

GOVERNMENT POLYTECHNIC, PUNE

‘180 OB’ – Scheme

Programme	Diploma in CM/IT
Programme code	06/07/26
Name of Course	ENGINEERING MATHEMATICS
Course Code	SC2102
Prerequisite	SC1102 – Applied Mathematics II
Class Declaration	NO

1. TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)		Examination Scheme				
					Theory		Tutorials		Total Marks
L	T	P	C		ESE	PA	ESE	PA	
03	02	00	05	Marks	80	20	NA	25	125
				Exam Duration	3 Hrs	1 Hr	--	--	—

Legends : L- Lecture, P- Practical, T- Tutorial, C- Credits ,ESE-End Semester Examination, PA- Progressive Assessment (Test I,II/TermWork) , *- Practical Exam, \$- Oral Exam, #- Online Examination each Lecture/Practical period is of one clock hour;

2. RATIONALE

The student shall learn various techniques in integration and differential equations and use these techniques to their related Engineering problems.

3. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Solve various engineering related problems using the principles of Engineering Mathematics

4. 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. Solve the given problems of integration using suitable methods.
2. Apply the concept of integration to find mean and RMS value.
3. Solve the differential equation of first order and first degree using suitable methods.
4. Utilize basic concepts of probability distribution to solve elementary engineering problems.
5. Use statistical measures to solve engineering related problems

5. SUGGESTED PRACTICALS/ EXERCISES

Sr. No.	Unit No.	Practical Exercises (Learning Outcomes in Psychomotor Domain)	Relevant COs	Approx. Hrs. required
1	1	Integration by substitution method	1	3
2	1	Integration on the type $1/ax^2+bx+c$, $1/\sqrt{ax^2+bx+c}$, $1/\sin x+b\cos x+c$, $1/\sin^2 x+b\cos^2 x+c$.	1	2
3	1	*Integration using By Part Rule and integration by partial fraction method.	1	2
4	1	*Integration by partial fraction method.	1	2
5	2	Examples on Definite integral and its properties	2	2
6	2	Examples on Mean and R.M.S. value	2	2
7	3	Examples on order, degree and formation of differential equations.	3	2
8	3	Solution of first order first degree D.E. using various methods.	3	3
9	4	Solve problems based on Binomial Distribution related to engineering problems.	4	2
10	4	Solve problems based on Poisson Distribution related to engineering problems.	4	2
11	4	Solve problems based on Normal Distribution related to engineering problems.	4	2
12	5	Solve problems on moments.	5	2
13	5	Solve problems on skewness.	5	2
14	5	*Solve problems on Kurtosis.	5	2
15	5	*Solve problems on correlation.	5	2
16	ALL	*Complete a Micro- project as per the guidelines in point no. 11 towards the fulfillment of the COs of the course.	ALL	4
Total				32

***Experiment No. 16 compulsory, perform experiment 3 or 4, experiment 14 or 15.**

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

6. 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	1-15
2	Interactive Classroom	1-15

7. THEORY COMPONENTS

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Units I : Integration (09 hrs, 20 marks)	
1a. Obtain the given simple integral(s) using substitution method. 1b. Integrate given simple functions using the integration by parts. 1c. Evaluate the given simple integral by partial fractions.	1.1 Methods of Integration: a. Integration by substitution. b. Integration by parts. c. Integration by partial fractions.
Unit II: Definite integrals (09 hrs, 16 marks)	
2a. Solve given simple problems based on properties of definite integration. 2b. Utilize the concept of definite integration to find the mean value of the function. 2c. Invoke the concept of definite integration to find root mean square value of function.	2.1 Definite Integration: a. Simple examples b. Properties of definite integral (without proof) and simple examples. 2.2 Applications of integration : a. Mean value. b. Root Mean Square Value.
Unit III: Differential Equations (12 hrs, 20 marks)	
3a. Find the order and degree of given differential equations 3b. Form simple differential equation for given simple engineering problems. 3c. Solve given differential equations using the method of Variable separable form. 3d. Solve the given differential equations using linear differential equations.	3.1 Concept of differential equation. 3.2 Order, degree and formation of Differential equations 3.3 Solution of differential equation a. Variable separable form. b. Linear differential equation. 3.4 Application of differential equations and related engineering problems.
Unit IV: Probability Distribution (09 hrs, 12 marks)	
4a. Make use of probability distribution to identify discrete and continuous probability distribution 4b. Solve given problems based on repeated trials using Binomial distribution 4c. Solve given problems when number of trials are large and probability is very small. 4d. Utilize the concept of normal distribution to solve related engineering problems.	4.1 Probability distribution Probability a. Discrete Probability distribution. b. Continuous Probability distribution. 4. 2 Binomial distribution. 4. 3 Poisson's distribution. 4. 4 Normal distribution.

Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit V: Statistical Measures (09 hrs, 12 marks)	
5a. Calculate Moments about the mean of the given frequency distribution. 5b. Calculate the coefficient of Skewness of given distribution. 5c. Calculate the coefficient of Kurtosis of given distribution. 5d. Calculate the coefficient of correlation of given simple data.	5.1 Moments of given frequency distribution. 5.2 Skewness and coefficient of skewness of the given frequency distribution. 5.3 Kurtosis, coefficient of Kurtosis and type of Kurtosis. 5.4 Karl Pearson's coefficient of Correlation of simple data.

8. 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	Integration	09	04	08	08	20
II	Definite integration	09	--	08	08	16
III	Differential equation	12	04	08	08	20
IV	Probability Distribution	09	04	04	04	12
V	Statistical Measures	09	04	04	04	12
Total		48	16	32	32	80

9. 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:

- Identify engineering problems based on real world problems and solve them with the use of free tutorials available on the internet.
- Use graphical software: EXCEL, DPLLOT and GRAPH for related topics.
- Use MathCAD as a Mathematical Tool and solve the problems on Calculus.
- Identify problems based on applications of differential equations and solve these problems.

10. 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:

- Massive open online courses (**MOOCs**) may be used to teach various topics/subtopics.
- About **15-20% of the topics/subtopics** 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).
- Use Flash/Animations to explain various components, operation.
- Teachers should ask the students to go through instruction and Technical manuals.

11. SUGGESTED MICRO-PROJECTS

Only one Micro Project is planned to be undertaken by a student assigned to him/her in the beginning of the semester. She/He ought to submit it by the end of semester to develop industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs. The Micro-Project could be industry application based, internet based, workshop based, laboratory based or field based. The assessment of micro-project is to be done under Practical (PA) Assessment. The Micro Project preferably assign to the group of (4-6) students or an individual taking into the considerations the capabilities and circumstances at the time

A suggested list is given here. Similar micro-project could be added by the concerned faculty.

- Prepare charts displaying the area of irregular shapes using the concept of integration.
- Prepare charts displaying the volume of irregular shapes using the concept of integration.
- Prepare models using the concept of differential equations for radiocarbon decay.
- Prepare models using the concept of differential equations for population growth.
- Prepare models using the concept of differential equations for thermal cooling.
- Prepare models using the concept of Probability Distribution to solve engineering problems.
- Prepare models using the concept of Statistical measures to solve engineering problems.

12. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1.	Higher Engineering Mathematics	Grewal B. S.	Khanna publication New Delhi , 2013 ISBN: 8174091955
2.	A textbook of Engineering Mathematics	Dutta. D	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3.	Advance Engineering Mathematics	Kreyszig, Ervin	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4.	Advance Engineering Mathematics	Das H.K.	S Chand publication New Delhi 2008 ISBN: 9788121903455

13. SOFTWARE/LEARNING WEBSITES

- www.scilab.org/ -SCI Lab
- www.mathworks.com/product/matlab/ -MATLAB
- Spreadsheet Applications
- www.dplot.com
- <https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig>

14 PO - COMPETENCY- CO MAPPING

CO-PO Mapping of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
<u>1</u>	2	2	1	-	-	-	1
<u>2</u>	3	3	1	-	-	1	2
<u>3</u>	3	3	-	-	-	-	1
<u>4</u>	3	3	1	1	-	-	1
<u>5</u>	3	3	1	1	-	-	1

CO-PSO Mapping of course

CO	CM		IT		
	PSO1	PSO2	PSO1	PSO2	PSO3
1	-	1	-	1	1
2	-	1	-	1	1
3	-	2	-	2	1
4	-	2	-	2	-
5	-	2	-	2	-

1)Sign: Name: S. B. Yede 2)Sign: Name: Shri. V. B. Shinde 3)Sign: Name : Mrs. P. R. Nemade (Course Experts)	Sign: Name: (Head of Department)
Sign: Name: U. V. Kokate Dr. S.B. Nikam (Programme head)	Sign: Name: Shri A. S. Zanpure (CDC)