

S. No.	Tutorials	Unit No.	Appro. Hrs. Required
4	Solve solution of Simultaneous Equation using inversion method.	I	2
5	Resolve into partial fraction using linear non repeated, repeated, and irreducible factors.	I	2
6	Solve problems on Compound, Allied, multiple and sub multiple angles.	II	2
7	Practice problems on factorization and de factorization.	II	2
8	Solve problems on inverse circular trigonometric ratios.	II	2
9	Practice problems on equation of straight lines using different forms.	III	2
10	Solve problems on perpendicular distance, distance between two parallel lines, and angle between two lines.	III	2
11	Solve problems on Area, such as rectangle, triangle, and circle.	IV	2
12	Solve problems on surface and volume, sphere, cylinder and cone.	IV	2
13	Solve practice problems on the surface area, volumes and its applications.	IV	2
14	Solve problems on finding range, coefficient of range and mean deviation.	V	2
15	Solve problems on standard deviation.	V	2
16	Solve problems on coefficient of variation and comparison of two sets.	V	2
Total			32

Note: The above tutorial sessions are for guideline only. The remaining tutorial hours are for revision and practice.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

- Not applicable -

8. UNDERPINNING THEORY COMPONENTS

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

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Algebra	a. Solve the given simple problem based on laws of logarithm. b. Calculate the area of the given triangle by determinant method. c. Solve given system of linear equations using matrix inversion method and by Cramer's rule. d. Obtain the proper and improper partial fraction for the given simple rational function.	1.1 Logarithm: Concept and laws of logarithm 1.2 Determinant and matrices a. Value of determinant of order 3x3 b. Solutions of simultaneous equations in three unknowns by Cramer's rule. c. Matrices, algebra of matrices, transpose adjoint and inverse of matrices. Solution of simultaneous equations by matrix inversion method. d. Types of partial fraction based on nature of factors and related

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
		problems.
Unit– II Trigonometry	2a. Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problem(s). 2b. Apply the concept of Sub- multiple angle to solve the given simple engineering related problem(s). 2c. 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.	2.1 Trigonometric ratios of Compound, allied, multiple and sub-multiple angles (without proofs) 2.2 Factorization and de-factorization formulae (without proofs) 2.3 Inverse trigonometric ratios and related problem. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratio.
Unit– III Coordinate Geometry	3a. Calculate angle between given two straight lines. 3b. Formulate equation of straight lines related to given engineering problems. 3c. Identify perpendicular distance from the given point to the line. 3d. Calculate perpendicular distance between the given two parallel 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. d. Perpendicular distance from a point on the line. e. Perpendicular distance between two parallel lines.
Unit-IV Mensuration	4a. Calculate the area of given triangle and circle. 4b. Determine the area of the given square, parallelogram, rhombus and trapezium. 4c. Compute surface area of given cuboids, sphere, cone and cylinder. 4d. 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.
Unit –V Statistics	5a. Obtain the range and coefficient of range of the given grouped and ungrouped data. 5b. Calculate mean and standard deviation of discrete and grouped data related to the given simple engineering problem. 5c. Determine the variance and coefficient of variance of given grouped and ungrouped data.	5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from mean of grouped and ungrouped data, weighted means 5.3 Variance and coefficient of variance. 5.4 Comparison of two sets of observation.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	5d. Justify the consistency of given simple sets of data.	

Note: To attain the COs and competency, above listed Unit Outcomes (UOs) need to be undertaken to achieve the 'Application Level' and above of Bloom's 'Cognitive Domain Taxonomy'

9. 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	20	02	08	10	20
II	Trigonometry	18	02	08	10	20
III	Coordinate Geometry	08	02	02	04	08
IV	Mensuration	08	02	02	04	08
V	Statistics	10	02	05	07	14
Total		64	10	25	35	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom 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 the internet.
- Use graphical softwares: EXCEL, DPLLOT and GRAPH for related topics.
- Use MathCAD as Mathematical Tools and solve the problems of Calculus.
- Identify problems based on applications of matrix and use MATLAB to solve these problems.
- Prepare models to explain different concepts.
- Prepare a seminar on any relevant topic.

11. 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.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- 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 UOs/COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.
- Guide student(s) in undertaking micro-projects.
- Apply the mathematical concepts learnt in this course to branch specific problems.

12. 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. S/he ought to submit it by the end of the semester to develop the industry oriented COs. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. 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.

In the first four semesters, the micro-project could be group-based. However, in higher semesters, it should 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. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty.

- Prepare charts using determinants to find area of regular shapes.
- Prepare models using matrices to solve simple problems based on cryptography.
- Prepare models using matrices to solve simple mixture problems.
- Prepare charts displaying regular solids.
- Prepare charts displaying regular closed figures.
- Prepare charts for grouped and ungrouped data.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna publications, New Delhi, 2015 ISBN: 8174091955
2	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi, 2014 ISBN :978-0-470-45836-5
3	Engineering Mathematics (third edition).	Croft, Anthony	Pearson Education, New Delhi, 2014 ISBN 978-81-317-2605-1
4	Getting Started with MATLAB-7	Pratap, Rudra	Oxford University Press, New Delhi, 2014, ISBN: 0199731241
5	Advanced Engineering Mathematics	Das, H.K.	S. Chand & Co.; New Delhi; 2008, ISBN-9788121903455

14. SOFTWARE/LEARNING WEBSITES

- www.scilab.org/ - SCI Lab
- www.mathworks.com/products/matlab/ - MATLAB
- www.dplot.com/ - DPlot
- www.allmathcad.com/ - MathCAD
- www.wolfram.com/mathematica/ - Mathematica
- <https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig>



- g. www.easycalculation.com
- h. www.math-magic.com

