COURSE HANDOUT
Part-A

PROGRAM : I B. Tech., I-Sem., CSE- B
ACADEMIC YEAR : 2021-22
COURSE NAME & CODE : Differential Equations
L-T-P STRUCTURE : 4-0-0
COURSE CREDITS : 4
COURSE INSTRUCTOR : Dr.M. Srinivasa Reddy
COURSE COORDINATOR : Dr. A. Rami Reddy
PRE-REQUISITES : None

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to introduce the first order and higher order differential equations, functions of several variables. The students will also learn solving of first order partial differential equations.

COURSE OUTCOMES (COs)

After completion of the course, the student will be able to

CO1: Apply first order and first degree differential equations to find orthogonal trajectories.

CO2: Distinguish between the structure and methodology of solving higher order differential equations with constant coefficients.

CO3: Apply various Numerical methods to solve initial value problem.

CO4: Generate the infinite series for continuous functions and investigate the functional dependence.

CO5: Solve partial differential equations using Lagrange's method.

COURSE ARTICULATION MATRIX (Correlation between Cos &POs, PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	-	-	-	-	-	-	-	1
CO2	3	2	-	2	-	-	-	-	-	-	-	1
CO3	3	2	-	2	-	-	-	-	-	-	-	1
CO4	2	1	-	1	-	-	-	-	-	-	-	1
CO5	3	2	-	2	-	-	-	-	-	-	-	1

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXT BOOKS:

T1 Dr. B.S. Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi, 2012.

T2 Dr. B. V. Ramana, "Higher Engineering Mathematics", 1st Edition, TMH, New Delhi, 2010.

BOS APPROVED REFERENCE BOOKS:

R1 M. D. Greenberg, "*Advanced Engineering Mathematics*", 2nd Edition, TMH Publications, New Delhi, 2011.

R2 Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 8th Edition, John Wiley & sons, New Delhi, 2011.

R3 W.E. Boyce and R. C. Diprima, " *Elementary Differential Equations"* , 7th Edition, John Wiley & sons, New Delhi,2011.

R4 S. S. Sastry, *" Introductory Methods of Numerical Analysis"* 5th Edition, PHI Learning Private Limited, New Delhi, 2012.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course, Course Outcomes	1	13/12/2022		TLM2			

UNIT-I: Differential Equations of First Order and First Degree

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
2.	Introduction to UNIT I	1	14/12/2021		TLM2	CO1	T1,T2	
3.	Formation of Differential Equations	1	15/12/2021		TLM1	CO1	T1,T2	
4.	Exact DE	1	16/12/2021		TLM1	CO1	T1,T2	
5.	Non-exact DE Type I	1	18/12/2021		TLM1	CO1	T1,T2	
6.	Non-exact DE Type II	1	20/12/2021		TLM1	CO1	T1,T2	
7.	Non-exact DE Type III	1	21/12/2021		TLM1	CO1	T1,T2	
8.	Non-exact DE Type IV	1	22/12/2021		TLM1	CO1	T1,T2	
9.	Orthogonal Trajectories (Cartesian)	1	23/12/2021		TLM1	CO1	T1,T2	
10.	Orthogonal Trajectories (Cartesian)	1	27/12/2021		TLM1	CO1	T1,T2	
11.	Orthogonal Trajectories (polar)	1	28/12/2021		TLM1	CO1	T1,T2	
12.	Orthogonal Trajectories (polar)	1	29/12/2021		TLM1	CO1	T1,T2	
13.	Problems	1	30/12/2022		TLM1	CO1	T1,T2	
14.	**TUTORIAL 1**	1	06/01/2022		TLM3	CO1	T1,T2	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II: Higher Order Differential Equations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
15.	Introduction to UNIT II	1	03/01/2022		TLM2	CO2	T1,T2	
16.	Solving a homogeneous DE	1	04/01/2022		TLM1	CO2	T1,T2	
17.	Finding Particular Integral, P.I for e^{ax+b}	1	05/01/2022		TLM1	CO2	T1,T2	
18.	P.I for Cos bx or sin bx	1	8/01/2022		TLM1	CO2	T1,T2	
19.	P.I for polynomial function	1	10/01/2022		TLM1	CO2	T1,T2	
20.	P.I for $e^{ax+b}v(x)$	1	11/01/2022		TLM1	CO2	T1,T2	
21.	P.I for $e^{ax+b}v(x)$	1	12/01/2022		TLM1	CO2	T1,T2	
22.	P.I for $x^k v(x)$	1	18/01/2022		TLM1	CO2	T1,T2	
23.	P.I for $x^k v(x)$	1	19/01/2022		TLM1	CO2	T1,T2	
24.	Method of Variation of parameters	1	20/01/2022		TLM1	CO2	T1,T2	
25.	Method of Variation of	1	22/01/2022		TLM1	CO2	T1,T2	

	parameters							
26.	Revision	1	24/01/2022					
27.	**TUTORIAL 2**	1	27/01/2022		TLM3	CO2	T1,T2	
No. of classes required to complete UNIT-II		13			No. of classes taken:			

UNIT-III: Numerical solution of Ordinary Differential Equations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
28.	Introduction to Unit-III	1	25/01/2022		TLM2	CO3	T1,T2	
29.	Numerical Methods	1	29/01/2022		TLM1	CO3	T1,T2	
30.	Solution by Taylor's series	1	31/01/2022		TLM1	CO3	T1,T2	
31.	Solution by Taylor's series	1	1/02/2022		TLM1	CO3	T1,T2	
32.	Picard's Method	1	2/02/2022		TLM1	CO3	T1,T2	
33.	Picard's Method	1	3/02/2022		TLM1	CO3	T1,T2	
34.	Revision	1	5/02/2022					
II MID EXAMINATIONS (07-02-2022 TO 12-02-2022)								
35.	Euler's Method	1	14/02/2022		TLM1	CO3	T1,T2	
36.	Modified Euler's Method	1	15/02/2022		TLM1	CO3	T1,T2	
37.	Modified Euler's Method	1	16/02/2022		TLM1	CO3	T1,T2	
38.	Runge- Kutta Method	1	17/02/2022		TLM1	CO3	T1,T2	
39.	Runge- Kutta Method	1	19/02/2022		TLM1	CO3	T1,T2	
40.	**TUTORIAL 3**	1	24/02/2022		TLM3	CO3	T1,T2	
No. of classes required to complete UNIT-III		13			No. of classes taken:			

UNIT-IV: Functions of Several Variables

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
41.	Introduction to UNIT IV	1	21/02/2022		TLM1	CO4	T1,T2	
42.	Generalized Mean Value Theorem, Taylor's series	1	22/02/2022		TLM1	CO4	T1,T2	
43.	Maclaurin's series	1	23/02/2022		TLM1	CO4	T1,T2	
44.	Functions of several variables	1	26/02/2022		TLM1	CO4	T1,T2	
45.	Jacobians(Cartesian coordinates)	1	28/02/2022		TLM1	CO4	T1,T2	
46.	Jacobians (polar, coordinates)	1	02/03/2022		TLM1	CO4	T1,T2	
47.	Jacobians (cylindrical, spherical coordinates)	1	03/03/2022		TLM1	CO4	T1,T2	
48.	Functional dependence	1	05/03/2022		TLM1	CO4	T1,T2	
49.	Maxima and Minima	1	07/03/2022		TLM1	CO4	T1,T2	

50.	Maxima and Minima of functions of two variables	1	08/03/2022		TLM1	CO4	T1,T2	
51.	Maxima and Minima of functions of two variables	1	9/03/2022		TLM1	CO4	T1,T2	
52.	**TUTORIAL 4**	1	10/03/2022		TLM3	CO4	T1,T2	
No. of classes required to complete UNIT-IV		12			No. of classes taken:			

UNIT-V: Partial Differential Equations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
53.	Introduction to UNIT V	1	14/03/2022		TLM1	CO5	T1,T2	
54.	Partial Differential equations	1	15/03/2022		TLM1	CO5	T1,T2	
55.	Formation of PDE by elimination of arbitrary constants	1	16/03/2022		TLM1	CO5	T1,T2	
56.	Formation of PDE by elimination of arbitrary functions	1	19/03/2022		TLM1	CO5	T1,T2	
57.	Formation of PDE by elimination of arbitrary functions	1	21/03/2022		TLM1	CO5	T1,T2	
58.	Formation of PDE by elimination of arbitrary functions	1	22/03/2022		TLM1	CO5	T1,T2	
59.	General Method of solving PDE	1	23/03/2022		TLM3	CO5	T1,T2	
60.	Solving of PDE	1	24/03/2022		TLM1	CO5	T1,T2	
61.	Solving of PDE	1	26/03/2022		TLM1	CO5	T1,T2	
62.	Lagrange's Method	1	28/03/2022		TLM1	CO5	T1,T2	
63.	Lagrange's Method	1	29/03/2022		TLM1	CO5	T1,T2	
64.	**TUTORIAL 5**	1	30/03/2022		TLM3	CO5	T1,T2	
65.	Revision	1	1/04/2022					
No. of classes required to complete UNIT-V		13			No. of classes taken:			

Contents beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
66.	Lagrange's Method	1	12/03/2022		TLM1	CO4	T1,T2	
67.	Solving of PDE other methods	1	31/03/2022		TLM5	CO5	T1,T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (03-04-2021 TO 09-04-2021)								

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering 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.
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.
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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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
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.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

Dr.M.Srinivasa Reddy	**Dr. A. RAMI REDDY**	**Dr. A. RAMI REDDY**	**Dr. A. RAMI REDDY**
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
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DEPARTMENT OF AEROSPACE ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. L. Prabhu
Course Name & Code : Engineering Mechanics / ME2002
L-T-P Structure : **2-2-0** **Credits:** 03
Program/Sem/Sec : Aerospace Engineering / I **A.Y.:** 2021-22

PREREQUISITE: Physics

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objectives of this course are to formulate the equilibrium equations of static and dynamic bodies from free-body diagram and understand the concepts of centroid, center of gravity and moment of inertia.

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO 1	Apply the principles of free body diagrams & equilibrium conditions for analysis of machine elements.
CO 2	Solve the equilibrium of rigid bodies associated with friction forces
CO 3	Locate the centroid, center of gravity and determine the area moment of inertia of plane sections
CO 4	Find the displacement, velocity and accelerations of moving bodies &Estimate the trajectory and range of missiles in defense.
CO 5	Find the forces acting on moving bodies by D'Alembert's principle and work energy methods for practical problems

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1									2			3
CO2	3	3	2	1								2			3
CO3	3	2		2								2			3
CO4	3	2		2								2			3
CO5	3	3		1								2			3
1 - Low					**2** –Medium							**3** - High			

TEXTBOOKS:

T1 S.S. Bhavikatti, Engineering Mechanics, 4thedition, New Age International (P) Ltd, 2012.

T2 N.H.Dubey, Engineering Mechanics, McGraw Hill, 2013

REFERENCE BOOKS:

R1 Ferdinand. L. Singer, Engineering Mechanics, 3rd edition, Harper – Collins, 1994

R2 B.Bhattacharya, Engineering Mechanics, 1stedition, Oxford University Press, 2008

R3 A.K.Tayal, Engineering Mechanics, 14thedition, 2ndreprint, Umesh Publications, 2012

R4 R.K.Bansal, Engineering Mechanics, 3rd edition, Laxmi Publications, 2016

R5 R.K.Bansal, Engineering Mechanics, 3rd edition, Laxmi Publications, 2016

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Forces

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Outcomes, CEOs, POs, PEOs Introduction to EM	1	13-12-2021		TLM1	
2.	Basic Concepts of Mechanics: Introduction	1	14-12-2021		TLM1	
3.	Resultant of System of Forces: Introduction, **TUTORIAL-1**	1	16-12-2021		TLM3	
4.	Force, Characteristics, Force Systems, **TUTORIAL-2**	1	17-12-2021		TLM3	
5.	Resultant of Coplanar Concurrent Force System	1	18-12-2021		TLM1	
6.	Problems	1	20-12-2021		TLM1	
7.	Problems	1	21-12-2021		TLM1	
8.	Moment of a Force, Couple – Varignon's Theorem	1	23-12-2021		TLM1	
9.	**TUTORIAL-3**	1	24-12-2021		TLM3	
10.	Resultant of Coplanar Non-Concurrent Force System	1	27-12-2021		TLM1	
11.	Problems	1	28-12-2021		TLM1	
12.	Equilibrium of a Body Subjected to Concurrent Forces and Non-concurrent Forces, Free Body Diagrams	1	30-12-2021		TLM1	
13.	**TUTORIAL-4**	1	31-12-2021		TLM3	
14.	Lami's Theorem - Equilibrium of Connected Bodies	1	03-01-2022		TLM1	
15.	Discussion, Assignment	1	04-01-2022		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Frictions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Introduction to Friction		06-01-2022		TLM1	
17.	Types of Friction, Laws of Friction		07-01-2022		TLM1	
18.	Angle of Friction – Angle of Repose		10-01-2022		TLM1	
19.	Blocks resting on horizontal plane		11-01-2022		TLM1	
20.	**TUTORIAL-5**		17-01-2022		TLM3	
21.	Blocks resting on Inclined plane		18-01-2022		TLM1	
22.	Problems		20-01-2022		TLM1	
23.	Ladder Friction		21-01-2022		TLM1	
24.	**Tutorial -6**		22-01-2022		TLM3	
25.	Discussion and Assignment		24-01-2022		TLM1	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Centroid and Centre of Gravity; Area Moment of Inertia; Mass Moment of Inertia

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Introduction to Centroid, Center of Gravity, Concept, Applications	1	25-01-2022		TLM1	
27.	Centroid of simple figures from basic principles	1	27-01-2022		TLM1	
28.	Centre of gravity of simple bodies	1	28-01-2022		TLM1	
29.	**TUTORIAL-7**	1	29-01-2022		TLM3	

30.	Area Moment of Inertia**:** Theorems of Moment of Inertia	1	31-01-2022		TLM1	
31.	Determination of Moment of Inertia of Circle, Rectangle	1	01-02-2022		TLM1	
32.	Hollow Circle, Semi Circle, Triangle from basic principles	1	03-02-2022		TLM1	
33.	**TUTORIAL-8**	1	04-02-2022		TLM3	
34.	Mass Moment of Inertia: Introduction**,** Radius of gyration	1	05-02-2022		TLM1	
35.	Determination of Mass Moment of Inertia of Uniform Rod, Rectangular Plate,	1	14-02-2022		TLM1	
36.	Circular Plate, Solid Cone, Solid Sphere, Solid Cylinder	1	15-02-2022		TLM1	
37.	Assignment and Discussion	1	17-02-2022		TLM1	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: KINEMATICS; PROJECTILES

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
38.	Introduction to Kinematics, Rectilinear Motion	1	18-02-2022		TLM1	
39.	Motion Curves	1	19-02-2022		TLM1	
40.	Motion with Uniform Velocity	1	21-02-2022		TLM1	
41.	**TUTORIAL-9**	1	22-02-2022		TLM3	
42.	Motion with Uniform Acceleration, Numericals	1	24-02-2022		TLM1	
43.	Motion with variable acceleration, Numericals	1	25-02-2022		TLM1	
44.	Introduction to Projectiles, Definitions, Derivations	1	26-02-2022		TLM1	
45.	Motion of a Body Projected Horizontally	1	28-02-2022		TLM1	
46.	Inclined projection on Level Ground	1	03-03-2022		TLM1	
47.	Inclined Projection with Point of Projection and Point of Strike at Different Levels	1	04-03-2022		TLM1	
48.	**TUTORIAL-10**	1	05-03-2022		TLM3	
49.	Discussion and Assignment	1	07-03-2022		TLM1	
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: KINETICS, WORKENERGY METHOD

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Introduction to Kinetics, Bodies in Rectilinear Translation, Derivations	1	08-03-2022		TLM1	
51.	Bodies in Curvilinear Translation, Derivations	1	10-03-2022		TLM1	
52.	Kinetics of Bodies Rotating about Fixed Axis, Derivations	1	11-03-2022		TLM1	
53.	Problems	1	14-03-2022		TLM1	
54.	**TUTORIAL-11**	1	15-03-2022		TLM3	
55.	Problems	1	17-03-2022		TLM1	
56.	Work Energy Method: Introduction	1	19-03-2022		TLM1	
57.	Derivation and simple problems on Rectilinear Translation	1	21-03-2022		TLM1	
58.	Problems	1	22-03-2022		TLM1	
59.	Derivation and simple problems on Curvilinear Translation	1	24-03-2022		TLM1	
60.	Derivation and simple problems on Bodies Rotating about Fixed Axis	1	25-03-2022		TLM1	

61.	**TUTORIAL-12**	1	26-03-2022		TLM3	
62.	Discussion and Assignment	1	28-03-2022		TLM1	
No. of classes required to complete UNIT-V: 13				**No. of classes taken:**		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R17 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering 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.
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.
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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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
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.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To Apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design.
PSO 2	To Prepare the students to work effectively in the defense and space research programs.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr. L. Prabhu**			**Dr. P. Lovaraju**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF AEROSPACE ENGINERRING

COURSE HANDOUT

Name of Course Instructor: S. Indrasena Reddy
Course Name & Code : Engineering Graphics & 20ME01
L-T-P Structure :**2-0-4** **Credits:** 4
Program/Sem/Sec : B.Tech/I Sem **A.Y.:** 2021-22

PRE-REQUISITES: - Mathematics, Physics

COURSE EDUCATIONAL OBJECTIVE:
The main objective of the course is to recognize the BI Standards of Engineering Drawing and develop an ability to get familiarized with orthographic projections and isometric views

COURSE OUTCOMES: At the end of the course, the student will be able to:

CO 1: Represent the geometrical objects considering BIS standards. (Understand - L2)

CO2: Comprehend the basics of orthographic projections and deduce orthographic projections of a point and a line at different orientations. (Understand - L2)

CO3: Visualize geometrical planes of different positions in real life environment (Apply - L3)

CO4: Imagine orthographic views of various solid objects at different orientations (Apply - L3)

CO5: Recognize the significance of isometric drawing to relate 2D environment with 3D environment. (Understand - L2)

Course Articulation Matrix:

Course Code	COs	Programme Outcomes											PSOs	
		a	b	c	d	e	f	g	h	i	j	k	l	1	2
S329	CO1	2	1	2									2	2	1
	CO2	3	2	2									2	2	2
	CO3	2	3	2									2	2	1
	CO4	2	3	2									2	2	1
	CO5	3	3	3									2	2	2

1 = Slightly correlated (Low) 2 = Moderately correlated (Medium) 3-Substantially correlated (High)

TEXT BOOK:
N. D. Bhatt, Engineering Drawing, 51th Revised and Enlarged Edition, Charotar publishers, 2012

REFERENCES:

1. Narayana K L, Kannaiah P, Textbook on Engineering Drawing, 2nd Edition, SciTech publishers.
2. R.K.Dhawan, Engineering Drawing, S.Chand Company LTD.
3. Venugopal, Engineering Drawing and Graphics, New Age publishers

4. Dhananjay A. Jolhe, Engineering Drawing, Tata McGraw Hill Publishers
5. N.S.Parthasarathy, Vela Murali, Engineering Drawing, Oxford Higher Education

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : Introduction To Engineering Drawing

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Engineering Drawing, Dimensioning –Geometrical Constructions	3	13-12-21		TLM 1	
2.	Engineering Curves: Conic Sections-Ellipse, General method	3	17-12-21		TLM 1	
3.	Ellipse Special methods	1	18-12-21		TLM 1	
4.	Ellipse Special methods	3	20-12-21		TLM 1	
5.	Parabola General method and other	3	24-12-21		TLM 1	
6.	Hyperbola and rectangular hyperbola	3	27-12-21		TLM 1	
7.	Cycloid, Epi-Cycloid	3	31-12-21		TLM 1	
8.	Hypo-Cycloid and Involutes	3	03-01-22		TLM 1	
No. of classes required to complete UNIT-I		22		No. of classes taken:		

UNIT-II : Orthographic Projections

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	Introduction to Orthographic Projections	3	07-01-22		TLM 1	
10.	Principle of orthographic projection-	1	08-01-22		TLM 1	
11.	Projections of Points	3	10-01-22		TLM 1	
12.	Projections of straight lines	3	21-01-22		TLM 1	
13.	Projections of straight lines inclined to one plane	1	22-01-22		TLM 1	
14.	Projections of straight lines inclined to both the planes	3	24-01-22		TLM 1	
15.	Projections of straight lines inclined to both the planes	3	28-01-22		TLM 1	
16.	True lengths and traces	1	29-01-22		TLM 1	
17.	True lengths and traces	3	31-01-22		TLM 1	
No. of classes required to complete UNIT-II		21		No. of classes taken:		

UNIT-III : Projection of planes

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Introduction to Projection of Planes	3	04-02-22		TLM 1	
19.	Planes parallel to one planes	1	05-02-22		TLM 1	
20.	Perpendicular to both the planes	3	14-02-22		TLM 1	
21.	Inclined to one reference plane and perpendicular to other	3	18-02-22		TLM 1	
22.	Inclined to both the planes	1	19-02-22		TLM 1	

23.	Planes Inclined to both the planes	3	21-02-22		TLM 1	
No. of classes required to complete UNIT-III		14		No. of classes taken:		

UNIT-IV: projection of solids

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Introduction to Projections of Solids	3	25-02-22		TLM 1	
25.	Axis inclined to one plane	1	26-02-22		TLM 1	
26.	Axis inclined to one of the reference planes and parallel to the other	3	28-02-22		TLM 1	
27.	Axis inclined to both H.P and V.P,	3	04-03-22		TLM 1	
28.	Axis inclined to both H.P and V.P,	1	05-03-22		TLM 1	
29.	Axis inclined to both H.P and V.P,	3	07-03-22		TLM 1	
30.	Axis inclined to both H.P and V.P,	3	11-03-22		TLM 1	
No. of classes required to complete UNIT-IV		17		No. of classes taken:		

UNIT-V : Isometric Views

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Introduction to Isometric Views	3	14-03-22		TLM 1	
32.	Isometric view of prism	1	19-03-22		TLM 1	
33.	Isometric view of pyramid, cylinder & cone	3	21-03-22		TLM 1	
34.	Isometric to orthographic	3	25-03-22		TLM 1	
35.	Transformation 0f Projections**:**	1	26-03-22		TLM 1	
36.	Conversion of Orthographic Projections to Isometric Views	3	28-03-22		TLM 1	
37.	Conversion of Orthographic Projections to Isometric Views	3	01-04-22		TLM 1	
No. of classes required to complete UNIT-V		17		No. of classes taken:		

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

EVALUATION PROCESS:

Evaluation Task	**COs**	**Marks**
Sheet Marks	1,2,3,4,5	A=15
I-Mid Examination	1,2,3	B1=15
II-Mid Examination	3,4,5	B2=15
Evaluation of Mid Marks: B=75% of Max(B1,B2)+25% of Min(B1,B2)	1,2,3,4,5	B=15
Cumulative Internal Examination : A+B	**1,2,3,4,5**	**30**
Semester End Examinations	**1,2,3,4,5**	**C=70**

Total Marks: A+B+C	**1,2,3,4,5**	**100**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems

PEO2: To train students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems

PEO3: To prepare students to excel in competitive examinations, postgraduate programs, advanced education or to succeed in industry/technical profession

PEO4: To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context

PEO5: To provide student with an academic environment with awareness of excellence, leadership, and the life-long learning needed for a successful professional career

PROGRAMME OUTCOMES (POs)

(a) To apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of engineering problems

(b) To identify, formulate and analyze complex engineering problems reaching substantiated conclusions

(c) To design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d) To conduct investigations of complex problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline

e) To create, select and apply appropriate techniques, resources, and modern engineering and IT tools

f) To apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

g) To understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

h) To apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

i) To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

j) To communicate effectively on complex engineering activities with the engineering community and with society

k) To demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

l) To recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PSOs

PSO1: To apply the knowledge of Aerodynamics, Propulsion, Aircraft structures and Flight Dynamics in the Aerospace vehicle design.

PSO2: To prepare the students to work effectively in Aerospace and Allied Engineering organizations

Mr.S.Indrasena Reddy	Mr.S.Indrasena Reddy	Dr.P.Lovaraju
Course Instructor	Module Coordinator	HOD

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DEPARTMENT OF FRESHMAN ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Jamili Reddy
Course Name & Code **:** Applied Chemistry&20FE-05
L-T-P Structure **:3-0-0** **Credits:03**
Program/Sem/Sec : B.Tech/I-sem/ASE **A.Y. :** 2021-22

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): It enables the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions. It helps to strengthen the basic concepts of water, fuel technologies**,** electrochemistry, corrosion and advanced materials used in technologies

COURSE OUTCOMES (COs): At the end of the course, student will be able to

CO1	Identify the troubles due to hardness of water and its maintenance in industrial applications. (Understand-L2)
CO2	Identify issues issues related to conventional fuels, biofuels and photo-voltaic cells in energy production. (Understand-L2)
CO3	Apply Nernst Equation for calculating electrode cell potentials and compare batteries for different applications. (Apply-L3)
CO4	Apply principles of corrosion for design and effective maintenance of various equipment. (Apply-L3)
CO5	Analyse the suitability of engineering materials like polymers, lubricants, nano materials and composites in technological applications. (Understand-L2)

COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

POs / COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	2		2	1					2
CO2	3	2	2	1		2	2					2
CO3	3	2	2	1		2	1					2
CO4	3	3	2	1		2	1					2
CO5	3	2	2	1		1	1					2
1 = Slight (Low) **2 = Moderate (Medium)** **3 = Substantial (High)**												

TEXTBOOKS:

T1 Shashi Chawla, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 3rd Edition, 2003.

T2 Jain, Jain, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 16th Edition, 2015.

REFERENCE BOOKS:

R1 Shikha Agarwal, "A text book of Engineering Chemistry", Cambridge University Press, New Delhi, 1st Edition, 2015.

R2 S.S. Dara, S.S. Umare, "A Text book of Engineering Chemistry", S. Chand Publications, New Delhi, 12th Edition, 2010.

R3 Y. Bharathi Kumari, Jyotsna Cherukuri, "A Text book of Engineering Chemistry", VGS Publications, Vijayawada, 1st Edition, 2009.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: WATER TECHNOLOGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Applied Chemistry	1	13-12-2021		TLM1	
2.	Sources of water and quality.	1	14-12-2021		TLM1	
3.	Hardness and types of hardness. Units of hardness interrelation	1	15-12-2021		TLM1	
4.	Problems on hardness	1	18-12-2021		TLM1	
5.	Scale and sludges	1	20-12-2021		TLM1	
6.	Causticembrittlement,priming and foaming	1	21-12-2021		TLM1	
7.	Bolier corrosion	1	22-12-2021		TLM1	
8.	W.H.O standards of potable water,Ion exchange process	1	27-12-2021		TLM2	
9.	Reverse osmosis and elecrodialysis	1	28-12-2021		TLM1	
10.	Treatment of industrial waste water	1	29-12-2021		TLM2	
11.	**Assignment**	1	03-01-2022			
12.	**Quiz**	1	04-01-2022			
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: FUEL TECHNOLOGY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Characteristics of good fuel, comparative study of solid,liquid and gaseous fuels	1	05-01-2022		TLM1	
2.	GCV,LCV and coal origin, Proximate analysis, significance.	1	08-01-2022		TLM1	
3.	Petroleum-origin, types of crude oil and refining of petroleum	1	10-01-2022		TLM1	
4.	Cracking - moving bed catalytic cracking, Synthetic petrol – Fischer Tropsch's process	1	11-01-2022		TLM2	
5.	Natural gas composition and C.N.G - advantages	1	12-01-2022		TLM2	
6.	Characteristics of bio fuels, sources of bio mass and advantages -Production of biodiesel from rape seed oil.	1	18-01-2022		TLM2	
7.	Photovoltaic cell design working, advantages and disadvantages.	1	19-01-2022		TLM2	
8.	**Assignment**	1	22-01-2022			
9.	**Quiz**	1	24-01-2022			
No. of classes required to complete UNIT-II: 09				No. of classes taken:		

UNIT-III: ELECTROCHEMISTRY&BATTERIES

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	25-01-2022		TLM1	
2.	Calomel Electrode	1	29-01-2022		TLM2	
3.	Glass Electrode	1	31-01-2022		TLM2	
4.	Calculation of EMF of Cell	1	01-02-2022		TLM1	
5.	Applications of Nernst Equation	1	02-02-2022		TLM1	
6.	Electrochemical series and Applications	1	05-02-2022		TLM1	
7.	Lead-acid Battery, Lithium ion Battery	1	14-02-2022		TLM2	
8.	Mg-Cu reserve battery, H_2– O_2 Fuel Cell	1	15-02-2022		TLM2	
9.	**Assignment & Quiz**	1	16-02-2022			
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV: SCIRNCE OF CORROSION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Types of dry corrosion-oxidative corrosion, Pilling Bed worth rule	1	19-02-2022		TLM1	
2.	Corrosion by other gases and liquid metal corrosion	1	21-02-2022			
3.	Wet corrosion ,mechanism	1	22-02-2022		TLM1	
4.	Concentration Cell Corrosion	1	23-02-2022		TLM1	

5.	Passivity and Galvanic series Nature of metal that influences rate of corrosion.	1	26-02-2022		TLM1	
6.	Nature of environment,	1	28-02-2022		TLM1	
7.	Cathodic Protection	1	02-03-2022		TLM2	
8.	Electro plating and metal cladding	1	05-03-2022		TLM2	
9.	**Assignment & Quiz**	1	07-03-2022			
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

UNIT-V: CHEN-MISTRY OF ENGINEERING MATERIALS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Differences between thermoplasts and thermosets, Types of polymerization with examples,	1	08-03-2022		TLM1	
2.	Preparation properties and engineering applications of PVC, Teflon, BUNA-S and Polyurethane.	1	09-03-2022		TLM1	
3.	Preparation properties and engineering applications of BUNA-S and Polyurethane.	1	12-03-2022		TLM1	
4.	Characteristics of a good lubricant and properties of lubricants	1	14-03-2022		TLM2	
5.	Application of lubricants	1	15-03-2022		TLM2	
6.	Nano Materials Introduction, definition, extraordinary changes observed at nano size of materials and reasons	1	16-03-2022		TLM2	
7.	Types of nano-materials, Gas-Phase Synthesis of nanomaterials, Applications.	1	19-03-2022		TLM2	
8.	Composites,advantageous characteristics of Comp Constituents	1	21-03-2022		TLM2	
9.	Fibre reinforced composites (GFRP, CFRP), Reasons for failure of composites.	1	22-03-2022		TLM2	
10.	**Assignment & Quiz**	1	23-03-2022			
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

CONTENTS BEYOND SYLLABUS						
1.	Batteries used in mobile phones of popular companies. Industrial applications of electroplating	1	26-03-2022		TLM1	

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

PART-C

EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering 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.
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.
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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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
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.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.K.Jamili Reddy**	**Dr.V.Parvathi**	**Dr.V.Parvathi**	**Dr.A.Rami Reddy**
Signature				

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF FRESHMAN ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.K.Jamili Reddy
Course Name & Code **:** Applied Chemistry Lab&20FE52
L-T-P Structure **:0-0-3** **Credits:1.5**
Program/Sem/Sec : B.Tech/I-sem/ASE **A.Y. :** 2021-22

Pre requisites: Nil

Course Educational Objective: This course enables the students to analyze water samples and perform different types of volumetric titrations. It provides them with an overview of preparation of polymers and properties of fuels.

Course Outcomes: After completion of the course, the students will be able to,

CO1: Assess quality of water based on the procedures given. (Understand-L2)
CO2: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. (Understand-L2)
CO3: Acquire practical knowledge related to preparation of polymers. (Understand-L2)
CO4: Exhibit skills in performing experiments based on theoretical fundamentals. (Apply-L3)

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1		2	2					
CO2	2	1										
CO3	2		1									
CO4	3	2	1									
1 = Slight (Low)			2 = Moderate (Medium)				3 = Substantial (High)					

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

Bos Approved Lab Manual

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

S.No.	Experiment	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction to Applied chemistry lab	3	15-12-2021		TLM1	CO4	
2.	Determination of amount of HCl using standard Na_2CO_3 solution	3	22-12-2021		TLM4	CO2,CO4	
3.	Preparation of Bakelite	3	29-12-2021		TLM4	CO3,CO4	
4.	Determination of pH of the given sample solution/soil using pH meter.	3	05-01-2022		TLM4	CO2,CO4	
5.	Preparation of nylon fibres.	3	12-01-2022		TLM4	CO3,CO4	
6.	Determination of alkalinity of water sample.	3	19-01-2022		TLM4	CO1,CO4	
7.	Determination of total Hardness of water using EDTA method.	3	02-02-2022		TLM4	CO1,CO4	
8.	Determination of permanent hardness of using EDTA method.	3	16-02-2022		TLM4	CO1,CO4	
9.	Estimation of Mohr's salt using potassium permanganate.	3	23-02-2022		TLM4	CO2,CO4	
10.	Estimation of Mohr's salt using potassium dichromate	3	02-03-2022		TLM4	CO2,CO4	
11.	Determination of Copper(II) using standard hypo solution	3	09-03-2022		TLM4	CO2,CO4	
12.	Additional lab	3	16-03-2022		TLM4	CO1,CO2, CO3,CO4	
13.	Internal lab exam	3	23-03-2022				
Total							

Teaching Learning Methods			
TLM1	Chalk and Talk	**TLM4**	Demonstration (Lab/Field Visit)
TLM2	PPT	**TLM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	Group Discussion/Project

Part - C

EVALUATION PROCESS:

According to Academic Regulations of R20 Distribution and Weightage of Marks For Laboratory Courses is as follows.

(a) Continuous Internal Evaluation (CIE):

- ✓ The continuous internal evaluation for laboratory course is based on the following parameters:

Parameter		Marks
Day – to – Day Work	Observation	05 Marks
	Record	05 Marks
Internal Test		05 Marks
Total		**15 Marks**

PROGRAMME OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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. **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.
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.
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.
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.

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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineeringand 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.
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.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr.K.Jamili Reddy	Dr.V.Parvathi	Dr.V.Parvathi	Dr.A.Rami Reddy
Signature				