Singapore: Morgan Kaufmann Publishers, 2016

Course Learning Outcomes(COs):

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

CO1: design data warehouse and implement OLAP operations
CO2: apply ETL & OLAP tools for data analysis
CO3: evaluate different data processing techniques using WEKA tool
CO4: implement data mining techniques on various data sets

Course Articulation Matrix (CAM): U18CS608 DATA ANALYTICS LABORATORY

Course Outcomes		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	U18CS608.1	1	2	2	2	1	-	-	-	1	1	1	1	2	2	2
CO2	U18CS608.2	1	2	2	2	-	-	-	-	1	1	-	1	2	2	2
CO3	U18CS608.3	1	2	2	2	1	-	-	-	1	1	-	1	2	2	2
CO4	U18CS608.4	1	2	2	2	-	-	-	-	1	1	1	1	2	2	2
U18CS608		1	2	2	2	1	-	-	-	1	1	1	1	2	2	2

U18CS609 INTERNET OF TECHNOLOGIES LABORATORY

Class: **B.Tech. V**I-Semester **Branch**: Computer Science and Engineering

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Outcomes(LO) :
This course will develop students' knowledge in/on

LO1: configuring Rasberry Pi for IoT applications
LO2: running python program on Rasberry Pi for developing IoT applications
LO3: implementing cloud based IoT applications
LO4: usage of Pi camera and 7-segment display

List of Experiments

Experiment I:

1. Installation of OS onto Raspberry Pi
2. Start Raspberry Pi and try various Linux commands in command terminal window:
   i. *ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip*
   ii. *cat, more, less, ps*

Experiment II:

3. Start Raspberry Pi and try various Linux commands in command terminal window:
   a. *sudo, cron, chown, chgrp, ping etc.*
   b. *process-related commands*
4. Run a python program on Pi to Read your name and print Hello message with name
5. Run a python program on Pi to Read two numbers and print their sum, difference, product and division
6. Run a python program on Pi to read a word and count characters in that word

Experiment III:

7. Run a python program on Pi to Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input

Experiment IV:

8. Run a python program on Pi to demonstrate *while* loop
9. Run a python program on Pi to demonstrate *for* loop
10. Run a python program on Pi to demonstrate handle *DivideByZero* Exception

Experiment V:

11. Run a python program on Pi to print current time for 10 times with an interval of 10 seconds.

12. Run a python program on Pi to print Read a file line by line and print the word count of each line.
13. Run a python program on Pi to demonstrate Light an LED through Python program

Experiment VI:

14. Run a python program on Pi to get input from two switches and Switch ON corresponding LEDs

Experiment VII:

15. Run a python program on Pi to Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
16. Run a python program on Pi to Flash an LED based on *cron* output (acts as an alarm)

Experiment VIII:

17. Switch on a relay at a given time using *cron*, where the relay's contact terminals are connected to a load.

Experiment IX:

18. Get the status of a bulb at a remote place (on the LAN) through web.

Experiment X:

19. Get input from DHT sensor and upload on cloud
20. Get input from ultrasonic sensor and upload on cloud

Experiment XI:

21. Working with LED, button, *pir* sensor

Experiment XII:

22. Working with Pi camera
23. Working with 7-segment display using Raspberry PI

Course Learning Objectives(CO) :
On completions of the course, students will be able to…

LO1: configure Rasberry Pi to develop IoT applications
LO2: implement python programs on Rasberry Pi for developing IoT applications
LO3: design cloud based IoT applications
LO4: develop real time IoT application using Pi camera and 7-segment display

Course Articulation Matrix(CAM): U18CS609 Internet of Technologies Laboratory																
Course Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	U18CS609.1	-	2	2	-	-	-	-	-	-	-	-	-	2	1	1
CO 2	U18CS609.2	1	2	2	-	2	-	-	-	-	-	-	-	2	1	1
CO 3	U18CS609.3	1	2	2	-	2	-	-	-	-	-	1	1	2	1	1
CO 4	U18CS609.4	1	2	2	-	2	-	-	-	-	1	1	1	2	1	1
U18CS609		1	2	2	-	2	-	-	-	-	1	1	1	2	1	1

U18CS610 MINI PROJECT

Class: B.Tech. VI - Semester **Branch:** Computer Science and Engineering

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…

LO4: implementing a project independently by applying knowledge to practice
LO5: literature review and well-documented report writing
LO6: creating PPTs and effective technical presentation skills
LO7: 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:

1. The HoD shall constitute a *Department Mini Project Evaluation Committee (DMPEC)*
2. 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
3. There shall be only Continuous Internal Evaluation (CIE) for mini project
4. 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

(i) on the chosen work and demonstrate before the *DMPEC* as per the dates specified by *DMPEC*

(j) **Report:** Each student is required to submit a well-documented report on the chosen seminar topic as per the format specified by *DMPEC*

(k) **Anti-Plagiarism Check:** The seminar report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(l) **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

(m) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his /

(n) 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

(o) 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

(p) 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): U18CS610 MINI PROJECT

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	PSO 3
CO1	U18CS610.1	1	1	2	2	1	1	1	2	2	2	1	2	2	2	2
CO2	U18CS610.2	1	1	-	2	-	-	-	2	2	2	-	2	2	2	2
CO3	U18CS610.3	-	-	-	-	-	-	1	2	2	2	-	2	2	2	2
CO4	U18CS610.4	-	-	-	-	-	-	-	2	2	2	-	2	2	2	2
U18CE609		**1**	**1**	**2**	**2**	**1**	**1**	1	2	2	2	1	**2**	**2**	**2**	**2**