

Government Polytechnic, Pune

'180 OB' – Scheme

Course Title: **ENGINEERING MATHEMATICS**

(Course Code: **SC 2102.**)

Diploma programme in which this course is offered	Semester in which offered
CM/IT Engineering	THIRD(IT)
06/07/26	FOURTH(CM)

1. RATIONALE

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

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:

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

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P	C	Theory Marks	Practical Marks			
				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	Integration by substitution method	1	3
2	Integration on the type $1/ax^2+bx+c$, $1/\sqrt{ax^2+bx+c}$, $1/asinx+bcosx+c$, $1/asin^2x+bcos^2x+c$.	1	2

3	Integration using By Part Rule and integration by partial fraction method.	1	2
4	Integration by partial fraction method.	1	2
5	Examples on Definite integral and it's properties	2	2
6	Examples on Mean and R.M.S. value	2	2
7	Examples on order, degree and formation of differential equation.	3	2
8	Solution of first order first degree D.E. using various methods.	3	3
9	Solve problems based on Binomial Distribution related to engineering problems.	4	2
10	Solve problems based on Poisson Distribution related to engineering problems.	4	2
11	Solve problems based on Normal Distribution related to engineering problems.	4	2
12	Solve problems on moments.	5	2
13	Solve problems on skewness.	5	2
14	Solve problems on Kurtosis.	5	2
15	Solve problems on correlation.	5	2
Total			16

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	1-15
2	Interactive Classroom	1-15

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 : Integration	1.1. Obtain the given simple integral(s) using substitution method. 1.2. Integrate given simple functions using the integration by parts. 1.3. Evaluate the given simple integral by partial fractions.	Methods of Integration: a) Integration by substitution. b) Integration by parts c) Integration by partial fractions.
Unit 2: Definite integrals	2 .1. Solve given simple problems based on properties of definite integration . 2.2. Utilize the concept of definite integration to find mean value of the function. 2.3. 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 3: Differential Equations	3.1. Find the order and degree of given differential equations 3.2. Form simple differential equation for given simple engineering problems. 3.3. Solve given differential equations using the method of variable separable 3.4 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 Equations a. Variable separable form. b. Linear differential equation. 3.4 Application of differential equations and related engineering problem(s).
Unit 4: Probability Distribution	4.1. Make use of probability distribution to identify discrete and continuous probability distribution 4.2. Solve given problems based on repeated trials using Binomial distribution 4.3. Solve given problems when number of trials are large and probability is very small. 4.4. 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 5: Statistical Measures	5.1. Calculate Moments about the mean of the given frequency distribution. 5.2 Calculate the coefficient of Skewness of given distribution. 5.3 Calculate the coefficient of Kurtosis of given distribution. 5.4 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.

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	Integration	09	06	08	16	20(30)
II	Definite integration	09	--	12	12	16(24)
III	Differential equation	12	06	12	12	20(30)
IV	Probability Distribution	09	06	08	04	12(18)
V	Statistical Measures	09	06	04	08	12(18)
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:

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

- Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.
- 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).
- Use Flash/Animations to explain various components, operation.
- 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 Publishers, New Delhi
2	Engineering Mathematics Vol.II	Vishwanath	Satya Prakashan, New Delhi
3	Mathematics for Polytechnic students	S.P. Deshpande	Pune Vidyarthi Griha Prakashan
4	Engineering Mathematics Part II	H.K. Dass	S. Chand & Co. Ltd. Delhi

12. SOFTWARE/LEARNING WEBSITES

- 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 Computer/ Information Technology related engineering problems.

2. Problem analysis: Identify and analyse well-defined 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 Computer/ Information Technology engineering.

4. Engineering Tools, Experimentation and Testing: Apply modern 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 Computer/ Information Technology engineering.

(B) Program Specific Outcomes (PSOs)-

Student wil able to

PSO1: Ability to repair, maintain and troubleshoot computer systems to applying knowledge of computer hardware and peripheral.

PSO2: Ability to apply programming, multimedia, internet, web and software engineering principles to solve entry level problems in software domain.

(C) COURSE OUTCOMES-

COURSE NAME	COURSE OUTCOMES(CO)
ENGINEERING MAHEMATICS (SC 2102)	1. Solve the given problems of integration using suitable methods.
	2. Apply the concept of integration to find Mean value and Root Mean Square 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

Name of Course: **ENGINEERING MAHEMATICS**

Course Code: SC-2102

Semester: III

CO-PO Matrices of course

<u>CO</u>	<u>PO1</u>	<u>PO2</u>	<u>PO3</u>	<u>PO4</u>	<u>PO5</u>	<u>PO6</u>	<u>PO7</u>
<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
AVERAGE	2.8	2.8	0.8	0.5	-	0.16	<u>1.17</u>

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

CO-PSO Matrices of course

CO	PS	PSO2	PSO3
1	-	-	-
2	-	-	-
3	1	-	-
4	1	-	-
5	1	-	-
Average	0.6	-	-

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

PREPARED BY:

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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	R	2	1	R	2	1	R	2	3	R	2	3	R	2	3	R	2	08/12
	4	R	2	4	R	2	4	R	2	5	R	2	5	R	2	5	R	2	
02	1	U	4	1	U	4	1	A	4	1	A	4	1	A	4	1	A	4	04/06
03	2	U	4	2	U	4	2	U	4	2	A	4	2	A	4	2	A	4	04/06
04	3	U	4	3	U	4	3	U	4	3	A	4	3	A	4	3	A	4	04/06
05	4	U	4	4	U	4	4	A	4	5	U	4	5	A	4	5	A	4	04/06

T= Unit/Topic Number

L= Level of Question

M = Marks

R-Remember

U-Understand

A-Analyze/ Apply