

## MATH 101 – ENGINEERING MATHEMATICS I

Course Code	Course Name	Semester		
MATH 101	Engineering Mathematics I	Fall <input checked="" type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/>		
Hours			Credit	ECTS
Theory	Practice	Lab	4	6
4				

Course Details	
Department	
Course Language	English
Course Level	Undergraduate <input checked="" type="checkbox"/> Graduate <input type="checkbox"/>
Mode of Delivery	Face to Face <input checked="" type="checkbox"/> Online <input type="checkbox"/> Hybrid <input type="checkbox"/>
Course Type	Compulsory <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
Lecturer (s)	
Course Objectives	The basic objective of Calculus is to relate small-scale (differential) quantities to large-scale (integrated) quantities. This is accomplished by means of the Fundamental Theorem of Calculus. Students should demonstrate an understanding of the integral as a cumulative sum, of the derivative as a rate of change, and of the inverse relationship between integration and differentiation.
Course Content	Functions, Limit and Continuity, Derivative, Applications of Derivative, Integral, Applications of Integral, Transcendental Functions
Course Method/ Techniques	Lecture <input checked="" type="checkbox"/> Question & Answer <input checked="" type="checkbox"/> Presentation <input type="checkbox"/> Discussion <input type="checkbox"/>
Prerequisites/ Corequisites	The prerequisites are high school algebra and trigonometry

**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	<input checked="" type="checkbox"/>	Education	<input type="checkbox"/>
Engineering	<input checked="" type="checkbox"/>	Science	<input checked="" type="checkbox"/>
Engineering Design	<input checked="" type="checkbox"/>	Health	<input checked="" type="checkbox"/>
Social Sciences	<input type="checkbox"/>	Profession	<input type="checkbox"/>

**Weekly Schedule**

No	Topics	Materials/Notes
1	Functions of a Single Variable	
2	Limit and Continuity	
3	Limit and Continuity	
4	Derivatives	
5	Derivatives	
6	Derivatives and Applications	
7	Derivatives and Applications	
8	Midterm Exam	
9	Integration	
10	Integration	
11	Integration and Applications	
12	Integration and Applications	
13	Transcendental Functions	
14	Integration techniques	
15	L'Hopital's Rule	
16	Final Exam	

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

<b>ECTS Allocated Based on Student Workload</b>			
<b>Activities</b>	<b>Quantity</b>	<b>Duration (Hrs)</b>	<b>Total Workload</b>
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
<b>Total Workload</b>			<b>147</b>
<b>Total Workload / 25</b>			
<b>ECTS Credit</b>			

### Course Learning Outcomes

No	Outcome
L1	Use both the definition of derivative as a limit and the rules of differentiation to differentiate functions.
L2	Sketch the graph of a function using asymptotes, critical points, and the derivative test for increasing/decreasing and concavity properties
L3	Set up max/min problems and use differentiation to solve them.
L4	Set up related rates problems and use differentiation to solve them.
L5	Evaluate integrals by using the Fundamental Theorem of Calculus
	Apply integration to compute areas and volumes by slicing, volumes of revolution, arclength, and surface areas of revolution. Evaluate integrals using techniques of integration, such as substitution, inverse substitution, partial fractions and integration by parts. Set up and solve first order differential equations using separation of variables. Use L'Hôpital's rule.

### Contribution of Course Learning Outcomes to Program Competencies/Outcomes


*Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant*

	1.1	1.2	2.1	2.2	2.3	4.1	5.3	6.3	7.1	7.2							Total
L1	x	x	-	x	-	-	x	x	x	x							
L2	x	x	x	x	-	-	x	x	x	x							
L3	x	x	x	x	x	x	x	x	x	x							
L4	x	x	x	x	x	x	x	x	x	x							
L5	x	x	x	x	x	x	x	x	x	x							
<b>Total</b>																	

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.

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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.

- 1.1. Matematik, fen bilimleri ve ilgili mühendislik disiplinine özgü konularda yeterli bilgi birikimi;
- 1.2. bu alanlardaki kuramsal ve uygulamalı bilgileri, karmaşık mühendislik problemlerinin çözümünde kullanabilme becerisi.
- 2.1. Karmaşık mühendislik problemlerini tanımlama, formüle etme ve çözme becerisi;
- 2.2. bu amaçla uygun analiz ve modelleme yöntemlerini seçme ve uygulama becerisi.
- 3.1. Karmaşık bir sistemi, süreci, cihazı veya ürünü gerçekçi kısıtlar ve koşullar altında, belirli gereksinimleri karşılayacak şekilde tasarlama becerisi;
- 3.2. bu amaçla modern tasarım yöntemlerini uygulama becerisi.

- 4.1. Mühendislik uygulamalarında karşılaşılan karmaşık problemlerin analizi ve çözümü için gerekli olan modern teknik ve araçları seçme ve kullanma becerisi;
- 4.2. bilişim teknolojilerini etkin bir şekilde kullanma becerisi.
- 5.1. Karmaşık mühendislik problemlerinin veya disipline özgü araştırma konularının incelenmesi için deney tasarlama,
- 5.2. deney yapma,
- 5.3. veri toplama, sonuçları analiz etme ve yorumlama becerisi.
- 6.1. Disiplin içi takımlarda etkin biçimde çalışabilme becerisi;
- 6.2. çok disiplinli takımlarda etkin biçimde çalışabilme becerisi;
- 6.3. bireysel çalışma becerisi.
- 7.1. Sözlü ve yazılı etkin iletişim kurma becerisi;
- 7.2. en az bir yabancı dil bilgisi;
- 7.3. etkin rapor yazma ve yazılı raporları anlama, tasarım ve üretim raporları hazırlayabilme becerisi,
- 7.4. etkin sunum yapabilme becerisi,
- 7.5. açık ve anlaşılır talimat verme ve alma becerisi.
- 8.1. Yaşam boyu öğrenmenin gerekliliği konusunda farkındalık;
- 8.2. bilgiye erişebilme, bilim ve teknolojiadaki gelişmeleri izleme ve kendini sürekli yenileme becerisi.
- 9.1. Etik ilkelerine uygun davranma, mesleki ve etik sorumluluk ve
- 9.2. mühendislik uygulamalarında kullanılan standartlar hakkında bilgi.
- 10.1. Proje yönetimi, risk yönetimi ve değişiklik yönetimi gibi, iş hayatındaki uygulamalar hakkında bilgi;
- 10.2. girişimcilik, yenilikçilik hakkında farkındalık;
- 10.3. sürdürülebilir kalkınma hakkında bilgi.
- 11.1. Mühendislik uygulamalarının evrensel ve toplumsal boyutlarda sağlık, çevre ve güvenlik üzerindeki etkileri ve çağın mühendislik alanına yansıyan sorunları hakkında bilgi;
- 11.2. mühendislik çözümlerinin hukuksal sonuçları konusunda farkındalık.