Government Polytechnic, Pune

'180 OB' – Scheme

Course Title: **APPLIED MAHEMATICS I**

(Course Code: ...SC1101.)

Diploma programme in which this course is offered	Semester in which offered
CE/EE/ET/ME/MT/CM/IT Engineering **01/02/03/04/05/06/07/21/22/23/24/26**	FIRST

1. RATIONALE

The students of Diploma in Engineering and technology must acquire some essential Competencies in Mathematics

2. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency**:**

1. Apply the concepts of algebra to solve engineering related problems.
2. Utilize basic concepts of trigonometry to solve elementary engineering problems.
3. Solve basic engineering problems under given conditions of straight lines.
4. Solve the problems based on measurement of regular closed figures and regular solids.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	2	-	5	80	20	-	25	125

4. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency**:**

S. No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Unit No.	Approx. Hrs. required
1	Solve simple problems of Logarithms based on definition and laws	1	2
2	Solve problems on determinant to find area of triangle, and solution of simultaneous equation by Cramer's Rules.	1	4
3	Resolve into partial fraction using linear non repeated, repeated, and irreducible factors	1	4
4	Solve problems on Compound, Allied, multiple and sub multiple angles..	2	4

5	Practice problems on factorization and de factorization.	2	2
6	Solve problems on inverse circular trigonometric ratios.	2	2
7	Practice problems on equation of straight lines using different forms.	3	4
8	Solve problems on perpendicular distance, distance between two parallel lines, and angle between two lines.	3	2
9	Solve problems on Area, such as rectangle, triangle, and circle.	4	2
10	Solve problems on surface and volume, sphere, cylinder and cone.	4	2
11	Solve simple problems of Logarithms based on definition and laws	4	2
12	Skill test		2
	Total		32

S.No.	Performance Indicators	Weightage in %
a.	Prepare experimental set up	-
b.	Handling of instruments during performing practical.	-
c.	Follow Safety measures	-
d.	Accuracy in calculation	20
e.	Answers to questions related with performed practices.	40
f.	Submit journal report on time	20
g.	Follow Housekeeping	10
h.	Attendance and punctuality	10
	Total	**100**

5.   MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of practicals, as well as aid to procure equipment by authorities concerned**.**

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	LCD Projector	1-11
2	Interactive Classroom	1-11

6.   THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to develop UOs for achieving the COs to attain the identified competency**.**

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Units 1 : Algebra	1.1. Solve the given simple problem based on laws of logarithm. 1.2.Calculate the area of the given triangle by determinant method. 1.3. Solve given system of linear Equations using by Cramer's rule. 1.4. Obtain the proper and improper partial fraction for the given simple rational function	1.1 Logarithm: Concept and laws of logarithm 1.2 Determinant a. Value of determinant of order 3x3 b. Solutions of simultaneous equations in three unknowns by Cramer's rule. 1.3 Partial Fractions: Types of partial fraction based on nature of factors and related Problems.
Unit 2: Trigonometry	2.1. Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problem(s) 2.2. Apply the concept of Sub- multiple	2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angle.(without proof) 2.2 Factorization and De factorization

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	angle to solve the given simple engineering related problem 2.3. Employ concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). 2d. Investigate given simple problems utilizing inverse trigonometric ratios	formulae (without proof). 2.3 Inverse Trigonometric Ratios and related problems 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios.
Unit 3: Co ordinate geometry	3.1. Calculate angle between given two straight lines. 3.2. Formulate equation of straight lines related to given engineering problems. 3.3. Identify perpendicular distance from the given point to the line.. 3.4. Calculate perpendicular distance between the given two lines.	3.1 Straight line and slope of straight line a. Angle between two lines. b. Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines. a. Slope point form, two point form. b. Two points intercept form. c. General form. 3.3. Perpendicular distance from a Point on the line. 3.4 Perpendicular distance between two parallel lines
Unit 4: Mensuration	4.1. Calculate the area of given triangle and circle 4.2. Determine the area of the given square, parallelogram, rhombus, trapezium. 4.3. Compute surface area of given cuboids, sphere, cone and cylinder. 4.4. Determine volume of given cuboids, sphere, cone and cylinder.	4.1 Area of regular closed figures, Area of triangle, square, parallelogram, rhombus, trapezium and circle. 4.2 Volume of cuboids, cone, cylinders and sphere.

7.   SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Algebra	12	08	20	08	24(36)
II	Trigonometry	18	08	08	20	24(36)
III	Co ordinate geometry	09	04	08	12	16(24)
IV	Mensuration	09	04	08	12	16(24)
Total		**48**	**24**	**44**	**52**	**80(120)**

8.   SUGGESTED STUDENT ACTIVITIES
Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course:
   a. Identify engineering problems based on real world problems and solve with the use of free tutorials available on internet.
   b. Use graphical software's:EXCEL,DPLOT and GRAPH for related topics.

    c. Use Mathcad as Mathematical Tool and solve the problems on Calculus.
    d. Indentify problems based on applications of differential equations and solve these problems

9. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

    a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
    b. About ***15-20% of the topics/sub-topics*** which is relatively simpler or descriptive in nature is to be given to the students for ***self-directed learning*** and assess the development of the COs through classroom presentations (see implementation guideline for details).
    c. Use Flash/Animations to explain various components, operation and
    d. Teacher should ask the students to go through instruction and Technical manuals

10. SUGGESTED MICRO-PROJECTS
(Only for Class Declaration Courses)

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be ***individually*** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should ***not exceed three.***

    The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than ***16 (sixteen) student engagement hours*** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

    A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

N.A.

11. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal B.S	Khanna Publications, New Delhi
2	AText Book of Engineering Mathematics	Dutta D	New Age Publications, New Delhi
3	Mathematics for Polytechnic students	S.P. Deshpande	Pune Vidyarthi Griha Prakashan
4	Advance Engineering Mathematics	H.K. Das	S. Chand & Co. Ltd. Delhi
5	Advance Engineering Mathematics	Krezig,Ervin	Wiley Publications New Dehli.

12. SOFTWARE/LEARNING WEBSITE
    a. *www.scilab.org/ -SCI Lab*
    b. *www.mathworks.com/product/matlab/ -MATLAB*

c. *Spreadsheet Applications*
d. *www.dplot.com*
e. *https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig*

13. **PO - COMPETENCY- CO MAPPING**

   (A) Program Outcomes(POs)

   (What s/he will continue to do at the entry point of industry soon after the diploma Programme)

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the CIVIL/ELECTRICAL/E&TC/MECHANICAL/METALLURGY/COMPUTER/INFORMATION TECHNOLOGY related engineering problems.

2. **Problem analysis:** Identify and analyse well-defined CIVIL/ELECTRICAL/E&TC/MECHANICAL/METALLURGY/COMPUTER/INFORMATION TECHNOLOGY related engineering problems using codified standard methods.

3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs in CIVIL/ELECTRICAL/E&TC/MECHANICAL/METALLURGY/COMPUTER/INFORMATION TECHNOLOGY engineering.

4. **Engineering Tools, Experimentation and Testing:** Apply modern CIVIL/ELECTRICAL/E&TC/MECHANICAL/METALLURGY/COMPUTER/INFORMATION TECHNOLOGY engineering tools and appropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities in diverse and multidisciplinary fields.

7. **Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes in CIVIL/ELECTRICAL/E&TC/MECHANICAL/METALLURGY/COMPUTER/INFORMATION TECHNOLOGY engineering.

(B) Program Specific Outcomes (PSOs)-

PSO1. Use latest MECHANICAL Engineering related software's for simple design drafting and manufacturing.

 PSO2. Use and operate machine, equipment and instruments related to mechanical engineering with more emphasis on automobile industry.

(C) COURSE OUTCOMES-

COURSE NAME	COURSE OUTCOMES(CO)
Applied Maths I (SC 1102)	1. Apply the concepts of algebra to solve engineering related problems.
	2. Utilize basic concepts of trigonometry to solve elementary engineering problems.
	3. Solve basic engineering problems under given conditions of straight lines.
	4. Solve the problems based on measurement of regular closed figures and regular solids.

Name of Course: Applied Maths I
Course Code: SC-1101
Semester: I
CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	2	2	1	-	-	-	1
2	3	3	1	-	-	1	2
3	3	3	-	-	-	-	1
4	3	3	1	1	-	-	1
AVERAGE	2.8	2.8	1	1	-	1	1.2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

CO-PSO Matrices of course

CO	PSO1	PSO2
1	1	-
2	-	-
3	1	-
4	1	-
Average	0.7	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

PREPARED BY

S.N.	Name	Designation	Institute / Industry
1.		Chairman PBOS	
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3.	Mrs P.R.Nemade	Faculty from Institute	Govt. Polytechnic ,Pune
4.		Consultant from Industry	
5.		Faculty from nearby Institute	
6.		R.B.T.E.Representative .	

14. **Question Paper Profile For Theory Paper:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	U	4	1	U	4	1	A	4	1	A	4	1	U	4	1	U	4	**4/6**
02	2	U	4	2	U	4	2	A	4	2	A	4	2	A	4	2	A	4	**4/6**
03	3	U	4	3	U	4	3	A	4	4	U	4	4	U	4	4	A	4	**4/6**
04	1	U	4	2	A	4	3	A	4	3	A	4	3	A	4	3	A	4	**4/6**
05	1	R	2	1	R	2	1	R	2	1	R	2	2	R	2	2	R	2	**8/12**
	2	R	2	2	R	2	3	R	2	3	R	2	4	A	2	4	R	2	

T= Unit/Topic Number   L= Level of Question   M = Marks

R-Remember   U-Understand   A-Analyze/ Apply