INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

AERONAUTICAL ENGINEERING

COURSE DESCRIPTOR

Course Title	BASIC SIMULATION WITH MAT LABORATORY				
Course Code	AAEB01				
Programme	B.Tech				
Semester	II	AE			
Course Type	Core				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	1.5
Chief Coordinator	Dr. Prasanta Kumar Mohanta, Professor				
Course Faculty	Dr. Prasanta Kumar Mohanta, Professor				

I. COURSE OVERVIEW:

The aim of this lab complements the basic knowledge of MATLAB programing and working environment. The students will be able to know the various application developments and various logics and available functions in the MATLAB.

II. COURSE PRE-REQUISITES: Nil

Level	Course Code	Semester	Prerequisites	Credits

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
BSML	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:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks forinternal assessment and 70 marks for semester end lab examination. Out of 30 marks ofinternal assessment, continuous lab assessment will be done for 20 marks for the day today performance and 10 marks for the final internal lab assessment.

Semester End Examination (SEE): The semester end labexamination for 70 marks shall be conducted by two examiners, one of them beingInternal Examiner and the other being External Examiner, both nominated by thePrincipal from the panel of experts recommended by Chairman, BOS.

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

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	**Laboratory**		**Total Marks**
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):
One CIE exams shall be conducted at the end of the 12thweek of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	**Performance**	**Calculations and Graph**	**Results and Error Analysis**	**Viva**	**Total**
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	Identify, formulate, and solve complex aerospace engineering problems by applying advanced principles of engineering	2	Discussion
PO 2	Apply aerospace engineering design to produce solutions that meet specified needs with frontier technologies.	3	Laboratory Practices
PO 5	Independently carry out research / investigation and development work to solve practical problems	3	Projects

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES AREASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	Professional skillsAble to utilize the knowledge of aeronautical/aerospace engineering in innovative, dynamic and challenging environment for design and development of new products	1	Lab exercises
PSO 2	Professional skills Imparted through simulation language skills and general purpose MATLAB.	-	-
PSO 3	Practical implementation and coding skills in MATLAB Providing different types of in house and training.	-	-
PSO 4	Successful career and entrepreneurship To prepare the students with broad aerospace knowledge to use MATLAB.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Understand the procedures, algorithms, and concepts require to solve specific problems
II	Analyze the concepts of algebra, calculus and numerical solutions using MATLAB software.
III	Enrich the knowledge in MATLAB and can apply for project works.
IV	Interpret and visualize simple mathematical functions and operations thereon using plots/display

3 = High; 2 = Medium; 1 = Low

IX. COURSE OUTCOMES (COs):

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Understand the need for simulation/implementation for the verification of mathematical functions Understand the main features of the MATLAB program development environment to enable their usage in the higher learning	CLO 1	Understand the basic of MATLAB
		CLO 2	Understand the basic of features of Matlab
CO 2	Implement simple mathematical	CLO 3	Understand the steps involved in developing MATLAB

	functions/equations in numerical computing environment such as MATLAB. Interpret and visualize simple mathematical functions and operations thereon using plots/display	CLO 4	Wring code of MATLAB code with .m extension
		CLO 5	Execution of .m file and analysis the results
CO 3	Understand the need for simulation/implementation for the verification of mathematical functions Understand the main features of the MATLAB program development environment to enable their usage in the higher learning	CLO 6	Executing the .m file and syntax analysis
		CLO 7	Runtime change the variable to analyze the properties
CO 4	Implement simple mathematical functions/equations in numerical computing environment such as MATLAB. Interpret and visualize simple mathematical functions and operations thereon using plots/display	CLO 8	Algebraic operations with Matrix
		CLO 9	Analyze the errors and fixing.
CO 5	Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.	CLO 10	Plotting options with various data structure
		CLO 11	Writing application from Aeronautical problems

3 = High; 2 = Medium; 1 = Low

X. 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
AAEB01.01	CLO 1	Understand the basic of MATLAB	PO1, PO2	3
AAEB01.02	CLO 2	Understand the basic of features of Matlab	PO1, PO2	3
AAEB01.03	CLO 3	Understand the steps involved in developing MATLAB	PO3	3
AAEB01.04	CLO 4	Wring code of MATLAB code with .m extension	PO2, PO5	3
AAEB01.05	CLO 5	Execution of .m file and analysis the results	PO2, PO5	3
AAEB01.06	CLO 6	Executing the .m file and syntax analysis	PO2, PO5	3
AAEB01.07	CLO 7	Runtime change the variable to analyze the properties	PO2, PO5	3
AAEB01.08	CLO 8	Algebraic operations with Matrix	PO1, PO5	3
AAEB01.09	CLO 9	Analyze the errors and fixing.	PO2, PO5	3
AAEB01.10	CLO 10	Plotting options with various data structure	PO2, PO5	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AAEB01.11	CLO 11	Writing application from Aeronautical problems	PO2, PO5	3

XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)		
	PO 1	PO 2	PO 5
CO 1	3	3	
CO 2			3
CO 3	3	3	
CO 4	3		
CO 5		3	3

3 = High; 2 = Medium; 1 = Low

XII. ASSESSMENT METHODOLOGIES–DIRECT

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

XIII. ASSESSMENT METHODOLOGIES-INDIRECT

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

XIV. SYLLABUS

LIST OF EXPERIMENTS	
Week-l	**BASIC FEATURES**
a. Features anduses. b. Local environmentsetup.	
Week-2	**ALGEBRA**
a. Solving basic algebraicequations. b. Solving system ofequations. c. Two dimensionalplots.	
Week-3	**CONTROL STRUCTURES**
a. For Loop. b. WhileLoop. c. If- elseif- else controlstructure.	
Week-4	**MATRICES**

a. Addition, subtraction and multiplication ofmatrices. b. Transpose of amatrix. c. Inverse of amatrix.	
Week-5	**SYSTEM OF LINEAR EQUATIONS**
a. Rank of amatrix. b. Gauss Jordanmethod. c. LU decompositionmethod.	
Week-6	**LINEAR TRANSFORMATION**
a. Characteristicequation. b. Eigenvalues. c. Eigen vectors.	
Week-7	**DIFFERENTIATION AND INTEGRATION**
a. Higher order differentialequations. b. Doubleintegrals. c. Tripleintegrals.	
Week-8	**NUMERICAL DIFFERENTION AND INTEGRATION**
a. Trapezoidal, Simpson'smethod. b. Eulermethod. c. RungeKutta method	
Week-9	**3D PLOTTING**
a. Lineplotting. b. Surfaceplotting. c. Volumeplotting.	
Week-10	**DEFLECTION OF SIMPLY SUPPORTED BEAM**
a. Calculating vertical displacement with pointload. b. Calculating vertical displacement with uniformly distributedload. c. Calculating vertical displacement with uniformly varyingload.	
Week-11	**DEFLECTION OF CANTILEVER BEAM**
a. Calculating vertical displacement with pointload. b. Calculating vertical displacement with uniformly distributedload. c. Calculating vertical displacement with uniformly varying load	
Week-12	**FORMULATION OF IDEAL AND REAL GAS EQUATIONS**
a. Calculating the pressure, temperature, density for Earth's atmospheric conditions atdifferent altitudes. b. Calculating the pressure, temperature, density for other planets at differentaltitudes.	

XV. COURSE PLAN:

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

Week No.	Topics to be covered	Course Learning Outcomes
1.	• Features anduses. • Local environmentsetup.	CLO 1
2.	• Solving basic algebraicequations. • Solving system ofequations. • Two dimensionalplots.	CLO 2
3.	• For Loop. • While Loop. • If- elseif- else control structure.	CLO 3
4.	• Addition, subtraction and multiplication ofmatrices.	CLO 4

Week No.	Topics to be covered	Course Learning Outcomes
	• Transpose of amatrix. • Inverse of amatrix.	
5.	• Rank of amatrix. • Gauss Jordanmethod. • LU decompositionmethod.	CLO 5
6.	• Characteristicequation. • Eigenvalues. • Eigen vectors.	CLO 6
7.	• Higher order differentialequations. • Doubleintegrals. • Tripleintegrals.	CLO 7
8.	• Trapezoidal, Simpson'smethod. • Eulermethod. • RungeKutta method	CLO 8
9.	• Lineplotting. • Surfaceplotting. • Volumeplotting.	CLO 9
10.	• Calculating vertical displacement with pointload. • Calculating vertical displacement with uniformly distributedload. • Calculating vertical displacement with uniformly varyingload.	CLO 10
11.	• Calculating vertical displacement with pointload. • Calculating vertical displacement with uniformly distributedload. • c. Calculating vertical displacement with uniformly varying load	CLO 11
12.	• Calculating the pressure, temperature, density for Earth's atmospheric conditions atdifferent altitudes. • Calculating the pressure, temperature, density for other planets at differentaltitudes.	CLO 11

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

S.NO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	Relevance with PSOs
1	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO1, PO3	PSO 1

Prepared By:
Dr. Prasanta Kumar Mohanta, Professor

HOD, AE