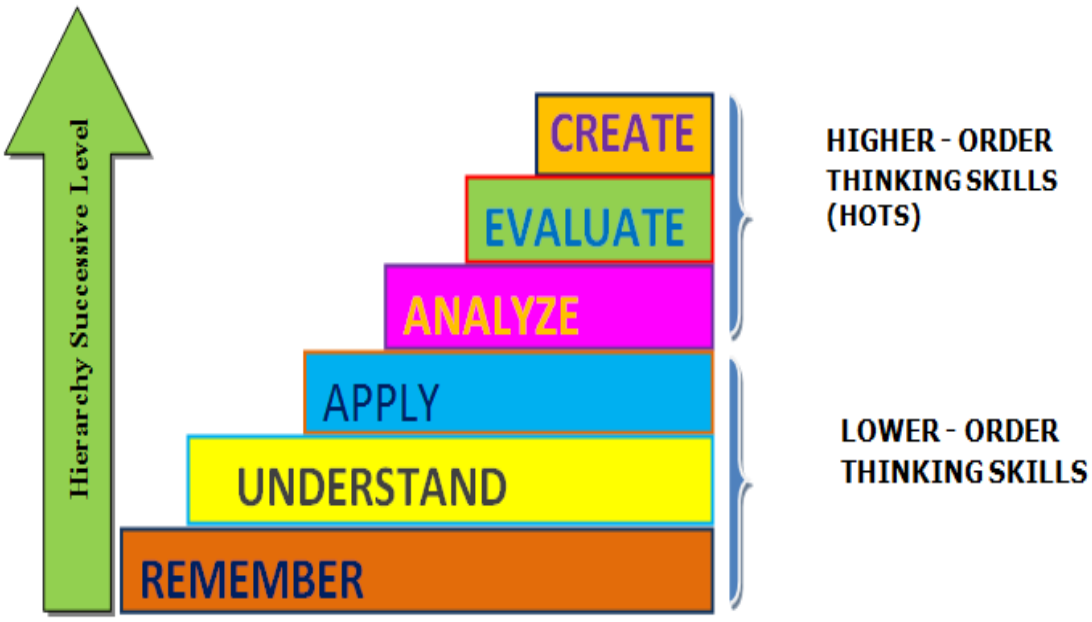
COURSE DESCRIPTOR BOOKLET

B.Tech

INFORMATION TECHNOLOGY

(Accredited by NBA)

R-16 REGULATIONS



BLOOM'S TAXONOMY OF LEARNING OUTCOMES

.....Moving Towards Perfection in Engineering

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Approved by AICTE; Affiliated to JNTUH and Accredited by NAAC with 'A' Grade
Dundigal, Hyderabad - 500 043

I SEMESTER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**COMPUTER PROGRAMMING**				
Course Code	ACS001				
Programme	B.Tech				
Semester	I	CSE | IT| ECE | EEE			
	II	AE | CE| ME			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	4	2
Chief Coordinator	Dr. K Srinivasa Reddy, Professor & HOD, IT				
Course Faculty	Ms N Jayanthi Dr. G Ramu Dr. J Sirisha Devi Dr. K Suvarchala Ms. B Rekha Ms. B Padmaja Ms. G Geetha Reddy Ms. K Laxmi Narayanamma Mr. R M Norullah				

I. COURSE OVERVIEW:

The course covers the basics of programming and demonstrates fundamental programming techniques, customs and terms including the most common library functions and the usage of the preprocessor. This course helps the students in gaining the knowledge to write simple C language applications, mathematical and engineering problems. This course helps to undertake future courses that assume this programming language as a background in computer programming. Topics include variables, data types, functions, control structures, pointers, strings, arrays and dynamic allocation principles. This course in reached to student by power point presentations, lecture notes, and lab involve the problem solving in mathematical and engineering areas.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic Mathematics and Logical Thinking

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Computer Programming	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into fiveunits and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complexengineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	3	Assignments
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Seminars, Viva
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Engineering knowledge:** Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	2	Projects
PSO 2	**Broadness and diversity:** Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage	3	Lectures, Assignments
PSO 3	**Self-Learning and service:** Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	1	5 minutes video

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Learn adequate knowledge by problem solving techniques.
II	Understand programming skills using the fundamentals and basics of C Language.
III	Improve problem solving skills using arrays, strings, and functions.
IV	Understand the dynamics of memory by pointers.
V	Study files creation process with access permissions

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS001.01	CLO 1	Identify and understand the working of key components of a computer system.	PO 1, PO 4	2
ACS001.02	CLO 2	Analyze a given problem and develop an algorithm to solve the problem.	PO 2, PO 3	3
ACS001.03	CLO 3	Describe the fundamental programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.	PO 2, PO 4	2
ACS001.04	CLO 4	Gain knowledge to identify appropriate C language constructs to write basic programs.	PO 1, PO 3	3
ACS001.05	CLO 5	Identify the right data representation formats based on the requirements of the problem.	PO 2,PO 3	3
ACS001.06	CLO 6	Describe the operators, their precedence and associativity while evaluating expressions in program statements..	PO 1, PO 4	2
ACS001.07	CLO 7	Understand branching statements, loop statements and use them in problem solving.	PO 1,PO 4	2
ACS001.08	CLO 8	Learn homogenous derived data types and use them to solve statistical problems.	PO 2, PO 3	3
ACS001.09	CLO 9	Understand procedural oriented programming using functions.	PO 2	3
ACS001.10	CLO 10	Understand how recursion works and write programs using recursion to solve problems.	PO 1, PO 2	3
ACS001.11	CLO 11	Differentiate call by value and call by reference parameter passing mechanisms.	PO 2	3
ACS001.12	CLO 12	Understand pointers conceptually and apply them in C programs.	PO 1	3
ACS001.13	CLO 13	Distinguish homogenous and heterogeneous data types and apply them in solving data processing applications.	PO 3	2
ACS001.14	CLO 14	Explain the concept of file system for handling data storage and apply it for solving problems.	PO 1, PO 3	3
ACS001.15	CLO 15	Differentiate text files and binary files and write the simple C programs using file handling functions. Searching, Sorting.	PO 2	3
ACS001.16	CLO 16	Apply the concepts to solve real-time applications using the features of C language.	PO 2	3
ACS001.17	CLO 17	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.	PO 1, PO 4	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes POs												Program Specific Outcomes PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3			1										3	
CLO 2		3	2										2		1
CLO 3		3		1									2		

CLOs	Program Outcomes POs												Program Specific Outcomes PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 4	3			1									2		
CLO 5		3	2										2	3	
CLO 6	3			1											1
CLO 7	3			1										3	
CLO 8		3	2										2		
CLO 9		3												3	
CLO 10	3	3											2		1
CLO 11		3												3	
CLO 12	3												2	3	
CLO 13			2										2		
CLO 14	3		2											3	1
CLO 15		3												3	
CLO 16		3												3	
CLO 17	3			1									2		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO 1, PO2, PO 3, PO 4	SEE Exams	PO 1, PO2, PO 3, PO 4	Assignments	PO 2	Seminars	PO 3
Laboratory Practices	PO 1	Student Viva	PO 3	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES-INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	INTRODUCTION
Introduction to computers: Computer systems, computing environments, computer languages, creating and running programs, algorithms, flowcharts; Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types; Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions, formatted input and output.	
UNIT-II	**CONTROL STRUCTURES**
Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements; Arrays: Concepts, one dimensional arrays, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays; Strings concepts: String handling functions, array of strings.	
UNIT-III	**ARRAYS AND FUNCTIONS**
Functions: Need for user defined functions, function declaration, function prototype, category of functions, inter function communication, function calls, parameter passing mechanisms, recursion, passing arrays to functions, passing strings to functions, storage classes, preprocessor directives. Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers.	
UNIT-IV	**STRUCTURES, UNIONS AND POINTERS**
Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, passing structures through pointers, self referential structures, unions, bit fields, typedef, enumerations; Dynamic memory allocation: Basic concepts, library functions.	
UNIT-V	**FILE HANDLING AND BASICALGORITHMS**
Files: Streams, basic file operations, file types, file opening modes, file input and output functions, file status functions, file positioning functions, command line arguments.	
Text Books:	
1. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014. 2. B. A. Forouzan, R. F. Gillberg, "C Programming and Data Structures", Cengage Learning, India, 3rd Edition, 2014.	
Reference Books:	
1. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988. 2. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003. 3. E. Balagurusamy, "Programming in ANSI C", Mc Graw Hill Education, 6th Edition, 2012. 4. Schildt Herbert, "C: The Complete Reference", Tata Mc Graw Hill Education, 4th Edition, 2014. 5. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012. 6. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1 – 2	Introduction to Computers: computer systems, computing environments.	CLO 1	T2:1.1-1.2
3 – 4	Computer languages, creating and running programs, program development.	CLO 1	T2:2.1-2.2
5 – 6	Algorithms, flowcharts	CLO 2	T2:1.4-1.5
7 – 8	Introduction to C Language: background, C programs.	CLO 3	T2:2.1-2.2
9 – 10	Identifiers, data types, Input/output, variables, constants, Operators (arithmetic, relational, logical, bitwise etc).	CLO 3	T2: 2.3- 2.6,7
11 – 12	Expressions, precedence and associativity, expression evaluation, type conversions	CLO 6	T2:3.1-3.5
13 – 14	Statements - selection statements (making decisions) – if statement, switch statement.	CLO 7	T2: 5.2-5.3
15 – 16	Repetition statement (loops)-while, dowhile statements, for statements, loop examples	CLO 7	T2: 6.1-6.6
17 – 18	Other statements related to looping – break, continue, go to, simple C program examples.	CLO 7	T2: 6.7
19 – 20	Arrays- Concepts, using arrays in C, declaration and initialization of one dimensional array, C program example. Two dimensional arrays, initialization and accessing, multi dimensional arrays, C program example.	CLO 8	T2: 8.1-8.3,8.7-8.8
21-22	Strings – Strings concepts: String handling functions, array of strings, C program examples.	CLO 8	T2: 11.1-11.5
23-- 24	Functions- Need for user defined functions, function declaration, function prototype. Category of functions, inter function communication, function calls, parameter passing mechanisms.	CLO 9	T2: 4.1-4.5
25	Recursion, passing arrays to functions, passing strings to functions, Storage classes and preprocessor commands.	CLO 10	T1:7 T2:6.9 T2:G.1
26-27	Pointer basics, pointer arithmetic, pointers to pointers, generic pointers. Pointer applications-Arrays and pointers, pointer arithmetic and arrays, passing an array to a function.	CLO 12	T1:1.0
28 – 29	Array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers	CLO 12	T2:10.3-10.5
30 – 31	Structures – declaration, initialization, accessing structures, operations on structures.	CLO 13	T1:8
32 – 33	Complex structures, structures and functions, passing structures through pointers, self-referential structures.	CLO 13	T2: 12.3-12.4
34 – 35	Unions, C programming examples, Bit fields, typedef, enumerations.	CLO 13	T2:12.4 T2:12.1- 12.2
36 -- 38	Dynamic memory allocation: Basic concepts, library functions	CLO 13	T2:2.1-2.2
39 – 40	Files: Concept of a file, streams, types of files and file opening modes.	CLO 14	R3:12.1-12.3
41 – 42	File input/output functions (standard input/output functions for files).	CLO 14	R3:12.4

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
43 – 44	File status functions (error handling), positioning functions, C program examples.	CLO 15	R3:12.5
45	Command-line arguments.	CLO 15	R3:12.7

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Updating latest version and new features of the C language	Laboratory Sessions	PO5	PSO2
2	Familiarizing the role of C language in developing system level programs.	Assignments / Industrial visits	PO1,PO2	PSO2
3	Familiarizing different areas where C language can be used.	Seminars	PO12	PSO3
4	Solving different problems and Practicing various debugging strategies to become a good programmer	Extra Lab Sessions, Participating in Coding contests	PO2	PSO3

Prepared by:
N Jayanthi, Assistant Professor

HOD, CSE

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATION**				
Course Code	AHS002				
Programme	B.Tech				
Semester	I	AE | CSE | IT | ECE | EEE | ME | CE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Ms. P Rajani, Assistant Professor				
Course Faculty	Dr. M Anita, Professor Mr. J Suresh Goud, Assistant Professor Ms. P Srilatha, Assistant Professor Ms. C Rachana, Assistant Professor Ms. B Praveena, Assistant Professor				

I. COURSE OVERVIEW:

The course focuses on more advanced Engineering Mathematics topics which provide with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes Types of matrices, difference calculus methods and differential equations. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	-

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Linear Algebra and Ordinary Differential Equations	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✘	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Term Paper

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Enrich the knowledge of probability on single random variables and probability distributions.
II	Apply the concept of correlation and regression to find covariance.
III	Analyze the given data for appropriate test of hypothesis.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS002.01	CLO 1	Demonstrate knowledge of matrix calculation as an elegant and powerful mathematical languagein connection with rank of a matrix.	PO 1	1
AHS002.02	CLO 2	Finding rank by reducing the matrix to Echelon and Normal forms.	PO 1	3
AHS002.03	CLO 3	Determine inverse of the matrix by Gauss Jordon Method.	PO 1	3
AHS002.04	CLO 4	Apply the method of LU Decomposition	PO 2	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		and solve the simultaneous equations.		
AHS002.05	CLO 5	Use the method of LU factorization real world problems such as circuit designing and solving complex circuits	PO 2	3
AHS002.06	CLO 6	Use the method of LU factorization real world problems such as economize and accumulate sums in double precision Computer Programme.	PO 2	2
AHS002.07	CLO 7	Interpret the Eigen values and Eigen vectors of matrix for a linear transformation and use properties of Eigen values	PO 4	1
AHS002.08	CLO 8	Understand the concept of Eigen values in real world problems of control field where they are pole of closed loop system.	PO 4	1
AHS002.09	CLO 9	Apply the concept of Eigen values in real world problems of mechanical systems where Eigen values are natural frequency and mode shape.	PO4	1
AHS002.10	CLO 10	Use the system of linear equations and matrix to determine the dependency and independency.	PO 2	2
AHS002.11	CLO 11	Determine a modal matrix, and reducing a matrix to diagonal form.	PO 1	3
AHS002.12	CLO 12	Evaluate inverse and powers of matrices by using Cayley-Hamiltontheorem.	PO 1	3
AHS002.13	CLO 13	Solving differential equations of first order.	PO 1	3
AHS002.14	CLO 14	Finding orthogonal trajectories of Cartesian and polar equations.	PO 1, PO 2	2
AHS002.15	CLO 15	Apply the first order differential equations in real world problems such as Newton's Law of cooling and Law of natural growth and decay	PO 2	2
AHS002.16	CLO 16	Solving Second and higher order differential equations with constant coefficients.	PO 2	2
AHS002.17	CLO 17	Apply the second order differential equations for real world problems of electrical circuits and simple harmonic motion.	PO 4	1
AHS002.18	CLO 18	Apply the Mean value theorems for the single variable functions.	PO 1, PO 2	2
AHS002.19	CLO 19	Understand the basic concepts of Partial Differential equations.	PO 1, PO 2	2
AHS002.20	CLO 20	Determine Jacobian for the coordinate transformation	PO 1, PO 2	2
AHS002.21	CLO 21	Apply the technique of Jacobian and inverse Jacobian relation to real world problems such as kinematics and inverse	PO 4	1

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		kinematic solutions of robot manipulators.		
AHS002.22	CLO 22	Understand the techniques of multidimensional change –of –variables to transform the coordinates by utilizing the Jacobian.	PO 1	3
AHS002.23	CLO 23	Apply maxima and minima for functions of several variable's and Lagrange's method of multipliers	PO 1	3
AHS002.24	CLO 24	Understand the concept and acquire the knowledge for attempting the competitive exams	PO 4	1

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	1												1		
CLO 2	2												1		
CLO 3	3												1		
CLO 4		2													
CLO 5		3													
CLO 6		2													
CLO 7				1									1		
CLO 8				1											
CLO 9				2									1		
CLO 10		2											1		
CLO 11	3														
CLO 12	3														
CLO 13	3														
CLO 14	1	2											1		
CLO 15		2													

CLOs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 16		2													
CLO 17				1									1		
CLO 18	1	2											1		
CLO 19	1	2											1		
CLO 20	1	2											1		
CLO 21				1											
CLO 22	3														
CLO 23	3														
CLO 24				1											

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2	SEE Exams	PO 1, PO2, PO 4	Assignments	-	Seminars	PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	THEORY OF MATRICES
Real Matrices**:** Symmetric, skew-symmetric and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian and unitary matrices; Elementary row and column transformations, elementary matrix, finding rank of a matrix by reducing to Echelon form and normal form; Finding the inverse of a matrix using elementary row/column transformations: Gauss-Jordan method; Solving of linear system of equations by LU decomposition method.	
Unit-II	**LINEAR TRANSFORMATIONS**
Cayley-Hamilton theorem: Statement, verification, finding inverse and powers of a matrix; Linear dependence and independence of vectors; Linear transformation; Eigen values and eigen vectors of a matrix; Properties of eigen values and eigen vectors of real and complex matrices; Diagonalization of matrix.	
Unit-III	**DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS**
Formation of a differential equation; Differential equations of first order and first degree: Exact, non exact, linear equations; Bernoulli equation; Applications of first order differential equations: Orthogonal	

trajectories; Newton's law of cooling; Law of natural growth and decay.	
Unit-IV	**HIGHER ORDINARY LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS**
Linear differential equations of second and higher order with constant coefficients, non homogeneous term of the type $f(x) = e^{ax}$, $\sin ax$, $\cos ax$ and $f(x) = x^n$, $e^{ax}v(x)$, $x^n v(x)$; Method of variation of parameters; Applications to electrical circuits and simple harmonic motion.	
Unit-V	**FUNCTIONS OF SINGLE AND SEVERAL VARIABLES**
Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem and generalized mean value theorems-without proofs. Functions of several variables: Functional dependence, Jacobian, maxima and minima of functions of two variables without constraints and with constraints; Method of Lagrang multipliers.	
Text Books:	
1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014. 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.	
Reference Books:	
1. RK Jain & SRK Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016. 2. Ravish R Singh, Mukul Bhatt, "Engineering Mathematics-1", Tata Mc Graw Hill Education, 1st Edition, 2009. 3. Srimanthapal & Suboth C.Bhunia, "Engineering Mathematics", Oxford Publishers, 3rd Edition, 2015.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Theory of Matrices Introduction of matrices	CLO 1	T1:22.5 R1:2.3
2-3	Real and complex matrices	CLO 2	T1:22.5 R1:2.4
4-6	Find rank by echelon and normal form	CLO 2	T1:22.6 R1:2.6
7	Gauss-Jordan method	CLO 4	T1:22.7 R1:4.4
8	LU decomposition method	CLO 4	T1:22.7 R1:4.10
9-12	Cayley Hamilton theorem	CLO 7	T1:22.8 R1:4.15
13-16	Eigen values and Eigen vectors	CLO 9	T1:22.9 R1:5.4
17-18	Diagonalisation	CLO 9	T1:22.9 R1:5.8
19--22	Differential equations Introduction of first order differential equations	CLO 11	T1:23.10 R1:6.8
23-24	Orthogonal trajectories	CLO 11	T1:23.10 R1:6.13
25-26	Applications	CLO 13	T1:23.9 R1:7.5
27-30	Second and Higher order differential equations with constant coefficients	CLO 11	T1:23.10 R1:7.5
31-34	Method of variation of parameters	CLO 9	T1:23.10 R1:8.1

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
35-36	Applications of second order differential equations	CLO 14	T1:23.1 R1:9.2
37	Differential Calculus Methods Verification of Rolle's Theorem to the given functions	CLO 14	T1:23.1 R1:9.4
38-39	Verification of Lagrange's Mean value theorem to the given functions	CLO 14	T1:23.1 R1:9.9
40	Verification of Cauchy's mean value theorem to the given functions	CLO 14	T1:23.1 R1:9.10
41	Functional dependence for two and three functions	CLO 14	T2:27.5 R1:10.2
42-43	Maxima and minima of functions of two variables without constraints	CLO 17	T2:27.7 R1:11.3
44-45	Lagranges method of undetermined multipliers	CLO 17	T2:27.8 R1:11.6

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with P0s	Relevance with PSOs
1	To improve standards and analyze the concepts.	Guest lecture	PO 1	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars / NPTEL	PO 4	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 2	PSO 1

Prepared by:
Ms. P Rajani, Assistant Professor

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS**				
Course Code	AHS003				
Programme	B.Tech				
Semester	I	CSE | IT| ECE | EEE			
	II	AE| ME | CE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Ms. V Subba Laxmi Assistant Professor				
Course Faculty	Dr. S Jagadha, Professor Ms. L Indira, Assistant Professor Mr. Ch Somashekar, Assistant Professor Ms. P Rajani, Assistant Professor Ms. B Praveena, Assistant Professor				

I. COURSE OVERVIEW:

The course focuses on more advanced Engineering Mathematics topics which provide with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes types of interpolation, curve fitting, numerical solutions of ordinary differential equations, multiple integrals, vector calculus and special functions. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Differentiation, integration and properties of vectors

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Computational Mathematics and Integral calculus	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✘	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Term Paper

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills**: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices**: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship**: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Enrich the knowledge of solving algebraic, transcendental and differential equation by numerical methods.
II	Apply multiple integration to evaluate mass, area and volume of the plane
III	Analyze gradient, divergence and curl to evaluate the integration over a vector field.
IV	Understand the Bessel's equation to solve them under special conditions with the help of series solutions.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS003.01	CLO 1	Solve the algebraic and transcendental equations using bisection method, method of false position and Newton-Raphson method.	PO 1	3
AHS003.02	CLO 2	Apply numerical methods to interpolate the functions of values for equal intervals using finite differences.	PO2	3
AHS003.03	CLO 3	Understand the Newton-Raphson method to the real-world problem for a finite barrier quantum well.	PO 4	1
AHS003.04	CLO 4	Evaluate the functional value by using Lagrange's interpolation formula for unequal intervals.	PO2	2
AHS003.05	CLO 5	Understand the Lagrange's interpolation in real-world problem for neural network learning.	PO 4	1
AHS003.06	CLO 6	Apply method of least squares to fit linear and non linear curves.	PO1, PO 2	2
AHS003.07	CLO 7	Solve differential equation using single step method- Taylor‟s series.	PO 1	3
AHS003.08	CLO 8	Solve differential equation using multi step methods- Euler's, Modified Euler's and Runge Kutta methods.	PO 2	2
AHS003.09	CLO 9	Understand the multistep methods in real-worl problem for real time Aircraft dynamics.	PO 4	1
AHS003.10	CLO 10	Understand the Runge-Kutta method in real-world problem for embedding the sensor signals into the iterative computation.	PO 4	1
AHS003.11	CLO 11	Evaluate double integral and triple integrals .	PO 1	2
AHS003.12	CLO 12	Utilize the concept of change order of integration to evaluate double integrals.	PO 1,PO2	2
AHS003.13	CLO 13	Determine the area and volume of a given curves using double and triple integration.	PO 2	3
AHS003.14	CLO 14	Understand transformation of co-ordinate system from plane to plane.	PO 1	3
AHS003.15	CLO 15	Analyze scalar and vector fields and compute the gradient, divergence and curl.	PO 2	3
AHS003.16	CLO 16	Understand integration of vector function .	PO 1	2
AHS003.17	CLO 17	Evaluate line, surface and volume integral of vectors.	PO 1	3
AHS003.18	CLO 18	Use Vector integral theorems to facilitate vector integration .	PO 2	2
AHS003.19	CLO 19	Analyze the concept of vector calculus in real-world problem for fluid dynamics.	PO 4	1
AHS003.20	CLO 20	Solve the Differential Equations by series solutions.	PO 1	3
AHS003.21	CLO 21	Understand Gamma function to evaluate improper integrals.	PO 1	2
AHS003.22	CLO 22	Analyze Bessel's function and study its properties	PO 1	3
AHS003.23	CLO 23	Analyze Bessel's function as a Solution to Schrödinger equation in a cylindrical function of the second kind.	PO 4	1
AHS003.24	CLO 24	Understand gamma function to find application diverse areas as quantum physics.	PO 4	1
AHS003.25	CLO 25	Possess the knowledge and skills for employability and to succeed in national and International level competitive examinations.	PO 4	1

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2		3											1		
CLO 3				1									1		
CLO 4		2													
CLO 5				1											
CLO 6	2	2													
CLO 7	3														
CLO 8	2														
CLO 9				1									1		
CLO 10				1									1		
CLO 11	2														
CLO 12	2	2													
CLO 13		3													
CLO 14	3												1		
CLO 15		3													
CLO 16	2														
CLO 17	3												1		
CLO 18		2											1		
CLO 19				1									1		
CLO 20	3												1		
CLO 21		2													
CLO 22	3														
CLO 23				1											
CLO 24				1											
CLO 25				1											

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1 PO 2 PO 4	SEE Exams	PO 1 PO 2 PO 4	Assignments	-	Seminars	PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	ROOT FINDING TECHNIQUES AND INTERPOLATION
Root finding techniques: Solving algebraic and transcendental equations by Bisection method, Method of False position, Newton-Raphson method; Interpolation: Finite differences, forward differences, backward differences and central differences; Symbolic relations; Newton's forward interpolation, Newton's backward interpolation; Gauss forward central difference formula, Gauss backward central difference formula; Interpolation of unequal intervals: Lagrange,'s interpolation .	
UNIT-II	**CURVE FITTING AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**
Fitting a straight line; Second degree curves; Exponential curve, power curve by method of least squares; Taylor's series method; Step by step methods: Euler's method, modified Euler's method and Runge-Kutta method for first order differential equations .	
UNIT-III	**MULTIPLE INTEGRALS**
Double and triple integrals; Change of order of integration. Transformation of coordinate system; Finding the area of a region using double integration and volume of a region using triple integration.	
UNIT-IV	**VECTOR CALCULUS**
Scalar and vector point functions; Gradient, divergence, curl and their related properties; Solenoidal and irrotational vector point functions; Scalar potential function; Laplacian operator; Line integral, surface integral and volume integral; Vector integral theorems: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem without proofs.	
UNIT-V	**SPECIAL FUNCTIONS**
Gamma function, properties of gamma function; Ordinary point and regular singular point of differential equations; Series solutions to differential equations around zero, Frobenius method about zero; Bessel"s differential equation: Bessel functions properties, recurrence relations, orthogonality, generating function, trigonometric expansions involving Bessel functions.	
Text Books:	
1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014. 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2012.	
Reference Books:	
1. T.K.V Iyengar, B.Krishna Gandhi, "Mathematical methods", S. Chand & Co., 6th Edition, 2014. 2. R K Jain, S R K Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016. 3. S. S. Sastry, "Introduction Methods of Numerical Analysis", Prentice-Hall of India Private Limited, 5th Edition, 2012.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Define Algebraic and Transcendental equations	CLO 1	T1:22.5 R1:2.3
2	Explain Bisection method to find the root of an equation.	CLO 1	T1:22.5 R1:2.4
3	Explain Method of False Position to to find root an equation.	CLO 1	T1:22.6 R1:2.6
4	Explain Newton-Raphson method to find root of an equation.	CLO 3	T1:22.7 R1:4.4
5	Define interpolation of the given data.	CLO 2	T1:22.7 R1:4.10
6	Explain symbolic relations the between the operators.	CLO 2	T1:22.8 R1:4.15
7	Define Newton's forward interpolation formula for evenly spaced intervals..	CLO 2	T1:22.9 R1:5.4
8	Define Newton's backward interpolation formula for evenly spaced intervals.	CLO 2	T1:22.9 R1:5.8
9	Define Gauss forward interpolation formula for evenly spaced intervals..	CLO 2	T1:23.10 R1:6.8
10	Define Gauss backward interpolation formula for evenly spaced intervals.	CLO 2	T1:23.10 R1:6.13
11	Demonstrate Lagrange's formula for unequal intervals.	CLO 5	T1:23.9 R1:7.5
12	Describe the best fit of a straight line by method of least squares.	CLO 6	T1:23.10 R1:7.5
13	Describe the best fit of a second degree parabola by method of least squares	CLO 6	T1:23.10 R1:8.1
14	Describe the best fit of an exponential curve by method of least squares	CLO 6	T1:23.1 R1:9.2
15	Describe the best fit of a power curve by method of least squares	CLO 6	T1:23.1 R1:9.4
16	Solve the ordinary differential equation by Taylors series method.	CLO 6	T1:23.1 R1:9.9
17	Solve the ordinary differential equation by Euler's Method-Euler's modified method.	CLO 8	T1:23.1 R1:9.10
18	Solve the ordinary differential equation by Runge-Kutta Method.	CLO 8	T2:27.5 R1:10.2
19	Evaluate double and triple integrals.	CLO 8	T2:27.7 R1:11.3
20	Use the Change of order of integration cartesian and polar form.	CLO 12	T2:27.8 R1:11.6
21	Explain Transformation of co-ordinate system	CLO 11	T2:27.12 R1:11.7
22	Use double integration for finding the area.	CLO 14	T2:27.12 R1:11.8
23	Use triple integration for finding the volume.	CLO 14	T2:27.12 R1:11.9
24	Define vector calculus and vector fields and their properties	CLO 19	T2:27.12 R1:11.10
25	Determine Gradient, divergent and curl of vector fields.	CLO 19	T2:27.14 R1:12.3

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
26	Solve line integral along smooth path and find work done .	CLO 17	T2:27.1 R1:12.7
27	Evaluate surface integral.	CLO 17	T2:27.17 R1:12.15
28	Use Green's theorem to evaluate line integrals along simple closed contours on the plane.	CLO 17	T2:27.18 R1:12.19
29	Use Stokes' theorem to give a physical interpretation of the curl of a vector field .	CLO 17	T2:27.19 R2:14.4
30	Use the divergence theorem to give a physical interpretation of the divergence of a vector field	CLO 17	T2:27.19 R2:14.5
31	Explain Gamma function for improper integrals and gamma properties .	CLO 21	T2:27.19 R2:14.5
32	Define Ordinary and regular point of a differential equation.	CLO 23	T2:27.20 R2:14.5
33	Determine the solution of ordinary differential equations in series form.	CLO 23	T2:27.20 R2:14.5
34	Explain Frobenius Method about zero.	CLO 20	T2:27.19 R2:14.5
35	Define Bessel's Differential equation.	CLO 22	T2:27.19 R2:14.5
36-37	Explain Bessel's differential functions and properties.	CLO 22	T2:27.19 R2:14.5
38-39	Explain Recurrence relations for Bessels function.	CLO 23	T2:27.19 R2:14.5
40-42	Explain Orthogonality of Bessels function.	CLO 23	T2:27.20 R2:14.5
43-44	Explain Generating function of Bessel's function.	CLO 23	T2:27.20 R2:14.5
45	Explain trigonometric expansions of Bessels function.	CLO 23	T2:27.19 R2:14.5

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed Actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Seminars	PO 1	PSO 1
2	Newton Raphson method, Lagranges interpolation, method of least square and Runge-kutta method	Seminars / NPTEL	PO 2	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 4	PSO 1

Prepared by:
Mr. V Subba Laxmi, Assistant Professor

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ENGINEERING CHEMISTRY**				
Course Code	AHS005				
Programme	B. Tech				
Semester	I	AE | CIVIL | CSE | ECE | EEE | IT | ME			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	2	1
Chief Coordinator	Ms. V Anitha Rani, Associate Professor				
Course Faculty	Dr. C Mahendar, Professor Mr. M Praveen, Assistant Professor Mr. B Raju, Assistant Professor Ms. M Malathi, Assistant Professor Mr. G Mahesh Kumar, Assistant Professor Ms. T Mallika, Assistant Professor Ms. M Lakshmi Prasanna, Assistant Professor Ms. M Swathi, Assistant Professor				

I. COURSE OVERVIEW:

The primary objective of an Engineering Chemistry course is to introduce the students to the concepts and applications of chemistry in engineering. It should cultivate in them an ability to identify chemistry in each piece of finely engineered products used in households and industry. It aims to strengthen the fundamental concepts of chemistry and then builds an interface with their industrial applications. It deals with applied and industrially useful topics, such as water technology, engineering materials, electrode potential and cells, fuels, polymers and corrosion. Water and its treatment for various purposes, engineering materials such as plastics, composites, ceramic, abrasives, their preparation, properties and applications, conventional and non-conventional energy sources, nuclear, solar, various batteries, combustion calculations, corrosion and control of metallic materials.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic principles of chemistry

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Engineering Chemistry	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Seminar
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	1	Seminar
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	2	Presentation on real-world problems

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Apply the electrochemical principles in batteries.
II	Understand the fundamentals of corrosion and development of different techniques in corrosion control.
III	Analysis of water for its various parameters and its significance in industrial, applications.
IV	Improve the fundamental science and engineering principles relevant to materials.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS005.01	CLO 1	Extrapolate the knowledge of electrolytic cell, electrochemical cell, electrode potential and reference electrodes.	PO 1	3
AHS005.02	CLO 2	Use of primary and secondary batteries in various fields such as automobiles, railways, medical devices, aircrafts and day to day life.	PO 1 PO 2	1
AHS005.03	CLO 3	Explain the characteristic factors of a metal and environment influencing the rate of corrosion.	PO 1 PO 7	2
AHS005.04	CLO 4	Use appropriate methods such as protective, metallic and organic coatings to control corrosion in metals.	PO 1 PO 7	2
AHS005.05	CLO 5	Evaluate the quality and utility of suitable water for industrial as well as domestic applications.	PO 1 PO 7	3
AHS005.06	CLO 6	Use innovative methods to improve the quality of soft water for Potable and industrial purpose at cheaper cost.	PO 1 PO 7	2
AHS005.07	CLO 7	Understand the concepts of polymers for viscoelastic nature of polymer materials in real-time application.	PO 1 PO 7	1
AHS005.08	CLO 8	Demonstrate the ability to use polymeric materials for engineering problems in different domains.	PO 1 PO 7	1
AHS005.09	CLO 9	Justify the immense importance of basic constructional material, Portland cement in civil engineering works.	PO 1	1
AHS005.10	CLO 10	Describe various instruments used for measuring various properties of lubricants in industries.	PO 1	3
AHS005.11	CLO 11	Understand refractory use in metallurgical furnaces, kilns and other equipments.	PO 1	2
AHS005.12	CLO 12	Demonstrate comprehensive knowledge of conventional fuel properties on engine performance.	PO 1	2
AHS005.13	CLO 13	Understand the importance of cracking, knocking in IC engines and operations involved in petroleum refining for real-time application.	PO 1 PO 2	2
AHS005.14	CLO 14	Describe the physical and chemical properties of alternate fuels like natural gas, LPG and CNG.	PO 1	1
AHS005.15	CLO 15	Determine efficiency of the fuel in terms of calorific value and combustion reactions of the fuel.	PO 1	2
AHS005.16	CLO 16	Understand the concepts of electro chemistry in solar cell, Fuel cells and batteries for real-time application.	PO 1	2
AHS005.17	CLO 17	Understand the concepts of corrosion control methods in pipeline leaks and ruptures as real-time application.	PO 1 PO 7	2
AHS005.18	CLO 18	Understand the concepts of water technology in applications of image recognition for real-time water level and surface velocity.	PO 1 PO 7	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3														
CLO 2	2	1											1		
CLO 3	2						2								
CLO 4	2						2								
CLO 5	3						3								
CLO 6	2						2								
CLO 7	2						1						1		
CLO 8	1						1						1		
CLO 9	1														
CLO 10	3														
CLO 11	2														
CLO 12	2														
CLO 13	3	1													
CLO 14	1														
CLO 15	2														
CLO 16	2														
CLO 17	2						2								
CLO 18	2						2								

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2, PO 7	SEE Exams	PO 1,PO 2 PO 7	Assignments	PO 2	Seminars	PO 1, PO 2
Laboratory Practices	PO 1	Student Viva	-	Mini Project	-	Certificatior	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	ELECTROCHEMISTRY AND BATTERIES
Electrochemistry: Basic concepts of electrochemistry; Conductance: Specific, equivalent and molar conductance and effect of dilution on conductance; Electrochemical cells: Galvanic cell (daniel cell); Electrode potential; Electrochemical series and its applications; Nernst equation; Types of electrodes: Calomel electrode, quinhydrone electrode; Batteries: Classification of batteries, primary cells (dry cells) and secondary cells (lead-acid battery, Ni-Cd cell), applications of batteries, numerical problems.	
Unit-II	**CORROSION AND ITS CONTROL**
Corrosion: Introduction, causes and effects of corrosion; Theories of corrosion: Chemical and electrochemical corrosion with mechanism; Factors affecting the rate of corrosion: Nature of the metal and nature of the environment; Types of corrosion: Waterline and crevice corrosion; Corrosion control methods: Cathodic protection- sacrificial anodic protection and impressed current cathodic protection; Surface coatings: Metallic coatings, methods of application of metallic coatings-hot dipping(galvanizing, tinning), electroplating(copper plating); Organic coatings: Paints, its constituents and their functions.	
Unit-III	**WATER TECHNOLOGY**
Water: Sources and impurities of water, hardness of water, expression of hardness-units; Types of hardness: Temporary hardness, permanent hardness and numerical problems; Estimation of temporary and permanent hardness of water by EDTA method; Determination of dissolved oxygen by Winkler's method; Boiler troubles: Priming, foaming, scales, sludges and caustic embrittlement. Treatment of water: Internal treatment of boiler feed water- carbonate, calgon and phosphate conditioning, softening of water by Zeolite process and Ion exchange process; Potable water-its specifications, steps involved in the treatment of potable water, sterilization of potable water by chlorination and ozonization, purification of water by reverse osmosis process.	
Unit-IV	**MATERIALS CHEMISTRY**
Materials chemistry: Polymers-classification with examples, polymerization-addition, condensation and co-polymerization; Plastics: Thermoplastics and thermosetting plastics; Compounding of plastics; Preparation, properties and applications of polyvinyl chloride, Teflon, Bakelite and Nylon-6, 6; Rubbers: Natural rubber its process and vulcanization; Elastomers: Buna-s and Thiokol rubber; Fibers: Characteristics of fibers, preparation properties and applications of Dacron; Characteristics of fiber reinforced plastics; Cement: Composition of Portland cement, setting and hardening of Portland cement; Lubricants: Classification with examples; Properties: Viscosity, flash, fire, cloud and pour point; Refractories: Characteristics and classification with examples.	
Unit-V	**FUELS AND COMBUSTION**
Fuel: Definition, classification of fuels and characteristics of a good fuels; Solid fuels: Coal; Analysis of coal: Proximate and ultimate analysis; Liquid fuels: Petroleum and its refining; Cracking: Fixed bed catalytic cracking; Knocking: Octane and cetane numbers; Gaseous fuels: Composition, characteristics and applications of natural gas, LPG and CNG; Combustion: Calorific value: Gross Calorific Value(GCV) and Net Calorific Value(NCV), calculation of air quantity required for complete combustion of fuel, numerical problems.	
Text Books:	
1. P. C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 15th Edition, 2015. 2. Shashi Chawla, "Text Book of Engineering Chemistry" Dhanat Rai and Company, 1st Edition 2011	

Reference Books:
1.B. Siva Shankar, "Engineering Chemistry", Tata McGraw Hill Publishing Limited, 3rd Edition, 2015. 2. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006. 3. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5thEdition, 2013. 4.R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

XIV.COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	CLOs	Reference
1	Understands the concept of electrochemistry. Differentiate the electronic conductors and electrolytes.	CLO 1	T1:5.1,6.3
2	Define the terms specific, equivalence and molar conductance. Explain the dilution effect on these conductance	CLO 1	T1:5.5
3	Understands the concept of specific, equivalence and molar conductance. Define the EMF of the cell. Demonstrate the Daniel cell.	CLO 1	T2:6.1,6.2, 6.3
4	Describe the construction and chemical reactions of different electrodes. Use the Calomel	CLO 1	T2:11,12.2.1
5	Quinhydrone electrodes in calculation of potential of the single electrode.	CLO 1	T1:6.7(4)
6	Derive the relation between cell reaction and emf of the single electrodes.	CLO 1	T2:3.4
7	Use the standard potential values of elements from electrochemical series.	CLO 1	T2:5,5.1
8	Define the battery; differentiate the primary and secondary batteries. Demonstrate the construction of the dry cell.	CLO 2	T2:16,17.1
9	Identify the anode, cathode and electrolyte in different types of secondary batteries. Employ the applications of different types of batteries.	CLO 2	T2:17.3
10	Identify the anode, cathode and electrolyte in different types of secondary batteries. Employ the applications of different types of batteries.	CLO 2	T2:17.4
11	Define corrosion and its disadvantages.	CLO 3	T2:1.1
12	Explain the mechanism of oxidation corrosion when dry gases attack on metal.	CLO 3	T2:2.1
13	Explain the mechanism of hydrogen evolution type and oxygen absorption type corrosion.	CLO 3	T2:2.2
14	Distinguish the types of corrosion.	CLO 3	T2:2.4.5
15	Analyze the effect of different factors on rate of corrosion.	CLO 3	T2:5,5.1,5.2
16	Explain the process of cathodic protection with examples.	CLO 4	T2:6.4
17	Use the methods of application of metallic coatings and Relate the galvanization and tinning	CLO 4	T1:17.1
18	Explain the process of electroplating. Apply the organic coatings for control of corrosion.	CLO 4	T1:8.6 T2:6.3.3
19	List the various sources of water, Differentiate the temporary and permanent hardness and give its units.	CLO 5	T2:3,4,5
20	Calculate the total, permanent and temporary hardness of sample hard water by using EDTA	CLO 5	T2:6

Lecture No	Topics to be covered	CLOs	Reference
21	Calculate the dissolved oxygen in water by Winkler's method	CLO 5	T1:1.14(4)
22-23	Recognize the boiler troubles.	CLO 5	T2:9.2,9.5
24	Discuss the internal treatment methods of boiler feed water. Name the different chemicals used in internal treatment.	CLO 6	T2:12,12.4, 12.2,12.3
25	Explain the process of zeolite and analyze the advantages and disadvantages.	CLO 6	T2:11.2
26	Explain ion-exchange process.	CLO 6	T2:11.3,13
27	Demonstrate the treatment of potable water Purification of potable water. Describe the process of reverse osmosis	CLO 6	T2:13,14 (d)
28	Define monomer and polymer Explain the mechanism of different types of Chain and step growth polymerization.	CLO 7	T2:2,2.2,4,4.1,4.2,4.7
29	Distinguish the thermoplastic and thermo set plasitcs. Illustrate the compounding of plastics.	CLO 7	T1:3.14,3.13.12
30	Identify the preparation, properties and applications of different thermo and thermo set plastics.	CLO 8	T2:2.3,2.7,2.8
31	Identify the preparation, properties and applications of thermo set plastics. Explain about natural rubber.	CLO 8	T2:3,3.1,3.2, 3.3
32	Explain the preparation, properties and applications of synthetic rubbers.	CLO 8	T1:3.24 T2:4.2
33	Explain the preparation, properties and applications of fibers.	CLO 8	T1:3.28 R4:114
34	Generalize the process of setting and hardening reactions of cement	CLO 9	T2:9.3.2, 9.3.3
35	Define the term lubricant and it's classification.	CLO 10	T2:7.4
36	Compare the different types of lubricants based on their properties.	CLO 10	T2:7.5
37	Name the different types of refractories. Discuss the characteristics and applications of refractories.	CLO 11	T2:8.2,8.3
38	Define the fuel with examples. Categorize the different types of fuels.	CLO 12	T2:5.2,5.3
39	Analyze the different types of coals. Explain the significance of proximate analysis of coal.	CLO 12	T2:5.7,5.8,5.8.1
40	Explain the significance of Ultimate analysis of coal.	CLO 12	T2:5.8.2
41	Identify the chemical constituents of petroleum. Describe the refining of petroleum. Define the term cracking. Distinguish the fixed bed and catalytic cracking.	CLO 13	T1:2.18,2.19 2.19(a)
42	Evaluate the octane and cetane rating of the petrol and diesel.	CLO 13	T1:2.23
43	Identify the chemical constituents of the gaseous fuel. Discuss the characteristics of natural gas. Compare the LPG and CNG.	CLO 14	T1:2.28,2.26 T2:5.14.1 R4:247
44	Explain the combustion process of different chemical constituents present in the fuel. Differentiate the HCV and LCV.	CLO 15	T2:5.4,5.5
45	Evaluate the air quantity required for complete combustion of fuel.	CLO 15	T2:5.4.1, 6.5

XIV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Galvanic cell, batteries-lead acid cells, Crevice corrosion, cathodic protection, galvanizing, Electroplating.	Seminars / Guest Lectures / NPTEL	PO 1	PSO 1
2	Softening techniques, plastics, cement, refining of petroleuim.	Seminars / Guest Lectures / NPTEL	PO 1	PSO 1
3	Thiokol rubber, EDTA method, Dissolved oxygen, Viscosity, P^H meter.	Assignments / Laboratory Practices	PO 1	PSO 1

Prepared by:
Ms. V Anitha Rani, Associate Professor

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ENGINEERING PHYSICS**				
Course Code	AHS006				
Programme	B.Tech				
Semester	I	CSE | IT | ECE | EEE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Ms. S Charvani, Assistant Professor				
Course Faculty	Ms. S Charvani, Assistant Professor Ms K Sowmya, Assistant Professor Mr. K Saibaba, Assistant Professor Mr. V S K Prasada Rao, Assistant Professor Mr. A Chandra Prakash., Assistant Professor				

I. COURSE OVERVIEW:

The course matter is divided into five units covering duly-recognized areas of theory and study. This course develops abstract and critical reasoning by studying mathematical and logical proofs and assumptions as applied in basic physics and to make connections between physics and other branches of sciences and technology. The topics covered include nano materials, lasers, dielectric and magnetic properties, principles of quantum mechanics and semiconductors physics. The course helps students to gain knowledge of basic principles and appreciate the diverse applications in technological fields in respective branches and also in their lives.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic principles of physics

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Engineering Physics	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Term Paper

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies..	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Develop strong fundamentals of nano materials.
II	Meliorate the knowledge of theoretical and technological aspects of lasers.
III	Correlate principles with applications of the quantum mechanics, dielectric and magnetic materials.
IV	Enrich knowledge in modern engineering materials like semiconductors..

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS010.01	CLO 1	Recall the basic principles of physics.	PO 1 , PO 2	3
AHS010.02	CLO 2	Apply the concepts and principles in solving the problems of physics.	PO 1 , PO 4	3
AHS010.03	CLO 3	Acquire knowledge of basic terms related to dielectric material and different polarization mechanisms.	PO 1 , PO 4	3
AHS010.04	CLO 4	Review the properties of different magnetic materials and magnetization based on orientation of domains.	PO 1 , PO 4	2
AHS010.05	CLO 5	Understand the basic principles involved in the production of Laser light.	PO 1 , PO 2	2
AHS010.06	CLO 6	Describe the construction and working of different types of Laser systems.	PO 1 , PO 2	2
AHS010.07	CLO 7	Explain the basic principles, properties and applications of nanomaterials.	PO 1 , PO 4	1
AHS010.08	CLO 8	Develop knowledge about different techniques of producing nanomaterials.	PO 2 , PO 4	1
AHS010.09	CLO 9	Interpret and verify dual nature of matter wave concept using Davisson & Germer's experiment.	PO 2 , PO 4	2
AHS010.10	CLO 10	Estimate the energy of the particles using Schrödinger's wave equation and apply it to particle in potential box.	PO 1 , PO 2	2
AHS010.11	CLO 11	Recollect the conductivity mechanism involved in semiconductors and calculate carrier concentrations.	PO 1 , PO 4	3
AHS010.12	CLO 12	Discuss about energy gap, direct, indirect band-gap semiconductors and Hall Effect.	PO 1 , PO 2	3
AHS010.13	CLO 13	Correlate different concepts of physics with day to day life applications.	PO 1	3
AHS010.14	CLO 14	Understand the technical importance of dielectric, magnetic and semiconductor materials.	PO 2	2
AHS010.15	CLO 15	Identify the modern engineering devices based on nano materials and Lasers.	PO 2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2												1	
CLO 2	3			1										1	

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 3	2			2										1	
CLO 4	3	1													
CLO 5	3	2													
CLO 6	3	2												1	
CLO 7	2			1										1	
CLO 8		2		1										1	
CLO 9		1		2											
CLO 10	3	1													
CLO 11	3			1											
CLO 12	2	2												1	

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO2,PO4	SEE Exams	PO1,PO 2,PO4	Assignments	PO 4	Seminars	PO 2
Laboratory Practices	PO 1,PO 2,PO4	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	DIELECTRIC AND MAGNETIC PROPERTIES
Dielectric properties: Basic definitions, electronic, ionic and orientation polarizations-qualitative; Internal field in solids; Magnetic properties: Basic definitions, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve.	
Unit-II	**LASERS**
Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, metastable state, population inversion, lasing action, Einstein's coefficients, ruby laser, He-Ne laser, semiconductor diode laser and applications of lasers.	
Unit-III	**NANOMATERIAL**
Nanomaterial: Origin of nanomaterial, nano scale, surface to volume ratio, quantum confinement; Properties of nanomaterials: Physical, chemical, electrical, optical, magnetic and mechanical. Bottom-up fabrication: Sol-gel; Top-down fabrication: Chemical vapour deposition; Applications of nanomaterials, characterization by XRD, TEM.	
Unit-IV	**QUANTUM MECHANICS**
Quantum mechanics: Waves and particles, De Broglie hypothesis, matter waves, Heisenberg's uncertainty principle, Davisson and Germer experiment, Schrodinger's time independent wave equation, physical significance of the wave function, infinite potential well and its extension to three dimensions.	
Unit-V	**SEMICONDUCTOR PHYSICS**
Semiconductor physics: Fermi level in intrinsic and extrinsic semiconductors, calculation of carrier concentration in intrinsic and extrinsic semiconductors, energy gap, direct and indirect band gap semiconductors, Hall effect.	
Text Books:	
1. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, "Modern Engineering Physics", Chand & Co. New Delhi, 1st Edition, 2010. 2. P. K. Palanisamy, "Engineering Physics", Scitech Publishers, 4th Edition, 2014.	
Reference Books:	
1. V. Rajendran, "Engineering Physics", Tata Mc Graw Hill Book Publishers, 1st Edition, 2010. 2. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001. 3. A. J. Dekker, "Solid State Physics", Macmillan India ltd, 1st Edition, 2000. 4. Hitendra K. Malik, A. K. Singh, "Engineering Physics", Mc Graw Hill Education, 1st Edition, 2009.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Acquire knowledge of basic terms related to dielectric materials.	CLO 3	T1:13.5 R1:1.3
2	Discuss different polarization mechanisms in dielectrics	CLO 3	T1:13.5 R1:1.3
3	Derive expression for total electric field at a given point inside dielectrics.	CLO 3	T1:13.5 R1:1.3
4	Acquire knowledge of basic terms related to magnetic materials.	CLO 4	T1:14.7 R1:3.4
5	Describe magnetic moment in an atom in terms of Bohr Magneton	CLO 4	T1:15.7 R1:4.10
6	Classify different magnetic materials based on electron theory.	CLO 4	T1:16.8 R1:4.15
7	Examine the spontaneous magnetization in ferro-magnets	CLO 4	T1:16.9

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
	based on orientation of domains.		R1:5.4
8	Explain the principle involved in Lasers	CLO 5	T1:17.9 R1:5.8
9	Review basic phenomena's of laser	CLO 5	T1:18.10 R1:6.8
10	Acquire knowledge of basic terms related to lasers	CLO 5	T1:19.10 R1:6.13
11	Discuss functioning of laser system	CLO 5	T1:19.9 R1:7.5
12	Derive relation between Einstein's Coefficients	CLO 5	T1:23.10 R1:7.5
13	Explain the principle and working of Ruby laser	CLO 5	T1:23.10 R1:8.1
14	Explain the principle and working of Helium-Neon laser	CLO 5	T1:23.1 R1:9.2
15	Explain the principle and working of semiconductor diode laser	CLO 5	T1:23.1 R1:9.4
16	Explain the principle and working of Helium-Neon laser	CLO 5	T1:23.1 R1:9.9
17	Explain the principle and working of semiconductor diode laser	CLO 5	T1:23.1 R1:9.10
18	Discuss the uses of lasers	CLO 5	T2:27.5 R1:10.2
19	Identify the principle of nano technology	CLO 7	T2:27.7 R1:11.3
20	Recall origin of nanomaterials	CLO 7	T2:27.8 R1:11.6
21	Acquire knowledge of basic principle of nanomaterials.	CLO 7	T2:27.12 R1:11.7
22	Analyze nano material with their properties	CLO 7	T2:27.12 R1:11.8
23	Develop nanomaterials in sol gel method	CLO 8	T2:27.12 R1:11.9
24	Develop nanomaterials chemical method	CLO 8	T2:27.12 R1:11.10
25	Discuss applications of nanomaterials	CLO 8	T2:27.14 R1:12.3
26	Analyze nanomaterials by XRD	CLO 8	T2:27.1 R1:12.7
27	Analyze nanomaterials by TEM	CLO 8	T2:27.17 R1:12.15
28	Understand dual nature of radiation	CLO 9	T2:27.18 R1:12.19
29	Correlate dual nature to material particle	CLO 9	T2:27.19 R2:14.4
30	Analyze matter wave concept mathematically	CLO 9	T2:27.20 R2:14.5
31	Describe matter waves and Heisenberg's Uncertainty Principle	CLO 9	T2:30.19 R2:14.5
32-34	Identify existence of matter wave experimentally	CLO 9	T2:30.20 R2:15.5
35-37	Derive wave equation of matter wave	CLO 9	T2:32.19 R2:16.5
38	Correlate wavefunction to probability density.	CLO 10	T2:32.20 R2:16.5

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
39-41	Derive the solution of wave equation in terms of Potential box	CLO 10	T2:33.1 R2:16.6
42-44	Apply to three dimensions	CLO 10	T2:34.1 R2:17.1
45-48	Explain basic concepts of semiconductors	CLO 11	T2:35.2 R2:17.2
49-55	Derive carrier concentration in intrinsic Semiconductors	CLO 11	T2:36.1 R2:18.1
56-58	Identify Fermi level in semiconductors	CLO 11	T2:39.19 R2:16.5
59	Determine energy gap mathematically	CLO 12	T2:40.19 R2:16.5
60	Compare Direct &Indirect Band Gap semiconductors, Hall Effect	CLO 12	T2:41.19 R2:16.5

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Seminars	PO 1	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars / NPTEL	PO 4	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	Guest Lecture	PO 2	PSO 1

Prepared by:
Ms. S Charvani, Assistant Professor

HOD, FRESHMAN ENGINEERING

II SEMESTER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY
COURSE DESCRIPTOR

Course Title	**DATA STRUCTURES**				
Course Code	ACS002				
Programme	B.Tech				
Semester	II	CSE | IT | ECE | EEE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Ms. B Padmaja, Associate Professor				
Course Faculty	Dr. J Sirisha Devi, Professor Ms. N Jayanthi, Assistant Professor Ms. G Vasavi, Assistant Professor Ms. K Radhika, Assistant Professor Ms. G Geetha, Assistant Professor Ms. B Rekha, Assistant Professor Ms. A Soujanya, Assistant Professor Mr. D Rahul, Assistant Professor				

I. COURSE OVERVIEW:

This course covers some of the general-purpose data structures and algorithms, and software development. It is aimed at helping students understand the reasons for choosing structures or algorithms. Topics covered include managing complexity, analysis, lists, stacks, queues, trees, graphs, balanced search trees and hashing mechanisms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter in real life. This course in reached to student by power point presentations, lecture notes, and lab involve the problem solving in mathematical and engineering areas.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS001	I	Computer Programming	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Data Structures	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✔	Mini Project	✔	Videos
✔	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments/Quiz
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	3	Assignments/Quiz
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Mini Project
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Mini Project
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage independent and life-long learning in the broadest context of technological change.	2	-

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	3	Lectures, Assignments
PSO 2	**Problem-Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	3	Mini Projects
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	1	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Learn the basic techniques of algorithm analysis.
II	Demonstrate searching and sorting algorithms and analyze their time complexities.
III	Implement linear data structures viz. stack, queue and linked list.
IV	Demonstrate non-linear data structures viz. tree and graph traversal algorithms.
V	Study and choose appropriate data structure to solve problems in real world.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CCS002.01	CLO 1	Understand algorithms and data structures in terms of time and space complexity of basic operations.	PO 1	3
ACS002.02	CLO 2	Analyze a given problem; choose an appropriate data structure and an algorithm to solve the problem.	PO 3,PO4	2
ACS002.03	CLO 3	Choose a suitable algorithm to organize the data in ascending or descending order.	PO 2,PO5	2
ACS002.04	CLO 4	Understand the difference between iterative and recursion approaches to solve problems.	PO 1	3
ACS002.05	CLO 5	Explore an algorithm to find the location of an element in a given list.	PO 2, PO3,PO5	3
ACS002.06	CLO 6	Understand the usage of divide and conquer strategy in searching and sorting applications.	PO 1,PO2	3
ACS002.07	CLO 7	Compare the time complexities of various searching and sorting algorithms.	PO 1,PO5	2
ACS002.08	CLO 8	Understand the working principle of linear data structures and their real time applications.	PO1,PO 2, PO5	3
ACS002.09	CLO 9	Organize the data in various linked representation format.	PO1,PO 2, PO5	3
ACS002.10	CLO 10	Design and implement abstract data types for linear and non-linear data structures.	PO1,PO 2	3
ACS002.11	CLO 11	Describe the concept of non-linear data structures viz. trees and graphs and their applications.	PO 1,PO2	2
ACS002.12	CLO 12	Compare and Contrast the operations of binary search trees and AVL trees.	PO 1	3
ACS002.13	CLO 13	Understand the concept of M-way search trees, operations and applications.	PO1,PO 2, PO5	3
ACS002.14	CLO 14	List out different tree and graph traversal techniques.	PO1,PO 2,PO5	2
ACS002.15	CLO 15	Understand the implementation of hashing using hash table and hash function.	PO1,PO 2, PO5	3
ACS002.16	CLO 16	Describe the concept of collision and its resolving methods in applications.	PO1,PO 2, PO5	2
ACS002.17	CLO 17	Strengthen the knowledge of data structures and algorithms for employability.	PO1,PO 2, PO5	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3														
CLO 2		3	2										3		
CLO 3		3			2								3		
CLO 4	3														
CLO 5		3	3		2									2	
CLO 6	3	3											3		
CLO 7	3				2								2		
CLO 8	3	3	2										3		
CLO 9	2	3			2								3		
CLO 10	3	3											2		
CLO 11	3	3												3	
CLO 12	3														3
CLO 13	3	3			2								3		
CLO 14	2	3			2								3		
CLO 15	3	3			2								3		
CLO 16	2	3			2							2		3	3
CLO 17	2	3			2							3		3	3

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1, PO2,PO3, PO5	SEE Exams	PO 1	Assignments	PO 1	Seminars	PO 2
Laboratory Practices	PO 1	Student Viva	PO 1	Mini Project	PO 1	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING
Basic concepts: Introduction to data structures, classification of data structures, operations on data structures, abstract data type, algorithms, different approaches to design an algorithm, recursive algorithms; Searching techniques: Linear search, binary search and Fibonacci search; Sorting techniques: Bubble sort, selection sort, insertion sort, quick sort, merge sort, and comparison of sorting algorithms.	
UNIT-II	**LINEAR DATA STRUCTURES**
Stacks: Primitive operations, implementation of stacks using Arrays, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (deque).	
UNIT-III	**LINKED LISTS**
Linked lists: Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation. Types of linked lists: Circular linked lists, doubly linked lists; Linked list representation and operations of Stack, linked list representation and operations of queue.	
UNIT-IV	**NON LINEAR DATA STRUCTURES**
Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs, Priority Queue.	
UNIT-V	**BINARY TREES AND HASHING**
Binary search trees: Binary search trees, properties and operations; Balanced search trees: AVL trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.	
Text Books:	
1. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition. 2. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers, 2017.	
Reference Books:	
1. S. Lipschutz, "Data Structures", Tata McGraw Hill Education, 1st Edition, 2008. 2. D. Samanta, "Classic Data Structures", PHI Learning, 2nd Edition, 2004. 3. Y Daniel Liang, "Introduction to Programming using Python", Pearson. 4. Martin Jones, "Python for Complete Beginners", 2015. 5. Zed A. Shaw, "Learn Python the Hard Way: a very simple introduction to the terrifyingly beautiful world of computers and code", 3e, Addison-Wesley, 2014. 6. Hemant Jain, "Problem Solving in Data Structures and Algorithms using Python: programming interview guide", 2016.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1 – 2	Basic concepts: Introduction to Data Structures.	CLO 1	T1:1.1.3 R2 : 1.2
3 – 4	Classification of data structures, operations on data Structures.	CLO 2	T1:1.1.3 R2 : 1.4
5 – 6	Abstract data type, Algorithms, Different approaches to design an Algorithm.	CLO 2	T1:1.2
7 – 8	Recursive algorithms ,Searching techniques: Linear search, binary search	CLO 4	T1:5.1
9 – 10	Fibonacci search	CLO 4	R1:14.5

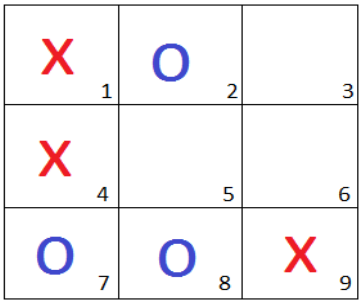
Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
11 – 14	Sorting techniques: Bubble sort, selection sort, insertion sort, and quick sort; merge sort, and comparison of sorting algorithms.	CLO 7	T1:5.2 R2 : 10.2
15 – 16	Stacks: Primitive operations, implementation of stacks using Arrays.	CLO 9	T1:7.1
17 – 20	Applications of stacks arithmetic expression conversion and evaluation.	CLO 9	T1:7.2
21 – 22	Queues: Primitive operations; Implementation of queues using Array.	CLO 11	T1:8.1
23 – 24	Applications of linear queue circular queue.	CLO 11	T1:8.4
25 – 26	Double ended queue (deque).	CLO 13	R2 : 5.4
27 – 28	Linked lists: Introduction, singly linked list, representation of a linked list in memory.	CLO 11	T1:9.1
29– 30	Operations on a single linked list, Applications of linked lists: Polynomial representation, Circular linked lists, doubly linked lists;	CLO 9	T1:9.2
31 - 32	Sparse matrix manipulation.	CLO 14	T2:9.2
33 – 35	Linked list representation and operations of Stack, Linked list representation and operations of queue.	CLO 14	T1:9
36 – 38	Trees: Basic concept, binary tree, binary tree representation, array and linked representations	CLO 14	T1:13.1-13.2
39 – 40	Binary tree traversal, binary tree variants, application of trees.	CLO 14	T1:13.2.3
41 – 43	Graphs: Basic concept, graph terminology, graph implementation.	CLO 14	R2 : 8.2
44 – 46	Graph traversals, Application of graphs,	CLO 17	T2:6.2
47 – 50	Priority Queue.	CLO 17	T1:6.1 T2:5.6
51 – 52	Binary search trees, properties and operations.	CLO 19	T1:14.1
53 – 55	Balanced search trees: AVL trees, Introduction to M-Way search trees, B trees.	CLO 19	T1:14.3
56 – 58	Hashing and collision: Introduction, hash tables, hash functions,	CLO 20	R2 : 6.4
59 - 60	Collisions, applications of hashing.	CLO 20	R2 : 6.4

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Updating latest version and new features of the Python language	Laboratory Sessions	PO5	PSO2
2	Familiarizing the role of Python language in developing application level programs.	Assignments/ Industrial visits	PO1,PO2	PSO2
3	Familiarizing different areas where Python language can be used.	Seminars	PO12	PSO3
4	Solving different problems and Practicing various debugging strategies to become a good programmer	Extra Lab Sessions, Participating in Coding contests.	PO2	PSO3

XVI. DESIGN BASED PROBLEMS (DP) / OPEN ENDED PROBLEM:

1. **Check a Single Linked List is Palindrome or not**: Given a singly linked list of integers, the task is to complete the function **is Palindrome** which returns true if the given list is palindrome, else returns false. The first line of input contains an integer T denoting the no of test cases. Then T test cases follow. Each test case contains 2 line the first line of each test case contains an integer N denoting the size of the linked list. The next line contains N space separated integers denoting the values of the nodes of the linked list.
2. **Tic-Tac-Toe Game**: The game of Tic-Tac-Toe is being played between two players and it is in below state after six moves.



Answer the following questions?

a. Who will win the game, O or X?
b. Which was the sixth mark and at which position?

Assume that both the players are intelligent enough.

3. **Lowest Common Ancestor in a Binary Tree:** Given a Binary Tree and 2 nodes value n1 and n2. The task is to find the lowest common ancestor of the two nodes. You are required to complete the function LCA. You should not read any input from stdin/console. There are multiple test cases. For each test case, this method will be called individually.
   The task is to complete the method LCA which takes 3 arguments, root of the Tree and two nodes value n1 and n2. The struct node has a data part which stores the data, pointer to left child and pointer to right child. There are multiple test cases. For each test case, this method will be called individually. The function should return the node which is the least common ancestor of the two nodes n1 and n2.

Prepared by:
B Padmaja, Associate Professor, CSE

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Course Code	AEE001				
Programme	B. Tech				
Semester	II	CSE | IT			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. K Lingaswamy, Assistant Professor, EEE				
Course Faculty	Dr. V. C. Jagan Mohan, Professor, EEE Mr. S Srikanth, Assistant Professor, EEE				

I. COURSE OVERVIEW:

This course introduces the concepts of basic electrical engineering parameters, quantities, analysis of a DC circuits. The course teaches the fundamentals of faraday-laws, ohms laws, Kirchhoff laws and different electrical concepts. They will be able to analyze network graphs and circuit theorems like Voltage shift theorem, zero current theorem, Tellegen's theorem, reciprocity, substitution theorem, Thevenin's and Norton's theorems, pushing a voltage source through a node, splitting a current source, compensation theorem, maximum power transfer theorem. It also describes introduction to three phase circuits and the concept of semiconductor diodes, bipolar junction transistors and their applications.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS006	I	Engineering Physics	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Fundamentals of Electrical and Electronics Engineering	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Seminar
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Seminar
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Presentation on real-world problems
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	2	Assignment

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	-	-
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Seminar
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	State the Ohms law, Kirchhoff's laws associated with electrical network to study its characteristics and understand concept of mutual inductance.
II	Apply network reduction technique ,network theorems , graph theory to solve complex electrical network
III	Analyse the behaviour of RLC circuit with sinusoidal input and summarise futures of three phase supply
IV	Illustrate the V-I characteristics of various diodes and bi-polar junction transistor.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEE001.01	CLO 1	Understand the concept of circuit, classification of elements and types of energy sources.	PO 1, PO2, PO 3	3
AEE001.02	CLO 2	State different laws associated with electrical circuits.	PO 1, PO 2	2
AEE001.03	CLO 3	Explain Energy due to mutual induction and constraint on mutual inductance.	PO 1	3
AEE001.04	CLO 4	Determine mesh currents, node voltages using network reduction techniques and define the various nomenclature related with network topology.	PO 2, PO 3	2
AEE001.05	CLO 5	Prove the law of conservation of energy, Superposition principle, reciprocity and maximum power transfer condition for the electrical network with DC excitations.	PO 2	2
AEE001.06	CLO 6	Summarize the procedure of Thevenin's, Norton's and Milliman's theorems to reduce complex network into simple equivalent network.	PO 1, PO 2, PO 3	3
AEE001.07	CLO 7	Explain the steps of compensation, zero current and voltage shift theorem to predict constraints of electrical networks.	PO 1, PO 3	2
AEE001.08	CLO 8	Identify the alternating quantities with it instantaneous, average and root mean square values.	PO1	3
AEE001.09	CLO 9	Analyze the steady state behavior of series and parallel RL, RC and RLC circuit with sinusoidal excitation.	PO 2, PO 3, PO 6	2
AEE001.10	CLO 10	Explain balance and unbalanced three phase circuits.	PO 3	2
AEE001.11	CLO 11	Illustrate the operation and biasing of PN junction diode, Zener diode.	PO 1, PO2, PO6	2
AEE001.12	CLO 12	Compare the operation of half wave, full wave and bridge rectifiers.	PO 1	2
AEE001.13	CLO 13	Demonstrate the Zener diode as a voltage regulator.	PO 1, PO 2	2
AEE001.14	CLO 14	Compare different configurations of Transistor	PO 1	2
AEE001.15	CLO 15	Summarize the DC load line and characteristics of BJT	PO 2	2
AEE001.16	CLO 16	Operate the transistor as an amplifier	PO 1,PO 6	2
AEE001.17	CLO 17	Process the knowledge and skills for employability and to succeed national and international level competitive examinations.	PO 1,PO 2, PO 3,PO 6	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2	2												
CLO 2	2	2												2	
CLO 3	3														

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 4		2	2											2	
CLO 5		2													
CLO 6	3	2	2												
CLO 7	2	2													
CLO 8	3													2	
CLO 9		2	2			2									
CLO 10			2												
CLO 11	2	2				2								2	
CLO 12	2														
CLO 13	2	1													
CLO 14	2														
CLO 15															
CLO 16	2					2									
CLO 17	2	2	2			2								2	

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 3	SEE Exams	PO 1, PO 2, PO 3	Assignments	PO 6	Seminars	PO 1, PO 2
Laboratory Practices	PO 1, PO 2, PO3, PO 6	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	ELECTRIC CIRCUIT ELEMENTS
Electric circuit elements: Voltage and current sources, linear, non linear, active and passive elements, inductor current and capacitor voltage continuity, Kirchhoff's laws, elements in series and parallel, superposition in linear circuits, controlled sources, energy and power in elements, energy in mutual	

inductor and constraint on mutual inductance.	
UNIT-II	**NETWORK ANALYSIS AND THEOREMS**
Network analysis: Nodal analysis with independent and dependant sources, modified nodal analysis, mesh analysis, notion of network graph, nodes, trees, twigs, links, co-tree, independent sets of branch currents and voltages; Network theorems: Voltage shift theorem, zero current theorem, Tellegen's theorem, reciprocity, substitution theorem, Thevenin's and Norton's theorems, pushing a voltage source through a node, splitting a current source, compensation theorem, maximum power transfer theorem	
UNIT-III	**AC CIRCUITS**
RLC circuits: Natural, step and sinusoidal steady state responses, series and parallel RLC circuits. AC signal measurement: Complex, apparent, active and reactive power, power factor. Introduction to three phase supply: Three phase circuits, star-delta transformations, balance and unbalanced three phase load, power measurement, two wattmeter method.	
UNIT-IV	**SEMICONDUCTOR DIODE AND APPLICATIONS**
P-N junction diode, symbol, V-I characteristics, half wave rectifier, full wave rectifier, bridge rectifier and filters, diode as a switch, Zener diode as a voltage regulator.	
UNIT-V	**BIPOLAR JUNCTION TRANSISTOR AND APPLICATIONS**
DC characteristics, CE, CB, CC configurations, biasing, load line, Transistor as an amplifier.	
Text Books:	
1. A. Chakrabarti, "Circuit Theory", Dhanpat Rai Publications, 6th Edition, 2004. 2. K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Education, 1st Edition, 2013. 3. William Hayt, Jack E. Kemmerly S. M. Durbin, "Engineering Circuit Analysis", Tata Mc Graw Hill, 7th Edition, 2010. 4. S. Salivahanan, N Suresh kumar, "Electronic Devices and Circuits", McGraw-Hill, 4th Edition.	
Reference Books:	
1. A Sudhakar, Shyammohan S Palli, "Circuits and Networks", Tata McGraw-Hill, 4th Edition. 2. R. L. Boylestad , Louis Nashelsky,"Electronic Devices and Circuits", PEI/PHI, 9th Edition, 2006. 3. David A.Bell,"Electric Circuits**",** Oxford University Press, 9th Edition, 2016. 4. M. Arshad,"Network Analysis and Circuit**s**", Infinity Science Press, 9th Edition, 2016. 5. A. Bruce Carlson,"Circuit**s**", Cengage Learning, 1st Edition, 2008.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic/s to be covered	CLOs	Reference
1	Understand the Ohms' law, the basic circuit components resistors inductors, and capacitors.	CLO 1	T1:1.1, R1:1.1
2	Learn the voltage and current sources	CLO 1	T1:1.5, R1:1.10
3	Discuss the Linear, non linear, active and passive elements.	CLO 1	T1:1.2, R1:1.10
4-7	Demonstrate the types of sources, resistive networks, inductive networks, capacitive networks.	CLO 1	T1:1.3, R1:1.9
8-10	Discuss the Kirchhoff's laws, elements in series and parallel, superposition in linear circuits.	CLO 2	T1:2.1, R1:2.1
11-15	Describe the Controlled sources, energy and power in elements, energy in mutual inductor and constraint on mutual inductance.	CLO 3	T1:1.5, R1:1.10

Lecture No	Topic/s to be covered	CLOs	Reference
16-17	Demonstrate Nodal analysis with independent and dependant sources	CLO 4	T1:2.5, R1:2.11
18-20	Examine nodal analysis, mesh analysis, notion of network graph, nodes, trees, twigs, links, co-tree, independent sets of branch currents and voltages.	CLO 4	T1:16.1, R1:2.12
21-25	Prove the law of conservation of energy, Superposition principle, reciprocity and maximum power transfer condition for the electrical network with DC excitations.	CLO 5	T1:3.1, R1:7.4
26-27	Summarize the procedure of Thevenin's, Norton's and Milliman's theorems to reduce complex network into simple equivalent network.	CLO 6	T1:3.5, R1:7.5
28	Explain the steps of compensation, zero current and voltage shift theorem to predict constraints of electrical networks.	CLO 7	T1:3.6, R1:3.10
29	Understand the concept of alternating quantities	CLO 8	T1:4.1, R1:3.10
30-32	Learn the RLC circuits, Natural, step and sinusoidal steady state responses, series and parallel RLC circuits.	CLO 9	T1:4.4, R1:3.10
33-35	Demonstrate the Complex, apparent, active and reactive power, power factor.	CLO 10	T1:6.3, R1:3.4
36-38	Understand the Three phase circuits, star-delta transformations.	CLO 10	T1:7.3, R1:3.17
39-44	Discuss the balance and unbalanced three phase load, power measurement, two wattmeter method	CLO 10	T1:7.4, R1:3.17
45	Understand the concept of P-N junction diode, symbol	CLO 11	T5:5.2, R2:3.17
46	Learn the V-I characteristics of P-N junction diode,	CLO 11	T5:5.6, R2:1.3
47-48	Discuss the concept of half wave rectifier and full wave rectifier	CLO 12	T5:6.1, R2:1.10
49-51	Understand the bridge rectifiers and filters	CLO 12	T5:6.4, R2:2.1
52-53	Discuss the concept of diode as a switch, Zener diode as a voltage regulator	CLO 13	T5:6.5, R2:2.4
54-55	Know the concept of Transistors and Understand the configurations..	CLO 14	T5:7.1, R2:1.15
56–57	Understand the DC characteristics of transistor	CLO 15	T5:7.2, R2:3.1
58-59	Understand the biasing and load line analysis.	CLO 15	T5:8.2, R2:3.5
60	Discuss how transistor acts as an amplifier.	CLO 16	T5:7.18, R2:3.6

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Voltage Current relationship for passive elements for different input signals – ramp and, saw tooth and triangular.	Seminars / Guest Lectures / NPTEL	PO 1	PSO 2

Prepared by:
Mr. K Lingaswamy, Assistant Professor, EEE

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ENGLISH FOR COMMUNICATION**				
Course Code	AHS001				
Programme	B.Tech				
Semester	I	AE | ME | CE			
	II	CSE | IT | ECE | EEE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	2	1
Chief Coordinator	Ms B Anand Lakshmi, Associate Professor				
Course Faculty	Dr Prudhvi Raju, Associate Professor Ms P B Esther Rani, Assistant Professor Ms Jayshree Naidu, Assistant Professor Ms Shirisha Deshpande, Assistant Professor Mr. Sudhakar Medi, Assistant Professor Mr Kondal, Assistant Professor				

I. COURSE OVERVIEW:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, this Engineering English has been designed to develop linguistic and communicative competence of the students. In the classroom the focus should be on the skills of reading, writing, listening and speaking. The teacher can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/ essays etc.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Standard applicability of grammar and vocabulary

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
English for Communication	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✘	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):

Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	3	Term paper
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	3	Seminar Listening Test Speaking Test Presentation (Technical / Review: Movie/Book)
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	2	Five minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills**: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	-	-
PSO 2	**Software Engineering Practices**: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship**: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	2	Written Test – Verbal Aptitude for Placement and Higher studies

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Communicate in an intelligible English accent and pronunciation.
II	Use the four language skills i.e., Listening, Speaking, Reading and Writing effectively.
III	Develop the art of writing simple English with correct spelling, grammar and punctuation.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS001.01	CLO 1	Understand the value of English as an international language and try to improve the knowledge regarding language skills and elements to be perfect in their usage.	PO 10	1
AHS001.02	CLO 2	Develop the ability to listen effectively in order to analyze the language used in descriptions and narrations.	PO 9	2
AHS001.03	CLO 3	Paraphrase listening skills for different purposes with special emphasis on intensive listening.	PO 9	2
AHS001.04	CLO 4	Interpret how to contextualize the use of language for different purposes.	PO 9 PO 10	2
AHS001.05	CLO 5	Ability to comprehend speaking skills for different purposes with special emphasis on intensive listening	PO 9, PO 10, PO 11	3
AHS001.06	CLO 6	Express fluently without any grammatical mistakes and also give presentations with proper modulation.	PO 10	3
AHS001.07	CLO 7	Translate the importance of critical reading to get information from the context with the help of root words and contextual clues.	PO 10	3
AHS001.08	CLO 8	Grasp the importance of reading skills for focused and selective information at various levels of professional career.	PO 10	3
AHS00.09	CLO 9	Summarize the topic to write different types of argumentative, narrative, descriptive and persuasive paragraphs and essays.	PO 9, PO 10	3
AHS001.10	CLO 10	Infer the use of language for developing behavioral skills.	PO 9, PO 10, PO 11, PSO 3	2
AHS001.11	CLO 11	Translate the importance of reading techniques and applying it to literary texts.	PO 11	3
AHS001.12	CLO 12	Ability to learn and understand techniques of grammar to apply in the functions of English language	PO 10	2
AHS001.13	CLO 13	Remember to use the knowledge of grammar and vocabulary in writing more meaningfully.	PO 10	3
AHS001.14	CLO 14	Infer the importance of language and applying to learn to be sensitive according to the needs of the society.	PO 9, PO 10, PO 11, PSO 3	2
AHS001.15	CLO 15	Develop writing skills in order to apply in day to day life.	PO 9, PO 10	3
AHS001.16	CLO 16	Understand the importance of written communication for the future correspondence throw out the career of the students.	PO 9, PO 10	3
AHS001.17	CLO 17	Develop the ability to analyze the results of experiments and be competent in writing reports, work in teams in real time situations	PO 9, PO 10	3
AHS001.18	CLO 18	Understand the value of writing skills to be a responsive, attentive and empathetic writer in order to face the real-world situations	PO 9, PO 10	3
AHS001.19	CLO 19	Infer the importance of vocabulary and writing as an essential ability in the real-time situations for those who desire to advance their career.	PO 11, PSO 3	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1										1					
CLO 2									2						
CLO 3									2						
CLO 4									2	1					
CLO 5									3	3	1				2
CLO 6										3					2
CLO 7										3					
CLO 8										3					
CLO 9									3	3					2
CLO 10									2	3	2				1
CLO 11											3				
CLO 12										2					
CLO 13										3					
CLO 14									1	1	3				1
CLO 15									3	3					
CLO 16									3	3					
CLO 17									3	3					
CLO 18									3	3					2
CLO 19											2				2

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 9, PO 10, PO11, PSO 3	SEE Exams	PO 9, PO 10, PO11, PSO 3	Assignments	-	Seminars	PO 10
Laboratory Practices	PO 9, PO 10, PO11, PSO 3	Student Viva	PO 10	Mini Project	-	Certification	-
Term Paper	PO 9						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	LISTENING SKILLS
Significance, essentials, barriers and effectiveness of listening; Listening to dialogues, conversation, discussions, monologues; Listening to sounds, silent letters, stressed syllables in English; Listening for the gist of the text, for identifying the topic, general meaning and specific information; Listening for multiple choice questions, positive and negative comments for interpretation. Note: instructions in theory and practice in the lab.	
Unit-II	**SPEAKING SKILLS**
Significance, essentials, barriers and effectiveness of speaking; Simple oral or casual interaction, dialogue, conversation; Debates: Differences between disagreeing and being disagreeable; Brief presentations; Role plays; Generating talks based on visual or written prompts; Addressing a small group or a large formal gathering; Speaking about present, past experiences and future plans; Arguing out a topic without verbal fights; Paper presentation. Note: instructions in theory and practice in the lab.	
Unit-III	**READING SKILLS**
Techniques of reading: Skimming, scanning, intensive and extensive reading; Reading comprehension: Exercises for multiple choice questions and contextual meaning- values in Dr. Kalam. Vocabulary enrichment and grammar exercises based on selective readings: Power of dreams- vision to mission- prose passage for intellectual and emotional comments; Reading for the gist of a text, for specific information, for information transfer and interpretation.	
Unit-IV	**WRITING SKILLS**
Significance, essentials and effectiveness of writing; Writing emails; Writing paragraphs: Comparing, contrasting, presentations with an introduction, body and conclusion; Writing formal and informal letters: Letter of invitation, accepting, declining, requesting, cover letter enclosing a CV.	
Unit-V	**GRAMMAR AND VOCABULARY**
Punctuation, parts of speech, articles, prepositions, tenses, concords, phrasal verbs; Forms of verbs: Regular and irregular, direct and indirect speech, change of voice; prefixes, suffixes, Synonyms, antonyms, one word substitutes, idioms and phrases, technical vocabulary.	
Text Books:	
1. Meenakshi Raman, Sangeetha Sharma, "Technical Communication Principles Practices", Oxford University Press, New Delhi, 3rd Edition , 2015.	
Reference Books:	
1. Norman Whitby, "Business Benchmark: Pre-Intermediate to Intermediate – BEC Preliminary", Cambridge University Press, 2nd Edition, 2008. 2. Devaki Reddy, Shreesh Chaudhary, "Technical English", Macmillan, 1st Edition, 2009. 3. Rutherford, Andrea J, "Basic Communication Skills for Technology", Pearson Education, 2nd Edition, 2010. 4. Raymond Murphy, " Essential English Grammar with Answers", Cambridge University Press, 2nd Edition 5. Dr. N V Sudershan, "President Kalam's Call to the Nation", Bala Bharathi Publications, Secunderabad, 1st Edition, 2003.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Explain the importance of English Language as a tool for global communication and emphasis to acquire communicative competence	CLO 1	T1:1.1
2	Recognize the importance of English as the global language.	CLO 1	T1:1.1
3	Identify the learning levels and their competencies	CLO 1	T1:1.1-1.5
4-7	Recall the functions of punctuation and practice exercises	CLO 6, CLO12	R3:5
8	Develop the ability to understand that speaking skills are essential to be a responsive, attentive and empathetic speaker in order to face the real-world situations.	CLO 5, CLO 14	R2:1.1
9-11	Apply the knowledge of preparation for oral presentation	CLO 6	R4:2.21
12	Identify common errors in the language through the concept of word formation	CLO 13, CLO 19	R4:60.1
13-15	Prepare the students to be aware of the importance of commonly used technical vocabulary	CLO 19	R4:1.1-2.1
16	Infer the concept of grammatical ambiguity & sentence construction	CLO 6, CLO 12	R4:4.2
17	Recognize the concept of "Subject-Verb agreement", to familiarize the students with the usage of "Concord"	CLO 6	R3:1.3
18-22	Identify and understand conventional signs, prefixes, suffixes, Synonyms, antonyms, one word substitutes used by writers to make their meaning clear to the reader	CLO 13	R4:47.1
23	Appraise the students in order to acquire the knowledge of sentence structure	CLO 6	R4:42.1
24-25	Learn to use the vocabulary in writing more meaningfully	CLO 13	R3:4.4
26-27	Infer the difference between phrases and idioms & learn to use them in sentences	CLO 13	R3:4.2
28	To make the students learn and identify commonly used technical vocabulary.	CLO 13	R4:1.3
29	Understand the significance, essentials, and effectiveness of reading	CLO 7, CLO 8	T1:2.4
30	Interpret derivatives, and standard abbreviations in English through reading skills	CLO 11	T1:27.2
31-33	Infer the gist of the text, for identifying the topic through reading skills	CLO 11	R4:5.8
34	Apply the general meaning and specific information through writing skills	CLO 16	T1:2.7
35	Analyze and Interpret multiple choice questions, positive and negative comments through comprehension passages	CLO 17	T1:2.6
36	Identify passage for intellectual and emotional comments; reading for the gist of a text.	CLO 11	T1:4.15
37	Associate the students to identify their common errors in the language	CLO 9	R2:3
38	Understand the importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents to foster the writing skills of the students	CLO 17	R2:3
39	Evaluate Letter writing-formal and Informal writing and E-mail writing.	CLO 19	T1:4.13
40	To make learners aware of the selection of language to make presentations and prepare the students for an effective presentation giving them necessary inputs	CLO 18	T1:4.13
41	Distinguish writing skills such as describing, defining,	CLO 17	T1:4.13

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
	classifying, writing introduction and conclusion.		
42-43	Evaluate writing skills through creating coherence, organizing principles of paragraphs in documents.	CLO 9	T1:3.10
44-45	Understand the importance of vocabulary enrichment and grammar exercises to foster the writing skill of the students.	CLO 19	T1:4.13

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Construct basic and intermediate skills in English language.	Seminars	PO 10	PSO 3
2	Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work.	Seminars / NPTEL	PO 9	PSO 3
3	To build confidence for communicating in English and create interest for the life-long learning of English language.	Guest lecture	PO 10	PSO 3

Prepared by:
Ms. B Anand Lakshmi, Associate Professor

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ENVIRONMENTAL STUDIES**				
Course Code	AHS009				
Programme	B.Tech				
Semester	II	AE | CSE | IT | ECE | EEE | ME | CE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Ms. M Lakshmi Prasanna, Assistant Professor				
Course Faculty	Dr. C Mahendar, Professor Ms. V Anitha Rani, Associate Professor Mr. B Raju, Assistant Professor Ms. M Praveen, Assistant Professor Ms. M Malathi, Assistant Professor Mr. G Mahesh Kumar, Assistant Professor Ms. T Mallika, Assistant Professor Ms. M Swathi, Assistant Professor				

I. COURSE OVERVIEW:

Environmental study is interconnected interrelated and interdependent subject. Hence, it is multidisciplinary in nature. The present course is framed by expert committee of UGC under the direction of honorable supreme court to be as a core module syllabus for all branches of higher education and to be implemented in all universities over India. The course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. The course description is multidisciplinary nature of environmental studies, natural resources Renewable and non-renewable resources Ecosystems Biodiversity and its conservation Environmental pollution Social issues and the environment Human population and the environment Pollution control acts and field work. The course is divided into five chapters for convenience of academic teaching followed by field visits.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic Principles of Environmental Studies

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Environmental Studies	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five modules and each module carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz/AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz - Online Examination
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

Alternative Assessment Tool (AAT)
This AAT enables faculty to design own assessment patterns during the CIA. The AAT converts the classroom into an effective learning centre. The AAT may include tutorial hours/classes, seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), five minutes video, MOOCs etc.

The AAT chosen for this course is given in section XI.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Seminar
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Seminar
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1	Real-time applications
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	1	Real-time applications

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Analyze the interrelationship between living organism and environment
II	Understand the importance of environment by assessing its impact on the human world
III	Enrich the knowledge on themes of biodiversity, natural resources, pollution control and waste management
IV	Understand the constitutional protection given for environment

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS009.01	CLO 1	Understand and realize the importance of multi-disciplinary nature of the environment in day to day life	PO 1, PO 3	2
AHS009.02	CLO 2	Describe various types of ecosystems its components and inter-relationship between man and environment	PO 1, PO 3	2
AHS009.03	CLO 3	Examine how pollutants move through various levels in an ecosystem in our daily life	PO 1, PO 3, PO 7	2
AHS009.04	CLO 4	Explain the pathways of relevant chemical elements through the components of the biosphere in real world applications	PO 1, PO 3, PO 7	2
AHS009.05	CLO 5	Understand the relevance and importance of the natural resources in the sustenance of life on earth and living standard.	PO 1, PO 3, PO 5, PO 7	2
AHS009.06	CLO 6	Develop an understanding of the natural resources problems and ethical issues facing humans and the environment	PO 1, PO 3, PO 7	2
AHS009.07	CLO 7	Correlate the exploitation and utilization of conventional and non-conventional resources.	PO 1, PO 3, PO 5,PO 7	2
AHS009.08	CLO 8	Demonstrate the level of chemical usage in agricultural development and its impact in our daily life	PO 1, PO 5, PO 7	2
AHS009.09	CLO 9	Understand the concept of growing energy needs in the world in terms of consumption of energy	PO 1, PO 7	2
AHS009.10	CLO 10	Establish knowledge and existence of endemic, extinct, endangered and threatened species, types and values of biodiversity	PO 1, PO 5, PO 7	2
AHS009.11	CLO 11	Describe our country as mega biodiversity nation in terms of hotspots	PO 1, PO 7	2
AHS009.12	CLO 12	Explain on threats and innovative methods for conservation of biodiversity.	PO 1, PO 3, PO 7	2
AHS009.13	CLO 13	Establish a foundation on different pollutants and pollutions in the environment.	PO 1, PO 3, PO 5, PO 7	2
AHS009.14	CLO 14	Ability to use methods, and strategies to investigate and interpret the pollution problems	PO 3, PO 5, PO 7	2
AHS009.15	CLO 15	Use innovative methods to control the level of water pollution in our day to day life.	PO 3, PO 5, PO 7	2
AHS009.16	CLO 16	Acquire Knowledge on global effects and how to interpret with global environmental problem in our daily life	PO 1, PO 7	2
AHS009.17	CLO 17	Acquire knowledge and skills about health and safety protocols when working with polluted environment in day to day life	PO 1, PO 7	2

AHS009.18	CLO 18	Describe the role of government and legal aspects in environmental protection.	PO 7	1
AHS009.19	CLO 19	Knowledge of proper decontamination techniques for solid waste management.	PO 3, PO 7	2
AHS009.20	CLO 20	Understand the importance of EIA for developmental activities to have minimum negative impacts on people	PO 1, PO 7	2
AHS009.21	CLO 21	Prepare entry level for future generations to meet sustainable development.	PO 7	1

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO 1	3		1													
CLO 2	3		1													
CLO 3	2		2				1									
CLO 4	2		2				1									
CLO 5	3		1		1		1									
CLO 6	2		2				1									
CLO 7	3		1		1		1									
CLO 8	2				1		1									
CLO 9	3						1									
CLO 10	3				1		1									
CLO 11	2						1									
CLO 12	2		2				1									
CLO 13	3		2		2		2									
CLO 14			2		1		1						1			
CLO 15			2		1		1						1			
CLO 16	2						1									
CLO 17	2						1									
CLO 18							1									
CLO 19			1				2									
CLO 20	1						1									
CLO 21							2									

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO3 PO5,PO7	SEE Exams	PO1,PO3 PO5,PO7	Assignments	PO1	Seminars	PO1 PO3
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS:

Unit-I	ENVIRONMENT AND ECOSYSTEMS
Environment: Definition, scope and importance of environment, need for public awareness; Ecosystem: Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web and ecological pyramids, flow of energy; Biogeochemical cycles; Biomagnifications	
Unit-II	**NATURAL RESOURCES**
Natural resources: Classification of resources, living and nonliving resources; Water resources: Use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; Mineral resources: Use and exploitation; Land resources; Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.	
Unit-III	**BIODIVERSITY AND BIOTIC RESOURCES**
Biodiversity and biotic resources: Introduction, definition, genetic, species and ecosystem diversity; Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and optional values; India as a mega diversity nation; Hot spots of biodiversity Threats to biodiversity: Habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation; National biodiversity act.	
Unit-IV	**ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS**
Environmental pollution: Definition, causes and effects of air pollution, water pollution, soil pollution, noise pollution; Solid waste: Municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: Waste water treatment methods, primary, secondary and tertiary; Concepts of bioremediation; Global environmental problems and global efforts: Climate change, ozone depletion, ozone depleting substances, deforestation and desertification; International conventions / protocols: Earth summit, Kyoto protocol and Montreal protocol.	
Unit-V	**ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT**
Environmental legislations: Environmental protection act, air act1981, water act, forest act, wild life act, municipal solid waste management and handling rules, biomedical waste management and handling rules2016, hazardous waste management and handling rules, Environmental impact assessment(EIA); Towards sustainable future: Concept of sustainable development, population and its explosion, crazy consumerism, environmental education, urban sprawl, concept of green building.	
Text Books:	
1. Benny Joseph (2005)., Environmental Studies, New Delhi, Tata McGraw Hill Publishing co. Ltd 2. Erach Bharucha (2005)., Textbook of Environmental Studies for Undergraduate Courses, Hyderabad, Universities Press.	
Reference Books:	
1. Anji Reddy .M (2007), Textbook of Environmental Sciences and Technology, Hyderabad, BS Publications.	

2. Anjaneyulu.(2004), Introduction to Environmental Sciences, BS Publications
3. Anubha Kaushik(2006).,Perspectives in Environmental Science, 3rd Edition, New Delhi, New age international.
4. Tyler Miller, Scott Spoolman, "Environmental Science", Cengage Learning, 14th Edition, 2012.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
1	Summarize about environment and its importance.	CLO 1	T2: 1.1.1, 1.1.2,1.1.3, 1.2.1,1.2.2 R3:1.1-1.3
2	Discuss environment and importance of ecosystems	CLO 1	R1: 1.1,1.2 R3:1.1-1.3
3	Provides the information regarding ecosystem and applicability.	CLO 1	T2:3.2 R1:1.6.1,1.6.2 R3:1.6,1.7
4	Provides the information regarding ecosystem and applicability	CLO 1	T2:3.2 R1:1.6.1,1.6.2 R3:1.6,1.7
5	Acquire knowledge of how all the animals are competing with their food requirements and also understand the various trophic levels in the food chain.	CLO 2	T2:3.6.1-3.6.3 R1:1.7.1,1.7.2, 1.7.3 R3:1.7.1,1.7.2
6	Describe the flow of energy through the various components of ecosystem	CLO 2	T2:3.4 R1:1.8 R3:1.7.5
7	Examine the importance a of nutrients and flow of nutrients in ecosystem	CLO 3	T2:3.4.1-3.4.4 R1:1.9,1.10 R3:1.7.6
8	Examine the importance a of nutrients and flow of nutrients in ecosystem	CLO 3	T2:3.4.1-3.4.4 R2:1.9,1.10 R3:1.7.6
9	Summarize about the toxicity of heavy metals on the biotic and a biotic components.	CLO 4	R1:1.11 R3:1.7.3
10	Distinguish about different types of natural resources and their applicability and illustrate the utility of renewable resources efficiency	CLO 5	R1:2.1 R3:2.1
11	Describe the impact of over utilization of underground and surface water	CLO 5	R1:2.3,2.4.1, 2.4.2,2.4.3 R3:2.2
12	Discuss the disaster manage mental plans	CLO 6	R1:2.4.4 R3:2.2.4,2.2.5
13	Describe the benefits and property dams	CLO 6	R1:2.4.5 R3:2.3
14	Illustrate the uses of mineral resources	CLO 2 CLO 6	R1:2.5 R3:2.4
15	Enumerate the application of the solar energy in modern days	CLO 6	R1:3.1 R3:2.5
16	Enumerate the application of the wind energy in modern days	CLO 6	R1:3.3.1.5 R3:2.5
17	Illustrate the definition and importance of biodiversity	CLO 6	T2:4.1 R1:4.1 R3:3.1

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
18	Acquire the genetic diversity, species and ecosystem diversity	CLO 7	T2:4.1.1,4.1.2, 4.1.3 R1:4.2 R3:3.2
19	Describe the ecological values and consumptive use of ecosystem	CLO 7	T2:4.3 R1:4.3 R3:3.3
20	Recall India is mega diversity nation	CLO 7	T2:4.5 R3:3.4
21	Discuss the hot spot center in and around	CLO 7	T2:4.6 R1:4.6 R3:3.4
22	Analyze the information regarding different causes for loss of biodiversity	CLO 7	T2:4.7 R1:4.4 R3:3.5
23	Analyze various reasons for conflict of species	CLO 7	T2:4.7 R3:3.5.3
24	Illustrate different methods to protect the biodiversity	CLO 7	T2:4.9 R1:4.5 R3:3.7
25	Correlate national biodiversity act	CLO 8	T2:4.9 R1:4.5 R3:3.7
26	Explain the meaning of environmental pollution and classification.	CLO 9	T2:5.1 R1:5.1 R3:4.1
27	Analyze the important pollutants in air pollutants	CLO 9	T2:5.2.1 R1:5.3 R3:4.2
28	Enumerate the sources types and effects of water pollution	CLO 9	T2:5.2.2 R1:5.4 R3:4.6
29	Correlate the sources types and effects of soil pollution	CLO 9	T2:5.2.3 R1:5.5 R3:4.8
30	Analyze the noise quality and permissible levels	CLO 9	T2:5.2.5 R1:5.7 R3:4.13
31	Describe the various methods commonly employed for the disposal of solid waste.	CLO 9	T2:5.3 R1:7.7
32	Identify To understand the recent trends in e- waste management practices.	CLO 10	R1:5.10.6 R3:4.16.3
33	Understand concept of climate change and impacts.	CLO 10	T2:6.6.1 R1:6.5 R3:5.5
34	Summarize the remedial measures of ozone depletion	CLO 10	T2:6.6.4 R1:6.6 R3:5.6,5.7
35	Evolve strategies to environmental issues	CLO 10	R1:6.8 R3:5.10
36	Describe the role of government and legal aspects in environmental protection	CLO 10	T2:6.9-6.14 R1:7.2,7.3,7.4, R3:7.3,7.4,7.5, 7.6,7.7
37	Discuss the silent features of the hazardous waste management	CLO 11	R1:7.9 R3:7.10
38	Understand the importance of EIA for developmental activities	CLO 12	T2:6.14 R3:6.3,6.4

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
39	Understand the importance of EIA for developmental activities	CLO 12	T2:6.14 R1:10.1 R3:6.3,6.4
40	State the aim and objectives of sustainable development	CLO 12	T2:6.1 R1:10.5 R3:8.3
41	State the aim and objectives of sustainable development	CLO 13	T2:6.1 R1:10.5 R3:8.3
42	Enumerate population and its explosion	CLO 15	T2:7.2 R1:10.3 R3:8.2
43	State the aim and objectives of sustainable development	CLO 19	T2:7.2.2.2 R1:10.8 R3:8.6
44	Acquire knowledge of environmental education	CLO 18	T2:7.3 R1:10.6 R3:8.4
45	Summarize the environmental ethics and objectives of green buildings	CLO 21	T2:6.5 R1:10.10,10.12 R3:8.10,8.12

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Types of ecosystem, Energy flow, Biomagnification	Seminars / Field visit	PO 1	-
2	Dams ,Mining Activities, Alternative energy resources	Seminars / NPTEL	PO 3	PSO 1
3	Sources of pollution EIA Methodology, Green building	Guest Lecture	PO 7	-

Prepared by:
Ms. M Lakshmi Prasanna, Assistant Professor

HOD, FRESHMAN ENGINEERING

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**PROBABILITY AND STATISTICS**				
Course Code	AHS010				
Programme	B.Tech				
Semester	II	CSE | IT			
	III	ME | CE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Mr. J Suresh Goud, Assistant Professor				
Course Faculty	Ms. P Srilatha, Assistant Professor Ms. B Praveena, Assistant Professor				

I. COURSE OVERVIEW:

The course focuses on more advanced Engineering Mathematics topics which provide with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes probability, random variables, probability distributions, correlation, regression, sampling distribution, testing of hypothesis and analysis of variance. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic principles of statistics

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Probability and Statistics	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Term Paper

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Enrich the knowledge of probability on single random variables and probability distributions.
II	Apply the concept of correlation and regression to find covariance.
III	Analyze the given data for appropriate test of hypothesis.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS010.01	CLO 1	Understand the basic concepts of probability and random variables.	PO 1	3
AHS010.02	CLO 2	Analyze the concepts of discrete and continuous random variables, probability distributions, expectation and variance.	PO 1	3
AHS010.03	CLO 3	Use the concept of random variables in real-world problem like graph theory, machine learning, Natural language processing.	PO 1	3
AHS010.04	CLO 4	Apply the binomial distribution and poisson	PO 2	2

		distribution to find mean and variance.		
AHS010.05	CLO 5	Understand binomial distribution to the phenomena of real-world problem like sick versus healthy.	PO 2	2
AHS010.06	CLO 6	Use poission distribution in real-world problem to predict soccer scores.	PO 2	2
AHS010.07	CLO 7	Apply the inferential methods relating to the means of normal distributions.	PO 4	1
AHS010.08	CLO 8	Understand the mapping of normal distribution in real-world problem to analyze the stock market.	PO 4	1
AHS010.09	CLO 9	Explain multiple random variables and the covariance of two random variables.	PO 2	2
AHS010.10	CLO 10	Understand the concept of multiple random variables in real-world problems aspects of wireless communication system.	PO 2	2
AHS010.11	CLO 11	Calculate the correlation coefficient to the given data.	PO 1	3
AHS010.12	CLO 12	Understand the correlation and regression to the real-world such as stock price and interest rates.	PO 1	3
AHS010.13	CLO 13	Calculate the regression to the given data.	PO 1	3
AHS010.14	CLO 14	Understand the concept of sampling distribution of statistics and in particular describe the behavior of the sample mean.	PO 1, PO 2	3
AHS010.15	CLO 15	Understand the concept of estimation for classical inference involving confidence interval.	PO 2	2
AHS010.16	CLO 16	Understand the concept of estimation in real-world problems of signal processing.	PO 2	2
AHS010.17	CLO 17	Understand the foundation for hypothesis testing.	PO 1, PO 2	3
AHS010.18	CLO 18	Understand the concept of hypothesis testing in real-world problem to selecting the best means to stop smoking.	PO 1, PO 2	3
AHS010.19	CLO 19	Apply testing of hypothesis to predict the significance difference in the sample means.	PO 1, PO 2	3
AHS010.20	CLO 20	Apply testing of hypothesis to predict the significance difference in the sample proportions.	PO 1, PO 2	3
AHS010.21	CLO 21	Apply Student t-test to predict the difference in sample means.	PO 1	3
AHS010.22	CLO 22	Apply F-test to predict the difference in sample variances.	PO 1	3
AHS010.23	CLO 23	Understand the characteristics between the samples using Chi-square test.	PO 1	3
AHS010.24	CLO 24	Understand the assumptions involved in the use of ANOVA technique.	PO 4	1
AHS010.25	CLO 25	Understand the concept ANOVA to the real-world problems to measure the atmospheric tides.	PO 4	1

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2	3												1		
CLO 3	3												1		
CLO 4		2													
CLO 5		2													
CLO 6		2													
CLO 7				2											
CLO 8				1											
CLO 9		3											1		
CLO 10		2											1		
CLO 11	3														
CLO 12	3														
CLO 13	3														
CLO 14	3	2											1		
CLO 15		2													
CLO 16		2													
CLO 17	3	2											1		
CLO 18	3	2											1		
CLO 19	2	2											1		
CLO 20	3	1											1		
CLO 21	3														
CLO 22	3														
CLO 23	2														
CLO 24				2											
CLO 25				1											
CLO 26															

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 4	SEE Exams	PO 1, PO 2, PO 4	Assignments	PO 4	Seminars	PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	SINGLE RANDOM VARIABLES AND PROBABILITY DISTRIBUTION
Random variables: Basic definitions, discrete and continuous random variables; Probability distribution: Probability mass function and probability density functions; Mathematical expectation; Binomial distribution, Poisson distribution and normal distribution.	
Unit-II	**MULTIPLE RANDOM VARIABLES**
Joint probability distributions, joint probability mass, density function, marginal probability mass, density functions; Correlation: Coefficient of correlation, the rank correlation; Regression: Regression coefficient, the lines of regression, multiple correlation and regression.	
Unit-III	**SAMPLING DISTRIBUTION AND TESTING OF HYPOTHESIS**
Sampling: Definitions of population, sampling, statistic, parameter; Types of sampling, expected values of sample mean and variance, sampling distribution, standard error, sampling distribution of means and sampling distribution of variance. Estimation: Point estimation, interval estimations; Testing of hypothesis: Null hypothesis, alternate hypothesis, type I and type II errors, critical region, confidence interval, level of significance. One sided test, two sided test.	
Unit-IV	**LARGE SAMPLE TESTS**
Test of hypothesis for single mean and significance difference between two sample means, Tests of significance difference between sample proportion and population proportion and difference between two sample proportions.	
Unit-V	**SMALL SAMPLE TESTS AND ANOVA**
Small sample tests: Student t-distribution, its properties: Test of significance difference between sample mean and population mean; difference between means of two small samples. Snedecor's F-distribution and its properties; Test of equality of two population variances Chi-square distribution and it's properties; Test of equality of two population variances Chi-square distribution, it's properties, Chi-square test of goodness of fit; ANOVA: Analysis of variance, one way classification, two way classification.	
Text Books:	
1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014. 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2012.	
Reference Books:	
1. T.K.V Iyengar, B.Krishna Gandhi, "Probability and Statistics", S. Chand & Co., 6th Edition, 2014. 2. G.C.Beri, "Business Statistics", Tata McGraw-Hill Publications, 2nd Edition, 2005.	

3. Richard Arnold Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Prentice Hall, 8th Edition, 2013.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Describe the concept of Random variables and Contrast discrete Random variables and calculate the mean and variance of discrete Random variables	CLO 1	T1:22.5 R1:2.3
2	Recall the continuous probability function	CLO 2	T1:22.5 R1:2.4
3	Identify mathematical mean	CLO 2	T1:22.6 R1:2.6
4-5	Recall characteristics of the Binomial Distribution and find mean , variance	CLO 4	T1:22.7 R1:4.4
6-7	Recognize cases where Poisson Distribution could be appropriate model to find mean and variance	CLO 4	T1:22.7 R1:4.10
8-9	Apply Normal Distributions find the probability over a set of values, mean and variance	CLO 7	T1:22.8 R1:4.15
10	Apply probability distribution	CLO 9	T1:22.9 R1:5.4
11	Apply marginal probability density function	CLO 9	T1:22.9 R1:5.8
12-13	Recognize the limitation of correlation as a summary of bivariate data.	CLO 11	T1:23.10 R1:6.8
14	Interpret the correlation between the bivariate data by allotting ranks.	CLO 11	T1:23.10 R1:6.13
15-16	Define the concept of least squares estimation in linear regression	CLO 13	T1:23.9 R1:7.5
17	Estimate the linear model to a bivariate data	CLO 11	T1:23.10 R1:7.5
18	Recognize the multiple correlation of bivariate data	CLO 9	T1:23.10 R1:8.1
19	Recall the sampling distribution of the sample mean in general situation	CLO 14	T1:23.1 R1:9.2
20	Distinguish between a population and a sample and between parameters & statistics	CLO 14	T1:23.1 R1:9.4
21	Recall the sampling distribution and define standard error	CLO 14	T1:23.1 R1:9.9
22-23	Recall the sampling distribution of the sample mean in general situation	CLO 14	T1:23.1 R1:9.10
24-25	Interpret the confidence interval and confidence level	CLO 14	T2:27.5 R1:10.2
26	Understand the foundation for classical inference involving hypothesis testing and two types of errors possible	CLO 17	T2:27.7 R1:11.3
27	Explain level of significance confidence interval	CLO 17	T2:27.8 R1:11.6
28-30	Identify the confidence interval with single mean	CLO 19	T2:27.12 R1:11.7
31-32	Identify the confidence interval with difference between the mean	CLO 19	T2:27.12 R1:11.8
33-34	Identify the confidence interval with difference between the proportions	CLO 20	T2:27.12 R1:11.9
35-36	Identify the confidence interval with difference between the proportions	CLO 20	T2:27.12 R1:11.10

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
37-38	Recall the definition of a t-statistics in terms of statistics of sample from a normal distribution	CLO 21	T2:27.14 R1:12.3
39	State and apply the definition of F-distribution	CLO 22	T2:27.1 R1:12.7
40-41	State and apply the definition of χ^2 –Distribution	CLO 23	T2:27.17 R1:12.15
42	Apply Chi-square distribution	CLO 23	T2:27.18 R1:12.19
43-44	Apply One way classification	CLO 24	T2:27.19 R2:14.4
45	Apply Two way classification	CLO 24	T2:27.19 R2:14.5

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed Actions	Relevance with Pos	Relevance with Psos
1	To improve standards and analyze the concepts.	Seminars	PO 1	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars / NPTEL	PO 4	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 2	PSO 1

Prepared By:
Mr. J Suresh Goud, Assistant Professor

HOD, FRESHMAN ENGINEERING

III SEMESTER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**COMPUTER ORGANIZATION AND ARCHITECTURE**					
Course Code	**ACS004**					
Programme	B.Tech					
Semester	III	CSE	IT			
Course Type	Core					
Regulation	IARE - R16					
Course Structure	**Theory**			**Practical**		
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**	
	3	1	4	-	-	
Chief Coordinator	Mr.A.Praveen, Assistant Professor					
Course Faculty	Ms.A.Swapna, Assistant Professor					

I. COURSE OVERVIEW:

This course introduces the principles of basic computer organization, CPU organization, and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, register transfer languages, arithmetic, logic and shift micro operations, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O organization of computer, parallel processing and inter process communication and synchronization. This course in reached to student by power point presentations, lecture notes, and assignment questions ,previous model question papers, multiple choice questions and question bank of long and short answers.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC020	III	Digital Logic Design	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Computer Organization and Architecture	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignment
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	2	Seminar
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the organization and architecture of computer systems and electronic computers.
II	Study the assembly language program execution, instruction format and instruction cycle.
III	Design a simple computer using hardwired and micro programmed control methods.
IV	Study the basic components of computer systems besides the computer arithmetic
V	Understand input-output organization, memory organization and management, and pipelining.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CACS004.01	CLO 1	Describe the various components like input/output units, memory unit, control unit, arithmetic logic unit connected in the basic organization of a computer.	PO 1	3
CACS004.02	CLO 2	Understand the interfacing concept with memory subsystem organization and input/output subsystem organization.	PO 1	3
CACS004.03	CLO 3	Understand instruction types, addressing modes and their formats in the assembly language programs.	PO 2	2
CACS004.04	CLO 4	Describe the instruction set architecture design for relatively simple microprocessor or Central Processing Unit.	PO 3	1
CACS004.05	CLO 5	Classify the functionalities of various micro operations such as arithmetic, logic and shift micro operations.	PO 3	2
CACS004.06	CLO 6	Understand the register transfer languages and micro operations involved in bus and memory transfers.	PO 2	2
CACS004.07	CLO 7	Describe the design of control unit with address sequencing and microprogramming Concepts.	PO 3, PO 4	1
CACS004.08	CLO 8	Understand the connections among the circuits and the functionalities in the hardwired control unit.	PO 2, PO 4	1
CACS004.09	CLO 9	Describe the various phases involved in the instruction cycle viz. fetching, decoding, reading effective address and execution of instruction.	PO 2	3
CACS004.10	CLO 10	Describe various data representations and explain how arithmetic and logical operations are performed by computers.	PO 4	1
CACS004.11	CLO 11	Classify the various instructions formats to solve the arithmetic expressions in different addressing modes.	PO 1, PO 4	1
CACS004.12	CLO 12	Understand the functionality of various instruction formats for writing assembly language programs.	PO 2	1
CACS004.13	CLO 13	Describe the implementation of fixed point and floating point addition, subtraction operations.	PO 1	3
CACS004.14	CLO 14	Understand the concept of memory hierarchy and different typed of memory chips.	PO 2	2
CACS004.15	CLO 15	Describe various modes of data transfer between CPU and I/O devices	PO 2, PO 3	1
CACS004.16	CLO 16	Understand the virtual memory concept with page replacement concept in memory organization	PO 2	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CACS004.17	CLO 17	Describe the hardware organization of associate memory and understand the read and write operations	PO 1, PO 2	1
CACS004.18	CLO 18	Describe the parallel processing concept with multiple functional units.	PO 2	2
CACS004.19	CLO 19	Understand the multiprocessor concept with system bus structure and the concept of inter processor communication and synchronization.	PO 1	2
CACS004.20	CLO 20	Understand the different priority interrupts in the input-output organization in the computer architecture.	PO 1	2
CACS004.21	CLO 21	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.	PO 2	1
CACS004.22	CLO 22	Possess the knowledge and skills to design advanced computer architecture for current industry requirements.	PO 1	1

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2	3												1		
CLO 3		2													
CLO 4			1										1		
CLO 5			2										1		
CLO 6		2											1		
CLO 7			2	1											
CLO 8		2		1									1		
CLO 9		3													
CLO 10				1									1		
CLO 11	2			1									1		
CLO 12		1													
CLO 13	3												1		
CLO 14		2											1		

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 15		1	2										1		
CLO 16		2													
CLO 17	2	1											1		
CLO 18		2													
CLO 19	2												1		
CLO 20	2												1		
CLO 21		1													
CLO 22	1														

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2, PO 3, PO 4	SEE Exams	PO 1,PO 2, PO 3, PO 4	Assignments	PO 2	Seminars	PO 3
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	INTRODUCTION TO COMPUTER ORGANIZATION
Basic computer organization, CPU organization, memory subsystem organization and interfacing, input or output subsystem organization and interfacing, a simple computer levels of programming languages, assembly language instructions, instruction set architecture design, a simple instruction set architecture.	
Unit-II	**ORGANIZATION OF A COMPUTER**
Register transfer: Register transfer language, register transfer, bus and memory transfers, arithmetic micro operations, logic micro operations, shift micro operations; Control unit: Control memory, address sequencing, micro program example, and design of control unit.	
Unit-III	**CPU AND COMPUTER ARITHMETIC**
CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer and manipulation, program control. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.	
Unit-IV	**INPUT-OUTPUT ORGANIZATION AND MEMORY ORGANIZATION**

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.	
Unit-V	**MULTIPROCESSORS**
Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, inter connection structures, inter processor arbitration, inter processor communication and synchronization.	
Text Books:	
1. M. Morris Mano, —"Computer Systems Architecture", Pearson, 3rd Edition, 2007. 2. John D. Carpinelli, —"Computer Systems Organization and Architecture", Pearson, 1st Edition, 2001. 3. Patterson, Hennessy, —"Computer Organization and Design: the Hardware/Software Interface", Morgan Kaufmann, 5th Edition, 2013.	
Reference Books:	
1. John. P. Hayes, —"Computer System Architecture", McGraw-Hill, 3rd Edition, 1998. 2. Carl Hamacher, Zvonko G Vranesic, Safwat G Zaky, —"Computer Organization", McGraw-Hill, 5th Edition, 2002. 3. William Stallings, —"Computer Organization and Architecture", Pearson Edition, 8th Edition, 2010.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Basic Computer Organization	CLO 1	T1: 4.1-4.2
2-4	Memory Subsystem Organization And Interfacing, Input Or Output Subsystem Organization And Interfacing	CLO 2	T1: 4.3-4.4
5-7	Computer Levels Of Programming Languages, Assembly Language Instructions	CLO 3	T1: 3.1-3.2
8-12	Instruction Set Architecture Design, A Simple Instruction Set Architecture	CLO 4	T1: 3.3-3.4
13-15	Arithmetic Micro Operations, Logic Micro Operations	CLO 5	T2: 4.4-45
16-19	Control Unit: Control Memory, Address Sequencing	CLO 7	T2: 7.1-7.2
20-22	Design Of Control Unit	CLO 7	T2: 7.4
23	Data Representation	CLO 10	T2: 3.1-3.3
24-26	Memory Reference Instructions, Input- Output, And Interrupt	CLO 11	T2: 5.6-5.7
27-32	Addressing Modes, Program Control	CLO 11	T2: 8.5-8.7
33-35	Memory Reference Instructions, Data Transfer And Manipulation	CLO 12	T2: 8.6
36-38	Computer Arithmetic: Addition And Subtraction, Floating Point Arithmetic Operations	CLO 13	T2: 10.1-10.5
39-42	Memory Organization	CLO 14	T2: 12.1
43-45	Input Or Output Interface	CLO 15	T2: 11.2
46-48	Asynchronous Data Transfer, Modes Of Transfer	CLO 17	T2: 11.3-11.4
49	Priority Interrupt	CLO 20	T2: 11.5

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
50-51	Direct Memory Access	CLO 17	T2: 11.6
52-53	Pipeline: Parallel Processing	CLO 18	T2: 9.1-9.2
54	Instruction Pipeline	CLO 19	T2: 9.4
55-56	Multiprocessors	CLO 19	T2: 13.1
57-58	Inter Connection Structures	CLO 19	T2: 13.2
59-60	Inter Processor Arbitration	CLO 19	T2: 13.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S no	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Data Representation – Arithmetic multiplication , division	Seminars / Guest Lectures/ NPTEL	PO 1	PSO 1
2	RISC ,CISC Characteristics	Seminars / Guest Lectures/ NPTEL	PO 2	PSO 1
3	Vector Processing	Assignments	PO 1	PSO 1

Prepared by:

Mr. N V Krishna Rao, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**DATABASE MANAGEMENT SYSTEMS**				
Course Code	ACS005				
Programme	B.Tech				
Semester	III	IT			
	IV	CSE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Ms. K. LaxmiNarayanamma, Assistant Professor				
Course Faculty	Mr. N Bhaswanth, Assistant Professor				

I. COURSE OVERVIEW:

This course introduces the core principles and techniques required in the design and implementation of database systems. This introductory application-oriented course covers the relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS002	II	Data Structures	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Database Management Systems	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✔	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignment /Quiz
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 3	**Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Mini Project
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Laboratory Practices
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	2	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Assignment / Quiz
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	3	Mini Project

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Discuss the basic database concepts, applications, data models, schemas and instances.
II	Design Entity Relationship model for a database.
III	Demonstrate the use of constraints and relational algebra operations.
IV	Describe the basics of SQL and construct queries using SQL.
V	Understand the importance of normalization in databases.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS005.01	CLO 1	Define the terminology, features, and characteristics of database system	PO 1	2
ACS005.02	CLO 2	Differentiate database systems from file systems by enumerating various features provided by database systems.	PO 1, PO 2	3
ACS005.03	CLO 3	Describe Data Models, Schemas, Instances, Three Schema Architecture and DBMS Component Modules	PO 1	3
ACS005.04	CLO 4	Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram.	PO 2, PO 3	3
ACS005.05	CLO 5	Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.	PO 2, PO 3	2
ACS005.06	CLO 6	Describe basics of the relational data model.	PO 1	3
ACS005.07	CLO 7	Define and illustrate the Relational Data Model, Constraints and Schemas	PO 1	3
ACS005.08	CLO 8	Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.	PO 2, PO 3	2
ACS005.09	CLO 9	Formulate solutions to a broad range of query problems using relational algebra.	PO 2, PO 3	3
ACS005.10	CLO 10	Apply relational calculus to solve broad range of query problems.	PO 2, PO 3,	3
ACS005.11	CLO 11	Illustrate the Functional Dependencies , Inference Rules, Minimal Sets of FDs	PO 1, PO 2	2
ACS005.12	CLO 12	Understand normalization theory and criticize a database design and improve the design by normalization.	PO 2, PO 3	2
ACS005.13	CLO 13	Explain various Normal Forms and Apply to normalize a database.	PO 1, PO 2	3
ACS005.14	CLO 14	Understand the SQL Data definition statements to formulate solutions to a broad range of query and data update problems	PO 1,PO 2, PO 5	2
ACS005.15	CLO 15	Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.	PO 2 , PO 5	3
ACS005.16	CLO 16	Use SQL queries for data aggregation, calculations, views, sub-queries, embedded queries, manipulation, and report generation.	PO 2 , PO 5	2
ACS005.17	CLO 17	Demonstrate PL/SQL including stored procedures, stored functions, cursors, packages.	PO 2, PO 3, PO 5, PO 12	3
ACS005.18	CLO 18	Gain knowledge on transaction processing to maintain consistency and integrity of data in database systems.	PO 1, PO 2	2
ACS005.19	CLO 19	Describe concurrency control techniques to implement data integrity in database systems.	PO 1,PO 2	2
ACS005.20	CLO 20	Illustrate various backup and recovery techniques for database systems.	PO 1,PO 2	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS005.21	CLO 21	Analyze transaction processing , concurrency control, Database recovery techniques	PO 1, PO 2	3
ACS005.22	CLO 22	Define disk storage devices, files of records, unordered files, ordered files and hashed files and organizations	PO 1	3
ACS005.23	CLO 23	Familiar with basic database storage structures and access techniques- file and page organizations, indexing methods	PO 1, PO 2	2
ACS005.24	CLO 24	Illustrate various operations in implementing data indices using various hashing techniques.	PO 1, PO 2, PO 5	3
ACS005.25	CLO 25	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.	PO 5, PO 12	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CLO 1	3												1		
CLO 2	3	2													
CLO 3	3												2		
CLO 4		3	3												
CLO 5		3	3											2	1
CLO 6	3														
CLO 7	3													2	
CLO 8		2	3											2	
CLO 9		3	2											3	
CLO 10		3	2											3	
CLO 11	3	2													
CLO 12		3	2											2	
CLO 13	3	3											2		
CLO 14	3	2											2		
CLO 15		2			3										3
CLO 16		2			3									2	

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
CLO 17		2	3		3							3			3
CLO 18	3	2											2		
CLO 19	3	2												2	
CLO 20	3	2												2	
CLO 21	3	2											3		
CLO 22	3												3		
CLO 23	3	2												2	
CLO 24	2	3			3										
CLO 25					3							2			3

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 3, PO 5	SEE Exams	PO 1, PO 2, PO 3, PO 5	Assignments	PO 1	Seminars	PO 2
Laboratory Practices	PO 2	Student Viva	PO 3	Mini Project	PO 3	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	CONCEPTUAL MODELING
Introduction to file and database systems: Database system structure, data models, introduction to network and hierarchical models, ER model, relational model.	
Unit-II	**RELATIONAL APPROACH**
Relational algebra and calculus: Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus, tuple relational calculus, domain relational calculus, expressive power of algebra and calculus	
Unit-III	**BASIC SQL QUERY**
SQL data definition; Queries in SQL: updates, views,integrity and security,relational database design. Functional dependencies and normalization for relational databases up to five normal forms.	
Unit-IV	**TRANSACTION MANAGEMENT**
Transaction processing: Introduction, need for concurrency control, desirable properties of transaction, schedule and recoverability, serializability and schedules, concurrency control; Types of locks: Two phases locking, deadlock, time stamp based concurrency control, recovery techniques , concepts, immediate update, deferred update, shadow paging.	

Unit-V	DATA STORAGE AND QUERY PROCESSING
Record storage and primary file organization, secondary storage devices, operations on files, heap File, sorted files, hashing techniques,and index structures for files; Different types of indexes, B tree, B+ tree, query processing.	
Text Books:	
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 4th Edition, 2002. 2. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 3rd Edition, 2003	
Reference Books:	
1. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2003. 2. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", PearsonEducation, United States 1st Edition, 2000. 3. Peter Rob, Corlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	CLOs	Reference
1-2	Introduction, Data base System Applications, Purpose of data base Systems, View of Data – Data Abstraction, Instances and Schemas Data Models,, Database Languages, Data base access for applications Programs	CLO 1	T2: 1.1- 1.5
3-4	Transaction Management component of DB architecture, Data base users, History of database systems, Database design, ER Diagrams.	CLO 2	T2: 1. 6 - 1.8,, 1.10,T1: 2.1
5-6	Entities, Attributes and entity sets, Relationships and relationship sets, Additional features of ER model,Conceptual design with ER model, Conceptual design for large enterprises	CLO 3, CLO4, CLO5	T1: 2.2-2.6
7-8	Relational Model: Introduction to the Relational Model – Integrity Constraint Over relations, Enforcing Integrity constraints – Querying relational data	CLO 6, CLO 7, CLO 8	T1: 3.1-3.7
9-10	Relational Algebra and Calculus: Relational Algebra – Selection and projection –set operations – renaming, Joins – Division	CLO 8, CLO 9	T1: 4.1, 4.2.2
11-12	Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.	CLO 10	T1:4.3, 4.4
13-14	Form of Basic SQL Query – Examples of Basic SQL Queries Comparison Operators – Aggregative Operators, NULL values , Logical connectivity's – AND, OR and NOT,,mplex Integrity Constraints in SQL	CLO 14, CLO 15	T1: 5.2-5.5
15-16	Introduction to Nested Queries – Correlated Nested Queries Set Comparison Operators – Aggregative Operators, Triggers and Active Data bases	CLO 16, CLO 17	T1: 5.6- 5.8
17-18	Introduction to Schema refinement – Problems Caused by redundancy ,Decompositions – Problem related to decomposition	CLO 11	T1: 19.1, 19.1.3
19-21	Functional dependencies, reasoning about FDS ,Lossless join Decomposition , Dependency preserving Decomposition	CLO 12	T2: 19.4-19.8
22-25	Schema refinement in Data base Design, Normal Forms, MVDs, JDs	CLO 13, CLO 14	T2: 19.8-19..9
26-29	Transaction Management: Transaction Concept-Transaction State-Implementation of atomicity and Durability, Concurrent Executions, Serializability , Recoverability, Implementation of Isolation, Testing for Serializability.	CLO 18	T2: 15.1-15.29

Lecture No	Topics to be covered	CLOs	Reference
30-33	Concurrency Control: Lock-Based Protocols –time Stamp Based protocols-,Validation Based Protocols-Multiple Granularity	CLO 19	T2: 16.1, 16.2 T2: 16.3, 16.4
34-37	Recovery System-Failure Classification-storage Structure recovery and Atomicity-Log Based Recovery-,Recovery with, Concurrent Transactions, Buffer Management-Failure with loss of Non Volatile Storage, Advance Recovery Systems-Remote Backup Systems	CLO 20, CLO 21	T2: 17.1 - 17.10
38-39	Overview of Storage and Indexing: Data on External Storage , File Organization and Indexing – Cluster Indexes, Primary and Secondary Indices	CLO 22	T1: 8.1,8.2
40-41	Index data Structures – Hash Based Indexing ,Tree base Indexing – Comparison of File Organizations	CLO 24	T1: 8.3- 8.4
42	Tree Structured Indexing: Intuitions for tree Indexes Indexed Sequential Access Methods (ISAM)	CLO 22	T1: 10 10.2
43	B+ Trees: A Dynamic Index Structure-Search, insert, Delete operations	CLO 22	T1: 10.3 - 10.6
44	Hash Based Indexing: Static Hashing – Extendable hashing ,Linear Hashing –Extendable vs. Liner hashing	CLO 24	T1: 11.1 – 11.4
45	Query Processing	CLO 24	T1:12.1-12.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

Sno	Description	Proposed Action	Relevance with POs	Relevance with PSOs
1	Conversion of ER model into Relational Model	Seminars /Guest Lecture	PO 2, PO 12	PSO 1
2	Practical Implementation of triggers and assertions using PL/SQL	Assignments/ Lab experiments	PO 3, PO 5, PO 12	PSO 2
3	Implementation of Transaction and security restriction using SQL.	Assignments/ Lab experiments	PO 2, PO 5, PO 12	PSO 2

Prepared by:
Ms. K.LaxmiNarayanamma, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**DIGITAL LOGIC DESIGN**				
Course Code	AEC020				
Programme	B.Tech				
Semester	III	CSE | IT			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mrs. G Bhavana, Assistant Professor , ECE				
Course Faculty	Mrs. G Bhavana, Assistant Professor , ECE				

I. COURSE OVERVIEW:

The course will make them learn the basic theory of microprocessor and their applications in detail. Subsequently the course covers important concepts like how to write an assembly language programming. They will learn to write an assembly language programming for interfacing various I/O modules. They will learn to design different advance architectures to design a new communication interfaces.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC005	II	Fundamentals of Electrical and Electronics Engineering	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Digital Logic Design	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Quiz
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignments
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Seminars

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Seminars and Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Quiz and Assignments
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Familiarize the basic concept of number systems, Boolean algebra principles and minimization techniques for Boolean algebra.
II	Analyze Combination logic circuit and sequential logic circuits such as multiplexers, adders, decoders flip flops and latches.
III	Understand about synchronous and asynchronous sequential logic circuits.
IV	Impart the basic understanding of memory organization, ROM, RAM, PLA and PAL.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEC020.01	CLO 1	Understand the basic concept of number systems, binary addition and subtraction for digital systems.	PO 1	3
AEC020.02	CLO 2	Explain 2's complement representation and implement binary subtraction using 1's and 2's	PO 1	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		complements.		
AEC020.03	CLO 3	Discuss about digital logic gates, error detecting and correcting codes for digital systems.	PO 1	3
AEC020.04	CLO 4	Describe the importance of SOP and POS canonical forms with examples.	PO 2	2
AEC020.05	CLO 5	Describe minimization techniques and other optimization techniques for Boolean formulas in general and digital circuits.	PO 2	2
AEC020.06	CLO 6	Evaluate Boolean algebra expressions by minimizing algorithms like sop and pos using Boolean Postulates and theorems.	PO 2	2
AEC020.07	CLO 7	Solve various Boolean algebraic functions using Karnaugh map and Tabulation Method.	PO 2	2
AEC020.08	CLO 8	Understand bi-stable elements and different type's combinational logic circuits.	PO 1	3
AEC020.09	CLO 9	Analyze the design procedures of Sequential logic circuits with the help of registers.	PO 1	3
AEC020.10	CLO 10	Discuss the concept of flip flops and latches by using sequential logic circuits.	PO 2	2
AEC020.11	CLO 11	Differentiate combinational logic circuits with sequential logic circuits along with examples.	PO 4	1
AEC020.12	CLO 12	Understand the concept of memory organization, read only memory and random access memory.	PO 1	3
AEC020.13	CLO 13	Discuss and implement combinational and sequential logic circuits using PLA and PLDs.	PO 1	3
AEC020.14	CLO 14	Explain the concept of memory hierarchy in terms of capacity and access time.	PO 1	3
AEC020.15	CLO 15	Explain about Synchronous and Asynchronous Sequential Circuits: Reduction of state tables for Mealy and Moore machines.	PO 2	2
AEC020.15	CLO 16	Discuss about various memory concepts with respect to temporary and permanent memory organizations.	PO 1	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	2												2	2	
CLO 2	3												1		
CLO 3													3		
CLO 4		2											1		
CLO 5		2													

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 6		3												3	
CLO 7		2												2	
CLO 8	3												2		
CLO 9	2													2	
CLO 10		2													
CLO 11				2											
CLO 12	3														
CLO 13	2												1		
CLO 14	3														
CLO 15		2											2	2	
CLO 16		2											1		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2	SEE Exams	PO 1, PO 2	Assignments	PO 2	Seminars	PO 4
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	NUMBER SYSTEMS AND CODES
Review of number systems, number base conversion; Binary arithmetic: Binary weighted and non-weighted codes; Complements: Signed binary numbers; Error Detection and Correcting Codes; Binary logic.	
UNIT -II	**BOOLEAN ALGEBRA AND GATE LEVEL MINIMIZATION**
Postulates and theorems; representation of switching functions; SOP and POS forms; Canonical forms; Digital logic gates; Karnaugh Maps: Minimization using three variable; four variable; five variable KMaps; Don‘t Care Conditions; NAND and NOR implementation; Other Two-Level Implementation; Exclusive –OR function.	

UNIT -III	DESIGN OF COMBINATIONAL CIRCUITS (CC)
Combinational Circuits: Analysis and Design Procedure; Binary adder and subtractors; Carry Look-a-head adder; Binary multiplier. Magnitude comparator;BCD adder; Decoders; Encoders; Multiplexers; Demultiplexer.	
UNIT-IV	**DESIGN OF SEQUENTIAL CIRCUITS**
Combinational Vs Sequential Circuits ; Latches, Flip Flops: RS flip flop, JK flip flop, T flip flop, D flip flop, Master-Slave Flip flop, Flip Flops excitation functions; Conversion of one flip flop to another flip flop; Shift Registers; Design of Asynchronous and Synchronous circuits; State Table, State diagram, State Reduction and State Assignment for Mealy and Moore Machines..	
UNIT -V	**MEMORY**
Random access memory; Types of ROM; Memory decoding; Address and Data bus; Sequential memory; Cache memory; Programmable logic arrays; Memory hierarchy in terms of capacity and access time	
Text Books:	
1. M. Morris Mano, Digital Design‖, Pearson Education/PHI, 3rdEdition 2001. 2. Charles H. Roth, Jr,Fundamentals of Logic Design‖, Thomson Brooks/Cole, 5thEdition, 2004.	
Reference Books:	
1. C. V. S. Rao, Switching Theory and Logic Design, Pearson Education, 1stEdition, 2005. 2. M. Rafiquzzaman, Fundamentals of Digital Logic & Micro Computer Design‖, John Wiley, 5thEdition, 2005. 3. Zvi. Kohavi, Switching and Finite Automata Theory‖, Tata McGraw-Hill, 2ndEdition 1991.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-5	Understand the need for digital systems,review of number systems, number base conversion	CLO 1	T1:1.1
6-10	Understand the arithmetic operations carried by digital systems.	CLO 4	T1:1.5
11-15	Learn Boolean algebra and Logical operations in Boolean algebra.	CLO 4	T1:2.2
16-20	Identify basic building blocks of digital systems and Minimization using three variable; four variable; five variable K-Maps; Don‘t Care Conditions.	CLO 5	T1:2.8
21-25	Discuss the Bistable multi with triggering methods. Fixed bias, self bias, unsymmetrical triggering, symmetrical triggering.	CLO 2	T1:3.5
26-28	Design functions using universal gates. NAND and NOR implementation; Other Two-Level Implementation; Exclusive –OR function.	CLO 6	T2:0.1
29-30	Discuss the availability of different logic circuits..	CLO 12	T2:3.2
31-35	Design different combinational logic circuits comparators multiplexers.	CLO 14	T1:3.1
36-40	Demonstrate the design of sequential logic circuits.	CLO 10	T1:4.3
41-44	Identify the significance of Master-Slave Flip flop.	CLO 13	T1:6.1
45-52	Design Flip Flops excitation functions; Conversion of one flip flop to another flip flop	CLO 15	R1:5.1
53-58	Understand and analyze the state tables, state diagram and state excitation table.	CLO 16	R1:5.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S. N0	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Practical use of number systems	Seminars / NPTEL/Assignments	PO 1, PO 2	PSO 1
2	Applications of flipflops and latches	Seminars / NPTEL	PO 2, PO 4	PSO 1
3	Designing of circuits using flipflops and latches.	Guest Lecture	PO 1, PO 2	PSO 2

Prepared by:
Mrs. G Bhavana, Assistant Professor,ECE

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**DISCRETE MATHEMATICAL STRUCTURES**				
Course Code	AHS013				
Programme	B.Tech				
Semester	III	CSE | IT			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Ms B Pravallika, Assistant Professor				
Course Faculty	Ms B Dhanalaxmi, Assistant Professor				

I. COURSE OVERVIEW:

The purpose of this course is to provide a clear understanding of the concepts that underlying fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science. It emphasizes mathematical definitions and proofs as well as applicable methods. The course contents include formal logic notation, proof methods; induction, well-ordering; sets, relations; growth of functions; permutations and combinations, counting principles, recurrence equations, trees and more general graphs.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic Principles of Mathematics

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Discrete Mathematical Structures	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✓	Chalk & Talk	✓	Quiz	✓	Assignments	✗	MOOCs
✓	LCD / PPT	✓	Seminars	✗	Mini Project	✓	Videos
✗	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	3	Assignments
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Seminars
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	2	Projects
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	3	Lectures, Assignments
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	1	5 minutes video

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Describe the logical and mathematical foundations, and study abstract models of computation.
II	Illustrate the limitations of predicate logic.
III	Define modern algebra for constructing and writing mathematical proofs
IV	Solve the practical examples of sets, functions, relations and recurrence relations
V	Recognize the patterns that arise in graph problems and use this knowledge for Constructing the trees and spanning trees.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS013.01	CLO 1	Understand logical connectives and compound prepositions for building compound statements.	PO 2	3
AHS010.02	CLO 2	Learn the formal symbols and use the preposition logic and predicate logic to solve problems on logical equivalences and implications.	PO 1, PO 2	3
AHS010.03	CLO 3	Memorize different scientific notations to simplify the logical statements.	PO 1	3
AHS010.04	CLO 4	Prepare valid arguments from the given propositional statements by using rules of inference.	PO 2, PO 4	2
AHS010.05	CLO 5	Identify ordered pairs to form a binary relation from the given sets.	PO 1,PO 2	3
AHS010.06	CLO 6	Construct directed graph and a matrix representation using a binary relation on finite order pairs.	PO 2, PO 3	3
AHS010.07	CLO 7	Identify the properties of relations to check for equivalence relation and partial order relation and compute relations using operations on relations.	PO 1,PO 2	3
AHS010.08	CLO 8	Construct a hasse diagram to recognize the relevant partial ordered sets from the given binary relation.	PO 3	2
AHS010.09	CLO 9	Describe the types of functions (one to one, on-to, bijective, Identity and constant function).	PO 2	3
AHS010.10	CLO 10	Implement the concept of the inverse and recursive functions to get an optimized solution for an appropriate problem.	PO 2, PO 4	2
AHS010.11	CLO 11	Use the concept of lattices (Greatest Lower Bound (GLB) and Least Upper Bound (LUB) to represent a defined finite set in multi-dimension applications.	PO 3	2
AHS010.12	CLO 12	Explain about the properties and types of lattices (bounded and distributive lattice).	PO 1	3
AHS010.13	CLO 13	Construct different algebraic structures by using concepts of groups, sub groups, monoids and rings.	PO 1, PO 3	3
AHS010.14	CLO 14	Understand binomial and multinomial theorems to compute the coefficients for the given expansions.	PO 4	1
AHS010.15	CLO 15	Understand the concept of homomorphism and isomorphism of semi-groups.	PO 1	3
AHS010.16	CLO 16	Analyze the given sets by using inclusion and exclusion principle.	PO 2	3
AHS010.17	CLO 17	Identify the different counting techniques (permutations) related to mathematics and computer science.	PO 1, PO 4	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS010.18	CLO 18	Solve discrete probability and set problems by using permutations and combinatorics.	PO 2	3
AHS010.19	CLO 19	Identify the series of expansion to represent the sequence by using generating functions.	PO 1, PO 4	2
AHS010.20	CLO 20	Identify the general solution for first-order and second-order linear homogeneous recurrence relations.	PO 1, PO 4	2
AHS010.21	CLO 21	Identify the roots of second and higher order linear non-homogeneous recurrence relations.	PO 1, PO 4	2
AHS010.22	CLO 22	Understand the use of graphs and trees as representation tools in a variety of context.	PO 2	3
AHS010.23	CLO 23	Identify Euler's and Hamilton rule for a simple connected graph in NP-complete problems.	PO 1, PO 2	3
AHS010.24	CLO 24	Construct a spanning tree by using search techniques (Depth First Search and Breadth First Search).	PO 2, PO 3	3
AHS010.25	CLO 25	Construct a minimal spanning tree by using Kruskal's and Prim's algorithm in order to obtain a solution for a real time problem.	PO 2, PO 3	3
AHS010.26	CLO 26	Possess the knowledge and skills for employability and to succeed in national and international level competitive exams.	PO 1, PO 4	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1		3											2	3	
CLO 2	3	3												3	
CLO 3	3													3	1
CLO 4		3		1										3	
CLO 5	3	3											2		
CLO 6		3	2											3	1
CLO 7	3	3											2		
CLO 8			2											3	
CLO 9		3											2		1
CLO 10		3		1										3	
CLO 11			2										2		1

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 12	3												2	3	
CLO 13	3		2											3	1
CLO 14				1									2	3	
CLO 15	3													3	
CLO 16		3											2		1
CLO 17	3			1										3	
CLO 18		3											2		
CLO 19	3			1									2		1
CLO 20	3			1										3	
CLO 21	3			1											1
CLO 22		3											2		
CLO 23	3	3												3	
CLO 24		3	2										2		1
CLO 25		3	2											3	
CLO 26	3			1											1

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 3, PO 4	SEE Exams	PO 1, PO 2, PO 3, PO 4	Assignments	PO1, PO 2	Seminars	PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✓	Early Semester Feedback	✓	End Semester OBE Feedback
✗	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	MATHEMATICAL LOGIC AND PREDICATES
Mathematical logic: Statements and notations, connectives, well-formed formulas, truth tables, tautology, equivalence implication; Normal forms: Disjunctive normal forms, conjunctive normal forms, principle disjunctive normal forms, principle conjunctive normal forms. **Predicate calculus:** Predicative logic, statement functions, variables and quantifiers, free and bound variables, rules of inference, consistency, proof of contradiction, automatic theorem proving.	
Unit-II	**RELATIONS, FUNCTIONS AND LATTICES**
Relations: Properties of binary relations, equivalence, transitive closure, compatibility and partial ordering relations, lattices, Hasse diagram;**Functions:** Inverse function, composition of functions, recursive functions. **Lattices:** Lattices as partially ordered sets; Definition and examples, properties of lattices, lattices as algebraic systems, sub lattices, direct product and homomorphism, some special lattices.	
Unit-III	**ALGEBRAIC STRUCTURES AND COMBINATORICS**
Algebraic structures: Algebraic systems, examples and general properties, semi groups and monoids, groups, sub groups, homomorphism, isomorphism, rings. **Combinatory:** The fundamental counting principles, permutations, disarrangements, combinations, permutations and combinations with repetitions, the binomial theorem, multinomial theorem, generalized inclusion exclusion principle.	
Unit-IV	**RECURRENCE RELATION**
Recurrence relation: Generating functions, function of sequences calculating coefficient of generating function, recurrence relations, solving recurrence relation by substitution and generating functions, characteristics roots solution of homogeneous recurrence relation.	
Unit-V	**GRAPHS AND TREES**
Graphs: Basic concepts of graphs, isomorphic graphs, Euler graphs, Hamiltonian graphs, planar graphs, graph coloring, digraphs, directed acyclic graphs, weighted digraphs, region graph, chromatic numbers **Trees:** Trees, spanning trees, minimal spanning trees.	
Text Books:	
. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, India, 1 Edition, 1997. . Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematics", Prentice Hall of India Learning Private Limited, New Delhi, India, 2 Edition, 2010.	
Reference Books:	
1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Tata Mcgraw-Hill, New Delhi, India, 6th Edition, 2012. 2. D S Chandrashekaraiah, "Mathematical Foundations of Computer Science (Discrete Structures)", Prism Books Pvt. Ltd., 2nd Reprint, 2007. 3. C. L. Liu, D. P. Mohapatra, "Elements of Discrete Mathematics", Tata Mcgraw-Hill, India, 3rd Edition, 2008. 4. Ralph P. Grimaldi, B. V. Ramana, "Discrete and Combinatorial Mathematics - An Applied Introduction", Pearson Education, India, 5th Edition, 2011. 5. D. S. Malik, M. K. Sen, "Discrete Mathematical Structures: Theoryand Applications", Thomson Course Technology, India, 1st Edition, 2004.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-3	Interpret statements and notations, connectives	CLO 1	T1:1.1,1.2
4-6	Build well-formed formulas, truth tables, tautology	CLO 2	T1: 1.2.7, 1.2.8
7	Define equivalence implications, DNF, CNF, PDNF, and PCNF.	CLO 3	T1:1.2.9, 1.2.11, 1.3
8 – 14	Illustrate predicative logic, statement functions, variables and quantifiers, free and bound variables, rules of inference, consistency	CLO 4	T1:1.5, 1.4.2,1.4.3
15-20	Recall proof of contradiction, automatic theorem proving, properties of binary relations, equivalence, transitive closure, Compatibility and partial ordering relations.	CLO 4, CLO 5, CLO 6	T1:1.4.3, 1.4.4, 2.3.1, 2.3.2
21-25	Construct Lattices, Hasse diagram, and inverse function composition of functions, recursive functions, Lattices as partially ordered sets; Definition and examples, properties of lattices, lattices as algebraic systems, sub lattices, direct product and homomorphism, some special lattices.	CLO 8, CLO 9, CLO 10	R2:4.3 T1:2.4.1, 2.4.2,2.4.3, 4.1
26-29	Demonstrate Algebraic systems, examples and general properties, semi groups and monoids, groups and subgroups, homomorphism, isomorphism, rings.	CLO 13	T1:3.1,3.2 R2:6.2-6.8
30-35	Apply the fundamental counting principles, permutations, disarrangements, combinations, permutations and combinations with repetitions, the binomial theorem, multinomial theorem, generalized inclusion exclusion principle.	CLO 14, CLO 15, CLO 16, CLO 18	R2: 7.1-7.6
36-38	Describe generating functions, function of sequences calculating coefficient of generating function.	CLO 19	R2:8.1
39-44	Solve recurrence relations, solving recurrence relation by substitution and generating funds, Characteristics roots solution of homogeneous recurrence relation	CLO 20, CLO 21	R2:8.2, 8.3
45-48	Define basic concepts of graphs, isomorphic graphs.	CLO 22	R2: 9.1-9.3
49-54	Describe Euler graphs, Hamiltonian graphs, planar graphs, graph coloring.	CLO 23	R2: 9.8, 9.9, 10.1, 10.2
55-59	Describe digraphs, directed acyclic graphs, weighted digraphs, region graph, and chromatic numbers.	CLO 23	T2:5.5, 5.9, 5.10
60	Define trees, spanning trees, minimal spanning trees.	CLO 24, CLO 25	R2:10.4, 10.6,10.7

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Modular arithmetic, RSA algorithm	Seminars / Guest Lectures/ NPTEL	PO 1, PO 2	PSO 1
2	Pigeon hole principle, vector implementation of sets, cardinality of finite sets Peano postulates	Seminars / NPTEL	PO 2	PSO 2
3	Encourage students to do innovate problems with real time examples	NPTEL	PO 1,PO 3	PSO 2

Prepared by:
Ms B Pravallika, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**DESIGN AND ANALYSIS OF ALGORITHMS**				
Course Code	AIT001				
Programme	B.Tech				
Semester	III	IT			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	2	1
Chief Coordinator	Dr. B.V. Rao, Professor, IT				
Course Faculty	Mr. Ch.Suresh Kumar Raju, Assistant Professor,CSE				

I. COURSE OVERVIEW:

The primary objective of this course is to introduce the concept of algorithm as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs. The course consists of a strong mathematical component in addition to the design of various algorithms.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	ACS001	I	Computer Programming
UG	ACS002	II	Data Structures

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Design And Analysis Of Algorithms	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✔	Mini Project	✔	Videos
✔	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**			**Total Marks**
Type of Assessment	CIE Exam	Quiz	AAT	
CIA Marks	20	05	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz - Online Examination
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

Alternative Assessment Tool (AAT)
This AAT enables faculty to design own assessment patterns during the CIA. The AAT converts the classroom into an effective learning centre. The AAT may include tutorial hours/classes, seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), five minutes video, MOOCs etc.
The AAT chosen for this course is given in section XI.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Assignments, Tutorials
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignments
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Mini Projects
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Projects

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Lectures, Assignments
PSO 2	**Software Engineering Practices**: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Projects
PSO 3	**Successful career and entrepreneurship:** Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies	2	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Calculate performance of algorithms with respect to time and space complexity.
II	Illustrate the graph traversals and tree traversals to solve the problems
III	Demonstrate the concepts greedy method and dynamic programming for several applications like knapsack problem, job sequencing with deadlines, and optimal binary search tree, TSP.
IV	Illustrating the methods of backtracking and branch bound techniques to solve the problems like n-queens problem, graph colouring and TSP respectively

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT001.01	CLO 1	Use big O-notation formally to give asymptotic upper bounds on time and space complexity of algorithms	PO 1, PO 2	2
AIT001.02	CLO 2	Explain the use of big-Omega, big-Theta, and little-o notations to describe the amount of work done by an algorithm.	PO 1, PO 2	2
AIT001.03	CLO 3	Use recurrence relations to determine the time complexity of recursive algorithms.	PO 2	2
AIT001.04	CLO 4	Evaluate and compare different algorithms using worst, average, and best-case analysis	PO 3	2
AIT001.05	CLO 5	Solve elementary recurrence relations, e.g., using some forms of a Master Theorem. Give examples that illustrate time-space trade-offs of algorithms.	PO 2, PO 3	3
AIT001.06	CLO 6	Demonstrate the ability to evaluate algorithms, to select from a range of possible options, to provide justification for that selection, and explain an implementation of the algorithm in a particular context.	PO 2, PO 12	3
AIT001.07	CLO 7	Describe and use major algorithmic techniques (brute-force, greedy, divide-and-conquer, dynamic programming, and graph explorations).	PO 3, PO 4	3
AIT001.08	CLO 8	Use a divide-and-conquer algorithm to solve an appropriate problem	PO 2, PO 4	2
AIT001.09	CLO 9	Use a greedy approach to solve an appropriate problem and determine if the greedy rule chosen leads to an optimal solution.	PO 2	3
AIT001.10	CLO 10	Use dynamic programming to develop the recurrence relations and to solve an appropriate problem.	PO 4	3
AIT001.11	CLO 11	Use recursive backtracking to solve a problem such as navigating a maze	PO 1, PO 2, PO 4	3
AIT001.12	CLO 12	Explain the major graph algorithms and their analysis and employ graphs to model application problems.	PO 5,PO 11	3
AIT001.13	CLO 13	Determine appropriate algorithmic approaches to apply to a given problem.	PO 1	3
AIT001.14	CLO 14	Describe heuristic problem-solving methods.	PO 5, PO 9, PO 11	3
AIT001.15	CLO 15	Understand the mapping of real-world problems to algorithmic solutions	PO 2, PO 3, PO 9	3
AIT001.16	CLO 16	Define the classes P and NP.	PO 2	3
AIT001.17	CLO 17	Explain the significance of NP-completeness.	PO 1, PO 2	3
AIT001.18	CLO 18	Provide examples of NP-complete problems	PO 2	2
AIT001.19	CLO 19	Explain the impact of NP-complete problems to different application domains.	PO 1	2
AIT001.20	CLO 20	Explain the difference between NP-complete and NP-hard.	PO 4	2
AIT001.21	CLO 21	Prove that a problem is NP-complete.	PO 2	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT001.22	CLO 22	Use reduction techniques between problems.	PO 1, PO 4	2
AIT001.23	CLO 23	Demonstrate the use of approximation algorithms for NP-hard problems	PO 1	2
AIT001.24	CLO 24	Explain the Halting problem and other un-decidable problems.	PO 2	3
AIT001.25	CLO 25	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations	PO 12	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2											2		
CLO 2	3	2											2		
CLO 3		3												2	
CLO 4			2										3		
CLO 5		2	2										2		
CLO 6		2										2	2		
CLO 7			2	2										2	
CLO 8		3		2									2		
CLO 9		3													
CLO 10				2										3	
CLO 11	2	2		3										2	
CLO 12					2							2	2		
CLO 13	2													2	
CLO 14					2				2			2		2	
CLO 15		2	3						2				2	3	
CLO 16		2												2	
CLO 17	2	2												2	

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO18		3												2	
CLO19	2												2		
CLO20				2										2	
CLO21		2													
CLO22	2			2											
CLO23	2														
CLO24		3												3	
CLO25												2			2

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 3	SEE Exams	PO 2	Assignments	PO 1	Seminars	PO 6
Laboratory Practices	PO 2	Student Viva	PO 2	Mini Project	PO 11	Certification	-
Term Paper	PO 6						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Assessment of course outcomes (by feedback, once)	✔	Student feedback on faculty (twice)
✔	Assessment of mini projects by experts		

XIII. SYLLABUS:

UNIT-I	INTRODUCTION
Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation-Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized complexity Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.	
UNIT-II	**SEARCHING AND TRAVERSAL TECHNIQUES**
Searching and traversal techniques, Disjoint set operations, union and find algorithms, Efficient non-recursive binary tree traversal algorithms, spanning trees, Graph traversals-Breadth first search, Depth first search, connected components, Bi-connected components.	
UNIT-III	**GREEDY METHOD AND DYNAMIC PROGRAMMING**
General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem. Dynamic Programming: General method,	

applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Single source shortest path problem, Travelling sales person problem.	
UNIT-IV	**BACKTRACKING AND BRANCH AND BOUND**
Backtracking: General method, applications-8-queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles. Branch and Bound: General method, applications-0/1 knapsack problem-LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling sales person problem.	
UNIT-V	**NP-HARD AND NP-COMPLETE PROBLEMS**
NP-Hard and NP-Complete problems: Basic concepts, Non-deterministic algorithms, the classes NP -Hard and NP, NP Hard problems, clique decision problem, chromatic number decision problem, Cook's theorem.	
Text Books:	
1. Horowitz, Satraj Sahni, Sanguthevar Rajasekharan, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition, 2015. 2. Ellis 2. Alfred V. Aho, John E. Hop croft, Jeffrey D, "The Design And Analysis Of Computer Algorithms", Pearson India, 1st Edition, 2013.	
Reference Books:	
1. Levi tin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rdEdition, 2012. 2. Goodrich, M. T. R Tamassia, "Algorithm Design Foundations Analysis and Internet Examples", John Wiley and Sons, 1st Edition, 2001. 3. Base Sara Allen Vangelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education, 3rdEdition ,1999	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic's to be covered	Course Learning Outcomes (CLOs)	Reference
1	Algorithm, Pseudo code for expressing algorithm	CLO 4	T1:1.1-1.2
2-5	Space complexity, time complexity Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation	CLO 1	T1:1.3
6-7	Probabilistic analysis, Amortized complexity, Divide and conquer – general method applications, Binary search, Quick sort,Merge sort, Strassen's matrix multiplication	CLO 6	T1: 1.4
8-15	non-recursive binary tree traversal, Disjoint set operations, union and find algorithms	CLO 7	T1:3.1,3.3 T1:3.5,3.6 T1:3.8
16-17	spanning trees, Graph traversals-Breadth first search, Depth first search, AND/OR graphs, Game trees	CLO 3	T1 :6.1
18-19	Connected components, Bi-connected components	CLO	T1: 2.5
20-22	Greedy Method: applications Job sequencing with deadlines, 0/1 knapsack problem Minimum cost spanning trees, Single source shortest path problem	CLO 12	T1: 6.2
23-24	Dynamic Programming: General method, applications Optimal binary search trees, matrix chain multiplication, 0/1 knapsack problem, All pairs shortest path problem, Single source shortest path problem , Travelling sales person problem	CLO 12	T1:11.3
25-26	Backtracking: General method, applications n-queen problem, sum of subsets problem graph coloring, Hamiltonian cycles	CLO	T1:6.3,6.4

Lecture No	Topic's to be covered	Course Learning Outcomes (CLOs)	Reference
27-32	Branch and Bound: General method, applications : Travelling sales person problem0/1 knapsack problem- LC Branch and Bound solution FIFO Branch and Bound solution	CLO 9	T1: 4.1 T1:4.3,4.5 T1:4.6,4.9
33-43	NP-Hard and NP-Complete problems Basic concepts	CLO 10	T1:5.15.3 T1:5.5 T1:5.7-5.9
44-51	Distinguish non-deterministic algorithms, NP - Hard and NP Complete classes NP Hard problems, Cook's theorem	CLO 11 CLO 24	T1: 7.17.5 T1:11.2

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Skip lists, Problem reductions, Polynomial time and intractability	Seminars / Guest Lectures/ NPTEL	PO 1, PO 2, PO 3	PSO 1
2	String matching: Knuth-Morris-Pratt, Boyer-Moore, Edit distance, Longest increasing subsequence, Smith-Waterman algorithm	Seminars / Guest Lectures/ NPTEL	PO 2, PO 5	PSO2
3	Encourage students to write programs based on the taught algorithms to solve problems	Assignments / Laboratory Practices	PO 1,PO 3, PO 4	PSO 2

Prepared by:
Mr. Ch Suresh Kumar Raju, Assistant Professor.

HOD, IT

IV SEMESTER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA**				
Course Code	ACS003				
Programme	B.Tech				
Semester	III	CSE			
	IV	IT			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. G Chandra Sekhar, Assistant Professor				
Course Faculty	Mr. E Sunil Reddy, Assistant Professor				

I. COURSE OVERVIEW:

This course explains the fundamental ideas behind the object oriented approach to programming. Knowledge of java helps to create the latest innovations in programming. Like the successful computer languages that came before, java is the blend of the best elements of its rich heritage combined with the innovative concepts required by its unique environment. This course involves OOP concepts, java basics, inheritance, polymorphism, interfaces, packages, Exception handling, multithreading, files, JDBC and GUI components. This course is presented to students by power point projections, course handouts, lecture notes, assignments, objective and subjective tests.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS001	I	Computer Programming	3
UG	ACS002	II	Data Structures	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Object Oriented Programming through JAVA	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Videos
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Assignments
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1	Assignments

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	3	Lectures, Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	3	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	1	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the basic object oriented programming concepts and apply them in problem solving.
II	Illustrate inheritance concepts for reusing the program.
III	Demonstrate on the multi-tasking by using multiple threads.
IV	Develop data-centric applications using JDBC.
V	Understand the basics of java console and GUI based programming.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CACS003.01	CLO 1	Use object oriented programming concepts to solve real world problems.	PO 1, PO 2	3
CACS003.02	CLO 2	Explain the concept of class and objects with access control to represent real world entities.	PO1,PO2, PO3	3
CACS003.03	CLO 3	Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.	PO1,PO3	3
CACS003.04	CLO 4	Use overloading methodology on methods and constructors to develop application programs.	PO 3	1
CACS003.05	CLO 5	Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.	PO 1,PO2	3
CACS003.06	CLO 6	Describe the concept of interface and abstract classes to define generic classes.	PO1,PO2,PO3	2
CACS003.07	CLO 7	Use dynamic and static polymorphism to process objects depending on their class.	PO 1,PO 4	2
CACS003.08	CLO 8	Illustrate different techniques on creating and accessing packages (fully qualified name and import statements).	PO1,PO2,PO4	2
CACS003.09	CLO 9	Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions.	PO 2 ,PO 3	2
CACS003.10	CLO 10	Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).	PO 1	2
CACS003.11	CLO 11	Use multithreading concepts to develop inter process communication.	PO 1,PO 2,PO 4	3
CACS003.12	CLO 12	Understand and implement concepts on file streams and operations in java programming for a given application programs.	PO 1,PO 2,PO 5	3
CACS003.13	CLO 13	Describe the backend connectivity process in java program by using JDBC drivers.	PO 5	1
CACS003.14	CLO 14	Develop java application to interact with database by using relevant software component (JDBC Driver).	PO3,PO 5	3
CACS003.15	CLO 15	Understand the process of graphical user interface design and implementation using AWT or swings.	PO1,PO2,PO3	3
CACS003.16	CLO 16	Use different layouts (Flow Layout, Boarder Layout, Grid Layout, Card Layout) to position the controls for developing graphical user interface.	PO1,PO2,PO3	2
CACS003.17	CLO 17	Build the internet-based dynamic	PO1,PO2,PO3	2

		applications using the concept of applets.		
CACS003.18	CLO 18	Develop applets that interact abundantly with client environment and deploy on the server.	PO 2, PO 3	2
CACS003.19	CLO 19	Knowledge on usage of graphical IDE for design and implementation of real time applications in java.	PO1,PO2,PO 5	3
CACS003.20	CLO 20	Posses the knowledge and skills for employability and to succeed in national and international level competitive exams.	PO 12	1

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2											3	3	1
CLO 2	3	2	3										1	1	
CLO 3	2		3											1	
CLO 4			2										3		
CLO 5	3	2											2	3	
CLO 6	3	2	2										2	3	
CLO 7	3			1										1	
CLO 8	1	2		1									1		
CLO 9		2	1												
CLO 10	3													3	
CLO 11	3	2		3										1	
CLO 12	2	2			2								1	3	
CLO 13					2									3	
CLO 14			3		2									2	
CLO 15	1	2	3										1	3	
CLO 16	1	1	3											2	
CLO 17	1	2	1											3	
CLO 18		1	3											2	
CLO 19	2	2			1								3	3	
CLO 20												2			1

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2	SEE Exams	PO 1	Assignments	-	Seminars	PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	PO 5	Certification	PO 12
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	OOPS CONCEPTS AND JAVA PROGRAMMING	Classes:09
OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm. Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring string class.		
UNIT-II	**MULTIPLE INHERITANCE ,INTERFACES AND PACKAGES**	**Classes:09**
Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface; Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.		
UNIT-III	**EXCEPTION HANDLING AND MULTITHREADING**	**Classes:09**
Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes. Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.		
UNIT-IV	**FILES AND CONNECTING TO DATABASE**	**Classes:09**
Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class: Connecting to Database, querying a database and processing the results, updating data with JDBC.		
UNIT-V	**GUI PROGRAMMING AND APPLETS**	**Classes:09**
GUI Programming with Java: The AWT class hierarchy, introduction to swing, swings Vs AWT, hierarchy for swing components. Containers: JFrame, JApplet, JDialog, Jpanel, overview of some swing components: JButton, JLabel, JTextField, JTextArea, simple applications. Layout management: Layout manager types, border, grid and flow.		

Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.
Text Books:
1. Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill, 1st Edition, 2013. 2. Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 7th Edition, 2011.2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2012. 3. T.Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.
Reference Books:
1. P.J.Dietel and H.M.Dietel , "Java How to program", Prentice Hall, 6th Edition, 2005. 2. P.Radha Krishna , "Object Oriented programming through Java", CRC Press, 1st Edition, 2007. 3. S.Malhotra and S. Choudhary, " Programming in Java", Oxford University Press, 2nd Edition, 2014 .

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Understand and use OOP concepts.	CLO 1	T1: 1.5, 4.2 R2:1.2
3-4	Understand variables and program.	CLO 1	T1:1.4, 2.2 R2: 2.1
5-6	Understand operators and expressions and program.	CLO 1	T1:2.6-.14, R2:3.5, 3.6
6-7	Understand the program on expressions, operators.	CLO 2	T1: 2.15
8-10	Use of arrays, formatted input and output.	CLO 4	T1:5.1-5.4 R2:3.7
11-12	Understand the methods, parameter passing and constructors.	CLO 4	T1:22.8 R1:4.15
13	Explain the concept of static fields and methods.	CLO 4	T1: 6.2-6.7 R2:4.1.5,
14	Use recursion and their applications.	CLO 5	T1:4.10, 4.11, 5.7,
15	Relate the concept of class and to the sub class.	CLO 6	T1:7.1-7.3
16	Explain the concept of final keyword with their usage	CLO 6	T1:7.4, 7.5, 7.13, 7.14
17	List the methods of polymorphism	CLO 6	T1: 7.9-7.12
18	Relate interfaces and abstract classes	CLO 6	T1:8.1-8.5 R2: 4.4
19	Explain the concept of abstract classes	CLO 7	T1:8.6, 8.7 R2:4.4
20-21	Define basic concepts of packages	CLO 8	T1:9.1R2 :4.3

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
22	Illustrate the concept of exception handling	CLO 9	T1: 10.1,10.11 R2:5.5,5.6
23	Understand the concept of re-throwing exceptions	CLO 10	T1:10.1 R2:5.8
24-25	Define multithreading and able to explain the differences between multiple processes and states	CLO 11	T1:12.1 R2: 6.2
26-27	Analyze the problem of producer consumer pattern	CLO 11	T1:12.2 R2:6.3, 6.4, 6.5, 6.8
28	Explain files and their types of reading and writing data to the files	CLO 12	T1:11.3 R2: 7.2, 7.3
29	Understand the concept of text and binary input/output.	CLO 12	T1: 1.12 R2:7.1
30-31	Identify various random access file operations.	CLO 12	T1:11.10 R2:7.6
32-33	Analyze the methods of file class	CLO 12	T1:11.12
34	Relate java program to JDBC	CLO 13	R2:9.2
35-36	Manage the connection to the data bases	CLO 13	R2:9.4
37-38	Understand the process of updating the data bases using JDBC	CLO 14	R2:9.4
39	Classify the AWT class hierarchy	CLO 15	T1:17.1 R2:10.2
40-41	List the swing components	CLO 15	T1:17.2
42-43	Explain the types of layout managers	CLO 16	T1:17.7,
44-45	Explain the differences between applets and applications, Understand the life cycle of applet, Explain the method of parameter passing to applets	CLO 17	T1:18.2

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed Actions	Relevance with POS	Relevance with PSOS
1	Producer consumer problem and inner classes.	Seminars / Guest Lectures / NPTEL	PO 1, PO 2, PO 3	PSO 1
2	Collection framework.	Seminars / Guest Lectures / NPTEL	PO 2, PO 5	PSO 2
3	Encourage students to develop web applications using IDE's.	Assignments / Laboratory Practices	PO 1, PO 3, PO 4	PSO 2

Prepared by:
Mr. E Sunil Reddy, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	OPERATING SYSTEMS				
Course Code	ACS007				
Programme	B.Tech				
Semester	IV	CSE	IT		
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. N Bhaswanth, Assistant Professor, IT				
Course Faculty	Ms. B Pravallika, Assistant Professor, IT				

I. COURSE OVERVIEW:

This course provides a comprehensive introduction to operating system design concepts, data structures and algorithms. The course is designed to provide in-depth critique on the problems of resource management and scheduling, concurrency and synchronization, memory management, file management, peripheral management, protection and security. This course is intended to discuss the topics in a general setting not tied to any one particular operating system. Throughout the course, the study of practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows are considered as case studies

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	ACS002	II	Data Structures
UG	ACS004	III	Computer Organization and Architecture

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Operating Systems	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignment
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	1	Assignment
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Seminar
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the fundamental principles of the operating system, its services and functionalities.
II	Illustrate the concepts of processes, inter-process communication, synchronization and scheduling.
III	Understand different types of memory management viz. virtual memory, paging and segmentation.
IV	Identify the reasons for deadlock and understand the techniques for deadlock detection,

	prevention and recovery.
V	Understand the need of protection and security mechanisms in computer systems.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CACS007.01	CLO 1	Describe the structure of operating system and basic architectural components involved in operating system design.	PO 1, PO 2	2
CACS007.02	CLO 2	Describe how the computing resources are managed by the operating system.	PO 1, PO 4	2
CACS007.03	CLO 3	Understand the objectives and functions of modern operating systems.	PO 3	2
CACS007.04	CLO 4	Analyze and design the applications to run in parallel either using process or thread models of different operating system	PO 1	3
CACS007.05	CLO 5	Understand and analyze implementation of virtual memory	PO 2	2
CACS007.06	CLO 6	Understand the various resource management techniques for timesharing and distributed systems.	PO 3	2
CACS007.07	CLO 7	Describe the mutual exclusion, deadlock detection in operating system	PO 3	2
CACS007.08	CLO 8	Describe the common algorithms used for both pre-emptive and non-pre-emptive scheduling of tasks in operating systems, such a priority and performance comparison	PO 2, PO 4	1
CACS007.09	CLO 9	Understand the difference between a process and a thread	PO 1	3
CACS007.10	CLO 10	Explain the state diagram that describes the states and state transitions during the whole lifetime of a process; likewise, interpret such a state transition diagram	PO 1, PO 3	2
CACS007.11	CLO 11	Identify the mapping between virtual memory address into a physical address	PO 2, PO 4	1
CACS007.12	CLO 12	Explain how a shared memory area can be implemented using virtual memory addresses in different processes	PO 5	1
CACS007.13	CLO 13	Identify the need of memory management in operating systems and understand the limits of fixed memory allocation schemes	PO 3	1
CACS007.14	CLO 14	Understand the fragmentation in dynamic memory allocation, and identify dynamic allocation approaches	PO 1, PO 5	2
CACS007.15	CLO 15	Understand how program memory addresses relate to physical memory addresses, memory management in base-limit machines, and swapping	PO 1, PO 2	2
CACS007.16	CLO 16	Understand the mechanisms adopted for file distribution in applications	PO 2	2
CACS007.17	CLO 17	Describe different Mass storage structure and	PO 2, PO 4	1

		I/O systems		
CACS007.18	CLO 18	Understand issues related to file system interface and implementation, disk management	PO 2, PO 3	1
CACS007.19	CLO 19	Identify the mechanisms adopted for file sharing in distributed applications	PO 1, PO 5	1
CACS007.20	CLO 20	Understand the concepts of Storage Management, disk management and disk scheduling	PO 1, PO 3	2
CACS007.21	CLO 21	Understand the concept of deadlock in operating systems and how they can be implemented in multiprogramming system	PO 2	2
CACS007.22	CLO 22	Identify how deadlock can occur and know how it can be prevented or avoided	PO 1, PO 3	1
CACS007.23	CLO 23	Describe the protection and security aspects of operating systems	PO 5	1
CACS007.24	CLO 24	Understand types of security risks in operating system and the role of operating system in establishing security	PO 1, PO 3	1
CACS007.25	CLO 25	Identify different protection and security mechanisms in operating system	PO 1, PO 2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2											1		
CLO 2	3			1									1		
CLO 3			2												
CLO 4	3												1		
CLO 5		2													
CLO 6			2										1		
CLO 7			2										1		
CLO 8		1		1											
CLO 9	3												1		
CLO 10	3		1										1		
CLO 11		2		1											
CLO 12					1								1		
CLO 13			1												

CLO 14	3				1								1		
CLO 15	2	2													
CLO 16	2														
CLO 17		2		1									1		
CLO 18		2	1												
CLO 19	2				1								1		
CLO 20	3		2										1		
CLO 21		2													
CLO 22	2		1										1		
CLO 23					1										
CLO 24	2		1										1		
CLO 25	3	2											1		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2, PO 3, PO 4, PO5	SEE Exams	PO 1,PO 2, PO 3, PO 4, PO5	Assignments	PO 2, PO 3	Seminars	PO 4, PO 5
Laboratory Practices	PO 1	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	**INTRODUCTION**
Operating systems objectives and functions: Computer system architecture, operating systems structure, operating systems operations; Evolution of operating systems: Simple batch, multi programmed, time shared, personal computer, parallel distributed systems, real time systems, special purpose systems, operating system services, user operating systems interface; Systems calls: Types of systems calls, system programs, protection and security, operating system design and implementation, operating systems structure, virtual machines	
Unit-II	**PROCESS AND CPU SCHEDULING, PROCESS COORDINATION**
Process concepts: The process, process state, process control block, threads; Process scheduling: Scheduling queues, schedulers, context switch, preemptive scheduling, dispatcher, scheduling criteria, scheduling algorithms, multiple processor scheduling; Real time scheduling; Thread scheduling; Case studies Linux windows; Process synchronization, the critical section problem; Peterson‘s solution, synchronization hardware, semaphores and classic problems of synchronization, monitors.	

Unit-III	MEMORY MANAGEMENT AND VIRTUAL MEMORY
Logical and physical address space: Swapping, contiguous memory allocation, paging, structure of page table. Segmentation: Segmentation with paging, virtual memory, demand paging; Performance of demand paging: Page replacement, page replacement algorithms, allocation of frames, thrashing.	
Unit-IV	**FILE SYSTEM INTERFACE, MASS-STORAGE STRUCTURE**
The concept of a file, access methods, directory structure, file system mounting, file sharing, protection, file system structure, file system implementation, allocation methods, free space management, directory implementation, efficiency and performance; Overview of mass storage structure: Disk structure, disk attachment, disk scheduling, disk management, swap space management; Dynamic memory allocation: Basic concepts; Library functions.	
Unit-V	**DEADLOCKS, PROTECTION**
System model: Deadlock characterization, methods of handling deadlocks, deadlock prevention, dead lock avoidance, dead lock detection and recovery form deadlock system protection, goals of protection, principles of protection, domain of protection, access matrix, implementation of access matrix, access control, revocation of access rights, capability based systems, language based protection.	
Text Books:	
1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", Wiley StudentEdition, 8th Edition, 2010.. 2. William Stallings, "Operating System- Internals and Design Principles", Pearson Education, 6th Edition, 2002.	
Reference Books:	
1. Andrew S Tanenbaum, "Modern Operating Systems", PHI, 3rd Edition, 2007. 2. D. M. Dhamdhere, "Operating Systems a Concept based Approach", Tata McGraw-Hill, 2nd Edition, 2006	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1 - 2	Computer system architecture, operating systems structure, operating systems operations.	CLO 1	T2: 2.1 T1: 1.1 - 1.5
3 - 4	Evolution of operating systems: Simple batch, multi programmed, time shared, personal computer, parallel distributed systems, real time systems, special purpose systems.	CLO 6	T2: 2.2
5 - 6	Operating system services, user operating systems interface. Systems calls: Types of systems calls, system programs.	CLO 2	T1: 2.1 - 2.5
7 - 8	Protection and security, operating system design and implementation, operating systems structure, virtual machines.	CLO 5	T1: 2.6 - 2.8
9 - 10	The process, process state, process control block, threads.	CLO 10	T1: 3.1 -3.4 T2: 3.1 -3.4
11 - 14	Process scheduling: Scheduling queues, schedulers, context switch, preemptive scheduling, dispatcher, scheduling criteria, scheduling algorithms, multiple processor scheduling.	CLO 8	T1: 5.2 - 5.3
15	Real time scheduling; Thread scheduling.	CLO 8	T1: 5.4 -5.5 T2:10.1-10.2
16	Case studies - Linux, Windows;	CLO 10	T1:5.6,21.4 T2: 8.3 -8.5
17 - 19	Process synchronization, the critical section problem, Peterson's solution, synchronization hardware.	CLO 7	T1: 6.1 - 6.4
20 - 21	Semaphores and classic problems of synchronization, monitors.	CLO 7	T1: 6.5 -6.7 T2: 6.7 -6.8,

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
			6.10
22 - 24	Swapping, contiguous memory allocation, paging, structure of page table, Segmentation with paging.	CLO 11	T1: 8.1 - 8.3
25 - 26	Virtual memory, demand paging, performance of demand paging.	CLO 13	T1: 8.4 -8.6 T1: 9.1 -9.2
27 - 29	Page replacement: Page replacement algorithms, allocation of frames, thrashing.	CLO 15	T1: 9.4 - 9.6
30- 31	The concept of a file, access methods, directory structure.	CLO 18	T1:10.1-10.3
32 - 35	File system mounting, file sharing, protection, file system structure, file system implementation.	CLO 18	T1:10.4-10.6 T1:11.1-11.2
36 - 38	Allocation methods, free space management, directory implementation, efficiency and performance.	CLO 19	T1: 11.3- 11.6
39 - 40	Overview of mass storage structure: Disk structure, disk attachment, disk scheduling, disk management, swap space management.	CLO 20	T1:12.1 - 12.6
41 - 42	Dynamic memory allocation: Basic concepts; Library functions.	CLO 19	T1:12.7 - 12.8
43 - 45	Deadlock characterization, methods of handling deadlocks.	CLO 21	T1: 7.1 - 7.2
46 - 50	Deadlock prevention, dead lock avoidance, dead lock detection and recovery form deadlock system protection.	CLO 22	T1: 7.3 - 7.7
51 - 52	Goals of protection, principles of protection, domain of protection.	CLO 23	T1:14.1 - 14.3
53 - 55	Access matrix, implementation of access matrix, access control, revocation of access rights.	CLO 25	T1:14.4 - 14.7
56 - 58	Capability based systems, language based protection.	CLO 25	T1:14.8 - 14.9

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S no	Description	Proposed actions	Relevance with pos	Relevance with psos
1	Interrupts, Exceptions, and System Calls.	Assignments	PO 2, PO 3	PSO 1
2	Multicore Programming, Multithreading Models	Seminars / Guest Lectures / NPTEL	PO 2, PO 3	PSO 1
3	Free Space Management, I/O Systems	Seminars / NPTEL	PO 1, PO 3	PSO 1

Prepared by:
Ms. B Pravallika, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**SOFTWARE ENGINEERING**				
Course Code	AHS008				
Programme	B.Tech				
Semester	IV	IT			
	III	CSE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. A.Praveen, Assistant Professor,IT				
Course Faculty	Ms. B.Dhana Laxmi, Assistant Professor,IT				

I. COURSE OVERVIEW:

The Present course concentrates on developing basic understanding about various activities that are involved in a software development. This course enables the student to develop necessary skills for developing a product or applications. The course focuses on all activities involved in software development (communication, planning, modeling, construction, deployment).In this course; students will gain a broad understanding of the discipline of software engineering and its application to the development and management of software systems. Student can implement and get knowledge about development of the software and gains knowledge of basic engineering methods and practices, and their appropriate application. A general understanding of software process models such as the waterfall and evolutionary models. An understanding of the role of project management including planning, scheduling, risk management, etc. An understanding of software requirements and the SRS document and different software architectural styles, implementation issues such as modularity and coding standards. An understanding of approaches to verification and validation including static analysis, and reviews.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	-	-	Basic knowledge of computer hardware and software

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Software Engineering	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Level	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Guest Lectures
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignments
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Seminars
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Assignments

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	3	Lectures, Assignments
PSO2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	3	Guest Lectures
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	2	Seminars

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Learn how to elicitate requirements and develop software life cycles.
II	Understand the design considerations for enterprise integration and deployment.
III	Analyze quality assurance techniques and testing methodologies.
IV	Understand implementation issues such as modularity and coding standards.
V	Prepare a project plan for a software project that includes estimates of size and effort, a schedule, resource allocation, configuration control, and project risk.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS008.01	CLO 1	Understand the key concerns that are common to all software development processes.	PO 1, PO3	3
ACS008.02	CLO 2	Identify the appropriate process models, approaches and techniques to manage a given software development process.	PO4	2
ACS008.03	CLO 3	Identify the approach to risks management through risk identification, risk measurement and risk mitigation.	PO1	3
ACS008.04	CLO 4	Use the concept of Earned Value Analysis (EVA) to measure the projects progress at any given point in time, forecasting its completion date and final cost, and analyzing variances in the schedule and budget as the project proceeds.	PO 2	2
ACS008.05	CLO 5	Memorize project planning activities that accurately help in selection and initiation of individual projects and of portfolios of projects in the enterprise.	PO 1	3
ACS008.06	CLO 6	Identify dependability and security issues that affect a given software product.	PO 2	2
ACS008.07	CLO 7	Use the concept of classical analysis to determine the acceptance criteria as part of specification.	PO 3	2
ACS008.08	CLO 8	Memorize the importance of eliciting the requirements for a software product and translate these into a documented design.	PO 2	2
ACS008.09	CLO 9	Understand the concept of data dictionary in order to manage the details in large-scale systems, to locate errors and omissions in the system.	PO 1	3
ACS008.10	CLO 10	Understand the concept of petri nets that exhibit concurrency, synchronization and used as a visual communication aid to model the system behavior.	PO 2	2
ACS008.11	CLO 11	Memorize the design of object oriented software using with the aid of a formal system modeling	PO 5	2

		notation.		
ACS008.12	CLO 12	Learn to model the structure and behavior of a software system.	PO 2	2
ACS008.13	CLO 13	Memorize different architectural styles, patterns and architectural mapping using data flow.	PO 1	3
ACS008.14	CLO 14	Understand the principles of graphical user interface design.	PO 1	3
ACS008.15	CLO 15	Understand the concept of component-level design used to define interface characteristics and communication mechanisms for each software component identified in the architectural design.	PO 2	2
ACS008.16	CLO 16	Understand the importance of testing with the performance of root cause analysis.	PO 2	2
ACS008.17	CLO 17	Memorize the concepts of software testing approaches such as unit testing and integration testing.	PO 1	3
ACS008.18	CLO 18	Understand the approaches to verification and validation including static analysis and reviews.	PO 4	2
ACS008.19	CLO 19	Identify the major differences between white box testing and black box testing.	PO 1	3
ACS008.20	CLO 20	Understand the importance of refactoring which improves the performance of non functional attributes of the software.	PO 5	2
ACS008.21	CLO 21	Learn to manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.	PO 1	3
ACS008.22	CLO 22	Use a proactive, structured risk assessment and analysis activity to identify and analyze root. causes.	PO 1	3
ACS008.23	CLO 23	Understand the concept of risk management through risk identification, risk measurement and mitigation.	PO 3	2
ACS008.24	CLO 24	Memorize the relationship between people and effort.	PO 3	2
ACS008.25	CLO 25	Identify the importance of earned value analysis related to project scheduling and also understand the various process and project metric used to improve the quality of software.	PO 4	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3		2										1		
CLO 2				2										3	
CLO 3	3														
CLO 4		2													
CLO 5	3													2	
CLO 6		2													
CLO 7			3											2	
CLO 8			2												
CLO 9	3														
CLO 10		2													
CLO 11					3										2
CLO 12															
CLO 13	3													3	
CLO 14	3														
CLO 15		2													
CLO 16		2											1		
CLO 17	3														
CLO 18				3											
CLO 19	3														
CLO 20					1										
CLO 21	3													1	
CLO 22	3														
CLO 23													1		3
CLO 24			3												
CLO 25				2									2		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO2, PO3,PO4, PO5	SEE Exams	PO1,PO2, PO3,PO4, PO5	Assignments	PO2	Seminars	PO3
Laboratory Practices	PO1	Student Viva	-	Mini Project	-	Certification	PO2
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	**SOFTWARE PROCESS AND PROJECT MANAGEMENT**
Software process and project management: Introduction to software engineering, software process, perspective and specialized process models; Software project management: Estimation: LOC and FP based estimation, COCOMO model; Project scheduling: Scheduling, earned value analysis, risk management.	
Unit-II	**REQUIREMENT ANALYSIS AND SPECIFICATION**
Requirement Analysis and Specification: Software requirements: Functional and nonfunctional, user requirements, system requirements, software requirements document; Requirement engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management; Classical analysis: Structured system analysis, petri nets, data dictionary.	
Unit-II	**SOFTWARE DESIGN**
Software Design: Design process: Design concepts, design model, design heuristic, architectural design, architectural styles, accessing alternative architectural designs, and architectural mapping using data flow. **User interface design**: Interface analysis, interface design; Component level design: Designing class based components, traditional components.	
Unit-V	**TESTING AND IMPLEMENTATION**
Testing and Implementation : Software testing fundamentals: Internal and external views of testing, white box testing, basis path testing, control structure testing, black box testing, regression testing, unit testing, integration testing, validation testing, system testing and debugging; Software implementation techniques: Coding practices, refactoring.	
Unit-V	**PROJECT MANAGEMENT**
Project Management: Estimation: FP based, LOC based, make/buy decision; COCOMO II: Planning, project plan, planning process, RFP risk management, identification, projection; RMMM: Scheduling and tracking, relationship between people and effort, task set and network, scheduling; EVA: Process and project metrics.	
Text Books:	
1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", McGraw-Hill International Edition, 7th Edition, 2010. 2. Ian Somerville, "Software Engineering", Pearson Education Asia, 9th Edition, 2011.	

Reference Books:
1. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Private Limited, 3rd Edition, 2009. 2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 1st Edition, 2010.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Introduction to Software Engineering	CLO1	T2: 1.1-1.3
2-5	Software processes	CLO2	T1: 2.2-2.3
6-9	Process models	CLO4	T1: 2.1, 2-3-2.6
11-12	Software Project Management	CLO3	R2: 3.4-3.9
11-12	LOC and FP based estimation COCOMO model	CLO5	R2: 4.1-4.3
12-13	Project Scheduling, EVA	CLO8	T1: 27.1, T1:27.2, 27.6
14	Risk management	CLO7	T1: 28.1
15-17	Software Requirements	CLO9	T2: 4.1-4.3
18-19	Requirements Engineering process	CLO6,CLO10	T1: 4.4-4.7
20-21	Classical Analysis	CLO11	R1: 1.1-1.4
22-24	Design process	CLO12	T1 8.1-8.4
25-28	Architectural design	CLO13, CLO14	T1:9.1, 9.3,9.4,9.6
29-33	User interface design	CLO15	T1:11.1,11.3-11.4
34-37	Component level design	CLO16	T1:10.2, 10.5
38-44	Software Testing fundamentals	CLO18	T1:17.3,17.6-17.8 T1:18.1-18.6
45-47	Software implementation techniques	CLO17	T1:10.1-1.3
48-51	Project management	CLO19	T1: 26.2, 26.6.4, T2:26.6.6, 26.10
52-55	COCOMO II	CLO21,CLO22	T1:26.1-26.3 28.1- 28.7
56-60	Project Scheduling, Project Metrics	CLO23,CLO24	T1:25.1-25.6 T1:27.1-27.6

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed Actions	Relevance With POs	Relevance With PSOs
1	How to collect useful requirements to build right product	Seminars/Guest Lectures / NPTEL	PO 1, PO 2, PO 3	PSO 1, PSO 2
2	Real time Risk management System	Seminars/Guest Lectures / NPTEL	PO 2, PO 3	PSO 1
3	Generation of test cases for usage of ATM machine and Banking Applications	Assignments/ Laboratory Practices	PO 1, PO 3, PO 4	PSO 2

Prepared by:
Ms. B.Dhana Laxmi, Assistant Professor,IT
Mr.A.Praveen, Assistant Professor,IT

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**THEORY OF COMPUTATION**				
Course Code	AIT002				
Programme	B.Tech				
Semester	IV	CSE | IT			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Dr. K Srinivasa Reddy, Professor and HOD, IT				
Course Faculty	Mr. Ch Suresh Kumar Raju, Assistant Professor, CSE				

I. COURSE OVERVIEW:

Introduction to the theory of computation, including models of computation such as Turing machines; theory of programming languages, including grammars, parsing, syntax and semantics. This course in reached to student by power point presentations, lecture notes, and assignment questions ,previous model question papers, multiple choice questions and question bank of long and short answers.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS002	II	Data Structures	4
UG	AHS013	III	Discrete Mathematical Structures	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
THEORY OF COMPUTATION	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and

MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	3	Lectures, Assignments
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignments
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Guest Lettuces
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Seminars

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Lectures, Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success	2	Assignments
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	1	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Comprehend abstract, mathematical models of computation and use them to solve computational problems.
II	Interpret the relationship between formal languages in Chomsky's hierarchy and different Machines.
III	Analyze and explain the behavior of push-down automata.
IV	Understand the limits and capacities of Turing‘s machines to recognize languages.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT002.01	CLO 1	Use the definitions and notations for sets, relations and functions in defining and study Finite Automata	PO1; PO2	3
AIT002.02	CLO 2	Knowledge on formal languages and Kleene's Theorem to intend programming languages	PO1; PO2; PO3	2
AIT002.03	CLO 3	Construct deterministic and nondeterministic finite state automata (DFA and NFA) for solving simple decision problems.	PO1; PO2; PO4; PO5	2
AIT002.04	CLO 4	Perform conversions between nondeterministic finite automata and deterministic finite automata and regular expressions and finite state automata to gain knowledge about formal proofs in computer science	PO1; PO2; PO3; PO4	2
AIT002.05	CLO 5	Knowledge on recursive definitions of regular languages, regular expressions and the use of regular expressions to represent regular languages	PO1; PO2; PO3; PO4	2
AIT002.06	CLO 6	Detailed knowledge on the relationship between regular expressions and finite automata	PO2; PO3	2
AIT002.07	CLO 7	Identify that few languages are not regular by using Pumping lemma	PO4	2
AIT002.08	CLO 8	Knowledge on Left Linear grammar, Right Linear grammars and converting grammars into Finite Automata.	PO1; PO2; PO5	2
AIT002.09	CLO 9	Understand the fundamental role played by Context-Free Grammars (CFG) in designing formal computer languages with simple examples	PO2; PO3	2
AIT002.10	CLO 10	Knowledge on Context-Free Grammars so that able to prove properties of Context-Free Grammars.	PO2	3
AIT002.11	CLO 11	Identify relationship between regular languages and context-free grammars	PO1; PO2; PO3	2
AIT002.12	CLO 12	Use the pumping lemma for Context Free Languages to show that a language is not context-free	PO2; PO4	2
AIT002.13	CLO 13	Understand the equivalence between Context-Free Grammars and Non-deterministic Pushdown Automata	PO1; PO2; PO3	2
AIT002.14	CLO 14	Understand deterministic Pushdown Automata to parse formal language strings by using (i) top down or (ii) bottom up techniques	PO2; PO4; PO5	2
AIT002.15	CLO 15	Knowledge on converting Context-Free Grammars into pushdown automata to identify the acceptance of a string by the Context Free Language	PO1; PO2	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT002.16	CLO 16	Understand the path processing computation using Turing Machines (Deterministic and Non-Deterministic) and Church-Turing Thesis in computers.	PO1; PO2; PO4; PO5	1
AIT002.17	CLO 17	Knowledge on non-halting Turing Machine accepted by Recursively Enumerable Languages	PO1; PO4	1
AIT002.18	CLO 18	Understand the power of the Turing Machine, as an abstract automaton, that describes computation, effectively and efficiently	PO1; PO4	1
AIT002.19	CLO 19	Theory of Computation is important in programming language design, parsers, web-scrappers, Natural Language Processing (NLP), and is at the heart of modern compiler architectures.	PO1; PO2; PO5	3
AIT002.20	CLO 20	Process the knowledge and skills for employability and to succeed in national and international level competitive exams.	PO5	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2												2	
CLO 2	3	3	2											2	
CLO 3	3	3		2	2								2		
CLO 4	3	2	3	2										3	
CLO 5	2	3	2	2										3	
CLO 6		3	2										2		
CLO 7				3									2		
CLO 8	2	3			2									2	
CLO 9		2	3											2	
CLO 10		3												2	
CLO 11	2	3	2										2	2	1
CLO 12		3		3									2	2	
CLO 13	3	2	2										2	2	
CLO 14		3		2	2									3	
CLO 15	2	3											2	2	

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 16	3	3		2	2									3	
CLO 17	3			2										1	
CLO 18	3			2									2	3	
CLO 19	3	2			2									3	
CLO 20					1								2		1

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1; PO2; PO3;PO4; PO5	SEE Exams	PO1;PO2; PO3;PO4; PO5	Assignments	PO1;PO2; PO3;PO4; PO5	Seminars	-
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	FINITE AUTOMATA
Fundamentals: Alphabet, strings, language, operations; Introduction to finite automata: The central concepts of automata theory, deterministic finite automata, nondeterministic finite automata, an application of finite automata, finite automata with epsilon transitions.	
Unit-II	**REGULAR LANGUAGES**
Regular sets, regular expressions, identity rules, constructing finite automata for a given regular expressions, conversion of finite automata to regular expressions, pumping lemma of regular sets, closure properties of regular sets (proofs not required), regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and finite automata, inter conversion.	
Unit-III	**CONTEXT FREE GRAMMARS**
Context free grammars and languages: Context free grammar, derivation trees, sentential forms, right most and leftmost derivation of strings, applications. Ambiguity in context free grammars, minimization of context free grammars, Chomsky normal form, Greibach normal form, pumping lemma for context free languages, enumeration of properties of context free language (proofs omitted).	
Unit-IV	**PUSHDOWN AUTOMATA**
Pushdown automata, definition, model, acceptance of context free language, acceptance by final state and acceptance by empty stack and its equivalence, equivalence of context free language and pushdown automata, inter conversion;(Proofs not required);Introduction to deterministic context free languages and	

deterministic pushdown automata.	
Unit-V	**TURING MACHINE**
Turing machine: Turing machine, definition, model, design of Turing machine, computable functions, recursively enumerable languages, Church's hypothesis, counter machine, types of Turing machines (proofs not required), linear bounded automata and context sensitive language, Chomsky hierarchy of languages.	
Text Books:	
John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, ―Introduction to Automata, Theory, Languages and Computation‖, Pearson Education, 3rd Edition, 2007.	
Reference Books:	
1. John C Martin, ―Introduction to Languages and Automata Theory, Tata McGraw-Hill, 3rd Edition, 2007.	
2. Daniel I.A. Cohen, ―Introduction to Computer Theory, John Wiley & Sons, 2nd Edition, 2004.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Alphabet, strings, language, operations	CLO 1	T1: 1.5-1.6
2	Introduction to finite automata: The central concepts of automata theory	CLO 1	T1: 2.1-2.2
3	Deterministic finite automata	CLO 3	T1: 2.2-2.3
4-5	Nondeterministic finite automata	CLO 3	T1: 2.3-2.4
6	An application of finite automata	CLO 4	T1: 2.4-2.5
7	Finite automata with epsilon transitions	CLO 2	T1: 2.5-2.6
8-9	Finite Automata with output: Moore and Melay Machines	CLO 3	R2: Chapter 9
10	Regular sets, regular expressions, identity rules	CLO 5	T1: 3.1-3.2
11	Constructing finite automata for a given regular expressions	CLO 5	T1: 3.1-3.2
12-13	Conversion of finite automata to regular expressions	CLO 5	T1: 3.1-3.2
14	Pumping lemma of regular sets	CLO 5	T1: 4.1-4.2
15	Closure properties of regular sets (proofs not required)	CLO 6	T1: 4.1-4.2
16-17	Regular grammars-right linear and left linear grammars	CLO 7	T1: 4.4-4.5
18	Equivalence between regular linear grammar and finite automata, inter conversion.	CLO 7	T1: 4.4-4.5
19	Context free grammar	CLO 8	T1: 5.1-5.2
20-22	derivation trees, sentential forms, right most and leftmost derivation of strings	CLO 9	T1: 5.1-5.2
23	Ambiguity in context free grammars	CLO 10	T1: 5.4-5.5
24-25	Minimization of context free grammars	CLO 11	T1: 7.4-7.5
26-27	Chomsky normal form, Greibach normal form	CLO 12	T1: 7.4-7.5
28-29	Pumping lemma for context free languages, properties	CLO 13	T1: 7.2-7.3
30	Pushdown automata, definition, model	CLO 14	T1: 6.1-6.2
31-33	Acceptance by final state and acceptance by empty stack and its equivalence	CLO 14	T1: 6.2
34-35	Equivalence of context free language and pushdown automata, inter conversion.	CLO 15	T1: 6.3
36	Deterministic context free languages and deterministic push down automata	CLO 16	T1: 6.4
37-38	Turing machine: Turing machine, definition, model	CLO 17	T1: 8.1-8.2
39-40	Design of Turing machine, computable functions,	CLO 18	T1: 8.1-8.2

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
41-43	Recursively enumerable languages, Types of Turing machines and Church's hypothesis.	CLO 19	T1: 8.2-8.6
44-45	Linear bounded automata and context sensitive language, Chomsky hierarchy of languages.	CLO 20	R2: Chapter 30

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed Actions	Relevance With POs	Relevance With PSOs
1	Finite automata with output	Seminars / Guest Lectures / NPTEL	PO 1, PO 2, PO 3	PSO 1, PSO 2
2	Deterministic Pushdown Automata	Seminars / Guest Lectures / NPTEL	PO 2, PO 3	PSO 1
3	JFLAP Automation Tool	Assignments / Laboratory Practices	PO 1, PO 3, PO 4	PSO 2

Prepared by: Dr. K Srinivasa Reddy, Professor and HOD, IT

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**COMPUTER NETWORKS**					
Course Code	**AIT003**					
Programme	B.Tech					
Semester	IV	IT	CSE			
Course Type	Core					
Regulation	IARE - R16					
Course Structure	**Theory**			**Practical**		
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**	
	3	1	4	-	-	
Chief Coordinator	Mr. N. Bhaswanth, Assistant Professor					
Course Faculty	Mr. D. Rahul, Assistant Professor					

I. COURSE OVERVIEW:

The growing importance of Internetworking in recent years and their use in every field has made Computer Networks a central issue for modern systems. The main objective of the course is to know the functions of various layers of a network model. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	ACS002	II	Data Structures

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Computer Networks	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Guest Lect`ures
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	5 minutes Video/ Seminars
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Seminars / Term Paper / 5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Lectures, Assignments
PSO2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success	2	Seminars
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	2	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Recognize modern network architectures from a design and performance perspective.
II	Understand the basics and challenges of network communication.
III	Provide an opportunity to do network programming using TCP/IP.
IV	Interpret the operation of the protocols that are used inside the Internet.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CAIT003.01	CLO 1	Understand the importance of data networks and the Internet in supporting business communications and everyday activities.	PO1; PO2	2
CAIT003.02	CLO 2	Classify different network topologies, LANs, MANSs, WANs, internetworks and models such as Open System Interconnect (OSI), TCP/IP.	PO1; PO2	2
CAIT003.03	CLO 3	Understand the significance and purpose of protocols, standards and their key elements use in data communications and networking.	PO2; PO5	3
CAIT003.04	CLO 4	Describe the relationship between data and signals, their types, behavior, properties, characterization and transmission in the physical layer.	PO3	3
CAIT003.05	CLO 5	Understand the basic concepts of data communications including the key aspects of networking and their interrelationship, packet switching, circuit switching as internal external operations, physical structures, types, models and internetworking.	PO2; PO3	3
CAIT003.06	CLO 6	Understand the concept, advantages, analysis of cyclic codes including their algebraic representation and explain the design, implementation, performance of cyclic redundancy check, checksum.	PO2;PO5	3
CAIT003.07	CLO 7	Understand the basic difference between data logical link control, media access control and discuss logical link control with reference to framing, flow and error control.	PO3; PO4	2
CAIT003.08	CLO 8	Describe the reliable inter-node transmission of frames and discuss the ability to compare and contrast high-level data link control protocol and point-to-point protocol (HDLC, PPP).	PO2; PO4	1
CAIT003.09	CLO 9	Understand connecting LAN's, backbone networks, and virtual LAN's and operations of bridges, spanning tree algorithm in networks.	PO2	3
CAIT003.10	CLO 10	Explain the role of data link layer protocols in data transmission and the preparation method of data for transmission on network media.	PO4	2
CAIT003.11	CLO 11	Understand routing principles and algorithms such as distance vector and link state and usage of the routing protocols on the Internet such as RIP, OSPF, and BGP.	PO1; PO2; PO4	2
CAIT003.12	CLO 12	Understand internetworking principles and the operation of Internet protocols IP, IPv4, IPv6 and ICMP.	PO2;PO5	2
CAIT003.13	CLO 13	Explain and demonstrate the mechanics associated with IP addressing, device interface, association between physical and logical addressing.	PO1	3
CAIT003.14	CLO 14	Understand the concepts of transport service, elements of transport protocol and congestion control in the computer networks.	PO5	3
CAIT003.15	CLO 15	Describe the utilization of transport layer protocols in the control congestion on the Internet.	PO2; PO3	2
CAIT003.16	CLO 16	Analyze the correct transport layer protocol, such as TCP and UDP to transfer data segments in the	PO2	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		networks.		
CAIT003.17	CLO 17	Describe the SCTP, RTP protocols and analyze the applications based on these protocols, network activity at the transport layer.	PO2	2
CAIT003.18	CLO 18	Analyze the operations and features of common application layer protocols such as Hyper Text Transfer protocol (HTTP), File transfer Protocol (FTP.)	PO1;PO2	3
CAIT003.19	CLO 19	Describe the operations and features of common application layer protocols such as Dynamic Host Configuration Protocol (DHCP), Simple Mail Transfer Protocol (SMTP).	PO;PO4	2
CAIT003.20	CLO 20	Describe SSH-based applications, socket programming and its role in application processing.	PO4	2
CAIT003.21	CLO 21	Analyze the process of map hostnames to IP addresses using Domain Naming System (DNS) protocol.	PO2	2
CAIT003.22	CLO 22	Understand the concepts of E-mail, telnet, secure shell in computer networks.	PO1; PO4	2
CAIT003.23	CLO 23	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.	PO1;PO2	2
CAIT003.24	CLO 24	Possess the knowledge and skills currently use in the Internet work and the requirements for designing network protocols.	PO2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2	1										2		
CLO 2	3	2											3		
CLO 3		3		3										2	
CLO 4			3										3		
CLO 5		3	3										2		
CLO 6	3			3									2		
CLO 7			3	2										2	
CLO 8		1		2									2		
CLO 9		3													
CLO 10				2										3	

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 11	3	2		3										2	
CLO 12		1			3								2		
CLO 13	3													2	
CLO 14					3									2	
CLO 15		2	3										2	3	
CLO 16		2												2	
CLO 17		2												3	
CLO 18	3	3												2	
CLO 19	3			1									2		
CLO 20				3										2	
CLO 21		2													2
CLO 22	3			2											
CLO 23	3	1													
CLO 24		2													

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1;PO2; PO3;PO4; PO5	SEE Exams	PO1;PO2; PO3;PO4; PO5	Assignments	PO1	Seminars	PO2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	INTRODUCTION TO PHYSICAL LAYER
Networks, network types, internet history, standards and administration; Network models: Protocol layering, TCP/IP protocol suite, the OSI model; Introduction to physical layer: Data and signals, transmission impairment, data rate limits, performance; Transmission media: Introduction, guided	

media, unguided media; Switching: Introduction, circuit switched networks, packet switching.	
Unit-II	**INTRODUCTION TO DATA LINK LAYER**
Link layer addressing; Error detection and correction: Cyclic codes, checksum, forward error correction; Data link control: DLC services, data link layer protocols, HDLC, point to point protocol, media access control: Random access, controlled access, channelization, connecting devices and virtual LAN: Connecting devices, virtual LAN.	
Unit-III	**THE NETWORK LAYER**
Network layer design issues, routing algorithms, congestion control algorithms, quality of service, and internetworking. The network layer in the internet: IPv4 addresses, IPv6, internet control protocols, OSPF (Open Shortest Path First), BGP (Border Gateway Protocol), IP, (Internet Protocol), ICMP (internet control message protocol	
Unit-IV	**THE TRANSPORT LAYER**
The transport service, elements of transport protocols, congestion control; The internet transport protocols: UDP (User Datagram Protocol), TCP (Transport Control Protocol), performance problems in computer networks, network performance measurement.	
Unit-V	**INTRODUCTION TO APPLICATION LAYERL**
client server programming, WWW (World Wide Web) and HTTP (Hyper Text Transfer Protocol), FTP (File Transfer Protocol), E-mail, telnet, secure shell, DNS(Domain Naming System), SNMP (Simple Network Management Protocol).	
Text Books:	
1. Andrew S. Tanenbaum, David.J.Wetherall, ―Computer Networks‖, Prentice-Hall, 5th Edition, 2010 2. Behrouz A. Forouzan, ―Data Communications and Networking‖, Tata McGraw-Hill, 5th Edition, 2012	
Reference Books:	
1. Douglas E. Comer, ―Internetworking with TCP/IP ―, Prentice-Hall, 5th Edition, 2011. 2. Peterson, Davie, ―Computer Networks‖, Elsevier, 5th Edition, 2011. 3. Comer, ―Computer Networks and Internets with Internet Applications‖, 4th Edition, 2004. 4. Chwan Hwa Wu, Irwin, ―Introduction to Computer Networks and Cyber Security‖, CRC Publications, 2014.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Understand and explore the basics of computer networks and various network Types.	CLO 1	T1:2.1
2	Recognize knowledge on previous versions of internet	CLO 2	T1:2.3
3	Understands on the various standards and administrations	CLO 2	T1:2.3.1
4-5	Discuss on networks models and understand layering scenarios and protocols	CLO 4	T1:7.2,7.3
6-9	Demonstrate on TCP/IP model	CLO 4	T1:10.3.1
10-11	Understand on Data, signal and Transmission Impairments.	CLO 7	T1:11.2, 12.1.1, 12.1.2,
12-13	Demonstrate on Guided and Unguided medium.	CLO 9	T1:13.3.2, 13.4.1

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
14	Understand the addressing mechanism of network layer.	CLO 9	T1:17.1.1, 17.1.3
15-17	Demonstrate on Error detection and correction Cyclic codes, checksum, and forward error correction.	CLO 11	T1:18.1, 18.2.1
18-19	Explain HDLC, Point To Point Protocol	CLO 11	T1:20.2
20-25	Explain Random access, controlled access, channelization	CLO 13	T1:18.3.4, 18.3.4.1
26-27	Understand Networking Devices and virtual LAN	CLO 11	T1:22.12, 19.1.2
28	Understand Network layer services provided to transport layer	CLO 9	T1:18.4, 18.4.3
29-31	Discuss Static and Non static routing algorithms	CLO 14	T1:19.2, 18.4.4
32-35	Demonstrate on various congestion control algorithms	CLO 14	T1:23.1.1, 23.1.3
36	Understand quality service provided by network layer and discuss on internetworking	CLO 14	T1:18.3.4, 18.3, 4.1
37-45	Explain IPv4 IPv6 IP addressing, OSPF, BGP protocols	CLO 14	T1:24.2,28.4
46-48	Discuss about TCP and UDP	CLO 14	T1:24.3.1, 24.3.3,24.3.4
49	Explain Performance problems in computer networks, network performance measurement.	CLO 17	T1:24.3.6, 24.3.9
50-52	Discuss about application layer and client server programming	CLO 17	T1:25.1,25.1.2
53-56	Discuss WWW, DNS SNMP and HTTP protocols	CLO 19	T1:26.1.2, 26.2, 26.3, 26.4,26.5

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Physical Layer Implementation with LIVE examples	Work Shops/ Guest Lectures / NPTEL/ Laboratory Practices	PO2;PO3	PSO 1,PSO2
2	Working Process of Networking Devices	Work Shops/ Laboratory Practices	PO1;PO3;PO5	PSO2;PSO2
3	Laboratory Practice on Error Handling Like CRC	Work Shops/ Laboratory Practices/ Guest Lectures	PO1;PO2;PO3; PO 4	PSO1;PSO2

Prepared by:
Mr. N. Bhaswanth, Assistant Professor
Mr. D. Rahul, Assistant Professor

HOD, IT

V SEMESTER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**WEB TECHNOLOGIES**				
Course Code	ACS006				
Programme	B.Tech				
Semester	V	CSE	IT		
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. A Krishna Chaitanya, Assistant Professor				
Course Faculty	Mr. A Krishna Chaitanya, Assistant Professor				

I. COURSE OVERVIEW:

The World Wide Web continues to provide a foundation for the development of a broad range of increasingly influential and strategic technologies, supporting a large variety of applications and services, both in the private and public sectors. There is a growing need for management and decision makers to gain a clearer understanding of the application development process, from planning through to deployment and maintenance. This module will give you an insight into architectures, protocols, standards, languages, tools and techniques; an understanding of approaches to more dynamic and mobile content; and demonstrate how you can analyze requirements, plan, design, implement and test arrange of web applications.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS001	I	Computer Programming	4
UG	ACS003	III	Object Oriented Programming Through Java	4

III. MARKS DISTRIBUTION

Subject	SEE Examination	CIA Examination	Total Marks
Web Technologies	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✔	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz/AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminars
PO 3	**Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Mini Projects
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Mini Projects
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2	Assignments

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	3	Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Mini Projects
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High;2 = Medium;1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Design static and dynamic web pages using HTML, CSS and Java Script.
II	Understand a well-formed XML schemes for developing web applications.
III	Design and implement web services from the server and client side.
IV	Understand how server-side programming works on the web using PHP
V	Apply tools to retrieve the information from the database using PHP.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS006.01	CLO 1	Understand the basic HTML tags.	PO1;PO3	3
ACS006.02	CLO 2	Understand and apply the design principles of HTML and Java Script to create static and dynamic web pages.	PO2;PO5	3
ACS006.03	CLO 3	Understand the difference between HTML and XML scripting languages.	PO3	2
ACS006.04	CLO 4	Identify the engineering structural design of XML and parse construction tree model.	PO1	2
ACS006.05	CLO 5	Analyze the client side validation procedure in web applications.	PO3	2
ACS006.06	CLO 6	Proficient in creating reusable web component using java bean.	PO1;PO5	3
ACS006.07	CLO 7	Identify the difference between the JSP and Servlet.	PO1;PO3	3
ACS006.08	CLO 8	Able to use web server and data base servers using specific vendor related software's.	PO5	3
ACS006.09	CLO 9	Create applications by using the concepts like JSP and Servlet.	PO2	2
ACS006.10	CLO 10	Identify and perform requesting and response generation process in web servers.	PO3	3
ACS006.11	CLO 11	Understand the PHP downloading, installation and configuring PHP process.	PO1;PO5	3
ACS006.12	CLO 12	Understand branching statements, loop statements and use them in problem solving.	PO1	2
ACS006.13	CLO 13	Identify the methods to read data from web pages using PHP.	PO3	2
ACS006.14	CLO 14	Understand how MYSQL server is connected with PHP	PO1;PO2	2
ACS006.15	CLO 15	Able to perform crude operations in data base servers, operations in PHP	PO1	3
ACS006.16	CLO 16	Understand the file handling methods using PHP.	PO 3	2
ACS006.17	CLO 17	Familiar with basic HTML, XML, JSP and PHP techniques: Creation of web pages, that Includes verification and validation of web pages.	PO2	2
ACS006.18	CLO 18	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.	PO1;PO12	3

3 = High;2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3		2												
CLO 2		2			3								3		
CLO 3			2												
CLO 4	2												2		
CLO 5			2										3		
CLO 6	2				3										
CLO 7	2		3												
CLO 8					3								3		
CLO 9		2													
CLO 10			3										3		
CLO 11	2				3										
CLO 12	2													2	
CLO 13			2										2		
CLO 14	2	2											3		
CLO 15	3														
CLO 16			2										3		
CLO 17		2													
CLO 18	2											2			

3 = High;2 = Medium;1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2, PO 3, PO 5	SEE Exams	PO 1,PO 2, PO 3, PO 5	Assignments	PO 12	Seminars	PO 2
Laboratory Practices	PO 1	Student Viva	-	Mini Project	PO 3, PO5	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	INRODUCTION TO HTML AND JAVA SCRIPT
Introduction to html: fundamentals of HTML elements, Document body, text, hyperlink, lists, tables, color and images, frames; Cascading Style Sheets: Introduction, defining your own styles, properties and values in styles, style sheets, formatting blocks, and layers. JavaScript: JavaScript basics, variables, string manipulation, mathematical functions, statements, operators, arrays and functions.	
UNIT-II	**OBJECTS IN JAVASCRIPT AND XML**
Objects in JavaScript: Data and objects in JavaScript, regular expressions, exception handling, built-in objects, events; Dynamic HTML with JavaScript: Data validation, opening a new window, Rollover buttons, moving images, multiple pages in a single download, floating logos. XML: Basics XML, document type definition, xml schemas, Document Object Model, presenting XML.	
UNIT-III	**SERVLETS AND JSP**
Servlet: Lifecycle of a Servlet, a simple Servlet, the Servlet API, the Javax. Servlet package, reading Servlet parameters, the javax.Servlet.HTTP package, Handling HTTP requests and responses, using cookies and sessions. JSP: The anatomy of a JSP page, JSP processing, declarations, directives, expressions, code snippets, implicit objects, using beans in JSP pages, connecting to database in JSP.	
UNIT-IV	**INTRODUCTION TO PHP**
Basics of PHP: downloading, installing, configuring PHP, programming in a web environment and the anatomy of a PHP page; Overview of PHP data types and concepts: Variables and data types, operators, expressions and statements, strings, arrays and functions.	
UNIT-V	**PHP AND DATABASE ACCESS**
PHP and database access: Basic database concepts, connecting to a My SQL database, retrieving and displaying results, modifying, updating and deleting data; MVC architecture: PHP and AJAX other web technologies: PHP and XML.	

Text Books:

1. Chris Bates, "Web Programming: Building Internet Applications", Wiley Dream Tech, 2nd Edition,2002
2. Jeffrey C K Jackson, "Web Technologies", Pearson Education, 1st Edition,2006
3. Steven Holzner,"the Complete reference PHP",TataMcGraw-Hill,1st Edition,2007

Reference Books:

1. W Hans Bergsten, "Java Server Pages", O"Reilly, 3rd Edition, 2003.
2. D. Flanagan, "Java Script", O"Reilly, 6th Edition, 2011.
3. Jon Duckett, "Beginning Web Programming", WROX, 2nd Edition, 2008.
4. Herbert Schildt, "Java the Complete Reference", Hill - Osborne, 8th Edition, 2011.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
1-4	Introduction to html, fundamentals of HTML elements, Document body, text, hyperlink	CLO 1	T1:1.1 T1:2.1-2.4
5-8	Lists, tables, color and images, frames ,Introduction to Cascading Style Sheets, defining your own styles	CLO 1	T1:2.6-2.9 T1:4.1-4.3
9-11	Properties and values in styles, Style sheets, formatting blocks, and layers	CLO 1	T1:4.4-4.7
12	JavaScript basics, variables, string manipulation	CLO 2	T1:5.1-5.5
13-14	Mathematical functions, statements, operators, arrays and functions.	CLO 2	T1:5.6-5.10
15-17	Data and objects in JavaScript, regular expressions, exception handling, built-in objects, events	CLO 2	T1:6.1-6.5
18-20	HTML with JavaScript: Data validation, opening a new window, Rollover buttons.	CLO 5	T1:7.1-7.3 T1:7.6
21-22	Moving images, multiple pages in a single download, floating logos	CLO 3	T1:7.7-7.10
23-25	Basics XML, document type definition, xml schemas, Document Object Model, presenting XML.	CLO 4	T1:14.1-14.5
26-28	Lifecycle of a Servlet, a simple Servlet, the servlet API, the Javax.servlet package, reading Servlet parameters, the javax.servlet.	CLO 7	T2:11.3
29	HTTP package, Handling HTTP requests and responses, using cookies and sessions.	CLO 8	T2:11.3
30	The anatomy of a JSP page, JSP processing, declarations, directives, expressions, code snippets	CLO 9	T2:11.4
31-33	Implicit objects, using beans in JSP pages, connecting to database in JSP.	CLO 9	T2:11.4
34-35	Basics of PHP, downloading, installing, configuring PHP	CLO 10	T3:1
36	Programming in a web environment and the anatomy of a PHP page	CLO 11	T3:1
37-38	Overview of PHP data types and concepts: Variables and datatypes, operators, expressions and statements	CLO 11	T3:1, 2
39	Complex structures, structures and functions, passing structures through pointers, self-referential structures.	CLO 12	T3:2
40	Strings, arrays, Functions.	CLO 13	T3:3, 4
41	PHP and database access: Basic database concepts, connecting to a My SQL	CLO 14	T3:10
42	Retrieving and displaying results, modifying, updating and deleting data	CLO 14	T3:10
43	MVC Architecture	CLO 15	T3:18
44	PHP and other web technologies: PHP and XML	CLO 17	T3:12
45	PHP and AJAX.	CLO 17	T3:13

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S no	Description	Proposed actions	Relevance with POS	Relevance with PSOS
1	Updating latest version and new features of the PHP Language.	Seminars /NPTEL	PO 1,PO2,PO5	PSO 1
2	Familiarizing the role of Java script Objects in developing system level programs.	Assignments / NPTEL	PO 2,PO5	PSO 3
3	Familiarizing different applications of java beans, Deployment of BDK..	Seminars / Guest Lectures / NPTEL	PO 5	PSO 2
4	Implementation of XML DTD and DOM with ALTOVA XML Spy Enterprise Edition	Guest Lecturers	PO2	PSO3

Prepared by:
Mr. A Krishna Chaitanya, Assistant Professor

HOD,IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**OBJECT ORIENTED ANALYSIS AND DESIGN**				
Course Code	**ACS009**				
Programme	**B.Tech**				
Semester	V	IT			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	3	2
Chief Coordinator	Mr. G Chandra Sekhar, Assistant Professor				
Course Faculty	Mr. G Chandra Sekhar, Assistant Professor				

I. COURSE OVERVIEW:

The Unified Modeling Language is a graphical language for visualizing, specifying, constructing and documenting the artifacts of a software intensive system. The UML gives you a standard way to write systems blueprints covering conceptual things such as business processes and system functions as well as concrete things such as classes written in a specific programming language database schemas and reusable software components. Learn what the UML is what it is not and why the UML is relevant to the process of developing software intensive systems.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS003	IV	Object Oriented Programming through JAVA	4
UG	ACS008	IV	Software Engineering	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Object Oriented Analysis And Design Patterns	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences**.**	3	Seminars
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	2	5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Seminars
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	3	Assignments
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	1	5 minutes video

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Develop the skills to analyze and design object-oriented problems.
II	Create design patterns to solve problems based on object oriented concepts.
III	Understand the various processes and techniques for building object-oriented software systems.
IV	Prepare unified modeling techniques for case studies.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACS015.01	CLO 1	Able to show the importance of modeling concept for object oriented development in system.	PO 1	3
ACS015.02	CLO 2	Demonstrate the Conceptual model of UML and SDLC.	PO 1	3
ACS015.03	CLO 3	Able to understand the role and function of	PO 1	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		each UML model in software development using object-oriented approach.		
ACS015.04	CLO 4	Illustrate the importance of classes and their associated relationships by understanding various common mechanisms.	PO 1	3
ACS015.05	CLO 5	Able to differentiate advance object-oriented approach from the traditional approach for design and development of System.	PO 2	3
ACS015.06	CLO 6	Analyze the Objects and Classes are required for the development of software system.	PO 2	3
ACS015.07	CLO 7	Creation of interaction diagram that model the dynamic aspects of a software system.	PO 1	2
ACS015.08	CLO 8	Use case and activity studies to illustrate the analysis and design concepts.	PO 1,PO 2,PO 3	2
ACS015.09	CLO 9	Identify, analyze, and model behavioral concepts of the system and also know the importance of events and signals and their modeling techniques.	PO 1, PO 2	3
ACS015.10	CLO 10	Analyze and understand the uses of process and threads and time and space to model and development of a system.	PO 2	3
ACS015.11	CLO 11	Demonstrate state machines and state chart diagrams and their modeling techniques	PO 1	3
ACS015.12	CLO 12	Illustrate the uses of component and deployment diagram and their modeling techniques.	PO 1	3
ACS015.13	CLO 13	Understands how to apply the pattern based analysis and design to the software to be developed.	PO 1	3
ACS015.14	CLO 14	Describe how design patterns facilitate development and list several of the most popular patterns.	PO 1, PO 2	3
ACS015.15	CLO 15	Identify and describe design patterns and their application in a software design project.	PO 1	2
ACS015.16	CLO 16	Ability to refactor poorly designed solutions by using the appropriate design patterns.	PO 3	2
ACS015.17	CLO 17	Develop UML models for design patterns using currently available software modeling tools.	PO 1, PO 2	2
ACS015.18	CLO 18	Evaluate and apply design patterns, architectural patterns and enterprise patterns to the development of software systems.	PO 1, PO 2 ,PO 3	2
ACS015.19	CLO 19	Assess the use of Design patterns in the design of software systems and the refactoring of existing systems.	PO 1, PO2	3
ACS015.20	CLO 20	Analyze software components and case studies of system architecture and determine how integration with new and existing systems may be achieved	PO 1, PO 2	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												2		
CLO 2	3													3	
CLO 3	3												2		1
CLO 4	3													3	
CLO 5		3											2		
CLO 6		3												3	
CLO 7	2												2		1
CLO 8	2	2												3	
CLO 9	2	2											2		
CLO 10		3												3	
CLO 11	3												2		
CLO 12	3													3	
CLO 13	3													3	
CLO 14	2	2											2		1
CLO 15	2												2		
CLO 16			2										2		
CLO 17	2	2											2		
CLO 18	2	2	2										2		
CLO 19	3	3												3	
CLO 20	3	3													1

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 3	SEE Exams	PO 1, PO 2, PO 3	Assignments	PO 1	Seminars	PO 2
Laboratory Practices	PO 1, PO 2, PO 3	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	STRUCTURAL MODELLING
Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, architecture, software development life cycle; Classes, relationships, common mechanisms and diagrams.	
UNIT -II	**ADVANCED BEHAVIORAL MODELING**
Advanced classes, advanced relationships, interfaces, types and roles, packages, terms, concepts, modeling techniques for class and object diagrams; Interactions: Interaction diagrams; Use cases: Use case diagrams, activity diagrams.	
UNIT -III	**ARCHITECTURAL MODELING**
Events and signals, state machines, processes and threads, time and space. State chart diagrams, component diagrams, deployment diagrams.	
UNIT -IV	**DESIGN PATTERN**
GRASP: Designing objects with responsibilities, creator, information expert, low coupling, high cohesion, design patterns, creational, factory method, structural, bridge, adaptor, behavioral, strategy.	
UNIT -V	**APPLYING DESIGN PATTENS**
System sequence diagrams, relation between sequence diagrams and use case logical architecture and UML package diagram, logical architecture refinement; Case study: The next gen POS system, inception, use case modeling, relating use cases, include, extend and generalization, domain models, domain model refinement.	
Text Books:	
1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2nd Edition, 2004. 2. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2005.	
References:	
1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", McGraw-Hill Education, 4th Edition, 2010. 2. Pascal Roques, "Modeling Software Systems Using UML2", WILEY- Dreamtech India Pvt. Ltd, 2nd Edition, 2007.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Importance of modeling, principles of modeling, object oriented modeling,	CLO 1	T1:1.1
3-4	Conceptual model of the UML	CLO 2	T1:2.3
5-9	Classes	CLO 4	T1:4.1
10-11	Relationships	CLO 4	T1:5.1
12-13	Common mechanisms	CLO 4	T1:6.1
14-15	Diagrams	CLO 2	T1:7.1.1
16-17	Interfaces, types and roles,	CLO 4	T1:11.4
18	Packages, terms, concepts,	CLO 4	T1:12.5
19-20	Modeling techniques for class and object diagrams;	CLO 6	T1:14.3
21	Interactions: Interaction diagrams;	CLO 7	T1:15.1
22-23	Use cases: Use case diagrams, activity diagrams.	CLO 8	T1:16.4
24-25	Events and signals	CLO 9	T1:20.5
26-27	State machines, processes and threads	CLO 10	T1:21.4
28	Time and space	CLO 10	T1:23.6
29-30	State chart diagrams	CLO 11	T1:23.1
31-32	Component diagrams	CLO 12	T1:29.3
33-34	Deployment diagrams.	CLO 12	T1:30.7
35	GRASP: Designing objects with responsibilities	CLO 13	T2:1.1
36-37	creator, information expert	CLO 13	T2:3.6
38-39	low coupling, high cohesion	CLO 14	T2:27.12
40	Design patterns	CLO 13	T2:27.12
41-42	Creational, factory method	CLO 15	T2:27.12
43-44	Structural, bridge	CLO 18	T2:4.2
45	Adaptor	CLO 16	T2:4.1
46	Behavioral, strategy	CLO 19	T2:5.1
47	System sequence diagrams	CLO 7	T2:27.17
48-50	Relation between sequence diagrams and use cases logical architecture and UML package diagram	CLO 7	T2:27.18
51-54	Case study: The next gen POS system	CLO 17	T2:27.19
55	Inception, use case modeling	CLO 8	T1:17.3
56-57	Relating use cases	CLO 8	T1:16.4
58	Include, extend and generalization	CLO 20	T1:10.3
59-60	Domain models	CLO 20	T3:31.1
61-62	Domain model refinement	CLO 20	T3:31.2

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Usage of software tools to build right product	Seminars / NPTEL	PO 1	PSO 1
2	Real time Online Transform System	Seminars / Guest / Lectures	PO 3	PSO 1
3	Case study of next gen POS system and other applications	Seminars / Laboratory Practices	PO 2	PSO 1

Prepared by:
Mr. G Chandra Sekhar, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**OPTIMIZATION TECHNIQUES**				
Course Code	AHS012				
Programme	B.Tech				
Semester	V	CSE | IT | EEE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	2	1	3	-	-
Chief Coordinator	Mr. R M Noorullah, Associate Professor CSE				
Course Faculty	Dr. K Suvarchala, Professor,CSE Mr. J Thirupathi,Assistant Professor,CSE Ms. B Geethavani, Assistant Professor,CSE Ms. A Soujanya, Assistant Professor,IT				

I. COURSE OVERVIEW:

The primary objective of this course is to introduce the methods of optimization techniques, precise mathematical concept, study how to design algorithms, establish their correctness, study their efficiency and memory needs. The goal is to maintain a balance between theory, numerical computation, and problem setup for solution by optimization software and applications to engineering systems.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS003	I	Computational Mathematics and Integral Calculus	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Optimization Techniques	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weight age in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	1	Assignment

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	1	Seminar
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:

I	Learn fundamentals of linear programming through optimization
II	Apply the mathematical results and numerical techniques of optimization theory to concrete Engineering Problems
III	Understand and apply optimization techniques to industrial applications.
IV	Apply the dynamic programming and quadratic approximation to electrical and electronic problems and applications.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS012.01	CLO 1	Explain the various characteristics and phases of linear programming.	PO 1	3
AHS012.02	CLO 2	Formulate the various linear programming problems by using graphical and simplex methods	PO 1	3
AHS012.03	CLO 3	Understand the artificial variable techniques like two phase and Big-M methods.	PO 1	2
AHS012.04	CLO 4	Explain Transportation problem and the formulation of the problem by using optimal solution.	PO 2	2
AHS012.05	CLO 5	Solve the assignment problems by using optimal solutions and the variance of assignment problems.	PO 2	2
AHS012.06	CLO 6	Describe the travelling sales man problem by using assignment method.	PO 2	2
AHS012.07	CLO 7	Explain the sequencing and the types of sequencing methods.	PO 10	1
AHS012.08	CLO 8	Use n jobs through two machines and n jobs through three machines to solve an appropriate problem.	PO 10	1
AHS012.09	CLO 9	Use two jobs through m machines to solve an appropriate problem.	PO 2	3
AHS012.10	CLO 10	Understand theory of games and the terminologies used in theory of games concept.	PO 2	3
AHS012.11	CLO 11	Determine appropriate technique to solve to a given problem.	PO 1	3
AHS012.12	CLO 12	Solve the problems by using dominance principle and Graphical method.	PO 1	3
AHS012.13	CLO 13	Understand the Bellman's principle of optimality.	PO 1	3
AHS012.14	CLO 14	Describe heuristic problem-solving methods with stages.	PO 1, PO 2	2
AHS012.15	CLO 15	Understand the mapping of real-world problems to algorithmic solutions.	PO 2	2
AHS012.16	CLO 16	List out the various applications of dynamic programming.	PO 2	2
AHS012.17	CLO 17	Define the shortest path problem with approximate solutions.	PO 1, PO 2	3
AHS012.18	CLO 18	Explain the linear programming problem with approximate solutions.	PO 1, PO 2	2
AHS012.19	CLO 19	Define the various quadratic approximation methods for solving constraint problems.	PO 1, PO 2	2
AHS012.20	CLO 20	Explain the direct quadratic approximation for solving the constraint problems.	PO 1, PO 2	2
AHS012.21	CLO 21	Explain the quadratic approximation method by using lagrangian function.	PO 1	3
AHS012.22	CLO 22	Describe the variable metric methods for constrained optimization.	PO 1	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2	3												1		
CLO 3	2												1		
CLO 4		2													
CLO 5		2													
CLO 6		2													
CLO 7										1					
CLO 8										1					
CLO 9		3											1		
CLO 10		3											1		
CLO 11	3														
CLO 12	3														
CLO 13	3														
CLO 14	2	2											1		
CLO 15		2													
CLO 16		2													
CLO 17	3	3											1		
CLO 18	2	2											1		
CLO 19	2	2											1		
CLO 20	2	2											1		
CLO 21	3														
CLO 22	2														

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1 PO 2 PO 10	SEE Exams	PO 1 PO 2 PO 10	Assignments	PO 10	Seminars	PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT I	**LINEAR PROGRAMMING**	**Classes:09**
Definition, characteristics and phases, types of models, operations research models, applications, linear programming problem formulation, graphical solution, simplex method; Artificial variables techniques: Two-phase method, Big-M method.		
UNIT II	**TRANSPORTATION AND ASSIGNMENT PROBLEMS**	**Classes:09**
Transportation problem, formulation, optimal solution, unbalanced transportation problem, degeneracy, assignment problem, formulation, optimal solution, variants of assignment problem, traveling salesman problem.		
UNIT III	**SEQUENCING AND THEORY OF GAMES**	**Classes:09**
Sequencing: Introduction, flow-shop sequencing, n jobs through two machines, n jobs through three machines, job shop sequencing two jobs through m machines. Theory of games: Introduction, terminology, solution of games with saddle points and without saddle points, 2 x 2 games, dominance principle, m x 2 and 2 x n games, graphical method.		
UNIT IV	**DYNAMIC PROGRAMMING**	**Classes:09**
Introduction: Terminology, Bellman's principle of optimality, applications of dynamic programming shortest path problem, linear programming problem.		
UNIT V	**QUADRATIC APPROXIMATION**	**Classes:09**
Quadratic approximation methods for constrained problems: Direct quadratic approximation, quadratic approximation of the Lagrangian function, variable metric methods for constrained optimization.		
Text Books:		
1. A Ravindran, "Engineering Optimization", JohnWiley&Sons Publications, 4th Edition, 2009. 2. Hillier, Liberman, "Introduction to Operation Research", Tata McGraw-Hill, 2nd Edition,2000.		
Reference Books:		
1. Dr. J K Sharma, "Operation Research", Mac Milan Publications, 5th Edition, 2013. 2. Ronald L. Rardin, "Optimization in Operation Research", Pearson Education Pvt. Limited, 2005. 3. N V S Raju, "Operation Research", S M S Education, 3rd Revised Edition.		

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Reference
1	Introduction, Characteristics and phases, Types of Models	T1:1.1-1.2
2-5	Operations Research Models and Applications, Linear Programming Problem Formulation, LPP solution by Graphical solution	T1:1.3
6-7	LPP solution by Simplex Method	T1: 1.3, 1.4
8-13	Artificial Variable Techniques by Two Phase Method, Artificial Variable Techniques by M Method, Transportation Problem: Introduction, assumptions and description, Formulation and Solution of Transportation Problem	T1:3.1,3.3, T1:3.5-3.6, T1:3.8
14-15	NWCM method problems, Row Minima Method Problems	T1 :6.1
16-18	Column Minima Method Problems, Least Cost Method Problems	T1: 2.5
19-21	VAM or Penalty Method Problems, Degeneracy in Transportation Problems	T1: 6.2
22-23	Unbalanced Transportation Problems	T1:11.3.6
24-26	Assignment Problem definition, method formulation and solution, Hungarian Method of Assignment Problem	T1: 6.3,6.4
27-30	Variations of the Assignment problems – unbalance problems, Travelling Salesman Problem, Processing n jobs through one machine problems	T1: 4.1 T1:4.3,4.5 T1:4.6,4.9
31-35	Processing n jobs through two machines problems, Processing n jobs through three machines problems, Processing n jobs through m machines problems, Characteristics of Games, Game Models, Terminology, Formulation	T1:5.1-5.3 T1:5.5 T1:5.7-5.9
36-38	Rules of Game Theory(with saddle point and without saddle point), 2X2 Games Problems, 3X3 Games Problems, 2Xn Games or mX2 Games Problems	T1: 7.1-7.5
39-43	Graphical method for 2Xn Games or mX2 Games Problems, Introduction, Characteristics, Formulation of Dynamic Programming Problems, Bellman's Principles of Optimality Problem	T1: 8.1-8.3
44-45	Bellman's Principles of Optimality Problem	T1:11.1
46-49	Applications of Dynamic Programming, Shortest path problem by using Dynamic Programming Problem	T1:11.1-11.2
50-52	Solution of LPP by using Dynamic Programming Problem, Types of Non-Linear Programming Problems, Direct Quadratic Approximation Problems	T2:10.1-10.2
53-56	Quadratic Approximation by Lagrangian Function Problems, Constrained External problem with more than one equality constraint problems	T2:10.2-10.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No.	Description	Proposed Actions	Relevance with POs	Relevance with PSOs
1	Skip lists, Problem reductions, Polynomial time and intractability	Seminars/ NPTEL	PO 1	PSO 1
2	Encourage students to write programs based on the taught algorithms to solve problems.	NPTEL	PO 1	PSO 1

Prepared by:
Mr.R.M.Noorullah **HOD, CSE**

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**				
Course Code	AHS015				
Programme	B.Tech				
Semester	V	ECE | IT | CSE | MECH |CIVIL | EEE			
Course Type	Skill				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	2	1	3	-	-
Chief Coordinator	Ms E. Sunitha, Assistant Professor, MBA				
Course Faculty	Ms E.Sunitha, Assistant Professor, MBA Ms S.Lakshmi , Assistant Professor, MBA Ms G.Joseph Mary, Assistant Professor, MBA Mr. P.Nagesh Assistant Professor, MBA				

I. COURSE OVERVIEW:

The present course is designed in such a way that it gives an overview of concepts of Economics. Managerial Economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial Analysis gives clear idea about concepts, conventions and accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements. Break Even Analysis is very helpful to the Business Concern for Decision Making, controlling and forward Strategic Planning. Ratio analysis gives an idea about financial forecasting, financial planning, controlling the business and decision making.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	-----

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Business Economics and Financial Analysis	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weight age in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	1	Assignments.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice**.**	1	Assignments.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	3	Seminars.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	3	Seminars

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	---	----
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	1	Seminar
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	----	----

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the concepts of managerial economics and financial analysis for optimal decision making in business environment.
II	Analyze the market dynamics namely demand, elasticity of demand and pricing in different market structures
III	Gain the knowledge on the production theories and cost analysis while dealing with the production and factors of production.
IV	Study the various pricing methods which are adopted in attracting the potential customers for the different commodities.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS015.01	CLO 1	Describe the economic activities performed by the businessmen in the business for profit earning.	PO 11	3
AHS015.02	CLO 2	Understand the significance of demand, its analysis, measurement of demand and its forecasting .	PO 2	1
AHS015.03	CLO 3	Write the production function through the Cobb Douglas Production Function.	PO 8	1
AHS015.04	CLO 4	Design and implement different structures of market covering how price is determined under different market structures	PO 8, PO 9	2
AHS015.05	CLO 5	Analyze different forms of business organizations existing in the modern business.	PO 2	3
AHS015.06	CLO 6	Describe the allocation of capital which plays a vital role in a business organization.	PO 11	3
AHS015.07	CLO 7	Demonstrate the concept of capital budgeting and allocations of the resources through capital budgeting methods	PO 9, PO11	3
AHS015.08	CLO 8	Apply the Principle of double entry to give an exposure to the maintenance of books of records and allocation of profits in an enterprise.	PO 2, PO8	1
AHS015.09	CLO 9	Explain the significance and objectives of trial balance and final accounts for knowing arithmetical accuracy of books of accounts	PO 2	1
AHS015.10	CLO 10	Understand the Ratio analysis to give an idea about financial forecasting	PO 11	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1											3				
CLO2		1												1	
CLO3								1							
CLO4								1	3						
CLO5									3						
CLO6											3				
CLO7									3		3				
CLO8		1						1						1	
CLO9		1												1	
CLO10											3				

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 2, PO8, PO 9, PO11	SEE Exams	PO 2, PO8, PO 9, PO11	Assignments	PO 2	Seminars	PO9,PO11
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	INTRODUCTION & DEMAND ANALYSIS
Introduction to Business Economics: Definition, Nature and Scope of Managerial Economics – Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting	
UNIT-II	**PRODUCTION & COST ANALYSIS**
Theory of Production and Cost Analysis: Production Function – Iso-quants and Iso-costs, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs vs. Implicit costs, out of pocket costs vs. Imputed costs, Break-even analysis, Determination of Break – Even point (Simple Problems) , Managerial Significance of BEA.	
UNIT-III	**MARKETS& NEW ECONOMIC ENVIRONMENT**
Market structures: Types of competition, Features of perfect competition, Monopoly and monopolistic competition. Price determination& Price Statistics: Price Output determination in case of perfect competition and monopoly. Features and evaluation of different forms of Business organization: Sole proprietorship, partnership, Joint Stock Company, public enterprises and their types.	
UNIT-IV	**CAPITAL BUDGETING**
Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising capital- Trading Forecast, Capital budget, Cash Budget. Features of capital budgeting proposals, methods of capital budgeting – payback method, Accounting rate of return (ARR), Net Present Value Method (simple problems).	
UNIT-V	**INTRODUCTION TO FINANCIAL ACCOUNTING AND FINANCIAL ANALYSIS**
Accounting Concepts and Conventions, Introduction to IFRS– Double – Entry Book keeping, Journal, Ledger, Trial balance, Final accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments.) Financial Analysis through Ratios: Significance, limitations of Ratio Analysis and Ratios Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio). Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt-Equity ratio, Interest Coverage ratio) and profitability ratios (Gross profit Ratio, Net profit ratio, Operating Ratio, P/E Ratio and EPS), Du Pont Chart.	
Text Books:	
1. Aryasri, "Managerial Economics and Financial Analysis", TMH publications, 4 th Edition, 2012. 2. M. Kasi Reddy, Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 2 nd Edition, 2012.	

3. Varshney, Maheswari, "Managerial Economics", Sultan Chand Publications, 11th Edition, 2009.

Reference Books:

1. D.N. Dwivedi, "Managerial Economics", Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.
2. S.N. Maheshwari & S.K.Maheshwari, "Financial Accounting", Vikas Publication House Pvt.Ltd, 4th Edition, 2012.
3. R.Narayana Swamy, "Financial Accounting- A managerial Perspective", Pearson publications, 1st Indian Reprint Edition, 2012.
4. J.V.Prabhakar Rao & P.V.Rao, "Managerial Economics & Financial Analysis", Maruthi Publishers, 1st Revised Edition, 2011.
5. .Kasi Reddy & Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 10th Revised Edition, 2012.
6. Varshney & Maheswari, "Managerial Economics", Sulthan Chand Publishers, 1st Revised Edition, 2009.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Explain about managerial economics according to the business	CLO 1	T1- 1.3-1.8
3-4	Describe about demand analysis, the Law of Demand and Demand Function.	CLO 2	T1-2.2-2.11
5-6	Understand elasticity of the demand of the product, different types, Measurement of Elasticity of Demand and Factors influencing on Elasticity of Demand.	CLO 2	T1-3.3-3.20
6-7	State different methods of Demand Forecasting and the factors governing Demand Forecasting.	CLO 4	T1-4.6-4.19
8-9	Demonstrate the Production function, features of Iso-Quants and Iso-Costs,	CLO 4	T1- 5.3-5.18
10-12	Different types of Internal Economies, External Economies and Law of Returns with appropriate examples	CLO 4	T1- 5.3-5.18
13-14	Illustrate different types of costs	CLO 5	T1- 5.29-6.8
15-16	Explain the Significance and Limitations of Break-Even Analysis	CLO 5	T1- 7.13-7.14
17-18	Calculate Break-Even Point (Simple Problems)	CLO 6	T1- 7.1-7.12
19-20	Illustrate the features, price-output determination under Perfect Competition, Monopoly and Monopolistic competition Markets.	CLO 6	T1- 8.4-8.16
22-23	Demonstrate the Objectives, Policies and Methods of Pricing Strategies and Price Methods.	CLO 7	T1- 8.21-8.25
24-25	Describe Features of business, Definitions of Various forms of Business Units.	CLO 7	T1-9.3-9.15
26-27	State the Merits & Demerits of Different types of Public	CLO 8	T1- 9.2-10.23
28-29	Enterprises Changing Business Environment to Post Liberalization Scenario.	CLO 8	T1- 9.2-10.23
30-31	Explain the significance and classification of capital, Methods	CLO 9	T1- 11.3-11.5
32-33	Demonstrate the concept of capital budgeting and allocations of the resources through capital budgeting methods and compute simple problems.	CLO 9	T1-12.1-12.26
34-35	Illustrate the Significance of Financial Accounting, Double Entry, Accounts.	CLO 8	T1-13.4-13.15
36-37	Accounting Concepts and Conventions	CLO 8	T1-13.4-13.15
38-39	Explain the meaning, advantages and Limitations of the Journal, Ledger and Trial Balance	CLO 10	T1-13.5-13.68
40-41	Final Accounts and Solve simple Problems.	CLO 8	T1-13.4-13.15
42-43	Describe Meaning, Definitions and Limitations of Ratio Analysis	CLO 10	T1-14.1-14.8
44-45	Compute different types of Financial Ratios (Problems)	CLO 10	T1-14.4-14.18

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S. No	Description	Proposed actions	Relevance with PO's	Relevance with PSO's
1	To improve standards and analyze the concepts.	Seminars	PO 1	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars	PO 4	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	Guest lectures	PO 2	PSO 1

Prepared by:
Ms E. Sunitha, Assistant Professor, MBA

HOD, MBA

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**COMPILER DESIGN**				
Course Code	AIT004				
Programme	B.Tech				
Semester	V	CSE	IT		
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Dr. K Srinivasa Reddy, Professor & HOD, IT				
Course Faculty	Dr. K Srinivasa Reddy, Professor & HOD, IT				

I. COURSE OVERVIEW:

This course deals with the basic techniques of Compiler Construction and tools that can used to perform syntax-directed translation of a high-level programming language into an executable code. This will provide deeper insights into the more advanced semantics aspects of programming languages, code generation, machine independent optimizations, dynamic memory allocation, types and their inferences, object orientation

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS002	II	Data Structures	4
UG	AHS013	III	Discrete Mathematical Structures	4
UG	AIT002	IV	Theory of Computation	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Compiler Design	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	3	Presentation on real-world problems
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Assignments
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Seminars
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions**.**	-	-

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	2	Assignments
PSO 2	**Software Engineering Practices**: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Seminars
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Apply the principles in the theory of computation to the various stages in the design of compilers.
II	Demonstrate the phases of the compilation process and able to describe the purpose and operation of each phase.
III	Analyze problems related to the stages in the translation process.
IV	Exercise and reinforce prior programming knowledge with a non-trivial programming project to construct a compiler.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT004	CLO 1	Define the phases of a typical compiler, including the front and backend.	PO1;PO2	3
AIT004	CLO 2	Recognize the underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.	PO1;PO 4	3
AIT004	CLO 3	Identify tokens of a typical high-level programming language; define regular expressions for tokens and design and implement a lexical analyzer using a typical scanner generator.	PO3	3
AIT004	CLO 4	Explain the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation	PO1;PO2	3
AIT004	CLO 5	Apply an algorithm for a top-down or a bottom-up parser construction; construct a parser for a given context-free grammar.	PO2	2
AIT004	CLO 6	Demonstrate Lex tool to create a lexical analyzer and Yacc tool to create a parser.	PO1;PO4	3
AIT004	CLO 7	Understand syntax directed translation schemes for a given context free grammar.	PO1;PO4	3
AIT004	CLO 8	Implement the static semantic checking and type checking using syntax directed definition (SDD) and syntax directed translation (SDT).	PO1;PO2	3
AIT004	CLO 9	Understand the need of intermediate code generation phase in compilers.	PO3;PO4	3
AIT004	CLO 10	Write intermediate code for statements like assignment, conditional, loops and functions in high level language.	PO1;PO4	3
AIT004	CLO 11	Explain the role of a semantic analyzer and type checking; create a syntax-directed definition and an annotated parse tree; describe the purpose of a syntax tree.	PO4	2
AIT004	CLO 12	Students will be able to design syntax directed translation schemes for a given context free grammar.	PO1;PO3	3
AIT004	CLO 13	Explain the role of different types of runtime environments and memory organization for implementation of programming languages.	PO1	2
AIT004	CLO 14	Differentiate static vs. dynamic storage allocation and the usage of activation records to manage program modules and their data.	PO2	3
AIT004	CLO 15	Understand the role of symbol table data structure in the construction of compiler.	PO1	2
AIT004	CLO 16	Learn the code optimization techniques to improve the performance of a program in terms of speed & space.	PO2	3
AIT004	CLO 17	Implement the global optimization using data flow analysis such as basic blocks and DAG.	PO1	2
AIT004	CLO 18	Understand the code generation techniques to generate target code.	PO3	3
AIT004	CLO 19	Design and implement a small compiler using a software engineering approach.	PO1;PO3	3
AIT004	CLO 20	Apply the optimization techniques to intermediate code and generate machine code	PO1;PO4	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2											3	2	
CLO 2	3			2									2		
CLO 3			3												
CLO 4	2	3											2		
CLO 5		2												3	
CLO 6	3			2									3		
CLO 7	2			3									2		
CLO 8	2	3													
CLO 9			3	3									2	3	
CLO 10	3			2											
CLO 11				2									3		
CLO 12	3		3										2		
CLO 13	2													2	
CLO 14		3											2		
CLO 15	2													2	
CLO 16		3											2		
CLO 17	2													2	
CLO 18			3												
CLO 19	3		3										2		
CLO 20	3			2									2	3	

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO2, PO3, PO4, PO10	SEE Exams	PO1,PO2 , PO3, PO4, PO10	Assignments	PO3	Seminars	PO4
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	INTRODUCTION TO COMPILERS AND PARSING
Introduction to compilers: Definition of compiler, interpreter and its differences, the phases of a compiler, role of lexical analyzer, regular expressions, finite automata, from regular expressions to finite automata, pass and phases of translation, bootstrapping, LEX-lexical analyzer generator; Parsing: Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar, classes of parsing, top-down parsing: backtracking, recursive-descent parsing, predictive parsers, LL(1) grammars.	
UNIT-II	**BOTTOM-UP PARSING**
Bottom-up parsing: Definition of bottom-up parsing, handles, handle pruning, stack implementation of shift- reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers-simple LR, canonical LR and Look Ahead LR parsers, error recovery in parsing, parsing ambiguous grammars, YACC-automatic parser generator.	
UNIT-III	**SYNTAX-DIRECTED TRANSLATION AND INTERMEDIATE CODE GENERATION**
Syntax-directed translation: Syntax directed definition, construction of syntax trees, S-attributed and Lattributed definitions, translation schemes, emitting a translation. Intermediate code generation: Intermediate forms of source programs– abstract syntax tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three-address code, translation of simple statements, Boolean expressions and flow-of control statements	
UNIT-IV	**TYPE CHECKING AND RUN TIME ENVIRONMENT**
Type checking: Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker, equivalence of type expressions, type conversions, overloading of functions and operators; Run time environments: Source language issues, Storage organization, storage- allocation strategies, access to nonlocal names, parameter passing, symbol tables, and language facilities for dynamic storage allocation.	
UNIT-V	**CODE OPTIMIZATION AND CODE GENERATOR**
Code optimization: The principle sources of optimization, optimization of basic blocks, loops in flow graphs, peephole optimization; Code generator: Issues in the design of a code generator, the target machine, runtime storage management, basic blocks and flow graphs, a simple code generator, register allocation and assignment, DAG representation of basic blocks.	
Text Books:	
1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, ―Compilers–Principles, Techniques and Tools‖, Pearson Education, Low Price Edition, 2004	
Reference Books:	
1. Kenneth C. Louden, Thomson, ―Compiler Construction– Principles and Practice‖, PWS Publishing 1st Edition ,1997 2. Andrew W. Appel, ―Modern Compiler Implementation C‖, Cambridge University Press, Revised Edition, 2004. 3 Andrew W. Appel, Modern Compiler Implementation C, Cambridge University Press, 2004.	

XIV. COURSE PLAN

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-4	Introduction, Analysis of the source program., Difference of compiler and interpreter, Phases of compilation, Grouping of phases, role of lexical analyzer	CLO 1	T1:1.1-1.3 T1 1.5,3.1
5-6	Construction of regular grammar from regular expression, NFA,DFA	CLO 2	T1: 3.6-3.7
7	Concept of pass and difference between pass and phase	CLO 1	T1: 1.5
8	Bootstrapping and types of compiler	CLO 3	T1: 1.1
9-11	Lex-Lexical analyzer generator, Derivations and parse tree, regular expressions v/s context free grammar	CLO 6	T1: 3.8 T2: 4.2 -4.3
12-15	Backtracking, eliminating ambiguity from dangling-else grammar, Elimination of left recursion and left factoring, Recursive decent parsing, Finding FIRST and FOLLOW.	CLO 4	T1: 4.3-4.4
16-18	Construction of parse tables, Predictive parsing, LL(1) grammar.	CLO 4	T1: 4.5-4.7
19-21	Handles, handle pruning, Shift reduce parsing, Conflicts during shift-reduce parsing, LR parsers- Goto and closure functions.	CLO 5	T1: 4.5-4.7
22-24	LR(0) and SLR and construction of parser table for SLR.	CLO 5	T1: 4.7
25-27	CLR operations and construction of parser table for LALR., LALR operations and construction of parser table for LALR.	CLO 5	T1: 4.7
28	Description of error recovery	CLO 11	T1: 4.7
29	Yacc parser generator.	CLO 6	T1: 4.9
30	Abstract syntax tree, three address code.	CLO 9	T1: 4.9
31-32	Introduction to attributes grammars, Syntax directed definitions, applications of SDD, Implementing L-attributed SDD's.	CLO 8	T1: 5.1-5.4
33	Control flow, back patching, translation of simple statements, Boolean expressions.	CLO 10	T1:8.4-8.6
34-35	Type checking, type expressions, type systems, Type conversions, Overloading.	CLO 11	T1: 6.1 T1:6.4-6.5
36-37	Source language issues, Storage organization, storage-allocation strategies. Access to nonlocal names, parameter passing	CLO 14	T1: 7.1 T1:7.2-7.3 T1:7.4-7.5
38-39	Symbol tables, and language facilities for dynamic storage allocation.	CLO 15	T1: 7.6-7.7
40	Principle sources of optimization	CLO 16	T1: 10.2
41-47	Optimization of basic blocks - Local, global and scope optimization, Loops in flow graphs, peephole optimization.	CLO 17	T1:10.1-10.2 T1: 10.4,9.9
48-49	Introduction, issues in code generation, , the target machine.	CLO 18	T1: 9.1-9.2
50	Runtime storage management	CLO 13	T1: 9.3
51-52	Basic blocks and flow graphs	CLO 17	T1: 9.4
53-54	a simple code generator, register allocation and assignment	CLO 20	T1: 9.6-9.7
55	DAG construction, applications	CLO17	T1: 9.8

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S no	Description	Proposed actions	Relevance with POS	Relevance with PSOS
1	ANTLR	Seminars / Guest Lectures / Assignments	PO1, PO3, PO4	PSO 1
2	JAVACC	Seminars / Guest Lectures / Assignments	PO 1, PO 3,PO4	PSO 3

Prepared by:

Dr. K Srinivasa Reddy, Professor & HOD, IT

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ADVANCED DATABASE**				
Course Code	**AIT505**				
Programme	B.Tech				
Semester	V				
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Mr. D. Rahul, Assistant Professor				
Course Faculty	Mr. D. Rahul, Assistant Professor				

I. COURSE OVERVIEW:

This course will address the advanced issues in modern database systems and applications. Databases underlie most complex computing systems. Major upcoming applications include scientific computing and enterprise integration. The present course will focus on the data-related issues in building, analyzing, and maintaining complex software systems. It will highlight the common concepts behind the different applications.

Increasingly, software systems that involve databases are heterogeneous. Traditionally, such systems are made to function in an unprincipled manner. This is because the simple approaches designed for small, centralized, homogeneous databases are ineffective and inappropriate for dealing with large, distributed, heterogeneous environments. Programmers often handcraft solutions, which distract them from their main objectives in scientific and business problem-solving and decision-support. However, the past few years have seen significant advances in techniques for operating and maintaining heterogeneous database systems.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	ACS005	III	Database Management Systems

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Advanced Database	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weight age in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Guest Lectures
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	5 minutes Video/ Seminars
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1	Seminars / 5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Lectures, Assignments
PSO2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success	2	Seminars
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Define entity relationship model and transaction processing system.
II	Understand various storage structures for database.
III	Describe the distributed and parallel database processing.
IV	Describe object oriented database concepts and models.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
CAIT505.01	CLO 1	Understand and explain the key ideas underlying database systems and the database approach to information storage and manipulation.	PO1; PO3; PO5	2
CAIT505.02	CLO 2	Design and implement database applications.	PO2; PO3	2
CAIT505.03	CLO 3	Understand the types of tasks involved in database administration and the facilities provided in a typical database system to support these tasks.	PO1; PO2	3
CAIT505.04	CLO 4	Design adequate backup, recovery and security measures for a database installation, and understand the facilities provided by typical database systems to support these tasks.	PO1; PO4	2
CAIT505.05	CLO 5	Define and use important temporal concepts, such as time point, time interval, and time-interval operators such as before, after and overlaps.	PO2; PO5	2
CAIT505.06	CLO 6	Understand the temporal data model at the conceptual level.	PO3;PO5	2
CAIT505.07	CLO 7	Describe some of the extensions to conventional query languages that have been proposed to support temporal query processing.	PO1; PO4	2
CAIT505.08	CLO 8	Critically assess the strengths and weaknesses of Object databases with respect to Relational systems.	PO2; PO4	1
CAIT505.09	CLO 9	Describe why Object databases appear to be such a good fit for a number of major growth areas in computing, such as Web-based and multimedia information systems.	PO3	3
CAIT505.10	CLO 10	Describe the strategy being adopted by major database supplier Oracle to address the apparent threat of Object database systems, and critically compare this approach with a pure Object technology approach	PO4	2
CAIT505.11	CLO 11	Formulate, using relational calculus solutions to a broad range of query problems	PO2; PO5	2
CAIT505.12	CLO 12	Identify a range of concepts, techniques and tools for creating and editing the interactive multimedia database	PO4;PO5	2
CAIT505.13	CLO 13	Identify the current and future issues related to multimedia technology to store information	PO2; PO5	1
CAIT505.14	CLO 14	Impart an overview of emerging data models like temporal, mobile and spatial databases	PO2; PO4	3
CAIT505.15	CLO 15	Understand the commercial relational database system (Oracle) by writing SQL using the system.	PO1; PO3	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3		3		1								2		
CLO 2		2	3										3		
CLO 3	3	3												2	
CLO 4	3			1									3		
CLO 5		3			2								2		
CLO 6			3		1								2		
CLO 7	3			2										2	
CLO 8		2		1									2		
CLO 9			3												
CLO 10		2			3									3	
CLO 11	3			1										2	
CLO 12			3	2									2		
CLO 13		2			1									2	
CLO 14		1		1										2	
CLO 15	3		3										2	3	

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1;PO2; PO3;PO4; PO5	SEE Exams	PO1;PO2; PO3;PO4; PO5	Assignments	PO1	Seminars	PO2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	ACTIVE DATABASES
Syntax and Semantics (Starburst, Oracle, DB2): Taxonomy, applications, integrity management, workflow management, business rules, design principles, properties, rule modularization, rule debugging, IDEA methodology, open problems.	
Unit-II	**TEMPORIAL AND OBJECT DATABASES**
Overview: Time domain, data types, associating facts with time, temporal query language; Transact-SQL (T-SQL): Time ontology, data model, language constructs; Implementation: System architecture, temporal support, support for TSQL2.	
Unit-III	**COMPLEX QUERIES AND REASONING**
Logic of Query Languages: Relational calculi, relational algebra, recursive rules, syntax and semantics of data log, fix point semantics. Implementation Rules and Recursion: Rule rewriting methods, compilation and optimization, recursive queries in SQL, open issues.	
Unit-IV	**SPATIAL, TEXT AND MULTIMEDIA DATABASES**
Traditional Indexing Methods: Secondary keys, spatial access methods, text retrieval; Multimedia indexing: 1D time series, 2D color images, sub pattern matching..	
Unit-V	**UNCERTAINITY IN DATABASES AND KNOWLEDGE BASES**
Introduction: Uncertainty in image database, uncertainty in temporal database, uncertainty in null value; Models of uncertainty; Uncertainty in relational databases: Lattice based relational databases, probabilistic relational databases	
Text Books:	
1. Carlo Zaniolo, Stefano Ceri, ―Advanced Database Systems‖, Morgan Kauffmann Publishers, VLDB Journal, 1st Edition, 1997.	
Reference Books:	
1. Raghu Ramakrishnan, ―Database Management System‖, McGraw-Hill Publications, 3rd Edition, 2000 2. Abraham Silberschatz, Henry F. Korth and S.Sudharshan, ―Database System Concepts‖, Tata McGraw-Hill, 6thEdition, 2010	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Syntax and Semantics Starburst	CLO 1	T2: 1.1
2	Syntax and Semantics Oracle	CLO 2	T2: 1.3
3	Syntax and Semantics DB2	CLO 2	T2: 1.4
4	Taxonomy	CLO 4	T2: 1.5
5	Applications ,integrity management	CLO 4	T2: 1.8.1
6	Workflow management	CLO 7	T2: 1.8
7	Business rules	CLO 6	T2: 1.10
8-10	Design principles, properties	CLO 5	T1: 2.1

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
10-13	Rule modularization, rule debugging	CLO 4	T1: 2.2
14	IDEA methodology	CLO 6	T1: 2.4
15	Open problems	CLO 2	T1: 2.5
16-17	Overview: temporal and object databases	CLO 3	T1: 3.2
18-19	Time domain, data types	CLO 4	T1: 3.5
20-22	Associating facts with time, temporal query language	CLO 1	T1: 3.7
23	Overview :Transact-SQL (T-SQL)	CLO 1	T1: 4.1
24-26	Time ontology, data model, language constructs	CLO 4	T1: 4.2.2 - 4.2.5
27-29	Implementation: System architecture, temporal support, support for TSQL2	CLO 4	T1:4.3, 4.4
30	Logic of Query Languages	CLO 3	T1: 19.1
31	Relational calculi, relational algebra, recursive rules,	CLO 8	T1:19.1.3
32-35	Syntax and semantics of data log, fix point semantics	CLO 9	T1: 19.4
36-38	Implementation Rules and Recursion	CLO 10	T1:19.4, 19.5
39	Rule rewriting methods,	CLO 8	T1: 19.5
40-42	Compilation and optimization, recursive queries in SQL	CLO 9	T1: 19.7, 19.8.1
43	Open issues	CLO 13	T1: 19.8.2
44	Traditional Indexing Methods	CLO 10	T2: 15.1, 15.2
45	Secondary keys, spatial access methods	CLO 14	T2: 15.3
46	Text retrieval	CLO 13	T2: 15.4 - 15.6
47	Multimedia indexing	CLO 12	T2: 16.1, 16.2
48	1D time series, 2D color images, sub pattern matching.	CLO 9	T2: 16.3, 16.4
49	Uncertainty in image database, uncertainty in temporal database	CLO 10	T2: 17.1, 17.2
50	Uncertainty in null value	CLO 11	T2: 17.3, 17.4
51	Models of uncertainty	CLO 15	T2: 17.6
52	Uncertainty in relational databases	CLO 10	T2: 17.7, 17.8
53	Lattice based relational databases	CLO 12	T1: 8.1
54	Probabilistic relational databases	CLO 14	T1: 8.3.1

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Active Databases: Syntax and Semantics of Starburst, Oracle and DB2	Work Shops/ Guest Lectures	PO1;PO2;PO3; PO4	PSO 1,PSO2
2	Object Databases and Complex Queries	Work Shops/ Laboratory Practices	PO1;PO3;PO5	PSO2;PSO2
3	Encourage students to write SQL Queries and PL/SQL programs based on the RDBMS Concepts.	Work Shops/ Laboratory Practices	PO1;PO2;PO3; PO4	PSO1;PSO2

Prepared by:
Mr. D. Rahul, Assistant Professor

HOD, IT

VI SEMESTER

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**DISASTER MANAGEMENT**				
Course Code	ACE551				
Programme	B.Tech				
Semester	VI	CSE|EEE|IT			
Course Type	Open Elective-I				
Regulation	IARE – R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Mr. Gude Ramakrishna, Associate Professor, CE.				
Course Faculty	Ms. P. Navya, Assistant Professor, IT. Ms. K. Sai saranya, Assistant Professor, CSE. Mr. R. Tarun kumar, Assistant Professor, CE. Mr. Selva Prakash, Assistant, CE.				

I. COURSE OVERVIEW:

This course is intended to provide fundamental understanding of different aspects of Disaster Management. It will expose the students to the concept and functions of Disaster Management and to build competencies of Disaster Management professionals and development practitioners for effective supporting environment as put by the government in legislative manner. It would also provide basic knowledge, skills pertaining to Planning, Organizing and Decision-making process for Disaster Risk Reduction.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	-

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Disaster Management	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each module carries equal weight age in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**			**Total Marks**
Type of Assessment	CIE Exam	Quiz	AAT	
CIA Marks	20	05	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz - Online Examination:
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

Alternative Assessment Tool (AAT):
This AAT enables faculty to design own assessment patterns during the CIA. The AAT converts the classroom into an effective learning centre. The AAT may include tutorial hours/classes,

seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), five minutes video, MOOCs etc.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Seminars
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Seminars
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Discussion of real-time applications
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	2	Discussion of real-time applications

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills**: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity	3	Seminars
PSO 2	**Software Engineering Practices**: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Discussion of real-time applications
PSO 3	**Successful Career and Entrepreneurship**: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	2	Seminars

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Identify the major disaster types and develop an understanding of modern disaster management.
II	Recognize and develop awareness of the chronological phases of natural disaster response and refugee relief operations.
III	Understand the key concepts of disaster management related to development and the relationship of different disaster management activities.
IV	Categorize the organizations that are involved in natural disaster assistance and relief system.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
ACE551.1	CLO 1	Integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.	PO 1	2
ACE551.2	CLO 2	Analyze and evaluate the environmental, social, cultural, economic, legal and organizational Aspects influencing vulnerabilities and capacities to face disasters. and to know about different types of environmental hazards	PO 1	2
ACE551.3	CLO 3	Obtain knowledge on different types of natural and man- made disasters. Work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery)	PO 1	2
ACE551.4	CLO 4	Describe endogenous and exogenous hazards their harmful effects to the environment. Case studies of India	PO 2	2
ACE551.5	CLO 5	Analyze, and communicate information on risks, relief needs and order to formulate strategies for mitigation.	PO 2	2
ACE551.6	CLO 6	Understand the Mitigation and control measures of exogenous hazards.	PO 2	2
ACE551.7	CLO 7	Understand different approaches of different phases	PO 2	2
ACE551.8	CLO 8	Capacity to analyze and evaluate research work on the field of emergencies and disaster.	PO 3	2
ACE551.9	CLO 9	Demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used. And emerging approaches of disasters.	PO 2	2
ACE551.10	CLO 10	Analyze the future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments.	PO 2	2
ACE551.11	CLO 11	Understand integrated approach for disaster preparedness, mitigation & awareness; Mitigation.	PO 1	2
ACE551.12	CLO 12	Understand different types of institution for disaster mitigation and management	PO 1	-
ACE551.13	CLO 13	Design and perform research on the different aspects of the emergencies and disaster.	PO 1; PO 6	2
ACE551.14	CLO 14	Relate their interconnections, particularly in the field of the Public Health aspects of the disasters.	PO 1; PO 2	2
ACE551.15	CLO 15	Understand different approaches to prevent disasters.	PO 2	2
ACE551.16	CLO 16	Understanding the race process of dealing with work place hazards.	PO 2	2
ACE551.17	CLO 17	Identification of natural calamities that tends to hazards and disasters.	PO 1; PO 2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												3		2
CLO 2	3	2												2	
CLO 3	1													2	
CLO 4		2	2										3		2
CLO 5		2												2	
CLO 6		2											3		2
CLO 7		3													
CLO 8			3												
CLO 9			2											2	
CLO 10		2													2
CLO 11			3											2	
CLO 12	3	1													
CLO 13	3					2									
CLO 14	2	2											3		2
CLO 15		3											3		
CLO 16		2													2
CLO 17			2										3		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES - DIRECT

CIE Exams	PO 3	SEE Exams	PO 2	Assignments	PO 3	Seminars	PO 1,PO 2
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS:

UNIT-I	ENVIRONMENTAL HAZARDS AND DISASTERS
Environmental hazards and disasters: meaning of environmental hazards, environmental disasters and environmental stress; concept of environmental hazards, environmental stress and environmental disasters, different approaches and relation with human ecology, landscape approach, ecosystem approach, perception approach, human ecology and its application in geographical researches.	
UNIT-II	**TYPES OF ENVIRONMENTAL HAZARDS AND DISASTERS**
Types of environmental hazards and disasters: Natural hazards and disasters, man induced hazards and disasters, natural hazards, planetary hazards/ disasters, extra planetary hazards/ disasters, planetary hazards, endogenous hazards, exogenous hazards.	
UNIT-III	**ENDOGENOUS HAZARDS**
Endogenous hazards, volcanic eruption, earthquakes, landslides, volcanic hazards/ disasters, causes and distribution of volcanoes, hazardous effects of volcanic eruptions, environmental impacts of volcanic eruptions. Earthquake hazards/ disasters, causes of earthquakes, distribution of earthquakes, hazardous effects of, earthquakes, earthquake hazards in India, human adjustment, perception and mitigation of earthquake.	
UNIT-IV	**EXOGENOUS HAZARDS**
Exogenous hazards/ disasters, infrequent events, cumulative atmospheric hazards/ disasters; Infrequent events: Cyclones , lightning , hailstorms; Cyclones: Tropical cyclones and local storms, destruction by tropical cyclones and local storms (causes, distribution human adjustment, perception and mitigation); Cumulative atmospheric hazards/ disasters: Floods, droughts, cold waves, heat waves floods; Causes of floods, flood hazards India, flood control measures (human adjustment, perception and mitigation); Droughts: Impacts of droughts, drought hazards in India, drought control measures, extra planetary hazards/ disasters, man induced hazards /disasters, physical hazards/ disasters, soil erosion, Soil erosion: Mechanics and forms of soil erosion, factors and causes of soil erosion, conservation measures of soil erosion; Chemical hazards/ disasters: Release of toxic chemicals, nuclear explosion, sedimentation processes; Sedimentation processes: Global sedimentation problems regional sedimentation problems, sedimentation and environmental problems, corrective measures of erosion and sedimentation, biological hazards/ disasters, population explosion.	
UNIT-V	**EMERGING APPROACHES IN DISASTER MANAGEMENT**
Emerging approaches in Disaster Management. Three Stages 1. Pre, disaster stage (preparedness) 2. Emergency Stage 3. Post Disaster stage, Rehabilitation.	
Text Books:	
1. Pardeep Sahni, "Disaster Mitigation: Experiences and Reflections", PHI Learning Pvt. Ltd., 1 st Edition, 2001. 2. J. Glynn, Gary W. Hein Ke, "Environmental Science and Engineering", Prentice Hall Publishers, 2 nd Edition, 1996.	
Reference Books:	
1. R.B.Singh (Ed), "Environmental Geography", 2 nd Edition, 1990. 2. R.B. Singh (Ed), "Disaster Management", 2 nd Edition, 2006.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic's to be covered	Course Learning Outcomes (CLOs)	Reference
1	Environmental Hazards & Disasters:	CLO 1	T1:22.5 R1:2.3
2	Meaning of Environmental Hazards	CLO 2	T1:22.5 R1:2.4
3	Environmental Stress	CLO 2	T1:22.6 R1:2.6
4	Environmental stress.	CLO 4	T1:22.7 R1:4.4
5-6	Concept of Environmental Hazards	CLO 4	T1:22.7 R1:4.10
7	Environmental stress & Environmental Disasters	CLO 7	T1:22.8 R1:4.15
8	Ecology	CLO 9	T1:22.9 R1:5.4
9	Different Approaches	CLO 9	T1:22.9 R1:5.8
10	Landscape Approach -.	CLO 11	T1:23.10 R1:6.8
11	Ecosystem approach -Perception approach.	CLO 11	T1:23.10 R1:6.13
12-13	Human ecology & its application in geographical researches	CLO 13	T1:23.9 R1:7.5
14	Types of Environmental hazards & Disasters	CLO 11	T1:23.10 R1:7.5
15-16	Natural hazards and Disasters	CLO 9	T1:23.10 R1:8.1
17-18	Man induced hazards & Disasters	CLO 14	T1:23.1 R1:9.2
19-20	Natural Hazards- Planetary Hazards/ Disasters	CLO 14	T1:23.1 R1:9.4
21-22	Planetary Hazards-Endogenous Hazards - Exogenous Hazards	CLO 14	T1:23.1 R1:9.9
23-24	Volcanic Eruption – Earthquakes – Landslides	CLO 14	T1:23.1 R1:9.10
25-26	Volcanic Hazards/Disasters- Causes and distribution of Volcanoes	CLO 14	T2:27.5 R1:10.2
27-28	Hazardous effectsof volcanic eruptions	CLO 17	T2:27.7 R1:11.3
29-30	Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes	CLO 17	T2:27.8 R1:11.6
31	Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India	CLO 19	T2:27.12 R1:11.7
32-33	Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters	CLO 19	T2:27.12 R1:11.8
34-35	Infrequent events: Cyclones, Lightning, Hailstorms, Cyclones: Earthquake Hazards in India	CLO 20	T2:27.12 R1:11.9
36-37	Tropical cyclones and Local storms	CLO 20	T2:27.12 R1:11.10
38	Destruction by tropical cyclones and local storms (causes, distribution human adjustment, perception and mitigation)	CLO 21	T2:27.14 R1:12.3
39-40	Cumulative atmospheric hazards/ disasters : Floods, Droughts, Cold waves, Heat waves Floods	CLO 22	T2:27.1 R1:12.7

Lecture No	Topic's to be covered	Course Learning Outcomes (CLOs)	Reference
41-42	Flood control measures (Human adjustment, perception and mitigation),	CLO 23	T2:27.17 R1:12.15
43-44	Droughts: Impacts of droughts, Drought hazards in India	CLO 23	T2:27.18 R1:12.19
45	Extra Planetary Hazards/ Disasters- Man induced Hazards /Disasters	CLO 24	T2:27.19 R2:14.4

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Methods for obtaining flow nets, seepage in anisotropic soils	Seminars/Guest Lectures	PO 3;PO 4	PSO 1
2	Stresses in soil due to externally applied line, strip and trapezoidal loading	Seminars/Guest Lectures	PO 1	PSO 1
3	Fields tests to determine the shear strength of soils	Seminars/NPTEL	PO 4	PSO 1

Prepared by:
Ms. P. Navya, Assistant Professor, IT.
Ms. K. Sai saranya, Assistant Professor, CSE.

HOD, IT.

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	INTERNET OF THINGS (IoT)				
Course Code	ACS510				
Programme	B. Tech				
Semester	VI	CSE	IT		
Course Type	Elective				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Dr. Chukka Santhaiah, Associate Professor, CSE				
Course Faculty	Ms. A. Soujanya, Assistant Professor, CSE				

I. COURSE OVERVIEW:

The course covers the concepts of data communication, computer networks, cloud computing and network security fundamental techniques, customs and terms including the basic components of hardware and software. This course helps the students in gaining the knowledge about the sensor devices, mathematical and engineering problems. This course helps to undertake future courses that assume this course as a background in networks and security.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
UG	AIT003	IV	Computer Networks

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Internet of Things	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✔	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignment
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	1	Assignment/ Term paper/ Mini projects

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Lectures/ Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success	2	Seminars
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	2	Guest lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the architecture of Internet of Things and connected world.
II	Explore on use of various hardware and sensing technologies to build IoT applications.
III	Illustrate the real time IoT applications to make smart world.
IV	Understand the available cloud services and communication API‘s for developing smart cities.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO’s	At the end of the course, the student will have the ability to:	PO’s Mapped	Strength of Mapping
ACS510.01	CLO 1	Understand and intuition of the whole process line of extracting knowledge from data about the Internet of Things.	PO1; PO2	2
ACS510.02	CLO 2	Deep insight in one of the specializations within the network, depending on the study	PO1	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
		and the choice of the concepts of IoT.		
ACS510.03	CLO 3	Solid knowledge in a broad range of methods based on design and implementation of IoT in network performance, analysis and problem solving with design of networks.	PO3	2
ACS510.04	CLO 4	Experience in deriving theoretical properties of methods involved in IoT.	PO1	3
ACS510.05	CLO 5	Design and implementation/modification of methods involved in IoT.	PO2	2
ACS510.06	CLO 6	Describe what IoT is and the skill sets needed to be a network analysis.	PO3	2
ACS510.07	CLO 7	Use IoT design to carry out basic statistical modeling and analysis.	PO3	2
ACS510.08	CLO 8	Motivate and explain trade-offs in IoT tool technique design and analysis of applications with IoT.	PO2	1
ACS510.09	CLO 9	Understand significance of models in IoT.	PO1	3
ACS510.10	CLO 10	Describe the Transport layer protocols and how its uses in IoT	PO1; PO3	2
ACS510.11	CLO 11	Apply basic IoT algorithms for predictive network performance.	PO2	1
ACS510.12	CLO 12	Understand basic terms what security issues. Identify key distribution methods.	PO3	1
ACS510.13	CLO 13	Identify common approaches used for Feature Generation of IoT.	PO3	1
ACS510.14	CLO 14	Create effective results of IoT future approaches	PO1	2
ACS510.15	CLO 15	Work effectively in teams on IoT projects.	PO1; PO2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3	2											2		
CLO 2	3												2		
CLO 3			2												
CLO 4	3												2		
CLO 5		2												2	
CLO 6			2										2		
CLO 7			2										2		

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 8		1													
CLO 9	3														
CLO 10	3		1												
CLO 11		2												2	
CLO 12															
CLO 13			1												2
CLO 14	3														2
CLO 15	2	2													2

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO1;PO2; PO3	SEE Exams	PO1;PO2; PO3	Assignments	PO2; PO3	Seminars	PO1
Laboratory Practices	PO1	Student Viva	-	Mini Project	PO3	Certification	-
Term Paper	PO3						

XII. ASSESSMENT METHODOLOGIES-INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✔	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	INTRODUCTIONTO INTERNET OF THINGS (IoT)
Definition and characteristics of IoT, physical design of IoT, logical design of IoT, IoT enabling technologies, IoT levels and deployment, domain specific IoTs.	
UNIT-II	**IoT AND M2M**
Introduction, M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT, basics of IoT system management with NETCONF-YANG.	
UNIT-III	**IoT ARCHITECTURE AND PYTHON**
IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model. Logical design using Python: Installing Python, Python data types and data structures, control flow, functions, modules, packages, file handling.	
UNIT-IV	**IoT PHYSICAL DEVICES AND ENDPOINTS**
Introduction to Raspberry Pi interfaces (Serial, SPI, I2C), programming Raspberry PI with Python, other IoT devices.	

UNIT-V	IoT PHYSICAL SERVERS AND CLOUD OFFERINGS
Introduction to cloud storage models and communication APIs; WAMP: AutoBahn for IoT, Xively cloud for IoT; Case studies illustrating IoT design: Home automation, smart cities, smart environment.	
Text Books:	
1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things: A Hands-on-Approach, VPT, 1st Edition, 2014. 2. Matt Richardson, Shawn Wallac, --Getting Started with Raspberry Pi, O'Reilly (SPD), 3rd Edition, 2014. 3. Bernd Scholz-Reiter, Florian Michahelles, — Architecting the Internet of Things, Springer	
Reference Books:	
1. Adrian McEwen, Hakim Cassimally, --Designing the Internet of things, John Wiley and sons, 1st edition, 2014. 2. Francis Da Costa, --Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications, 1st Edition, 2013.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Understanding the basics concepts of IoT	CLO1	T1:19
2	Motivations of IoT and various Applications of IoT	CLO3	T1:22
3	Describe the Things of IoT and characteristics of IoT	CLO3	T1:24
4-6	Analysis and Design of IoT in physical view	CLO5	T1:24
7-8	Understandings the Logical design of IoT	CLO5	T1:31
9-10	Describing various IoT enabling technologies	CLO5	T1:34-49
11-12	Identifying specific Domains IoTs	CLO4	T1:53-72
13	Understanding the basic differences between IoT and M2M	CLO6	T1: 6.16.4
14	Implementation of SDN and NFV architecture in IoT	CLO9	T1:80-85
15	Identifying IoT system management with NETCONF-YANG	CLO8	T1:91-92
16	Uses of SNMP in IoT protocols	CLO9	T1:93-94
17-18	Implementation of NETCONF-YANG by using Python	CLO10	T1:96-97
19-21	Development of IoT Architecture with standards	CLO7	T3:170-86
22-27	Logical design of IoT using Python	CLO5	T1:141-50
28-35	Describe the physical endpoints used in IoT	CLO11	T1:186-96
36-38	Identifying the various IoT physical servers and cloud offerings	CLO12	T1:197-98
39-45	Real time applications of IoT with Case studies design	CLO15	T1:254-64

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S no	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	IoT devices implementation	Assignments	PO2; PO3	PSO1
2	IoT real time examples	Seminars / NPTEL	PO2; PO3	PSO1; PSO3
3	IoT Securities Issues	Seminars / NPTEL	PO1; PO3	PSO1;PSO3

Prepared by:
Dr Chukka Santhaiah, Associate Professor, CSE

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**MICROPROCESSORS INTERFACING AND APPLICATIONS**				
Course Code	AEC023				
Programme	B.Tech				
Semester	VI	IT			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mrs. G Bhavana, Assistant Professor , ECE				
Course Faculty	Mrs. G Bhavana, Assistant Professor , ECE				

I. COURSE OVERVIEW:

The course will make them learn the basic theory of microprocessor and their applications in detail. Subsequently the course covers important concepts like how to write an assembly language programming. They will learn to write an assembly language programming for interfacing various I/O modules. They will learn to design different advance architectures to design a new communication interfaces.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS004	III	Computer Organization and Architecture	4
UG	AEC020	III	Digital Logic Design	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Microprocessors Interfacing and Applications	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Quiz
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignments
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Seminars

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Seminars and Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Quiz and Assignments
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the basic concepts of microprocessors and develop the architectures of 8085 and 8086.
II	Analyze and develop assembly language programming for 8086 microprocessor.
III	Develop various interfacing modules by using assembly language programming.
IV	Understand and know the basic concepts of advance micro processor architectures like 80386 and 80486.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEC023.01	CLO 1	Understand the internal Architecture of 8086 microprocessor and explain various modes of	PO 1	3

		operation of 8086.		
AEC023.02	CLO 2	Differentiate between 8085 and 8086 microprocessors architectures and its functionalities.	PO 1	3
AEC023.03	CLO 3	Distinguish between RISC and CISC architecture based microprocessors.	PO 1	3
AEC023.04	CLO 4	Explain various addressing modes and instruction set present in 8086 microprocessor.	PO 2	2
AEC023.05	CLO 5	Ability to understand and apply the fundamentals of assembly level programming of microprocessors.	PO 2	2
AEC023.06	CLO 6	Analyze and develop low level languages like ALP in 8086 Microprocessor systems for real time applications.	PO 2	2
AEC023.07	CLO 7	Describe in detail about the concept of interrupt, types of interrupts and ISR present in 8086 microprocessor.	PO 2	2
AEC023.08	CLO 8	Understand the concept of memory organization in processors which helps in various system designing aspects.	PO 1	3
AEC023.09	CLO 9	Identify the importance and significance of serial communication protocols in 8086 microprocessor.	PO 1	3
AEC023.10	CLO 10	Explain in detail about the importance of interrupt and interrupt sub routines in 8086 microprocessor.	PO 2	2
AEC023.11	CLO 11	Discuss the interfacing diagram of I/O devices with keyboard, 7-segment display, LCD and DAC to ADC.	PO 4	1
AEC023.12	CLO 12	Develop and design the interfacing circuit diagram of 8251 with 8086 processor.	PO 1	3
AEC023.13	CLO 13	Analyze and understand various synchronous and asynchronous serial data transfer schemes in 8086.	PO 1	3
AEC023.14	CLO 14	Explain the advance architectures of PIC and also the importance of interfacing a interrupt controller in PIC.	PO 1	3
AEC023.15	CLO 15	Understand basic architecture of 16 bit and 32 bit microprocessors with the help of multitasking and addressing modes.	PO 2	2
AEC023.15	CLO 16	Analyze the various advanced microprocessors internal architectures for 80X86 by paging and technical features.	PO 1	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	2												2	2	
CLO 2	3												1		

CLO 3													3		
CLO 4		2											1		
CLO 5		2													
CLO 6		3												3	
CLO 7		2												2	
CLO 8	3												2		
CLO 9	2													2	
CLO 10		2													
CLO 11				2											
CLO 12	3														
CLO 13	2												1		
CLO 14	3														
CLO 15		2											2	2	
CLO 16		2											1		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1	SEE Exams	PO 1	Assignments	PO 2	Seminars	PO 4
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO 4						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	OVERVIEW OF 8086 MICROPROCESSOR
Introduction to 8085 microprocessor. RISC and CISC processors, architecture of 8086 microprocessor, special functions of general purpose register, 8086 flag register and function of 8086 flags, addressing modes of 8086, instruction set of 8086, assembler directives.	
Unit-II	**8086 ASSEMBLY LANGUAGE PROGRAMMING**
Minimum mode and maximum mode of operation, timing diagram, Assembly language programs: Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation.	

Unit-III	8255 PROGRAMMABLE PERIPHERAL INTERFACE (PPI)
Various modes of 8255 operation and interfacing to 8086; Interfacing keyboard, displays, 8279 Stepper motor and actuators, digital to analog and analog to digital converter interfacing. Interrupt structure of 8086: Interrupt structure of 8086, Vector interrupt table, interrupt service routines; Introduction to DOS and BIOS interrupts, 8259 PIC architecture and interfacing cascading of interrupt controller and its importance.	
Unit-IV	**SERIAL DATA TRANSFER SCHEMES**
Asynchronous and synchronous data transfer schemes, 8251 USART architecture and interfacing; TTL to RS 232C and RS232C to TTL conversion; Sample program of serial data transfer; Introduction to high-speed serial communications standards, USB.	
Unit-V	**ADVANCED MICROPROCESSORS:**
80286 Microprocessor: Architecture, registers (Real/Protected mode), privilege levels, descriptor cache, memory access in GDT and LDT, multitasking, addressing modes; Flag register 80386: Architecture, register organization, memory access in protected mode, paging; 80486: Only the technical features.	
Text Books:	
1. D. V. Hall, "Microprocessors and Interfacing", Tata McGraw-Hill Education, 3rd Edition 2013. 2. A.K Ray, K. M. Bhurchandani, "Advanced Microprocessors and Peripherals" Tata McGraw-Hill Education, 2nd Edition, 2006. 3. Savaliya M. T, "8086 Programming and Advance Processor Architecture", Wiley India Pvt., 1st Edition, 2012.	
Reference Books:	
1. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, "Microprocessors and Interfacing", Oxford University, 1st Edition, 2012. 2. Lyla B. Das, "The x86 Microprocessors", Pearson India, 2nd Edition, 2014.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-5	Basic understanding of 8085 and 8086 microprocessors architectures and its functionalities.	CLO 1	T2:1.2
6-10	Able to understand the importance of addressing modes and the instruction set of the processor which is used for programming.	CLO 4	T2:2.2
11-15	Analyze the importance of the instruction set of the processor which is used for programming.	CLO 4	T2:2.3
16-20	Discuss about the assembly language programming and of 8086 microprocessor.	CLO 5	T2:3.2
21-25	Understand the internal Architecture and different modes of operation of popular 8086 microprocessors.	CLO 2	T2:5.5
26-28	Ability to understand and apply the fundamentals of assembly level programming of microprocessors.	CLO 6	T2:3.3
29-30	Explain sorting and evaluation concepts of 8086 microprocessor.	CLO 12	T2:2.2
31-35	Ability to interface the external peripherals and I/O devices and program the 8086 microprocessor using 8255.	CLO 14	T2:5.1
36-40	Understand the concepts of interrupt and interrupt sub routines in 8086 microprocessor.	CLO 10	T2:4.3
41-44	Identify the significance of serial communication in 8086. Develop the interfacing of 8251 with 8086 processor.	CLO 13	T2:6.1
45-52	Analyze and understand the Interfacing of RS-232C and high speed buses.	CLO 15	R2:5.1

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
53-58	Understand and analyze the various advanced microprocessors internal architectures such as 80X86.	CLO 16	R2:5.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S. N0	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	ALP for Microprocessors like 8086 and 80x86	Seminars / NPTEL/Assignments	PO 1, PO 2	PSO 1
2	Interfacing IO devices to various types of Microprocessors	Seminars / NPTEL	PO 2, PO 4	PSO 1
3	Programming of all microprocessors by using ALP	Guest Lectures	PO 1, PO 2	PSO 2

Prepared by:
Mrs. G Bhavana, Assistant Professor.

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**EMBEDDED SYSTEMS DESIGN**				
Course Code	AEC551				
Programme	B.Tech				
Semester	VI	IT			
Course Type	Open Elective-I				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	4	-	-
Chief Coordinator	Mr. N Nagaraju, Assistant Professor, ECE				
Course Faculty	Mr. N Nagaraju, Assistant Professor, ECE				

I. COURSE OVERVIEW:

Embedded systems course is continuous of the Microprocessor and Microcontrollers, is intended to designing, implementation and Test of embedded applications. The topics covered are definition of embedded systems, history, classification, and major applications. Introduction to microcontroller and its interfacing, embedded firmware design and development, RTOS, task scheduling, threads, multitasking, task communication, task synchronization. Understand need of microcontrollers in development of various projects and to know operating systems and RTOS.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS007	IV	Operating Systems	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Embedded Systems Design	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for SEE. Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows: Two full questions with "either" or "choice" are drawn from each unit of the syllabus. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the theoretical concepts and derivation capabilities.
50 %	To test the analytical and problem solving skills.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks of which 25 marks for problem solving and 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Lectures, Assignments
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Lectures, Assignments
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	One minute videos
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	3	Lectures

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	2	Seminars
PSO 2	**Problem-Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Imbibe knowledge about the basic functions, structure, concepts and applications of Embedded Systems.
II	Understand Real time operating system concepts.
III	Analyze different tools for development of embedded software.
IV	Understand the architecture of advanced processors.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to	PO's Mapped	Strength of Mapping
AEC551.01	CLO 1	Understand basic concept of embedded systems.	PO 1, PO 3	3
AEC551.02	CLO 2	Understand and analyze the applications in various domains of embedded system.	PO 1, PO 3	2
AEC551.03	CLO 3	Develop embedded system development process and tools.	PO 5, PO 12	3
AEC551.04	CLO 4	Understand and remember what is microcontroller, and core of the embedded system.	PO1, PO 3	3
AEC551.05	CLO 5	Understand the memory interface and assembly language programming process.	PO 1, PO 3	2
AEC551.06	CLO 6	Understand the counters and timers of 8051 microcontroller.	PO 1, PO 3	3
AEC551.07	CLO 7	Understand the embedded C programming in Keil IDE, and compiling.	PO 5, PO 12	2
AEC551.08	CLO 8	Understand different concepts of display and keyboard interfacing using embedded C.	PO 5, PO 12	2
AEC551.09	CLO 9	Understand different concepts of serial communication using embedded C.	PO 5, PO 12	2
AEC551.10	CLO 10	Understand the RTOS concepts for firmware development.	PO 3, PO 5	3
AEC551.11	CLO 11	Develop host and target machines for linking to embedded software.	PO 3, PO 5	2
AEC551.12	CLO 12	Develop debugging techniques for testing on host machine.	PO 3, PO5	2
AEC551.13	CLO 13	Understand the advanced processors such as ARM and SHARC.	PO 3, PO 12	3
AEC551.14	CLO 14	Understand the bus protocols such as I2C and CAN bus.	PO 3, PO 12	2
AEC551.15	CLO 15	Design an application based on advanced technological changes.	PO 3, PO12	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3		3										2		
CLO 2	2		2										3		
CLO 3					3							3	2		
CLO 4	3		3												
CLO 5	2		2										1		
CLO 6	1		3										2		

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 7					3							2			
CLO 8					3							3			
CLO 9					2							2			
CLO 10			3		3										
CLO 11			2		2								1		
CLO 12			2		3								1		
CLO 13			3									3			
CLO 14			2									2	1		
CLO 15			2									3	3		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 3, PO 5, PO 12	SEE Exams	PO 1, PO 3, PO 5, PO 12	Assignments	PO 1, PO 3	Seminars	PSO 1
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	EMBEDDED COMPUTING
Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, complex systems and microprocessor, classification, major application areas, the embedded system design process, , formalisms for system design, design examples.	
UNIT-II	**THE 8051 ARCHITECTURE**
Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts. The Assembly Language Programming Process, Instructions of 8051 Programming Tools and Techniques, Simple Programs.	
UNIT-III	**INTRODUCTION TO EMBEDDED C AND APPLICATIONS**
Embedded systems programming in C, binding and running embedded C program in Keil IDE, dissecting the program, building the hardware. Basic techniques for reading and writing from I/O port pins, LED interfacing, interfacing with keyboards,	

displays, D/A and A/D conversions, using embedded C interfacing.	
UNIT-IV	**INTRODUCTION TO REAL – TIME OPERATING SYSTEMS**
Tasks and Task States, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Interrupt Routines in an RTOS Environment. Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine.	
UNIT-V	**INTRODUCTION TO ADVANCED ARCHITECTURES**
ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus.	
Text Books:	
1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill. 2. Wayne Wolf, "Principles of Embedded Computing System Design", Elseveir, 2nd Edition 2014. 3. Kenneth J.Ayala, "The 8051 Microcontroller", Thomson, 3rd Edition 2016. 4. Dr. K V K K Prasad, "Embedded / Real-Time Systems: Concepts, Design And Programming", Black Book , DreamTech Press.	
Reference Books:	
1. Embedding system building blocks, Labrosse, via CMP publishers. 2. Embedded Systems, Raj Kamal, TMH. 3. An Embedded Software Primer, David E. Simon, Pearson Education. 4. 8051 Microcontroller and Embedded Systems, by Muhammad Ali Mazadi,Janice Mazidi, Janice Gillispie Mazdi.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Definition of Embedded System, Embedded Systems Vs General Computing Systems	CLO 1	T1-1.1
3-4	History of Embedded Systems, complex systems and microprocessor	CLO 1	T1-1.2
5-6	Classification of Embedded Systems, Major Application Areas	CLO 2	T1-1.3
7	Embedded system design process	CLO 3	T2-1.4
8-9	Formalisms for system design	CLO 3	T2-1.5
10-12	Design examples	CLO 3	R2-1.2
13-14	Introduction, 8051 Micro controller	CLO 4	T3-1.3
15-16	Micro controller Hardware, Input/output Ports and Circuits	CLO 4	T3-2.4
17-18	External Memory, Counter and Timers	CLO 6	T3-2.5
19-20	Serial data Input/output, Interrupts	CLO 4	T3-2.6
21-22	The Assembly Language Programming Process	CLO 5	T3-2.7
23-24	Instructions of 8051 Programming Tools and Techniques	CLO 5	T3-2.8

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
25-26	Simple Programs	CLO 5	T3-2.9
27-28	Embedded systems programming in C	CLO 7	R2-3.1
29-30	Binding and running embedded C program in Keil IDE	CLO 7	R2-3.2
31-32	Dissecting the program, building the hardware	CLO 7	R2-3.3
33-34	Basic techniques for reading and writing from I/O port pins	CLO 8	R2-3.4
35-36	LED interfacing, interfacing with keyboards	CLO 8	R2-3.5
37-38	Displays, D/A and A/D conversions using embedded C interfacing	CLO 9	R2-3.6
39-40	Tasks and Task States, Shared Data	CLO 10	R3-3.7
41-42	Message Queues, Mailboxes and Pipes	CLO 10	R3-3.8
43-44	Timer Functions, Events, Semaphores and Queues	CLO 10	R3-4.1
45-46	Hard Real-Time Scheduling Considerations, Interrupt Routines in an RTOS Environment.	CLO 11	R3-4.2
47-48	Embedded Software Development Tools: Host and Target machines	CLO 11	R3-4.3
49-50	Linker/Locators for Embedded Software, Getting Embedded Software into the Target System	CLO 12	R3-4.4
51-52	Debugging Techniques: Testing on Host Machine	CLO 12	R3-4.5
53-54	ARM and SHARC	CLO 13	T2-8.1
55-56	Processor and memory organization and Instruction level parallelism	CLO 13	T2-8.2
57-58	Networked embedded systems: Bus protocols, I2C bus	CLO 14	T2-8.3
59-60	CAN bus.	CLO 14	T2-8.4

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Advanced embedded systems with real time examples.	Guest Lectures	PO 5	PSO 1
2	Real time operating system concepts which applicable to advanced systems.	Seminars / NPTEL	PO 1	PSO 1
3	Design of elevator controller.	NPTEL	PO 3	PSO 1

Prepared by:
Mr. N Nagaraju, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ENERGY FROM WASTE**					
Course Code	AEE551					
Programme	B.Tech					
Semester	VI	CSE	IT			
Course Type	Elective					
Regulation	IARE - R16					
Course Structure	**Theory**			**Practical**		
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**	
	3	-	3	-	-	
Chief Coordinator	Ms. B. Navothna, Assistant Professor,EEE					
Course Faculty	Ms. B. Manogna ,Assistant Professor, EEE Ms. B Navothna, Assistant Professor,EEE					

I. COURSE OVERVIEW:

The course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. The course description is: to understand what municipal solid waste, composition is its characteristics and to improve the methods to minimize municipal solid waste. To understand the methods of disposal of solid waste by thermal biochemical and land filling methods and to know the environmental impacts of all types of municipal waste To get a good knowledge of environmental in context of global trade.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS009	II	Environmental Studies.	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Energy from Waste	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminar
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignment
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Assignment
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	2	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity	-	-
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Seminar
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:

I	Understand the principles associated with effective energy management and to apply these principles in the day to day life.
II	Develop insight into the collection, transfer and transport of municipal solid waste.
III	Explain the design and operation of a municipal solid waste landfill.
IV	Evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities and device key processes involved in recovering energy from wastes.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEE551.01	CLO 1	Apply the knowledge about the operations of Waste to Energy Plants.	PO2	2
AEE551.02	CLO 2	Understand physical and chemical analysis of municipal solid wastes and apply them for a management system that will be set up.	PO1	3
AEE551.03	CLO 3	Analyze the various aspects of Waste to Energy Management Systems.	PO2	2
AEE551.04	CLO 4	Design a compost facility, incineration facility and make site selection for a landfill.	PO5	2
AEE551.05	CLO 5	Explain the hierarchical structure in solid waste management and a requirement for an integrated solution.	PO3	2
AEE551.06	CLO 6	Use Geographical Information System for landfill site selection that takes place in Solid Waste Management Plan.	PO3	
AEE551.07	CLO 7	Collect required data for a Solid Waste Management Plan and edit the collected dataset up Solid Waste Management Plan.	PO5	2
AEE551.08	CLO 8	Understand Biochemical conversion of biomass for energy application, Bioenergy systems and process integration.	PO3, PO5	2
AEE551.09	CLO 9	Discuss Thermo chemical conversion of biomass for energy application.	PO3, PO5	2
AEE551.10	CLO 10	Understand the concept of bio mass briquetting and its advantages.	PO3, PO5	2
AEE551.11	CLO 11	Evaluate the subject from the technical, legal and economical points by learning of all terms related to general solid waste management.	PO7	2
AEE551.12	CLO 12	Use multiple criteria decision making systems for an optimum and sustainable integrated solid waste management system based on entire data.	PO7	2
AEE551.13	CLO 13	Apply the knowledge in planning and operations of Waste to Energy plants.	PO3,PO5	2
AEE551.14	CLO 14	Examine the technical points that are required to set up a solid waste management system.	PO5	2
AEE551.15	CLO 15	Apply the legal legislation related to solid waste management.	PO5	2
AEE551.16	CLO 16	Encourage students to organize recycling events and waste audit.	PO3	2
AEE551.17	CLO 17	Discuss the growth of electrical and electronics in waste to energy industry in India.	PO2	2
AEE551.18	CLO 18	Understand need for stringent health safeguards and environmental protection laws of India.	PO7	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

CLOs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1		2												2	
CLO 2	3														
CLO 3		2												2	
CLO 4					2									2	
CLO 5			2											2	
CLO 6			2												
CLO 7					2										
CLO 8			2		2									2	
CLO 9			2		2									2	
CLO 10			2		2									2	
CLO 11							2								
CLO 12							2							2	
CLO 13			2		2									2	
CLO 14					2										
CLO 15					2										
CLO 16			2											2	
CLO 17		2													
CLO 18							2								

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO2, PO3,PO5	SEE Exams	PO2, PO3,PO5	Assignments	PO3, PO5	Seminars	PO2,PO7
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS:

UNIT I	INTRODUCTION TO WASTE AND WASTE PROCESSING	Classes:09
Solid waste sources solid waste sources, types, composition, properties, global warming; Municipal solid waste: Physical, chemical and biological properties, waste collection and, transfer stations, waste minimization and recycling of municipal waste, segregation of waste, size reduction, managing waste, status of technologies for generation of energy from waste treatment and disposal aerobic composting, incineration, furnace type and design, medical waste / pharmaceutical waste treatment technologies, incineration, environmental impacts, measures to mitigate environmental effects due to incineration .		
UNIT II	**WASTE TREATMENT AND DISPOSAL**	**Classes:09**
Land fill method of solid waste disposal land fill classification, types, methods and sitting consideration; Layout and preliminary design of landfills: Composition, characteristics, generation, movement and control of landfill leach ate and gases, environmental monitoring system for land fill gases.		
UNIT III	**BIO-CHEMICAL CONVERSION**	**Classes:09**
Energy generation from waste bio-chemical conversion: Sources of energy generation, anaerobic digestion of sewage and municipal waste, direct combustion of MSW-refuse derived solid fuel. Industrial waste, agro residues and anaerobic digestion.		
UNIT IV	**THERMO-CHEMICAL CONVERSION**	**Classes:09**
Biogas production, land fill gas generation and utilization, thermo-chemical conversion: Sources of energy generation, gasification of waste using gasifies briquetting, utilization and advantages of briquetting, environmental benefits of bio-chemical and thermo- chemical conversion.		
UNIT V	**E-WASTE MANAGEMENT**	**Classes:09**
E-waste: E-waste in the global context: Growth of electrical and electronics industry in India, environmental concerns and health hazards; Recycling e-waste: A thriving economy of the unorganized sector, global trade in hazardous waste, impact of hazardous e-waste in India; Management of e-waste: Ewaste legislation, government regulations on e-waste management, international experience, need for stringent health safeguards and environmental protection laws of India.		
Text Books:		
1. Nicholas P Cheremisinoff, "Handbook of Solid Waste Management and Waste Minimization Technologies", An Imprint of Elsevier, New Delhi, 2003. 2. Paul Breeze, "Energy from Waste", An Imprint of Elsevier, New Delhi, 2018. 3. P Aarne Vesilind, William A Worrell and Debra R Reinhart, "Solid Waste Engineering", 2 nd edition 2002.		
Reference Books:		
1. C Parker and T Roberts (Ed), "Energy from Waste", An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985. 2. KL Shah, "Basics of Solid and Hazardous Waste Management Technology", Prentice Hall, Reprint Edition, 2000. 3. M Datta, "Waste Disposal in Engineered Landfills", Narosa Publishing House, 1997.		

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	CLOs	Reference
1	Summarize about solid waste sources and its importance.	CLO 2	T1:3.3 T2: 1.2
2	Discuss solid waste properties and its composition.	CLO 2	T1: 3.4 T2: 1.4
3	Provides the information regarding collection and transfer of solid waste.	CLO 2	T1: 3.5 T2: 1.5

Lecture No	Topics to be covered	CLOs	Reference
4	Discuss the need of waste minimization and recycling	CLO 1	T1: 3.7 T2: 1.8
5	Discuss the need of segregating waste and managing solid waste.	CLO 1	T1: 3.9 T2: 1.10
6	Aquire the knowledge about the technologies for generation of energy from solid waste	CLO 4	T1: 5.5 T2: 6.2
7	Aquire the knowledge about the technologies for generation of energy from biomedical waste	CLO 4	T1: 5.6 T2: 6.3
8	Discuss the environmental impacts of incineration.	CLO 4	T1: 4.3 T2: 5.2
9	Illustrate the importance of landfill method of disposal.	CLO 4	T1: 4.4 T2: 5.3
10	Discuss the types of land fill disposal.	CLO 4	T1: 4.5 T2:5.4
11	Analyze the layout of landfills.	CLO 4	T1: 4.6 T2: 5.5
12	Summarize the properties and characteristics of landfills.	CLO 4	T1: 4.5.2 T2: 5.6
13	Aquire the knowledge of generating energy from landfills.	CLO 4	T1: 4.6 T2: 5.5
14	Discuss the emission of gasses and leach ate from landfills	CLO 4	T1: 4.6.2 T2: 5.5.2
15	Discuss the environmental monitoring system for land fill gases	CLO 4	T1: 4.7 T2: 5.6
16	Discuss about biochemical conversion.	CLO 8	T1: 4.7 T2: 5.8
17	Illustrate the sources of biochemical conversion.	CLO 8	T1: 4.7.2 T2: 5.8.2
18	Analyze anaerobic digestion of sewage.	CLO 8	T1: 4.8 T2: 5.9
19	Analyze direct combustion of MSW.	CLO 8	T1: 4.9 T2: 5.7
20	Discuss about refuse derived solid fuel.	CLO 2	T1: 6.2 T2: 5.6
21	Discuss about industrial waste and agro residues.	CLO 10	T1: 6.3 T2: 5.7
22	Understand the concept of Thermo-chemical Conversion	CLO 9	T1: 6.4 T2: 5.8
23	Discuss about Biogas production	CLO 9	T1: 6.5 T2: 5.3
24	Explain land fill gas generation and utilization	CLO 4	T1: 6..6 T2: 5.2
25	Illustrate sources of thermo chemical energy generation	CLO 9	T1: 6.7 T2: 5.3
26	Explain gasification of waste using gasifies briquetting	CLO 9	T1: 6.5 T2: 7.5
27	Discuss utilization of various waste waster treatments	CLO 8	T1: 6.2, 6.3 T2: 7.6
28	Discuss advantages of briquetting	CLO 10	T1: 6.2, 6.3
29	Summarize environmental benefits of bio-chemical conversion	CLO 8	T1: 6.2 T2: 7.2
30	Summarize environmental benefits of thermo- chemical conversion	CLO 9	T1: 6.3 T2: 7.3
31	Outline of E-waste in India	CLO 12	T1:6.4 T2:7.5
32	Summarize E-waste in the global context	CLO 12	T1: 6.2 T2: 5.6

Lecture No	Topics to be covered	CLOs	Reference
33	Understand the Growth of electrical and electronics industry in India	CLO 17	T1: 6.3 T2:5.7
34	Identify environmental concerns and health hazards	CLO 18	T1: 6.4 T2:5.8
35	Determine recycling concept Of E-Waste	CLO 15	T1: 2.1 T2: 9.1
36	Discuss A thriving economy of the unorganized sector	CLO 10	T1: 2.2 T2:9.2
37	Discuss global trade in hazardous waste	CLO 18	T1: 2.1 T2: 9.1, 9.2
38	Discuss impact of hazardous e-waste in India	CLO 18	T1: 2.6 R1: 5.1
39	Understand management of e-waste	CLO 18	T1: 2.7 R1: 5.2
40	Outline E-waste legislation	CLO 17	T1:2.8 R1:5.5
41	Summarize government regulations on e-waste management	CLO 17	T1: 2.1 R1: 5.6
42	Outline international waste management	CLO 17	T1: 2.2 R1:5.4
43	Explain need for stringent health safeguards	CLO 18	T1:2.4 R1:5.5
44	Discuss need for environmental protection laws	CLO 18	T1: 2.2, 2.3 R1:5.2
45	Outline environmental protection laws of India.	CLO 18	T1: 2.5 R1:5.2.2

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No.	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Case studies on conversion of municipal solid and waste to energy conversion technologies.	NPTEL/ Guest lectures	PO 1	PSO 2

Prepared by:
Ms. B. Manogna, Assistant professor

HOD, EEE

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**LINUX INTERNALS**				
Course Code	AIT005				
Programme	B.Tech				
Semester	VI				
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. A Krishna Chaitanya, Assistant Professor				
Course Faculty	Mr. A Krishna Chaitanya, Assistant Professor				

I. COURSE OVERVIEW:

This course provides a deep understanding of the operating system architecture and low-level interfaces (principally, system calls and library functions) that are required to build system-level, multithreaded, and network applications on Linux and UNIX systems. The course consists of a mixture of detailed presentations coupled with a large number of carefully designed practical exercises that allow participants to apply the knowledge learned in the presentations.
By the completion of the course, participants will have the mastery needed to write complex system, network, and multithreaded applications on a Linux or UNIX system.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS001	I	Computer Programming	4
UG	AIT003	IV	Computer Networks	4

III. MARKS DISTRIBUTION

Subject	SEE Examination	CIA Examination	Total Marks
Linux Internals	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✔	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz/AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Seminars
PO 3	**Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignments
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Seminars
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2	Assignments

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer - based systems of varying complexity.	3	Assignments
PSO 2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	2	Seminars
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Familiarize students with the Linux environment, and able to run commands on a standard Linux operating system.
II	Provide the skills needed to develop and customize Linux shell programs and to make effective use of a wide range of standard Linux programming and development tools.
III	Able to write moderate C programs utilizing common system calls.
IV	Develop the skills necessary for system programming and inter and intra process communication programming.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT005.01	CLO 1	Learn the importance of Linux architecture along with features.	PO 1;PO 3	3
AIT005.02	CLO 2	Identify and use Linux utilities to create and manage simple file processing operations.	PO 2;PO 5	2
AIT005.03	CLO 3	Apply the security features on file access permissions by restricting the ownership using advance Linux commands.	PO 3	2
AIT005.04	CLO 4	Implement the SED, GREP and AWK commands for pattern matching and mathematical functions.	PO 1: PO 3	2
AIT005.05	CLO 5	Understand the shell responsibilities of different types of shells.	PO 2; PO 5	2
AIT005.06	CLO 6	Develop shell scripts to perform more complex tasks in shell programming environment.	PO 3	2
AIT005.07	CLO 7	Illustrate file processing operations such as standard I/O and formatted I/O.	PO 1	3
AIT005.08	CLO 8	Understand process structure, scheduling and management through system calls.	PO 2	2
AIT005.09	CLO 9	Generalize signal functions to handle interrupts by using system calls.	PO 1;PO 5	3
AIT005.10	CLO 10	Illustrate memory management of file handling through file/region lock.	PO 1;PO 3	3
AIT005.11	CLO 11	Design and implement inter process communication(IPC) in client server environment by using pipe, message queues, named Pipes.	PO 5	3
AIT005.12	CLO 12	Illustrate client server authenticated communication in IPC through semaphores and shared memory.	PO 2	2
AIT005.13	CLO 13	Demonstrate various client server applications on network using TCP or UDP protocols.	PO 3	3
AIT005.14	CLO 14	Design custom based network applications using the Sockets Interface in heterogeneous platforms.	PO 1;PO 5	3
AIT005.15	CLO 15	Understand the comparison of various Inter Process Communication Mechanisms.	PO 1	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3		3												
CLO 2		2			3								3		
CLO 3			2												

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 4	3		2												
CLO 5		2			3								3		
CLO 6			2											2	
CLO 7	3												3		
CLO 8			2										3		
CLO 9	3				3										
CLO 10	3		3												
CLO 11					3								3		
CLO 12		2													
CLO 13			3										3		
CLO 14	3				3										
CLO 15	3													2	

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO 1, PO 2, PO 3, PO 5	SEE Exams	PO 1, PO 2, PO 3, PO 5	Assignments	PO 12	Seminars	PO 2
Laboratory Practices	PO 1	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES-INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

UNIT-I	LINUX UTILITIES AND BOURNCE AGAIN SHELL (bash)
Introduction to Linux operating system: History of Linux, features of Linux, architecture of unix/linux, Linux Utilities-File handling utilities , Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities; Sed: Scripts, operation, addresses, commands; Awk: Execution, fields and records scripts, operation, patterns, actions, applications; Working with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and input Redirection, output redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing,	

functions, debugging shell scripts.

UNIT-II	FILES AND DIRECTORIES SYSTEM CALLS

Files and Directories: File Concept, File types, File System Structure, File metadata- Inodes, kernel support for files, file System calls for file I/O operations- open, create, read, write, close, lseek,dup2, file status information- stat family, file and record locking- fcntl function, permission- chmod, fchmod, file ownership- chown, lchown, fchown, links- soft links & hard links- symlink, link, ulink.
Directories: creating, removing and changing directories- mkdir, rmdir, chdir, obtaining current working directory- getcwd, directory contents, scanning directories- opendir, readdir, closedir, rewind dir functions.

UNIT-III	PROCESS AND SIGNALS

Process – Process concept, Layout of a C program, image in main memory, process environment- environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management- fork, vfork, exit, wait, waitpid, exec family, process groups, sessions & controlling terminal, differences between threads & processes.

Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

UNIT-IV	INTER PROCESS COMMUNICATION

Inter process Communication : Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs- creation, IPC between unrelated processes using FIFOs(named pipes), differences between unnamed and named pipes, popen & pclose library functions. Message Queues- Kernel support for messages, APIs for message queues, client/server example. Semaphores-Kernel support for semaphores, APIs for semaphores, file locking with Semaphores.

UNIT-V	SHARED MEMORY AND SOCKETS

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example. Sockets: Introduction to Berkeley Sockets, IPC over a network, client/server model, Socket Address structures (UNIX domain & internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs- single client/server connection, Multiple simultaneous clients, Socket options - setsockopt and fcntl system calls, Comparison of IPC Mechanisms.

Text Books:

1. Sumitabha Das, "Your Unix The Ultimate Guide", Tata McGraw-Hill, New Delhi, India, 2007.
2. W. Richard. Stevens, "Advanced Programming in the UNIX Environment", 1st Edition, Pearson Education, New Delhi, India, 2005.

Reference Books:

1. T. Chan, "Unix System Programming using C++", PHI.
2. N. Mathew, R. Stones, Wrox, "Beginning Linux Programming", 4th Edition, Wiley India Edition.
3. Graham Glass, King Ables, "Unix for Programmers and Users", 3rd Edition, Pearson Education.
4. A. Hoover, "System Programming with C and Unix", Pearson Education.
5. K. A. Robbins, "Unix System Programming, Communication, Concurrency and Threads", Pearson Education.
6. S. G. Kochan and P. Wood, "Unix Shell Programming", 3rd Edition, Pearson Education.
7. B. A. Forouzan and R. F. Gilberg, "Unix and Shell Programming", Cengage Learning.
8. Robert Love, "Linux System Programming", O'Reilly, SPD.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
1-2	Understand history of Linux and its features	CLO 1	T2: 1.1, 2.1-2.2
3-4	Use system level scripts to create and manage simple file processing operations.	CLO 1	T2: 4.7-4.8, 5.3-5.4
5-6	Illustrate manipulating of information.	CLO 2	T2: 3.10,15.6, 17.5-17.6
7-8	Understand restoring and retrieving text.	CLO 2	T2: 12.3-12.9 15.9-15.10
9	Understand two data buffers: the active pattern space.	CLO 2	T2: 13.4
10-11	Demonstrate pattern scanning and processing in problem solving.	CLO 5	T2: 18.1, T2:18.12
12-13	Understand basic shell scripting.	CLO 5	T2: 8.5
14	Understand shell script execution.	CLO 6	T2: 14.14
15	Classify use of special characters.	CLO 5	T2: 8.9
16-17	Illustrate forwarding the command output into another context	CLO 5	T2: 8.4, 8.10
18-19	Develop solutions to complex tasks.	CLO 7	T2: 14.5-14.17
20	Demonstrate the use of the formatting Specifies of IO.	CLO 7	R4: 4.1-4.14
21-22	Demonstrate standard stream and buffer based input and output system calls.	CLO 7	R4: 5.1-5.9
23	Demonstrate layout of what's being printed.	CLO 7	R4: 5.10-5.11
24-25	Demonstrate modification and editing.	CLO 7	R4: 3.1-3.12, 4.2
26-27	Demonstrate security concepts in files.	CLO 7	R4: 3.13
28	Discuss scanning and linking methods.	CLO 7	R4: 4.20-4.22, 4.15-4.17
29-31	Understand internal procedures and states of IPC	CLO 8	R4: 8.6
32-33	Illustrate daemons and varieties.	CLO 10	R4: 8.6
34	Classify processes to respond to asynchronous events.	CLO 9	R4: 10.1-10.3
35-36	Understand and to handle exceptional situations.	CLO 9	R4: 10.4-10.19
37-38	Demonstrate inter related process communication	CLO 11	R4: 14.1-14.4
39	Demonstrate named pipes.	CLO 11	R4: 14.5
40	Discuss types of restricting and accessing different resources.	CLO 11	R4: 14.6
41-43	Demonstrate dividing up work among to balance work over multiple processes.	CLO 11	R4: 14.7
44	Demonstrate user variables and semaphore operations, provided at the kernel level.	CLO 12	R4: 14.8

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
45-46	Solve security hurdles using programming interface of Linux	CLO 12	R4: 14.8
47	Demonstrate common memory portion which other processes	CLO 12	R4: 14.9
48-49	Illustrate common memory sharing interfacing example.	CLO 12	R4: 14.9
50-51	Demonstrate parallelism in Linux based system calls.	CLO 12	T1: 13.1-13.2
52	Demonstrate concurrency in Linux APIs.	CLO 13	T1: 13.4
53-54	Demonstrate multiple processes to a common resource in Linux based parallel	CLO 13	T1: 13.5
55-57	Demonstrate multiple threads access the same resource for read and write.	CLO 14	T1: 13.5
58	Understand end to end network communication	CLO 13	R2: 15.1
59-60	Understand TCP based system calls	CLO 13	R2: 15.5
61-62	Understand UDP protocol system calls	CLO 13	R2: 15.5
63-64	Demonstrate connection oriented, connectionless communications in two and three	CLO 15	R2: 15.5

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POS	Relevance with PSOS
1	Familiarizing different types of Linux Internals.	Seminars /NPTEL	PO 1,PO 2,PO 5	PSO 2
2	Familiarizing different types of shells in Linux Internals.	Assignments/ NPTEL	PO 3,PO 12	PSO 1
3	Implementation of commands using system calls and learning Linux administration commands.	Seminars / Guest Lectures / NPTEL	PO 5	PSO 2
4	Familiarizing of inter process communication between unrelated process.	Seminars/ Guest Lecturers	PO 1	PSO 2

Prepared by:
Mr. A Krishna Chaitanya, Assistant Professor

HOD, IT

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	DATA WAREHOUSING AND DATA MINING					
Course Code	AIT006					
Programme	B. Tech					
Semester	VI	CSE	IT			
Course Type	Core					
Regulation	IARE - R16					
Course Structure	**Theory**			**Practical**		
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**	
	3	1	4	3	2	
Chief Coordinator	Ms. K .LaxmiNarayanamma, Assistant Professor					
Course Faculty	Ms. K .LaxmiNarayanamma, Assistant Professor					

I. COURSE OVERVIEW:

The course addresses the concepts, skills, methodologies, and models of data warehousing. The proper techniques for designing data warehouses for various business domains, and covers concepts for potential uses of the data warehouse and other data repositories in mining opportunities are addressed. Data mining, the extraction of hidden predictive information from large databases, is a powerful new technology with great potential to help companies focus on the most important information in their data warehouses. Data mining tools predict future trends and behaviors, allowing businesses to make proactive, knowledge- driven decisions.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACS005	III	Database Management Systems	4
UG	AHS010	II	Probability and statistics	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Data Warehousing and Data Mining	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	CIE Exam	Quiz / AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz / Alternative Assessment Tool (AAT):
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Presentation on real-world problems
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	3	Assignment
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignment
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Seminar
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1	Seminar

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	2	Seminar
PSO 2	**Software Engineering Practices**: The ability to apply standard practices and strategies in software service management using open-ended programming environments with agility to deliver a quality service for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	1	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Identifying necessity of Data Mining and Data Warehousing for the society.
II	Familiar with the process of data analysis, identifying the problems, and choosing the relevant models and algorithms to apply.
III	Develop skill in selecting the appropriate data mining algorithm for solving practical problems.
IV	Develop ability to design various algorithms based on data mining tools.
V	Create further interest in research and design of new Data Mining techniques and concepts.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AIT006.01	CLO 1	Learn data warehouse principles and find the differences between relational databases and data warehouse	PO 1	3
AIT006.02	CLO 2	Explore on data warehouse architecture and its components	PO 1;PO4	2
AIT006.03	CLO 3	Learn Data warehouse schemas	PO 1;PO 2	2
AIT006.04	CLO 4	Differentiate different OLAP Architectures	PO1;PO2	2
AIT006.05	CLO 5	Understand Data Mining concepts and knowledge discovery process	PO 2;PO3,	2
AIT006.06	CLO 6	Explore on Data preprocessing techniques	PO 1; PO5	2
AIT006.07	CLO 7	Apply task related attribute selection and transformation techniques	PO 2;PO5	1
AIT006.08	CLO 8	Understand the Association rule mining problem	PO 2	2
AIT006.09	CLO 9	Illustrate the concept of Apriori algorithm for finding frequent items and generating association rules. Association rules.	PO 1;PO 3	2
AIT006.10	CLO 10	Illustrate the concept of Fp-growth algorithm and different representations of frequent item sets.	PO 1	3
AIT006.11	CLO 11	Understand the classification problem and prediction	PO 3;PO5	1
AIT006.12	CLO 12	Explore on decision tree construction and attribute selection	PO3	2
AIT006.13	CLO 13	Understand the classification problem and Bayesian classification	PO 3;PO 4	2
AIT006.14	CLO 14	Illustrate the rule based and back propagation classification algorithms	PO 3;PO 4	2
AIT006.15	CLO 15	Understand the Cluster and Analysis.	PO 3	2
AIT006.16	CLO 16	Understand the Types of data and categorization of major clustering methods.	PO 2;PO 3	2
AIT006.17	CLO 17	Explore on partition algorithms for clustering.	PO 2;PO 3	2
AIT006.18	CLO 18	Explore on different hierarchical based methods, different density based methods, grid based and Model based methods.	PO2;PO3	2
AIT006.19	CLO 19	Understand the outlier Analysis.	PO 3;PO5	1
AIT006.20	CLO 20	Understand mining complex data types.	PO 1;PO 2	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
CLO 1	3												3		1
CLO 2	3			2									1		1
CLO 3	3	3													
CLO 4	3	2											2		
CLO 5		2	3												1
CLO 6	3				1										
CLO 7		2			1								2		
CLO 8		2													
CLO 9	3		3										2		
CLO 10	3												2		
CLO 11			2		1										
CLO 12	3		2										2		
CLO 13			2	2											1
CLO 14			2	2									2		
CLO 15			2												
CLO 16		2	3												
CLO 17		2	3										2		
CLO 18		1	3												
CLO 19			3		2										
CLO 20	3	2													

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2, PO 3, PO 4, PO5	SEE Exams	PO 1,PO 2, PO 3, PO 4, PO5	Assignments	PO 2, PO 3	Seminars	PO 4, PO 5
Laboratory Practices	PO 1,PO5	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	**DATA WAREHOUSING**
Introduction to Data warehouse, Differences between OLAP and OLTP, A Multi dimensional data model- Star, Snow flake and Fact constellation schemas, Measures, Concept hierarchy, OLAP Operations in the Multidimensional Data Model, Data warehouse architecture- A three tier Data warehouse architecture, Data warehouse Back-End Tools and Utilities, Metadata Repository, types of OLAP servers, Data warehouse Implementation, Data Warehouse models- Enterprise warehouse, Data Marts, Virtual warehouse.	
Unit-II	**DATA MINING**
Introduction, what is Data Mining, Definition, Knowledge Discovery in Data (KDD), Kinds of data bases, Data mining functionalities, Classification of data mining systems, Data mining task primitives, Data Preprocessing: Data cleaning, Data integration and transformation, Data reduction, Data discritization and Concept hierarchy.	
Unit-III	**ASSOCIATION RULE MINING**
Association Rules: Problem Definition, Frequent item set generation, The APRIORI Principle, support and confidence measures, association rule generation; APRIORI algorithm. FP-Growth Algorithms, Compact Representation of Frequent item Set-Maximal Frequent item set, closed frequent item set.	
Unit-IV	**CLASSIFICATION AND PRIDICTION**
Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods, Prediction, Classifier Accuracy.	
Unit-V	**CLUSTERING**
Types of data, categorization of major clustering methods, K-means partitioning methods, hierarchical methods, density based methods, grid based methods, model based clustering methods, outlier analysis. Mining Complex Types of Data: Multi dimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web. S	
Text Books:	
1. Jiawei Han, Michelin Kamber, “Data Mining-Concepts and techniques”, Morgan Kaufmann Publishers, Elsevier, 2nd Edition, 2006 2. Alex Berson, Stephen J.Smith, “Data warehousing Data mining and OLAP”, Tata McGraw-Hill, 2nd Edition, 2007	

Reference Books:
1. Arum K Pujari, "Data Mining Techniques", 3rd Edition, Universities Press, 2005 2. PualrajPonnaiah, Wiley, "Data Warehousing Fundamentals", Student Edition, 2004. 3. Ralph Kimball, Wiley, "The Data warehouse Life Cycle Toolkit", Student Edition, 2006.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1-3	Introduction to Data warehouse, Difference between operational database systems and data warehouses	CLO 1	T1: 3.1
4-7	Data warehouse Architecture and its components	CLO 2	T1: 3.3
8-10	Multi dimensional data model -Show-Flake Schema, Fact Consultation, Fact Table, Dimension Table	CLO 3	T1: 3.2
11-14	OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.	CLO 4	T1: 3.4-3.5
15-16	Introduction, Fundamentals of Data Mining, Definition, KDD, Challenges, Data Mining Tasks.	CLO 5	T1: 1.1-1.7
17-19	Data Processing, Data Cleaning, , Dimensionality Reduction	CLO 6	T1: 2.1-2.5
20-22	Feature Subset Selections, Data Transformation. Discretization and Measures of Similarity and Dissimilarity-Basics.	CLO 7	T1: 2.3-2.4
23-25	Association Rules: Problem definition, Frequent item set generation,	CLO 8	T1: 5.3
26-27	The APRIORI Principle. Support and confidence measures, association rule generation; APRIORI algorithm.	CLO 9	T1: 5.2
28-29	The partition algorithms, fp-growth Algorithm.	CLO 10	T1: 5.2.2
30	Compact Representation of Frequent item Set-Maximal Frequent item set closed frequent item set.	CLO 11	T1: 5.2.4
31-35	Classification and prediction, basic concepts, decision tree induction,	CLO 12	T1: 6.1-6.2
36-37	Bayesian classification	CLO 13	T1: 6.4
38-39	Rule based classification	CLO 14	T1: 6.5
40-44	Classification by back propagation.	CLO 15	T1: 6.6
40-45	Clustering Analysis	CLO 16	T1: 7.1-7.3
46-47	hierarchical methods,	CLO 17	T1: 7.5
48-52	density based methods	CLO 18	T1: 7.6
53-56	grid based methods, outlier analysis	CLO 19	T1: 7.7
57-60	Mining Complex Types of Data	CLO 20	T1: 7.11

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S no	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Spatial Data mining	Seminars / Guest Lectures	PO 1, PO 2, PO 3	PSO 1
2	Graph mining, social network analysis	Seminars	PO 2, PO 5	PSO 3
3	Mining the world wide web	Seminars NPTEL	PO 1, PO 3, PO 4	PSO 2

Prepared by:
Ms. K.LaxmiNarayanamma, Assistant Professor

HOD, IT