

Subject Code: 01MA0102

Subject Name: Engineering Mathematics -II

B.Tech. Year – I (Sem-II)

Objective: To study the fundamental concepts of Engineering Mathematics to get a sound knowledge of important aspects of the subject.

Credits Earned: 5 Credits

Course Outcomes: After completion of this course, student will be able to

- Understand role of mathematical modeling in solving various problems related to heat transfer, mechanics, momentum, etc.
- Understand the role of multiple integral in finding volume of three dimensional objects, finding area between two curves, finding moment of inertia etc.
- Check the convergence and divergence of various functions which are expandable in infinite terms.
- Understand the key role of vector integral calculus in finding flux in vector field, finding potential function, etc.
- Gain the fundamental knowledge about special function like Beta and Gamma and its applications.

Teaching and Examination Scheme

| Teaching Scheme (Hours) | | | Credits | Theory Marks | | | Tutorial/ Practical Marks | | Total Marks |
|-------------------------|----------|-----------|---------|--------------|-------------|--------------|---------------------------|----------------|-------------|
| Theory | Tutorial | Practical | | ESE (E) | Mid Sem (M) | Internal (I) | Viva (V) | Term work (TW) | |
| 4 | 2 | - | 5 | 50 | 30 | 20 | 25 | 25 | 150 |

Contents:

| Unit | Topics | Contact Hours |
|-------------|---|----------------------|
| 1 | Multiple Integrals: Evaluation of double and triple integrals, Change of order of integration, Transformation to polar, spherical and cylindrical coordinates. | 7 |
| 2 | Vector differential calculus: Revision of concept of vector algebra, Scalar and vector fields., gradient of a scalar functions, directional derivatives, Divergence and Curl of a vector field and their properties, Physical interpretations of gradient, divergence and curl. Irrotational, solenoidal and conservative vector fields | 7 |
| 3 | Vector Integral calculus: Line integrals, Path Independence of Line Integrals, Concept of surface integrals, Statement and examples of Green's theorem, Stoke's and Divergence theorems. | 7 |
| 4 | Ordinary Differential Equations: Reorientation, order and degree, Separable variable, Linear differential equations, Bernoulli differential equations, Exact differential equations. | 7 |
| 5 | Infinite Series: concept of sequence, convergence and divergence of infinite series, necessary condition for convergence, geometric series, Tests of convergence viz., comparison, p-series, ratio, n^{th} root test. | 7 |
| 6 | Special Functions: Improper integrals and their convergence, Definitions, properties and examples of Beta, Gamma and error functions. | 7 |
| | Total Hours | 42 |

Recommended Textbooks:

1. M. D. Weir *et al*: Thomas' Calculus, 11th Ed., Pearson Education, 2008.
2. Stewart James: Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. Wylie & Barrett: Advanced Engineering Mathematics, McGraw-Hill pub.
4. Greenberg M D: Advanced Engineering Mathematics, 2nd ed., Pearson
5. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley, INC
6. H. K. Dass, Advanced Engineering Mathematics, S Chand Publishing.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

| Distribution of Theory for course delivery and evaluation | | | | | |
|---|------------|-------|---------|----------|--------|
| Remember | Understand | Apply | Analyze | Evaluate | Create |
| 20% | 20% | 30% | 15% | 10% | 5% |

Instructional Method:

- The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- <http://mathworld.wolfram.com/>
- <http://en.wikipedia.org/wiki/Math>