# MATH 102 – ENGINEERING MATHEMATICS II

| Course Code | Course Name | | Semester | |
|---|---|---|---|---|
| MATH 102 | Engineering Mathematics II | | Fall ☐ Spring ☒ Summer ☐ | |
| **Hours** | | | **Credit** | **ECTS** |
| **Theory** | **Practice** | **Lab** | | |
| | | | | |

| **Course Details** | |
|---|---|
| **Department** | |
| **Course Language** | English |
| **Course Level** | Undergraduate ☒ Graduate ☐ |
| **Mode of Delivery** | Face to Face ☒ Online ☐ Hybrid ☐ |
| **Course Type** | Compulsory ☒ Elective ☐ |
| **Lecturer (s)** | |
| **Course Objectives** | The aim of this course is to build the mathematical infrastructure that a student will need by teaching theoretically and practically the basic concepts and subjects of mathematics that a student should use in engineering faculty department courses, and at the same time, to help the student see the big picture |
| **Course Content** | Trancendental functions, Integration techniques, Infinite series and sequences, Parametric equations and Polar coordinates, Partial Derivatives, Multiple Integrals |
| **Course Method/ Techniques** | Lecture ☒ Question & Answer ☒ Presentation ☐ Discussion ☐ |
| **Prerequisites/ Corequisites** | Engineering Mathematics I |

| **Work Placement(s)** | |
|---|---|

**Textbook/References/Materials**

Textbook(s): G.B Thomas, J. Hass, M.D.Weir, C. Heil*, Thomas' Calculus,* 14th Edition*,* (Pearson Global Edition) R.A. Adams*, Calculus*: A complete course 8-th revised ed. , Prentice Hall, 2013.
J. Stewart, *Calculus*, Metric Version, Eighth Edition, 2016, Cengage Learning
References:

- Materials:

| **Course Category** | | | | |
|---|---|---|---|---|
| Mathematics and Basic Sciences | ☒ | | Education | ☐ |
| Engineering | ☒ | | Science | ☒ |
| Engineering Design | ☒ | | Health | ☒ |
| Social Sciences | ☐ | | Profession | ☐ |

**Weekly Schedule**

| No | Topics | Materials/Notes |
|---|---|---|
| 1 | Techniques of Integration | |
| 2 | Techniques of Integration | |
| 3 | Infinite Sequences and Series | |
| 4 | Infinite Sequences and Series | |
| 5 | Parametric Equations and Polar Coordinates | |
| 6 | Parametric Equations and Polar Coordinates | |
| 7 | Vectors and the Geometry of Space | |
| 8 | Midterm Exam | |
| 9 | Vector Valued Functions and Motion in Space | |
| 10 | Partial Derivatives | |
| 11 | Partial Derivatives | |
| 12 | Multiple Integrals | |
| 13 | Multiple Integrals | |
| 14 | Integrals and Vector Fields | |
| 15 | Integrals and Vector Fields | |
| 16 | Final Exam | |

| **Assessment Methods and Criteria** | | |
|---|---|---|
| **In-term studies** | **Quantity** | **Percentage** |
| Attendance | - | - |
| Lab | - | - |
| Practice | - | - |
| Fieldwork | - | - |
| Course-specific internship | - | - |
| Quiz/Studio/Criticize | - | - |
| Homework | - | - |
| Presentation / Seminar | - | - |
| Project | - | - |
| Report | - | - |
| Seminar | - | - |
| Midterm Exam | 1 | 40 |
| Final Exam | 1 | 60 |
| | **Total** | **100%** |
| **Contribution of Midterm Studies to Success Grade** | 1 | 40 |
| **Contribution of End of Semester Studies to Success Grade** | 1 | 60 |
| | **Total** | **100%** |

| **ECTS Allocated Based on Student Workload** | | | |
|---|---|---|---|
| **Activities** | **Quantity** | **Duration (Hrs)** | **Total Workload** |
| Course Hours | 16 | 4 | 64 |
| Lab | - | - | - |
| Practice | - | - | - |
| Fieldwork | - | - | - |
| Course-specific Work Placement | - | - | - |
| Out-of-class study time | 16 | 3 | 48 |
| Quiz/Studio/Criticize | - | - | - |
| Homework | - | - | - |
| Presentation / Seminar | - | - | - |
| Project | - | - | - |
| Report | - | - | - |
| Midterm Exam and Preparation for Midterm | 1 | 15 | 15 |
| Final Exam and Preparation for Final Exam | 1 | 20 | 20 |
| **Total Workload** | | | **147** |
| **Total Workload / 25** | | | |
| **ECTS Credit** | | | |

| **Course Learning Outcomes** | |
|---|---|
| **No** | **Outcome** |
| **L1** | Evaluate integrals using techniques of integration, such as substitution, inverse substitution, partial fractions and integration by parts. |
| **L2** | Determine convergence/divergence of improper integrals, and evaluate convergent improper integrals |
| **L3** | Estimate and compare series and integrals to determine convergence |
| **L4** | Graph polar coordinate equations |
| **L5** | Sketch the graph of surfaces in the three-dimensional coordinate systems<br>Take the derivative of functions with several variebles.<br>Evaluate double integrals over rectangles.<br>Evaluate triple integrals over rectangles. |

| **Contribution of Course Learning Outcomes to Program Competencies/Outcomes** | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant* | | | | | | | | | | | | | | | | |
| | **P1** | **P2** | **P3** | **P4** | **P5** | **P6** | **P7** | **P8** | **P9** | **P10** | **P11** | | | | | **Total** |
| **L1** | | | | | | | | | | | | | | | | |
| **L2** | | | | | | | | | | | | | | | | |
| **L3** | | | | | | | | | | | | | | | | |
| **L4** | | | | | | | | | | | | | | | | |
| **L5** | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | **Total** | |

i. Sufficient knowledge in the fields of mathematics, natural sciences, and related engineering disciplines; the ability to apply theoretical and practical knowledge in solving complex engineering problems.

ii. The ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.

iii. The ability to design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.

iv. The ability to select and use modern techniques and tools required for the analysis and solution of complex problems encountered in engineering applications; the ability to effectively use information technologies.

v. The ability to design experiments, conduct experiments, collect data, analyze results, and interpret findings for the investigation of complex engineering problems or discipline-specific research topics.

vi. The ability to work effectively in intra-disciplinary and multidisciplinary teams; the ability to work independently.

vii. The ability to communicate effectively both orally and in writing; proficiency in at least one foreign language; the ability to write effective reports, understand written reports, prepare design and production reports, make effective presentations, and give and receive clear and understandable instructions.

viii. Awareness of the necessity of lifelong learning; the ability to access information, track developments in science and technology, and continuously renew oneself.

ix. Acting in accordance with ethical principles, knowledge of professional and ethical responsibilities, and the standards used in engineering applications.

x. Knowledge of business practices such as project management, risk management, and change management; awareness of entrepreneurship and innovation; knowledge of sustainable development.

xi. Knowledge of the impact of engineering practices on health, environment, and safety at global and societal levels, and awareness of contemporary engineering issues; awareness of the legal consequences of engineering solutions.