

Government Polytechnic, Pune

'180 OB' – Scheme

Course Title: APPLIED MAHEMATICS II

(Course Code: SC 1102)

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

1. RATIONALE

This subject intends to teach students basic facts, concepts, principles and procedure of Mathematics as a tool to analyze Engineering problems and as such it lays down foundation for the understanding of engineering science and core technology subjects

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. Calculate the equation of tangent, maxima, minima, by differentiation.
2. Solve the given problems of integration using basic formulae.
3. Use basic concepts of statistics to solve engineering related problems.
4. Apply the concept of numerical methods to find the roots of equation.
5. Apply the concept of matrix to solve the engineering problems.

3. TEACHING AND EXAMINATION SCHEME

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

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 problems based on finding value of the function at different points	1	2
2	Solve problems based on standard formulae of derivatives	1	2
3	Solve problems to find derivatives of implicit function and parametric function.	1	2

4	Solve problems to find derivative of logarithmic and exponential functions	1	2
5	Solve problems based on finding equation of tangent and normal.	1	2
6	Solve problems based on finding maxima, minima of function	1	2
7	Solve problems based on finding radius of curvature at a given point.	1	2
8	Solve the problems based on standard formulae of integration.	2	2
9	Solve problems on finding range, coefficient of range and mean deviation.	3	2
10	Solve problems on standard deviation.	3	2
11	Solve problems on coefficient of variation and comparison of two sets. 2	3	2
12	Solve the algebraic equation using Bisection method, Regula falsi method and Newton –Raphson method	4	2
13	Solve the simultaneous equation using Gauss elimination method, Gauss Seidal and Jacobi's method	4	2
14	Solve elementary problems on Algebra of matrices.	5	2
15	Solve solution of Simultaneous Equation using inversion method.	5	4
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 practical's, 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
Unit 1 : Differential Calculus	1.1. Solve the given simple problems based on functions. 1.2. Solve the given simple problems based on rules of differentiation. 1.3. Obtain the derivatives of logarithmic, exponential functions. 1.4. Apply the concept of differentiation to find given equation of tangent and normal. 1.5. Apply the concept of differentiation to calculate maxima and minima and radius of curvature for given function.	1.1 Functions and Limits : a) Concept of function and simple b) Concept of limits without examples. 1.2 Derivatives: a) Rules of derivatives such as sum, Product, Quotient of functions. b) Derivative of composite functions to find derivative of given function (chain Rule), implicit and parametric functions. c) Derivatives of inverse, logarithmic and exponential functions. 1.3 Applications of derivative : a) Second order derivative without examples. b) Equation of tangent and normal c) Maxima and minima d) Radius of curvature
Unit 2: Integration	2.1 Solve the given simple problem(s) based on rules of integration.	2.1 Simple Integration: Rules of integration and integration of standard functions
Unit 3: Statistics	3.1. Obtain the range and coefficient of range of the given grouped and ungrouped data. 3.2. Calculate mean and standard deviation of discrete and grouped data related to the given simple engineering problem. 3.3 Determine the variance and coefficient of variance of given grouped and ungrouped data. 3.4. Justify the consistency of given simple sets of data.	3.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard from mean of grouped and ungrouped data, weighted means 3.3 Variance and coefficient of variance. 3.4 Comparison of two sets of observation.
Unit 4: Numerical Methods	4.1. Apply the concept of approximate to find root of algebraic equation 4.2. Apply the concept of iteration to solve the system of equations in three unknowns	4.1 Solution of algebraic equations : a. Bisection method, b. Regula falsi method and c. Newton –Raphson method. 4.2 Solution of simultaneous equations containing 3Unknowns : Gauss elimination method. Iterative methods- Gauss Seidal and Jacobi's method
Unit 5: Matrices	5.1 Solve given system of linear equations using matrix inversion method	5.1 Matrices, algebra of matrices, transpose adjoint and inverse of matrices. 5.2 Solution of simultaneous equations by matrix inversion method.

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	Differential Calculus	24	12	16	32	40(60)
II	Integration	06	02	12	--	10(14)
III	Statistics	06	04	--	12	10(16)
IV	Numerical methods	06	02	08	04	10(14)
V	Matrices	06	04	04	08	10(16)
Total		48	24	40	56	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, DPLOT 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 and
- 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	A Text 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 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 civil/mechanical /metallurgical related engineering problems.

2.Problem analysis: Identify and analyse well-defined civil/mechanical /metallurgical 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/mechanical /metallurgical engineering.

4.Engineering Tools, Experimentation and Testing: Apply modern civil/mechanical /metallurgical 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/mechanical /metallurgical engineering.

(B) Program Specific Outcomes (PSOs)-

Student will able to

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 II (SC 1102)	1. Calculate the equation of tangent, maxima, minima, by differentiation.
	2. Solve the given problems of integration using basic formulae.
	3. Use basic concepts of statistics to solve engineering related problems.
	4. Apply the concept of numerical methods to find the roots of equation.
	5. Apply the concept of matrix to solve the engineering problems

Name of Course: Applied Maths II

Course Code: SC-1102

Semester: I

Name of Staff member:

CO-PO Matrices of course

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
<u>1</u>	3	3	1	-	-	-	1
<u>2</u>	2	2	-	-	-	1	1
<u>3</u>	3	3	-	-	-	-	1
<u>4</u>	3	3	1	1	-	-	1
<u>5</u>	3	3	1	-	-	-	2
<u>AVERAGE</u>	2.8	2.8	0.6	0.2	-	0.2	<u>1.2</u>

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

CO-PSO Matrices of course

CO	PSO1	PSO2
1	-	-
2	-	-
3	-	-
4	2	-
5	1	-
Average	0.6	-

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

PREPARED BY:

S.N.	Name	Designation	Institute / Industry
1.		Chairman PBOS	
2.	Shri. V.B.Shinde	Faculty from Institute	Govt. Polytechnic ,Pune
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	R	2	1	R	2	1	R	2	1	R	2	1	R	2	1	R	2	08/12
	2	R	2	3	R	2	3	R	2	4	R	2	5	R	2	5	R	2	
02	1	U	4	1	U	4	1	U	4	1	A	4	1	A	4	1	A	4	04/06
03	1	U	4	1	A	4	1	A	4	1	A	4	1	A	4	1	A	4	04/06
04	2	U	4	2	U	4	2	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