الجامعة الإسلامية لعالمية
INTERNATIONAL ISLAMIC UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING

CURRICULUM 2017

(Updated in Fall-2019)

DEPARTMENT OF MECHANICAL ENGINEERING

Mission

Department of Mechanical engineering is committed to inculcate the students with pragmatic education, professional ethics, industrial academic linkage, R&D environment and leading tools to solve the challenges of society in the better ways.

Program Educational Objectives (PEOs)

PEO1: Competent mechanical engineers pursuing in successful professional careers.

PEO2: Serving industry and society through professional growth R & D and / entrepreneurship.

PEO3: Effective mechanical engineers with leadership qualities having ethical Islamic values, interpersonal and managerial skills.

Program Learning Outcomes (PLOs)

PLO-1	**Engineering Knowledge** - Apply knowledge of mathematics, science, eengineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PLO-2	**Problem Analysis** - Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PLO-3	**Design/Development of Solutions** - Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PLO-4	**Investigation** - Conduct investigation into complex problems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PLO-5	**Modern Tool Usage** - Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the Limitations.
PLO-6	**The Engineer and Society** - Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PLO-7	**Environment and Sustainability** - Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PLO-8	**Ethics** - Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PLO-9	**Individual and Team Work** – Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PLO-10	**Communication** - Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PLO-11	**Project Management and Finance -** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PLO-12	**Life-long Learning** - Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Linkage of PEOs and PLOs

PEOs / PLOs	PEO1 (Engineering Practice)	PEO2 (Professional Growth)	PEO3 (Social Service)
PLO-1 (Engineering Knowledge)	√	√	
PLO-2 (Problem Analysis)	√	√	
PLO-3 (Design/Development of Solutions)	√	√	
PLO-4 (Investigation)	√	√	
PLO-5 (Modern Tool Usage)	√	√	
PLO-6 (The Engineer and Society)		√	
PLO-7 (Environment and Sustainability)		√	
PLO-8 (Ethics)			√
PLO-9 (Individual and Team Work)		√	√
PLO-10 (Communication)			√
PLO-11 (Project Management and Finance)		√	√
PLO-12 (Life-long Learning)		√	

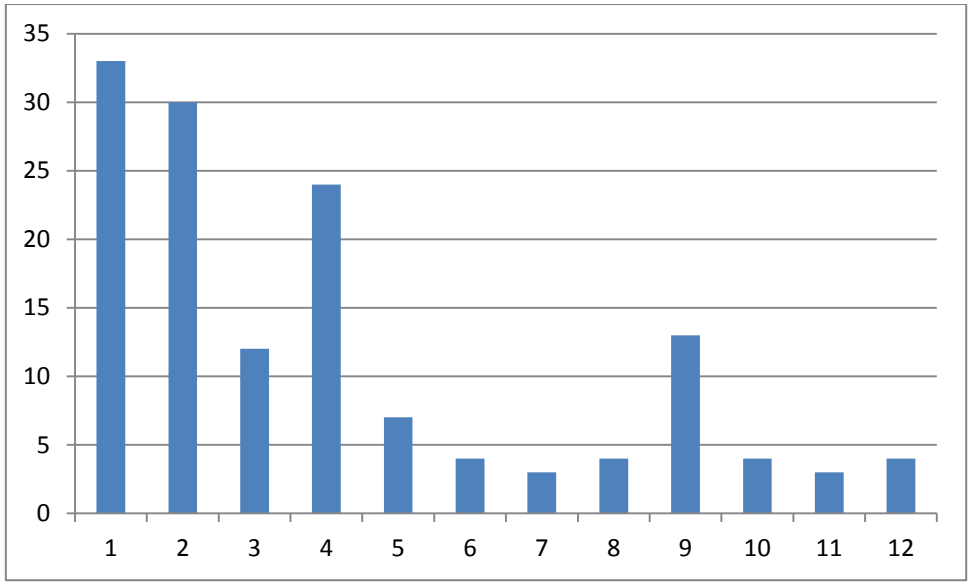
Mapping of CLO'S and PLO'S to curriculum																
Semester	**Course Code**	**Course Title**	**Type of Course**	**PLO-01**	**PLO-02**	**PLO-03**	**PLO-04**	**PLO-05**	**PLO-06**	**PLO-07**	**PLO-08**	**PLO-09**	**PLO-10**	**PLO-11**	**PLO-12**
				Engineering Knowledge	**Problem Analysis**	**Design and Development of Solutions**	**Investigation**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management**	**Life Long Learning**
1	GS-101	Math-I Calculus and Analytical Geometry	T	√	√		√								
	GS-103	Applied Chemistry	T	√	√					√					
	GS-102	Applied Physics	T	√	√		√								
	EN-101	Functional English	T										√		

	CS-101	Computer Systems and Programming	T	√											
	ME-111	Engineering Drawing and Graphics	T	√											
	GR-101	Arabic for Understanding Quran-I	T						√						√
	ME-111L	Engineering Drawing and Graphics Lab	L	√		√		√							
	GS-102L	Applied Physics Lab	L		√		√								
	CS-101L	Computer Systems and Programming Lab	L			√		√							
2	GS-104	Math-II Linear Algebra and Ordinary Differential Equations	T	√	√										
	EE-101	Electrical Engineering	T	√											
	ME-121	Thermodynamics-I	T	√	√										
	ME-113	Engineering Mechanics-I: Statics	T	√	√										
	GR-102	Arabic for Understanding Quran-II	T						√						√
	ME-112L	Workshop Practice Lab	L	√			√				√				
	EE-101L	Electrical Engineering Lab	L	√	√							√			
	ME-113L	Engineering Mechanics-I: Statics Lab	L				√					√			
3	GR-201	Pakistan Studies	T						√						
	ME-221	Thermodynamics-II	T		√		√								

	ME-211	Engineering Mechanics-II: Dynamics	T	√	√											
	ME-212	Mechanics of Materials–I	T	√	√											
	ME-222	Fluid Mechanics-I	T	√	√		√									
	EN-201	Communication Skills & Report Writing	T										√			
	ME-221L	Thermodynamics-II Lab	L		√		√									
	ME-211L	Engineering Mechanics-II: Dynamics Lab	L				√					√				
4	ME-213	Engineering Materials	T	√	√											
	EE-201	Electronics Engineering	T	√												
	GS-201	Statistics and Probability for Engineer	T	√	√											
	ME-215	Mechanics of Materials–II	T		√	√										
	ME-223	Fluid Mechanics-II	T	√	√											
	GR-202	Islamic Studies/Ethics	T								√					
	EE-201L	Electronics Engineering Lab	L	√	√							√				
	ME-215L	Mechanics of Materials–II Lab	L	√												
	ME-223L	Fluid Mechanics-II Lab	L				√					√				
5	ME-311	Machine Design and CAD-I	T	√	√		√									

	ME-312	Mechanics of Machines	T	√	√	√									
	ME-313	Manufacturing Processes	T	√	√		√								
	ME-314	Introduction to Mechatronics	T	√											
	GS-301	Applied Math-III Vector Calculus and PDEs)	T		√										
	ME-311L	Machine Design and CAD-I Lab	L					√							
	ME-312L	Mechanics of Machines Lab	L		√		√								
	ME-313L	Manufacturing Processes Lab	L	√			√								
	ME-314L	Introduction to Mechatronics Lab	L	√	√							√			
6	ME-315	Machine Design and CAD-II	T	√	√		√								
	MS-301	Engineering Management and Economics	T	√	√		√								
	ME-316	Control Engineering & Instrumentation	T		√	√									
	GS-302	Applied Math-IV (Complex Variable Technique& Fourier Transform)	T	√	√										
	ME-321	Heat & Mass Transfer	T		√	√									
	GR-301	Ethical and Legal Dimensions for Engineers	T								√				
	ME-315L	Machine Design and CAD-II Lab	L					√				√			

	ME-316L	Control Engineering & Instrumentation Lab	L				√	√				√			
	ME-321L	Heat & Mass Transfer Lab	L				√					√			
7	ME-421	IC Engines	T		√	√				√					
	GS-401	Numerical Analysis & Computation	T	√	√										
	ME-422	Refrigeration and Air Conditioning	T		√	√									
	ME-4xy	Technical Elective-I	T		√	√	√								
	ME-499	Project		√	√	√		√	√	√		√	√	√	
	ME-421L	IC Engines Lab	L				√								
	GS-401L	Numerical Analysis& Computation Lab	L		√	√									
	ME-422L	Refrigeration and Air Conditioning Lab	L				√					√			
8	ME-4xy	Technical Elective-II	T												
	ME-411	Mechanical Vibrations	T		√	√	√								
	ME-4xy	Technical Elective-III	T	√	√										√
	MS-4xy	Management Elective	T											√	
	ME-499	Project					√	√			√	√	√	√	√
	ME-411 L	Mechanical Vibrations Lab	L				√					√			



CLOs and PLOs Mapping

Mapping of CLO'S and PLO'S of Technical Electives													
Course Code	**Course Title**	**PLO-01**	**PLO-02**	**PLO-03**	**PLO-04**	**PLO-05**	**PLO-06**	**PLO-07**	**PLO-08**	**PLO-09**	**PLO-10**	**PLO-11**	**PLO-12**
		Engineering Knowledge	**Problem Analysis**	**Design and Development of Solutions**	**Investigation**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management**	**Life Long Learning**
ME-423	Renewable energy resources	√			√								
ME-412	Tribology	√											
ME-424	Computational fluid dynamics	√	√										
ME-425	Gas dynamics	√	√										
ME-426	Aerodynamics	√	√										
ME-416	Automation and robotics	√			√			√					

ME-431	Finite element method	√	√										
ME-431L	Finite element method Lab					√							
ME-434	Introduction to composite materials	√	√										
ME-417	Production engineering			√	√								
ME-419	Engineering optimization	√	√										
ME-414	Fracture mechanics	√	√		√								
ME-433	Hydraulics & pneumatics	√	√										
ME-428	Introduction to nuclear engineering	√											
ME-413	Maintenance engineering	√	√										
ME-418	Modeling and simulation		√	√									
ME-429	Power plant	√	√										√
ME-429L	Power plant Lab				√					√			

Mapping of CLO'S and PLO'S of Management Electives													
Course Code	**Course Title**	**PLO-01**	**PLO-02**	**PLO-03**	**PLO-04**	**PLO-05**	**PLO-06**	**PLO-07**	**PLO-08**	**PLO-09**	**PLO-10**	**PLO-11**	**PLO-12**
		Engineering Knowledge	**Problem Analysis**	**Design and Development of Solutions**	**Investigation**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management**	**Life Long Learning**
MS-406	Business and entrepreneurship		√									√	
MS-401	Industrial management											√	
MS-405	Operations management				√							√	
MS-403	Operations research	√	√	√									
MS-408	Production management	√										√	
MS-402	Project management											√	

MS-407	Safety, health and environment management						√	√	√				
MS-404	Total quality management											√	

Department of Mechanical Engineering

BS (Mechanical Engineering)

Scheme of Studies and Course Outline

Revision III prepared For Fall 2014 and onward

Semester/Term1

	Subjects		Credit Hrs		Credit Hours
			Theory	Lab	
1	GS-101	Math-I Calculus and Analytical Geometry	3	0	3
2	GS-102	Applied Physics	2	1	3
3	GS-103	Applied Chemistry	2	0	2
4	EN-101	Functional English	2	0	2
5	CS-101	Computer Systems and Programming	2	1	3
6	ME-111	Engineering Drawing and Graphics	2	1	3
7	GR-101	Arabic for Understanding	2	0	2
		Total:	**15**	**3**	**18**

Semester/Term2

	Subjects		Credit Hrs		Credit Hours
			Theory	Lab	
1	GS-104	Math-II Linear Algebra and Ordinary Differential Equations	3	0	3
2	EE-101	Electrical Engineering	2	1	3
3	ME-121	Thermodynamics-I	3	0	3
4	ME-112	Workshop Practice	0	2	2
5	ME-113	Engineering Mechanics-I:	3	1	4
6	GR-102	Arabic for Understanding	2	0	2
		Total:	**13**	**4**	**17**

Semester/Term3

	Subjects		Credit Hrs		Credit Hours
			Theory	Lab	
1	GR-201	Pakistan Studies	2	0	2
2	ME-221	Thermodynamics-II	3	1	4
3	ME-211	Engineering Mechanics-II: Dynamics	3	1	4
4	ME-212	Mechanics of Materials–I	3	0	3
5	ME-222	Fluid Mechanics-I	3	0	3
6	EN-201	Communication Skills& Report Writing	2	0	2

		Total:	**16**	**2**	**18**

Semester/Term4

	Subjects		**Credit Hrs**		**Credit Hours**
			Theory	**Lab**	
1	ME-213	Engineering Materials	3	0	3
2	EE-201	Electronics Engineering	2	1	3
3	GS-201	Statistics and Probability for Engineer	2	0	2
4	ME-215	Mechanics of Materials–II	3	1	4
5	ME-223	Fluid Mechanics-II	3	1	4
6	GR-202	Islamic Studies/Ethics	2	0	2
		Total:	**15**	**3**	**18**

Semester/Term5

	Subjects		**Credit Hrs**		**Credit Hours**
			Theor	**Lab**	
1	ME-311	Machine Design and CAD-I	2	1	3
2	ME-312	Mechanics of Machines	3	1	4
3	ME-313	Manufacturing Processes	3	1	4
4	ME-314	Introduction to Mechatronics	2	1	3
5	GS-301	Applied Math-III Vector Calculus and PDEs)	3	0	3
		Total:	**13**	**4**	**17**

Semester/Term6

	Subjects		**Credit Hrs**		**Credit Hours**
			Theory	**Lab**	
1	ME-315	Machine Design and CAD-II	2	1	3
2	MS-301	Engineering Management and Economics	2	0	2
3	ME-316	Control Engineering& Instrumentation	2	1	3
4	GS-302	Applied Math-IV (Complex Variable Technique& Fourier Transform)	3	0	3
5	ME-321	Heat & Mass Transfer	3	1	4
6	GR-301	Ethical and Legal Dimensions for Engineers	2	0	2
		Total	**14**	**3**	**17**

Semester/Term7

	Subjects		Credit Hrs		Credit Hours
			Theory	**Lab**	
1	ME-421	IC Engines	2	1	3
2	GS-401	Numerical Analysis&	2	1	3
3	ME-422	Refrigeration and Air Conditioning	2	1	3
4	ME-4xy	Technical Elective-I	3	0	3
5	ME-499	Project	0	3	3
		Total:	**9**	**6**	**15**

Semester/Term8

	Subjects		Credit Hrs		Credit Hours
			Theory	**Lab**	
1	ME-4xy	Technical Elective-II	3	0	3
2	ME-411	Mechanical Vibrations	3	1	4
3	ME-4xy	Technical Elective-III	3	0	3
4	MS-4xy	Management Elective	3	0	3
5	ME-499	Project	0	3	3
		Total:	**12**	**4**	**16**
		Grand Total:	**107**	**29**	**136**

Non Engineering Courses Credit Hours	44
Engineering Courses Credit Hours	92
Engineering Percent	67.7%

List of Elective Courses in BS Mechanical Engineering

(Recommended by the Board of Studies DME)

Technical Electives		Course Title	Credit Hrs
Sr.#	**Course Code**		
01	ME423	Renewable Energy Technology	(3,0)
02	ME412	Tribology	(3,0)
03	ME413	Maintenance Engineering	(3,0)
04	ME424	Computational Fluid Dynamics	(2,1)
05	ME425	Gas Dynamics	(3,0)
06	ME426	Aerodynamics	(3,0)
07	ME414	Fracture Mechanics	(3,0)
08	ME416	Automation and Robotics	(3,0)
09	ME417	Production Engineering	(2,1)
10	ME418	Modeling and Simulation	(2,1)
11	ME419	Engineering Optimization	(2,1)
12	ME428	Introduction to Nuclear Engineering	(3,0)
13	ME431	Finite Element Methods	(2,1)
14	ME429	Power Plant	(2,1)
15	ME433	Hydraulics & Pneumatics	(3,0)
16	ME434	Introduction to Composites Materials	(3,0)

Management Electives		Course Title	Credit Hrs
Sr#	**Course Code**		
01	MS401	Industrial Management	(3,0)
02	MS402	Project Management	(3,0)
03	MS403	Operation Research	(3,0)
04	MS404	Total Quality Management	(3,0)
05	MS405	Operations Management	(3,0)
06	MS406	Business and Entrepreneurship	(3,0)
07	MS407	Safety, Health and Environment Management	(3,0)
08	MS408	Production Management	(3,0)

Course codes:

0 Non Mechanical

1, 3 Design

2 Thermo-Fluid

9 Project

Course code methodology

The following course code methodology is followed for the curriculum and syllabus of this program

- The first two alphabets in the course code indicate the discipline being referred to, for example, ME for Mechanical Engineering

- The first digit in the course code indicates the academic year during which the course is offered. The second digit indicates the stream and third digit indicates the sequence of the course in the respective area in that year.

Second Digit Stream

0 Non Mechanical Engineering Courses

1, 3 Design and Manufacturing Courses

2 Thermo fluid Courses

- For different domain abbreviation used are as follow

ME:	Mechanical Engineering
EE:	Electrical Engineering
CS:	Computer Systems Engineering
GS:	General Sciences
EN:	English Sciences
MS:	Management Sciences
GR:	Arabic/Islamic Studies/Pakistan Studies

Semester/Term1

ARABIC FOR UNDERSTANDING QURAN-I (GR-101)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Duroos al-Lughatil al-Arabia by Dr. V. Abdur Rahim (Vol.1) – an International Series Published by Darussalam, Islamabad.
[Arabic Course – Originally devised and taught at Islamic University, Madinah, KSA.]
The general terms/definitions will be explained by the teacher.
The text in the lessons will be translated and exercises will be solved by the teacher during the class.

REFERENCE BOOK(S)

Lisan ul Quran by Dr. Habib ur Rehman Asim, IIUI
Lisan ul Quran (Vo.1) – Maktaba al-Bushra, Karachi
Language of the Quran by Izzat Uroosa, Darussalam, Islamabad
Al-Arabia bayna Yadaik (Vol.1)
Arabic Tutor (Vol.1) by Abdus Sattar Khan

COURSE OBJECTIVES

The message of the Quran is addressed to the entire human kind in Arabic language. Almighty Allah says: "We have sent it down as an Arabic Quran that you may understand" (12:2)". Every verse in the Holy Quran that was revealed to Prophet Muhammad (PBUH) in Arabic some 1500 years ago is a specimen of eloquence. The appreciation of the beauty of the Quranic language could be gained through perfect understanding of Arabic. For a Muslim, it is not just eloquence or the beauty of the language that matters. He or she would like to go deeper into its meaning because it is the message that one wishes to imbibe in life. The knowledge of Arabic would help the students in better understanding the Quran.

The course is especially designed for the learning of the language of the Quran. All the examples to be used for explaining Arabic grammar will be taken straight from the Holy Quran.

This approach will help a beginner to enter the World of Quran directly. Two volumes will be taught in two semesters and if a student may studies the third volume at his own with the help of supporting material on internet he will understand 85% of the Quran. In this era, this is a great Award from Allah.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Memorize** basic principles and vocabulary of Arabic Grammar.	C1	06
2	**Translate** few verses of the Holy Quran in the light of principles of Arabic Grammar.	C2	12

COURSE CONTENTS

General Arabic Terms / Definitions

The Alphabet (28+1)	**حروف هجَا / تهجِّی**
3 Long Vowels (Alif – waw – ya)	**حروف مَدّة** (الف – واو – ی)
3 Short Vowels (u-a-i)	**الحركات:** (ضمۃ/ پیش/ رفع) – (فتحۃ / زبر/ نصب) - (کسرۃ / زیر / جرّ)
2 Dipthongs (au/aw – ai/ay)	**واو - ی**
Jazma	**جزمۃ / سُکُون**
Shortend Alif	**الف مقصورۃ**
Ta marbuta (Round)	**تاٴ مربوطۃ**
Definite Article	**ال / حرف تعریف**
Nunation/Indefinite Article	**تنوین / حرف تنکیر**
Sun / Solar Letters	**الحروف الشَّمسیۃ**
Moon /Lunar. Letters	**الحروف القمریۃ**
Tashdid/Shadda/Doubled letters	**تشدید/شدّة**
Hamza of Connection and Ordinary Hamza	**ہمزۃ الوصل و ہمزۃ القطع**
Word: Parts of Speech:	**أنواع الکلمۃ:** (اسم – فعل – حرف)
1. **Noun** (Nouns-Pronouns-Adjectives-Adverbs)	**اسم :** (اسم - ضمیر – صفت – ظرف)
2. Verb	**فعل :** (فعل)
3. **Particle** (Prepositions, Conjunctions, Interjections & Vocative Particles)	**حرف:** حرف جرّ – حرف عطف – حرف نداء – فجائیۃ)
Definite Nouns:	**اسماء المعرفۃ:**
• Proper Noun,	اسم عَلَم ،
• Personal Pronouns,	اسم ضمیرِ،
• Demonstrative Pronouns,	اسم اشارۃ ،
• Relative Pronouns,	اسم موصول ،
• Noun having Definite Article,	اسم مُنَادی،
• Vocative Nouns/Case,	معرف باللام و
• Related to a Definite Noun	مضاف الی المعرفہ
Indefinite Nouns:	**اسماء النکرۃ:**
(1) Concrete Noun and (2) Adjective	اسم ذات و اسم صفت
Interrogative Nouns	**اسماء استفہام**
Adverbs:	
• Adverb of Time and Adverb of Place	**ظرف زمان / ظرف مکان**
Compounds:	**مرکب بات:**
Different constructions	**مرکب توصیفی - مرکب اضافی – مرکب اشاری – مرکب جاری - مرکب عددی**
Gender: Masculine and Feminine	**مذکر و مؤنث**
Cases/Declension of Nouns:	**إعراب:**
• Nominative Case	**مرفوع – منصوب – مجرور**

- Objective / Accusative Case **(حالت رفعی – نصبی و جرّی)**
- The Genitive with Prepositions
- The Genitive of Possession
- Vocative Case

Number:

- Singular **مفرد –**
- Dual **تثنیۃ /مُثنی**
- Sound Plural (Masculine & Feminine) **جمع مذکر سالم / جمع مؤنث سالم**
- Broken Plural (and its Patterns) **الجمع التکسیر/ المکسر**

Collective Noun **اسم جمع**

Pronouns: **الضمائرالمرفوعہ المنفصلۃ / المتصلۃ**

- Personal Pronouns (Attached & Detached) **الضمائرالمنصوبۃ المنفصلۃ / المتصلۃ** **الضمائرالإضافیۃ:** ہ – ھما – ھم / **الضمائرالمجرورۃ:** ہ – ھما - ھم
- Demonstrative Pronouns **اسماء الإشارۃ:** ھذا - ھذہ – ھذان/ھذین – ھاتان/ھاتین – ھؤلاء / ذلك - تلك – ذانك / ذينك / تانك/تينك - اولئك / ما – من

Verbs: **افعال:فعل ماضی** (تصریف) – **فعل مضارع** (تصریف و بناء)

Present, Past & Future Tenses **فعل أمر/ فعل نھی** (تصریف وبناء)

Particles: **حروف:**

- Prepositions, Conjunction, Interjection, Vocative and Interrogative particles **حرف جرّ، حرف عطف ، حروف نجائیۃ – حرف نداء – حرف سوال**

Sentence: **الجملۃ:**

- Nominal Sentence & Verbal Sentence **جملۃ اسمیۃ و جملۃ فعلیۃ**

Counting: (1-10) with things to be counted **عدد – معدود**

Diptotes and Triptotes **منصرف و غیر منصرف/الممنوع من الصرف**

Recitation, Tajweed, Translation and Grammatical Analysis:

01 **Al-Fatiha** (the Opening)
98 **Al-Bayinah** (the Proof)
100 Al-**'Adiyah** (the Runners)
102 At-**Takathur** (the Piling Up)
104. A**l-Humazah** (the Slanderer)
106 **Quraish** (Quraish)
108 Al-**Kauthar** (the River of Abundance)
110 An-**Nasr** (the Help)
112 Al-**Ikhlas** (the Sincerity)
114 **An-Nas**(Mankind)
97. **Al-Qadar** (the Night of Decree)
99. **Az-Zilzal** (the Earthquake)
101. **Al-Qari'ah** (the Striking Hour)
103. **Al-'Asr** (the Time)
105. **Al-Fil** (the Elephant)
107. **Al-Ma'un** (the Assistance)
109. **Al-Kafirun** (the Disbelievers)
111. **Al-Masad** (the Palm Fiber)
113. **Al-Falaq** (the Daybreak)

MATH-I CALCULUS AND ANALYTICAL GEOMETRY (GS-101)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Calculus and analytical Geometry, 11th Edition by Thomas Finney John Wiley & Sons

REFERENCE BOOK(S)

Advanced Engineering Mathematics, 5th Edition by C. R Wylie McGraw-Hill Education
Advanced Engineering Mathematics, 8th Edition by H T Erwin Kreyszig T H John Wiley & Sons

COURSE OBJECTIVES

The main aim of this course is to give students some basic ideas of calculus, which is the mathematics of motion. The purpose is not just making the students learn these ideas but to enable them to apply these ideas to solve problems of practical nature. The course will provide the students with the necessary tools to understand and formulate advanced mathematical concepts and an awareness of their relationship to a variety of problems arising in engineering and sciences. Students wishing to major in the sciences, engineering, or medicine are required to have a working knowledge of the calculus and its applications.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** the ideas of rate of change and derivatives using the concept of limits and continuity.	C2	01
2	**Apply** the derivatives for solving different problems arising in engineering sciences.	C3	02
3	**Use** the techniques of integration for solving problems in integral calculus and the vector calculus and analytical geometry in multiple dimensions	C3	04

COURSE CONTENTS

Introduction to single valued functions
Introduction to limit and community
Derivatives and their applications
Integral calculations with applications
Introduction to analytical geometry
Straight lines in R^2 and R^3.
Planes
Cylindrical and spherical coordinates
Surfaces. Cylinders and cones, spheres
Spherical Trigonometry
Function of several variables.
Limit and continuity
Partial derivatives
Equation of tangent planes
Double integral in Cartesian and polar coordination.
Techniques of integration with application,

APPLIED PHYSICS (GS-102)

Pre-requisite: None

Credit Hours 02
Contact Hours 32

RECOMMENDED BOOK(S)

Sears and Zemansky's University Physics: Volume 1 – Mechanics, 12th Edition, Hugh D. Young & Roger A. Freedman
Sears and Zemansky's University Physics: Volume 2 – Electricity And Magnetism, 12th Edition, Hugh D. Young & Roger A. Freedman.

REFERENCE BOOK(S)

Physics by Resnick, Halliday and Krane: Volume 1 – 4th Edition

COURSE OBJECTIVES

Physics is the study of how the world works. This course provides an introduction to the physical world concepts that will be required in following Mechanical Engineering courses and in professional applications. The course objectives are as follows: 1. Working knowledge of fundamental physics and basic electrical and mechanical engineering principles to include advanced knowledge in one or more engineering disciplines. 2. The ability to identify, formulate, and solve engineering physics problems. 3. The ability to formulate, conduct, analyze, and interpret experiments in engineering physics

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** the fundamental laws of physics relevant to the engineering sciences (i.e. mechanical, electrical engineering etc.).	C1	01
2	**Apply** knowledge of basic physical laws to solve various problems of applied nature.	C3	02
3	**Analyze** different physical problems using the laws of physics from different areas like mechanics and thermodynamics.	C4	04

COURSE CONTENTS

Introduction: Scientific notation and significant figures. Units in different systems.

Vectors: Review of vectors, Vector derivatives, Line and surface integrals, Gradient of scalar.

Mechanics: Coordinate systems. Motion under constant acceleration, Newton laws and their applications, Uniform circular motion. Vortex Motion, Frictional forces. Work and energy. Potential energy, energy conservation, energy and our environment.

Electrostatics and magnetism: Coulombs law. Gauss's law. Electric field around

conductors. Dielectrics. Magnetic fields. Magnetic force on current.

Semiconductor Physics: Energy levels in a semiconductor. Hole concept. Intrinsic and extrinsic regions. Law of mass action. P-N junction. Transistor.

Waves and Oscillations: Free oscillation of systems with one degree of freedom. Classical wave equation. Transverse modes for continuous string. Standing waves. Dispersion relation for waves.

Optics and Laser: Basic introduction to Optics and Laser. Diffraction grating. Lasers, population in version. Resonant cavities. Quantum efficiency. He-Ne, Ruby and CO_2 lasers. Doppler Effect and sonic boom.

Modern Physics: Photo electric effect, Compton Effect. Bohr theory of hydrogen atom, atomic spectra, reduce mass, De-broglie hypothesis braggs law, electron microscope, Zeeman effect, atomic nucleus, mass energy relation, binding energy, nuclear force sand fundamental forces. Exponential decay and half- life.

APPLIED PHYSICS LAB (GS-102L)

Pre-requisite: None
Credit Hours 01
Contact Hours 48

RECOMMENDED BOOK(S)

Manual of Physics Lab

COURSE OBJECTIVES

Physics is the study of how the world works. This course provides an introduction to the physical world concepts that will be required in following Mechanical Engineering courses and in professional applications. The course objectives are as follows: 1. Working knowledge of fundamental physics and basic electrical and mechanical engineering principles to include advanced knowledge in one or more engineering disciplines. 2. The ability to identify, formulate, and solve engineering physics problems. 3. The ability to formulate, conduct, analyze, and interpret experiments in engineering physics

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Practice** record keeping of experimental work and data graphing.	P3	04
2	**Analyze** data using simple statistics and compare the results with the relevant theory.	C4	02

COURSE CONTENTS:

As per manual

APPLIED CHEMISTRY (GS-103)

Pre-requisite: None
Credit Hours 02
Contact Hours 32

RECOMMENDED BOOK(S)

Applied Chemistry: A Textbook For Engineers And Technologists By: O.V. Roussak H. D. Gesser: 2013 Edition: Springer

REFERENCE BOOK(S)

Chemistry, The Central Science, Theodore L. Brown Et Al. 13th Edition (2014)
Physical Chemistry (3rd Edt.) By Thomas Engel And Philip Reid : Prentice Hall, (2013)
Chemistry For Engineering Students (William H. Brown And Lawrence S. Brown), Cengage Learning; 2 Edition (2010)

COURSE OBJECTIVES

This course will represent mechanical engineering students to applied nature of chemistry by learning the fundamentals like balancing chemical equation, formulating a solution to a problem using these equations. Furthermore this course will relate chemistry to industrial application like processing of Plastics, refining of fossil fuel and petroleum products, adhesive, electrochemical nature of corrosion and its protection with paints and coatings. Treatment of waste/industrial water will also be covered. Advance topics like Nano chemistry and its applications and chemistry involved in silicon extraction and its application in electronic industry will also be introduced

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Demonstrate** working knowledge of applied chemistry and its application to mechanical engineering field.	C3	01
2	**Identify** chemical compounds with harmful effects on environment and propose their control.	C1	07
3	**Apply** the acquired knowledge to identify, formulate and **Solve** engineering problems of chemical nature in field of mechanical engineering.	C3	02

COURSE CONTENTS

Physical Chemistry: Properties of various groups and periods of periodic table. Sources, production and uses of the major chemicals with relevance to Pakistan.
Thermo-chemistry: Chemical Thermodynamics, Hess's Law, heat of formation and reaction, relation between H and U, measurement of heat reaction, Bomb calorimeter
Electrochemistry: Laws of electrolysis, E.M.F. Series, corrosion (Theories, inhibition & protection), batteries.

Industrial Chemistry: Industrial chemistry introduction, Manufacture and uses of various hydrocarbons. Lubricants and oils. Production and application of paints, rubbers and fuels. Environmental pollution and control. Water Treatment Methods: Water softening, treatment of water for industrial purposes.

FUNCTIONAL ENGLISH (EN-101)

Pre-requisite: None
Credit Hours 02
Contact Hours 32

RECOMMENDED BOOK(S)

Grammar
Practical English Grammar by A. J. Thomson and A. V. Martinet.
Exercises 1.Third edition. Oxford University Press. 1997. ISBN0194313492
Practical English Grammar by A. J. Thomson and A. V. Martinet.
Exercises 2.Third edition. Oxford University Press. 1997. ISBN0194313506
Writing. Intermediate by Marie-Christine Bout in, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression1993.
ISBN0194354057Pages20-27and35-41.
Reading/Comprehension
Reading.UpperIntermediate.BrainTomlinsonandRodEllis.OxfordSupplementaryS kills.ThirdImpression1992.ISBN019453402
Speaking

COURSE OBJECTIVES

The importance of English language cannot be denied. It enriches our thought and culture and provides us with the most important international vehicle of expression. It has opened for us several doors of knowledge for it is the lingua franca of the world and also the language of science, technology, commerce and diplomacy. The main objective of this course is to enhance English language skills of the students and develop their critical thinking. Moreover, the course will ensure enabling the students to be able to: • Write grammatically correct and structurally coherent English • Summarize lengthy texts in their own words • Know the format of memo writing and develop memorandum on their own •Translate texts into idiomatically correct language without sacrificing the originality of the source text •Develop paragraphs and essays beyond what they might have memorized in the past •Understand complex texts

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Prepare** official letters, memorandums and reports, and also to be able to produce these documents in a professional manner.	C3	10
2	**Differentiate** between different kinds of essays and to construct brainstorming-clustering method to generate ideas in the form of a coherent essay.	C4	10
3	**Apply** extensive reading habits in a bid to improve reading	C3	10

	skills, learn to apply place punctuation marks and use question tags in an appropriate manner.		
4	**Identify** presentation blind spots for sound presentation skills through presentation software such as Microsoft PowerPoint and Prezi.	C1	10

COURSE CONTENTS

Study Skills
Reading, dictionary, library skills, speed reading, writing outlines, note taking.
Oral communication
Confidence building, class discussions, speeches, verbal interaction
Advanced reading comprehension:
Using texts dealing with science, literature and human rights (as per HEC recommendation)
Précis writing
Rules of précis writing, practice précis.
Controlled and guided writing
Pre writing (planning, information gathering, preparing to write), writing, search for topic sentences, developing a theme, following up ideas and arguments, outline plans etc.
Essay writing
Types of writing–narrative, descriptive, expository, argumentative etc., using guided writing to organize essays. Including human rights as essay topics (as per HEC recommendation).
Writing short reports
Short background of report and its importance, memo report, brief reports on events seen/ experienced like visit to an exhibition etc.
Applied Grammar
Morphology, types of sentences, sentence analysis, tenses, jumbled sentences, question tags, homonyms and homophones and their use in sentences, punctuation–sentences and paragraphs, use of idioms.
Letter writing
Formatandlayout,formalletters,typesofletters–invitations(acceptanceandrefusals), condolence,thanks,congratulations,totheeditor,chairmanclassadvisor,dean,vice chancellor etc.

COMPUTER SYSTEM & PROGRAMMING (CS-101)

Pre-requisite: None
Credit Hours 02
Contact Hours 32

RECOMMENDED BOOK(S)

Turbo C, By Robert La fore
Programming with C++, Schaum‟s Series

REFERENCE BOOK(S)

Turbo C, By Deitel & Deitel

COURSE OBJECTIVES

To learn fundamentals of computer hardware and basic terminologies.
To learn structure programming to solve the engineering problems.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** the fundamental concepts of computing and basic computer programming	C1	01
2	**Explain** the concepts of computer programming to a particular situation	C2	01
3	**Apply** the acquired knowledge to conceive, design, implement and debug small-to-moderate scale C programs	C3	01

COURSE CONTENTS

Introduction to Computers:
Computer components and systems, Networks, Operating Systems. Input/output devices, CPU, Primary and secondary storage devices.
Software:
Word Processing, Spreadsheets, Presentation software, Internet Browsers & E-mail.
Introduction to Programming:
Flowcharts, Pseudo codes, logical gates.

COMPUTER SYSTEM & PROGRAMMING (CS-101L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

C by Yashavant P. Kanetar , 4th Edition

REFERENCE BOOK(S)

Turbo C, By Deitel & Deitel

COURSE OBJECTIVES

To learn fundamentals of computer hardware and basic terminologies.
To learn structure programming to solve the engineering problems.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** basic knowledge of the tools used	C1	05

	especially Visual Studio to develop computer programs		
2	**Develop** pseudo code and debug logical errors in C programs	C5	03
3	**Develop** small scale C programs using acquired skills, design algorithms and draw flow charts to represent the problem	C5	03

COURSE CONTENTS

Programming in C++: Structural Programming, logical and mathematical operators, loops, conditional statements, arrays, functions.

ENGINEERING DRAWING AND GRAPHICS (ME-111)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Engineering Drawing by N. D. Bhatt.
Practical Geometry & Engineering Graphics by Abbot.

REFERENCE BOOK(S)

Technical Graphics Communication by Bertoline Wiebe, Miller. Mohler, Irwin McGraw-Hill.

COURSE OBJECTIVES

To inculcate in students the ability to comprehend the science of Engineering Drawing so that they are able to convey their creative ideas effectively. To provide the link from conventional 2D drawings.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** the fundamentals of engineering drawing and graphics.	C1	01
2	**Describe** the concepts of projection of points, lines, planes and solids.	C2	01
3	**Explain** orthographic projections, isometric views, and sectional views of different mechanical parts, and development of surfaces.	C2	01

COURSE CONTENTS

Introduction / Role of graphics in engineering
Projections Theory
Orthographic Projections
Orthographic Reading
Dimensioning
Projection of Points
Projection of Lines
Projection of Planes
Projection of Solids
Section Views
Dimensioning and tolerance
Threaded Fasteners (Threads)
Threaded Fasteners (Nut, Bolts and Washers)
Working drawings
Isometric Projections
Development of surfaces

ENGINEERING DRAWING AND GRAPHICS LAB (ME-111L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Engineering Drawing by N. D. Bhatt.
Practical Geometry & Engineering Graphics By Abbot.
AutoCAD A Problem-Solving Approach By Sham Tickoo.

REFERENCE BOOK(S)

Technical Graphics Communication By Bertoline Wiebe, Miller. Mohler, Irwin McGraw-Hill.
Machine Drawing By. Dr. K. L. Narayana.

COURSE OBJECTIVES

This course is a part of engineering foundation. It is targeted to help student visualize the basics of engineering design. It is intended for improving students approach towards conceptual design.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Be aware** of appropriate Engineering Drawing tools and use the drawing principles for adequate representation of mechanical components.	A2	05
2	**Practice** 2-D Drawings/Sketches using orthographic projections.	P3	01

3	**Copy** a CAD drawing/project related to mechanical Engineering applications.	P3	03

COURSE CONTENTS

Part – I: (Manual)
Sheet Layout and Free-hand Sketching.
Lines, Lettering, Scaling and Sheet Planning.
Orthographic Projections (1st Angle).
Orthographic Projection (3rd Angle).
Dimensioning.

Part – II: (CAD)
Getting Started with AutoCAD and Advanced Sketching and Editing.
Advanced Sketching and Editing.
Technical Drawing with AutoCAD.
Isometric Drawings.
Section Views and Hatching.
Viewports, Layouts and Plots.
Dimensioning and Tolerances in AutoCAD.

Semester/Term2

ARABIC FOR UNDERSTANDING QURAN-II (GR-102)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Duroos al-Lughatil al-Arabia by Dr. V. Abdur Rahim (Vol.2) – an International Series Published by Darussalam, Islamabad.
[Arabic Course – Originally devised and taught at Islamic University, Madinah, KSA.]
The general terms/definitions will be explained by the teacher.
The text in the lessons will be translated and exercises will be solved by the teacher during the class.

REFERENCE BOOK(S)

Lughat ul Quran by Dr. Inam-ul-Haq Ghazi, IIUI
Lisan ul Quran (Vo.2) – Maktaba al-Bushra, Karachi
Language of the Quran by Izzat Uroosa, Darussalam, Islamabad
Al-Arabia bayna Yadaik (Vol.2)
Arabic Tutor (Vol.2&3) by Abdus Sattar Khan

COURSE OBJECTIVES

The message of the Quran is addressed to the entire human kind in Arabic language. Almighty Allah says: "We have sent it down as an Arabic Quran that you may understand" (12:2)". Every verse in the Holy Quran that was revealed to Prophet Muhammad (PBUH) in Arabic some 1500 years ago is a specimen of eloquence. The appreciation of the beauty of the Quranic language could be gained through perfect understanding of Arabic. For a Muslim, it is not just eloquence or the beauty of the language that matters. He or she would like to go deeper into its meaning because it is the message that one wishes to imbibe in life. The knowledge of Arabic would help the students in better understanding the Quran.

The course is especially designed for the learning of the language of the Quran. All the examples to be used for explaining Arabic grammar will be taken straight from the Holy Quran.

This approach will help a beginner to enter the World of Quran directly. Two volumes will be taught in two semesters and students will be encouraged to study the third volume at their own with the help of supporting material available on internet then they will understand 85% of the Quran. In this era, this is a great Award from Allah.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Use** rules of Arabic Grammar as well as vocabulary to learn the Holy Quran.	C3	06
2	**Analyze** few verses of the Holy Quran in the light of principles of Arabic Grammar.	C4	12

COURSE CONTENTS

- How to use Arabic Dictionary: كيف نستعمل القاموس العربي

- **Types of Sentences:**
  (1) **The Nominal Sentence الجملة الاسمية**
  Subject & Predicate **: المبتداء والخبر**
- (2) **The Verbal Sentence: الجملة الفعلية**
  Verb – Subject – Direct Object : فعل – فاعل – مفعول بہ

- The Particle ***Inna*** & Its Sisters: **إنّ و أخواتها**
- اسمُ اِنَّ و خبرُ اِنَّ
- **اخواتُ اِنَّ** : اَنَّ – لـكِنَّ – كأَنَّ – لِأَنَّ – ليتَ – لَعلّ
- ***Inna* and Attached Pronouns**: اِنَّہ – اِنّها – اِنَّكَ – اِنِّی/اِنِّنِی – اِنّا/ اِنَّنَا

Revision of الاسماء الخمسة

- أخُو – أخا – أخی / أبُو – أبا – أبی / ذُو – ذا – ذِی / فُو – فَا - فِی

- **اسم منقوص:** غالٍ / غالیٌ / غالیةٌ – مُحامٍ / مُحامیٌ – قاضٍ / قاضیٌ – وادٍ / وادیٌ

Kana and Its Sisters and their Action on Noun: **كان و أخواتها**

- كَان / ليس
- اسم كان / ليس و خبر كان / ليس

Relative Pronoun: which, who **الاسم الموصول**

الَّذی – الّذان/الذين – الذين / الّتی – اللتان/اللتين – اللاتی/اللائی

- Possessive Phrase **مركب أضافى: المضاف والمضاف إليه**
- Descriptive Phrase: **مركب توصيفى**: نعت/منعوت – **الصفة والموصوف**
- The Substitute: **اسم الاشارة – مشارٌ اليه/معرف باللام (البدل)**

التعريف بعض أنواع المشتقات: **اسم الفاعل – اسم المفعول – اسم الظرف – اسم الآلة**

- **Active Participle Noun, Passive Participle Noun, Adverb of Place & Time, Noun of Instrument**

- **Noun of Pre-eminence**/Degrees of the Adjective اسم التفضيل
- The Comparative Degree (تفضيل المقارن) The Superlative Degree (اسم التفضيل)

Declension of a Noun: الاعراب

- Indeclinable Nouns (المبنى)
- Declinable Nouns (المعرب)

The Accusative: المنصوبات

Noun for State (الحال), The Specification (التمييز) Direct Object (المفعول بہ) Absolute Object (المفعول المطلق)

The Verb: الفعل

- **Perfect Tense/Past Tense**: الفعل الماضى Consonants, Conjugation of Trilateral Verbs
- *Hamzated* Verb (الفعل المهموز), Weak Verbs (الافعال المعتلة)/Doubly Weak Verbs (اللفيف), Assimilated Verb (المثال) Hollow Verb (الأجوف), Doubly Letters Verb (المضاعف), Defective Verb (الناقص)
- **Imperfect Tense**: Present & Future Tense (الفعل المضارع)
- **Moods** of the Imperfect Tense (صِيَغ المضارع) (The subjunctive المضارع المنصوبand The Jussive المضارع المجزوم) -
- The Imperative Tense (الفعل الأمر)
- **Transitive & Intransitive** (الفعل المتعدى و الّلازم)
- Verbal Noun (اسم المصدر)

The Particle: الحرف

Prepositions: حروف الجر (9 out of 17 will be taught, which are frequently used)
(بِ – مِنْ – الى – على – فى – ك - عن – لِ - حتّى)

Particles of Conjunction (ادوات التصريف) and **Vocative Particles (حروف النداء)**

Counting/**Numbers**: 1-100 : **العدد والمعدود**

- **Cardinal** Numbers (**واحد – اثنان - ثلاثة**) and **Ordinal** Numbers (**اوّل – ثانٍ/ثانى - ثالث**)

Recitation, Tajweed, Translation and Grammatical Analysis:

Semester-1 (سورة النّاس ، سورة القدر الى سورة التاتحة) & Semester-2 (سورة الفجر الى سورة العلق)

- Memorization with translation of all these surahs is obligatory for BS Students in Hifz Test of IIUI.

89	al-Fajr	The Dawn	سورة الفجر
90	al-Balad	The Land	سورة البلد
91	al-Shams	The Sun	سورة الشّمس
92	al-Layl	The Night	سورة الليل
93	al-Duha	The Forenoon	سُورة الضحى

94	al-Inshirah	The Expanding	الم نشرح
95	al-Tin	The Fig	سُورة التِّين
96	al-`Alaq	The Blood-Clot	سُورة العلق

MATH-II LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS (GS-104)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Linear Algebra and Its Applications by David C. Lay, 4th Edition
Differential equation with modeling applications by D. G. Zill, 9th Ed.

REFERENCE BOOK(S)

Advanced Engineering Mathematics, By Erwin Kreyszig, 8th Edition
Elementary Linear Algebra with Applications, H. Antone, Chris Rorres

COURSE OBJECTIVES

An ability to define linear equation and identify system of linear equations and non-linear equations, describe linear transformation and matrix of linear transformation, classification eigen value and eigen vectors problems

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Student will develop the capability to classify and **apply** basic rules to **solve** various types of linear upto second order ordinary differential equations.	C3	01
2	**Apply** the knowledge of linear algebra to model and solve linear systems that appear in engineering sciences.	C3	01
3	Capability to develop, **solve** and **analyze** mathematical model for a given physical problem of practical engineering interest. .	C3, C4	02

COURSE CONTENTS

Basic Concept
Linear Algebra
System of Linear Equations and Matrices
Introduction to System of Linear Equations
Matrix Form of a System of Linear Equations

Gaussian Elimination Method
Gauss-Jordan Method
Consistent and Inconsistent Systems
Homogeneous System of Equations

Matrix Algebra
Definitions
An Algorithm for finding the Inverse of a matrix
Characterization of Invertible Matrices
LU Factorization

Applications of Linear Systems
Traffic Flow Problems
Electric Circuit Problems
Economic Models

Linear Transformations
Introduction
Matrix Transformations
Domain and Range of Linear Transformations
Geometric Interpretation of Linear Transformations
Matrix of Linear Transformations

Eigenvalues and Eigenvectors
Definition of Eigenvalues and Eigenvectors
Properties of Eigenvalues
Diagonalization
Applications of Eigenvalues

Introduction and classification of Differential Equations of ODE's
Separable Differential Equation (DE)
Homogenous DE
Exact and non-exact DE
Linear DE
Nonlinear DE's
Berneullies's DE's
Higher order DE's
Homogenous DE's
Non homogenous DE's
Cauchy Euler's DE's
Operator Methods to solve non homogenous DE's
Applications of Higher order DE's

ELECTRICAL ENGINEERING (EE-101)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Principles of Electric Circuits by Floyd , 9th Edition

REFERENCE BOOK(S)

Fundamentals of Electric Circuits by Charles Alexander

COURSE OBJECTIVES

To understand the basic circuit concepts, network laws and theorems.
To acquire fundamental knowledge for motors and generators.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** and **illustrate** basic circuit concepts, network laws and theorems used to analyze linear circuits	C2, C3	01
2	**Describe** the basic construction, operation and characteristics of motors and generators	C2	01

COURSE CONTENTS

Introduction, Voltage, Current & Resistance, Ohms Law
Energy & Power
Series & Parallel Circuits
Non Series & Parallel Circuits through Wye Delta Transformations
Branch, Loop & Node Analysis
DC Motors & DC Generators
Introduction to AC Current & Voltage, Sinusoidal Waveform, Agular measurement of a Sine Wave, Sinewave Formula
Introduction to Phasors, Analysis of AC Circuits
AC Generator, AC Synchronous Motor, AC Induction Motor

ELECTRICAL ENGINEERING LAB (EE-101L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Electronic Devices by Floyd 9 th Edition

REFERENCE BOOK(S)

Micro-Electronic Circuits by Sedra / Smith , 5 th Edition

COURSE OBJECTIVES

The objective of this lab is to verify the working principles, and to implement the basic concepts of different electrical devices in practical form including resistors, capacitor, potentiometer, transformer and different meters. How to use basic level concepts of electrical devices in practical life.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Perform** sensing techniques of basic electrical quantities.	P5	01
2	**Operate** electrical components using Kirchhoff's law	P3	02
3	**Present** a complete electrical system by using different electrical concepts.	A2	09

COURSE CONTENTS

Resistance and Capacitance:
Introduction to the Measuring Methods of Resistance and Capacitance
DMM:
Use of DMM
Series DC circuit:
To investigate the characteristics of a series DC circuit
Parallel DC circuit:
To investigate the characteristics of a parallel DC circuit
Kirchhoff's Laws:
To verify experimentally Kirchhoff's voltage and current Law
Slide Potentiometer:
Variation of output voltage with setting of slide Potentiometer
Wheatstone Bridge:
Building of Wheatstone Bridge
Star /Delta conversion:
Star /Delta conversion and calculate power
Earth Resistor:
Measurement of Earth Resistance using Earth Resistor
Clamp Meter:
Use of Clamp Meter
Frequency Meter:
Use of Frequency Meter
Watt Meter:
Use of Watt Meter
Transformer:
To study working of Transformer

THERMODYNAMICS-I (ME-121)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Applied Thermodynamics for Engineering Technologists by T.D Eastopand A Mc Conkey
Thermodynamics, an Engineering Approach, By Yunus A. Cengel, Michael A. Boles McGraw-Hill

Fundamentals of Engineering Thermodynamics, By M.J.Moranand H.O.Shapiro, John Wiley & Sons

REFERENCE BOOK(S)

Fundamentals of Thermodynamics**,** By Sonntang, Borgnakke, VanWylen JohnWiley & Sons

COURSE OBJECTIVES

To gain basic concepts of thermodynamics and its laws, conservation of energy and cycle concepts.
Properties of working fluids.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Apply** the first law of thermodynamics to closed systems, compute the thermodynamic properties of fluids and use of steam stables for phase diagrams.	C3	01
2	**Construct** thermodynamic processes on appropriate diagrams and **apply** the second law of thermodynamics in view of entropy balance**.**	C3, C5	02
3	**Apply** the second law of thermodynamics to refrigeration and heat pump cycles with a view to improve their performance.	C3	02

COURSE CONTENTS

Basic concepts: the system, control volume, working substance, heat and work, state and properties, thermodynamic process and cycle, first law of thermodynamics, ideal gas laws, equations of state, thermodynamic temperature scale concept of open and closed cycles
Properties of pure substances: phase diagram, use of steam tables.
Thermodynamic processes relationship: constant volume, constant pressure, constant temperature constant enthalpy and general law processes, steady state and steady flow process, uniform state and uniform flow processes, steady flow energy equation and steady flow devices.

Second law of thermodynamics: definitions, applications, reversible and irreversible processes, Carnot cycle and concept of entropy and its application to flow and non-flow processes, enthalpy-entropy diagrams of working fluids, thermodynamic cycles, efficiencies, and their applications, Idealized P-V and T-S diagrams of cycles, Rankine cycle and its application.

WORKSHOP PRACTICE LAB (ME-112L)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 96

RECOMMENDED BOOK(S)

Workshop Technology, Latest Edition by W. A. J. Chapman.

REFERENCE BOOK(S)

Mechanical Workshop Practice, By K. C. John, PHI Learning.
Reference and Instruction Sheets Given By Course Instructor during the Course.

COURSE OBJECTIVES

To give introduction of different mechanical workshop practices and experience of basic manufacturing processes. 1. To introduce students to the basic operations of bench fitting tools. 2. To familiarize students with the various types of manual machines and introduce them to different operation of machining. 3. To familiarize students with the various types of Welding and introduce them to different type of welding joints. 4. To familiarize students with the different tools of electric shop and introduce them to parallel and series circuit. 5. To familiarize students with the different tools of woodshop and introduce them to different type of wood joints.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** different machines, equipment and processes related to various mechanical workshops.	C2	01
2	**Pay attention** to the correct and safe usage of machine components, tools and their associated operations.	A1	08
3	**Operate** to show development of parts by utilizing machines from different shops to solve practical engineering problems.	P3	04

COURSE CONTENTS

Workshop Safety:
Demonstration of safety concepts and practices in workshop.
Measurement Section:
Practice of basic measuring tools, like Vernier calipers, micrometer, thread pitch gauge etc.
Bench Fitting Shop:
Introduction to bench fitting tools, use of tools and equipment, bench work.
Machine Shop:
Introduction to machine tools, basic lathe operations including facing, turning, step turning, taper turning grooving, chamfering, parting and external threading.
Welding Shop:

Introduction to welding. Introduction of arc welding tools, equipment and welding practice.
Wood shop:
Introduction of different tools used in wood shop. To make different wood joint like Lap joint, Dado joint, Wood block joint Miter joint.
Basics of Electric Shop:
Use of electrical tools. Types and uses of cables and electrical accessories for house wiring. Practice of simple house wiring and testing methods.

ENGINEERING MECHANICS I LAB (ME- 113 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Vector Mechanics for Engineers by Beer and Johnston
Engineering Mechanics (Statics) by J. L. Meriam

REFERENCE BOOK(S)

Course objectives

To gain basic understanding of various engineering structures in equilibrium.
To develop knowledge regarding physical phenomena in mathematical terms

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Conduct** experiments and find out unknowns such as forces, moments, positions and velocities etc.	P4	04
2	**Analyze** the theoretical values of variables of concern and **compare** them with experimental values	C3	04
3	**Contribute** effectively as an individual member of a team	A2	09

COURSE CONTENTS

To verify the principle of moments, which states that if a number of co-planar forces acting on a body, keep it in equilibrium and their moments are taken about any point in their pale, the sum of the clockwise moments is equal to the sum of the anticlockwise moments.
To determine the reaction of a beam under various loadings.
To verify the laws of friction between solid bodies and to find the coefficient of friction between wool and various other materials.
To find the tension in various parts of a hanging rope loaded at various points with various loadings.
To verify the law connecting the coefficient of friction between a cord and drum and angle of lap.
To resolve, by experiment, by suitable combination of three static, coplanar forces.
To compare the results with the graphical solution obtained by drawing triangle of forces diagram.

To illustrate the "resultant of two of the forces and to compare the magnitude and direction of its equal and opposite "equilibrant" with the experimental values.
If a system is in equilibrium under several co-planar concurrent forces:
the forces on their free vectors must form a closed polygon
To verify the condition of (a) $\sum Fx = 0$ (b) $\sum Fy = 0$
Determine the forces acting in the members of a roof truss.
To determine the forces acting in the tie and the jib of simple jib (wall) crane.
To verify Hook's law for helical springs and to find their stiffness
To find the modulus of rigidity of helical springs using various spring balances.
To find the tension in various parts of a hanging rope loaded at various points with uniform loading conditions.

ENGINEERING MECHANICS I: STATICS (ME-113)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Hibbler, R. C "Engineering Mechanics, Statics And Dynamics" Pearson Prentice Hall, 11th Edition,

REFERENCE BOOK(S)

Engineering Mechanics, 6th Edition by Meriam & L. G. Kraige, John Wiley & Sons

COURSE OBJECTIVES

Statics is a fundamental course in Mechanical Engineering. It purely emphasizes on bodies that are in Static Equilibrium (i.e. either they are at rest or moves with uniform velocity). The course of Statics is of particular significance because of the extensive use of its principle/techniques in the other core courses of mechanical engineering.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** concepts of vectors and scalars, conditions of equilibrium for particles and rigid bodies in two and three dimensions.	C2	01
2	**Analyze** structures such as trusses, beams and frames for reaction forces	C4	02
3	**Explain** the concepts of shear and bending moment of beams and the concepts of dry friction.	C2	01

COURSE CONTENTS

General Principles
Force Vectors

Equilibrium of a Particle
Force System Resultants
Equilibrium of a Rigid Body
Structural Analysis
Internal Forces
Friction
Center of Gravity
Moment of inertia

Semester/Term3

PAKISTAN STUDIES (COMPULSORY) (GR-201)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Burki, Shahid Javed. State &Society in Pakistan, the Macmillan Press Ltd1980.
Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: Oxford University Press, 2000.
S. M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
Mehmood, Safdar. Pakistan Political Roots & Development .Lahore, 1994.
Wilcox, Wayne. The Emergence of Bangladesh. Washington: American Enterprise, Institute of Public Policy Research, 1972.
Mehmood, Safdar. Pakistan Kayyun Toota, Lahore: Idara-e-Saqafat-e-Islamia, Club Road,

REFERENCE BOOK(S)

Amin, Tahir. Ethno -National Movement in Pakistan, Islamabad: Institute of Policy Studies, Islamabad.
Ziring, Lawrence. Enigma of Political Development. Kent England: W m Dawson & Sons Ltd, 1980.
Zahid, Ansar. History &Culture ofSindh. Karachi: Royal Book Company, 1980.
Afzal, M. Rafique. Political Parties in Pakistan, Vol. I, II&III. Islamabad:National Institute of Historical and cultural Research, 1998.
Sayeed Khalid Bin. The Political System of Pakistan. Boston: Houghton Mifflin, 1967.
Aziz, K. K. Party, Politics in Pakistan, Islamabad: National Commission on Historical and Cultural Research, 1976.
Muhammad Waseem, Pakistan under Martial Law, Lahore: Vanguard, 1987.
Haq, Noorul. Making of Pakistan: The Military Perspective. Islamabad: National Commission on Historical and Cultural Research, 1993.

COURSE OBJECTIVES

To develop vision of Historical Perspective, Government, Politics, Contemporary Pakistan, ideological background of Pakistan and

To study the process of governance, national development, issues arising in the Modern age and posing challenges to Pakistan.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** the history of Pakistan (for understanding the peculiarities of Pakistani society).	C2	06
2	**Explain** political and constitutional development in Pakistan.	C3	06
3	**Analyze** and **explains** socio-economic structure of Pakistan.	C2, C4	06

COURSE CONTENTS

Historical Perspective:
Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
Factors leading to Muslim separatism
People and Land
Indus
Civilization
Muslim advent
Location and Geo-Physical features.
Government and Politics in Pakistan:
Political and constitutional phases:
A. 1947-58
B. 1958-71
C. 1971-77
D. 1977-88
E. 1988-99
F. 1999 onward
Contemporary Pakistan:
Economic institutions and issues
Society and social structure
Ethnicity
Foreign policy of Pakistan and challenges e.
Futuristic outlook of Pakistan

THERMODYNAMICS-II (ME-221)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Applied Thermodynamics for Engineering Technologists, by T.D. Eastopand A. McConkey
Thermodynamics, an Engineering Approach, By Yunus A. Cengel, Michael A. Boles McGraw-Hill
Fundamentals of Engineering Thermodynamics, by M. J. Moran and H.O.Shapiro, John

Wiley & Sons

REFERENCE BOOK(S)

Fundamentals of Thermodynamics**,** By Sonntang, Borgnakke, Van Wylen John Wiley & Sons

COURSE OBJECTIVES

To introduce turbo-machinery (Turbines, compressors and engines etc.)
To study the behavior of ideal and real gas mixtures.
Understanding of different thermodynamic systems and to deal with real-world engineering problems in order to improve the performance of such systems

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Analyze** the combustion reactions of different air-fuel mixtures and their enthalpy of formation.	C4	02
2	**Compare** and **Contrast** technical processes in compressors, Boiler, Nozzles and Turbines, as well as important cycles such as those in different engineering components.	C4	04
3	**Explain** and **discuss** internal combustion engines, its parts and its types.	C2	02

COURSE CONTENTS

Mixture with chemical reaction: Combustion reaction equations, stoichiometric chemical reaction, air-fuel ratio, rich and lean mixtures, enthalpy of formation.
Compressors: classification and working principles, single stage and multi stage Compressor compressors, inter-cooling, efficiencies and P-V diagrams of velocity diagrams of centrifugal compressors, Reciprocating performance characteristics and working regimes.
Boilers: generation of steam through boilers, classification and configurations of boilers and their applications, boiler efficiencies and heat balance sheet.
Nozzles: Introduction to nozzles, flow through steam nozzle and its efficiencies, their classification working principles.
Turbines: Steam turbine, their classification & working principles.
Introduction to internal combustion engines: Two and four-stroke engines,SI and CI engines, carburetion and fuel injection system.

THERMODYNAMICS-I LAB (ME-221L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Thermodynamics Lab Manual

REFERENCE BOOK(S)

Thermodynamics by Estop Mckonky.

COURSE OBJECTIVES

To able students to demonstrate the application of the First Law, Second Law, conservation of mass and properties of substances to practical engineering systems.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Operate thermometers, Marcet Boiler, Mini Steam Turbines, and Compressors to determine various thermodynamics properties.	P3	04
2	Setup various experimental apparatus such as the Boyle's Law, dead weight tester etc. accurately.	P2	02
3	Demonstrate the four and two stroke engines, carburetor and radiator of internal combustion engine to Observe different thermodynamics processes.	P4	04

COURSE CONTENTS

To Study the Layout of Thermodynamics Lab
To Study various temperature measuring Apparatus and to find their Accuracy or Calibration of different temperature measuring Apparatus
The Calibration of Pressure Gauge by Using Plunger and Weights
To measure the Relative Humidity of air in the thermodynamics Laboratory by using Dry bulb Hygrometer and Wet bulb Hygrometer
To Find the Relationship between Pressure and Temperature by Using Marcet Boiler or
To Verify the Gay Lussac's Law by using Marcet Boiler
To Study the working and sensitivity of different temperature measuring Instruments
Study of Internal Combustion Engin
Study of Two Stroke Petrol Engin
Study of Four Stroke Petrol Engine
Study of Steam Bench Apparatus

ENGINEERING MECHANICS-II: DYNAMICS (ME-211)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Engineering Mechanics (Vol. 1) 12th Edition by R.C. Hibbler, Prentice Hall,

REFERENCE BOOK(S)

Engineering Mechanics 6thEdition by Merriam &L.G.Kraige John Wiley & Sons

Vector Mechanics for Engineers (Dynamics) 4thEditionby Ferdinand P. Beer & E. Russell Johnston Jr.Mc Graw-Hill Science

COURSE OBJECTIVES

Students will learn about Cartesian coordinate system, Position, Velocity, Acceleration, and Position-Time, Velocity-Time, Acceleration –Time Graphs, Rectilinear, curvilinear motion and projectile motion. Students would be able to solve the problems related to Polar coordinate system and its application on space curvilinear motion. Students would be familiarized with Newton's second law and its application in Cartesian, Normal and tangential and polar coordinates system. Students would learn to apply principles of work energy impulse and momentum for particles and rigid bodies

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** key concepts related to position, velocity and acceleration in Cartesian, Normal and Tangential and Polar Coordinate Systems, kinetics, work and energy for particles and rigid bodies.	C2	01
2	**Analyze** the problems related to kinematics of particles and rigid bodies using different coordinate systems.	C4	02
3	**Analyze** the problems related to Kinetics of rigid bodies using different principles and techniques for their solution.	C4	02

COURSE CONTENTS

Kinematics of a Particle
Kinetics of a Particle: Force and Acceleration
Kinetics of a Particle: Work and Energy
Kinetics of a Particle: Impulse and Momentum
Planar Kinematics of a Rigid Body
Planar Kinetics of a Rigid Body: Force and Acceleration
Planar Kinetics of a Rigid Body: Work and Energy
Planar Kinetics of a Rigid Body: Impulse and Momentum

ENGINEERING MECHANICS II LAB (ME- 211 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Vector Mechanics for Engineers (Dynamics) by Beer and Johnston

REFERENCE BOOK(S)

Engineering Mechanics 6thEdition by Merriam &L.G.Kraige John Wiley & Sons

Vector Mechanics for Engineers (Dynamics) 4thEditionby Ferdinand P. Beer & E. Russell Johnston Jr.Mc Graw-Hill Science

COURSE OBJECTIVES

To gain fundamental concepts of bodies under dynamic conditions
To implement laws of motions to components/structures under the influence of forces

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Execute** experiments and find out unknowns such as forces, moments, positions and velocities etc	P4	04
2	**Solve** theoretical values of variables of concern and compare them with experimental values	C3	04
3	**Contribute** effectively as an individual member of a team	A2	09

COURSE CONTENTS

To determine Mechanical Advantage of Inclined Plane. To compare Actual and Ideal Mechanical Advantage.
To compare actual and ideal mechanical advantage of inclined plane. To derive relationship between angle and mechanical advantage (actual and ideal) at different angles.
To determine the mechanical advantage of screw jack.
To compare efficiencies and M.A of square and v-thread. To draw relationship between n and M.A with the help of graph.
To compare efficiencies and M.A of square and v-thread. To draw relationship between efficiency and Mechanical Advantage with the help of graph.
To determine Moment of Inertia of fly wheel by free falling method.
To verify the relationship between angular and linear velocity

To find tension in jib and tie of derrick crane. To compare experimental and graphical value:

To find the velocity ratio, mechanical advantage and load lost in friction and the efficiency of worm and worm wheel.
To find the velocity ratio, mechanical advantage and the load lost in friction and the efficiencies of a western differential pulley.

MECHANICS OF MATERIALS-I (ME-212)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Mechanics of Materials 5th Edition by Ferdinand P. Beer & Russel Johnston Jr. HT McGraw-Hill.
Strength of Materials: Andrew Pytel, Ferdinand L. Singer

REFERENCE BOOK(S)

Mechanics of Engineering Materials by P.P. Benham &R.J. Crawford Longman Sc & Tech (Jul 1987)
D. L. Logan, Mechanics of Materials, Harper Collins, 1991
Gere and Timoshenko, Mechanics of Materials, PWS/ITP Publishing, 1997

COURSE OBJECTIVES

This course is the foundation to many advanced techniques that allow engineers to design machine components, mechanisms, predict failure and understand the physical properties of materials. Mechanics of Materials gives the student basic tools for stress, strain and deformation analysis. Methods for determining the stresses, strains and deformations produced by applied loads are presented. Engineering design concepts are integrated throughout the course. At the completion of the course, students must be able to: 1.) Analyze and design components and structural members subjected to tension, compression, torsion, bending and combined loads using fundamental concepts of stress, strain, elastic and inelastic behavior. 2.) Conduct themselves in a professional manner and with regard to their responsibilities to society; especially with regard to design of mechanisms and prevention of failure. 3.) Communicate their results and conclusions effectively. 4.) Recognize the nature of a comp.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** and **Explain** key concepts, such as stresses and strains and constitutive relationships.	C2	01
2	**Analyze** statically determinate and indeterminate structures for safety based on strength or deflection considerations.	C4	02

COURSE CONTENTS

Module 1 concept of stress
Module 2 stress and strain – axial loading
Module 3 torsion
Module 4 pure bending
Module 5 analysis and design of beams for bending

FLUID MECHANICS-I (ME-222)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Fundamentals of Fluid Mechanics, Bruce R, Munson.

REFERENCE BOOK(S)

Fluid Mechanics, Frank M. White. McGraw Hill. Lates Edition.
Fluid Mechanics, J. M. Cimbala Y. Cengel. McGraw Hill,

COURSE OBJECTIVES

The course is designed to provide strong foundation for the related subjects to be taught in the latter part of Bachelor program. It attempts to cover

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** clearly the concepts of fluid mechanics based on analytical relations.	C2	01
2	**Solve** problems correctly related to fluid properties, fluid statics and fluid dynamics.	C3	02
3	**Apply** the concepts of control volume to interpret the flow field.	C3	04

COURSE CONTENTS

Fluid properties.
Fluid statics
Kinematics of flow
Fluid kinematics
Equation of continuity, flow energy equation
Dimensional analysis and similitude

COMMUNICATION SKILLS AND REPORT WRITING (EN-201)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Grammar J. Thomson and A. V. Martinet, Practical English Grammar. Exercises Third edition. Oxford University Press 1986. ISBN 019431350
Writing Marie-Chrisitinec Boutin, Suzanne Brinand and Francoise Grellet, Writing. Intermediate. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).

REFERENCE BOOK(S)

Rob Nolasco, Writing. Upper-Intermediate. Oxford Supplementary Skills. Fourth Impression 1992ISBN0194354065 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).

COURSE OBJECTIVES

Developing technical documents, writing reports of various types, and contributing to the existing stock of knowledge through writing research articles are the tasks which can be the writing-related assignments of any engineering professional. This course of English-III is designed to ensure that the students are able to learn all the intricacies of the aforementioned technical as well as academic writing, to be used in their professional life. It aims at making the students learn all the basics of writing technical reports and research articles. At the end of the course, the students will be able to • Know the importance, purpose and characteristics of technical writing • Have knowledge of the basics of academic writing • Learn in-text citation methods, footnotes, endnotes and bibliography • Differentiate between technical writing and academic writing • Write proposal for a research article • Know the style, content, language, form, clarity and consistency in technical

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** academic writing and classify between in-text citation methods, footnotes, endnotes, references and bibliography.	C2	10
2	**Describe** the style, content, language, form, clarity and consistency in technical and academic writing by analyzing user manuals, research proposals, technical papers, and project reports	C3	10
3	**Be aware** of the common mistakes in PowerPoint presentations, learn presentation rules, and develop sound presentation skills.	A1	10

COURSE CONTENTS

Knowledge Area / Sub Area: Humanities/English–II
Specific Objective:
To enable the students to meet their real life communication needs
Paragraph writing: Practice in writing a good, unified and coherent paragraph
Essay writing**:** Introduction
CV and job application
Translation skills**:** Urdu to English
Study skills**:** Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension
Academic skills**:** Letter/memo writing and minutes of the meeting, use of library and internet recourse.
Presentation skills**:** Personality development (emphasis on content, style and pronunciation)

Semester/Term4

ENGINEERING MATERIALS (ME- 213)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Material Science and Engineering: An Introduction by William D. Callister, Jr Second Edition, John Wiley & Sons, Inc.

REFERENCE BOOK(S)

Materials and Processes in Manufacturing, By E. P Degarmo Prentice Hall
Process and Materials of Manufacturing by Lindberg.
Ceramic Science for Materials Technologist by T. J McCalm

COURSE OBJECTIVES

To understand the appropriate use and selection of various engineering materials in designing and manufacturing of components and associated processes. To acquire knowledge related to the microstructure of engineering materials

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** structures, properties and applications of metals, ceramics, polymer and composite materials	C1	01
2	**Explain** the effect of heat treatment in materials	C2	02
3	**Describe** the production methods for steels, polymers and alloys	C2	02

COURSE CONTENTS

Metals: Structure of Metals: Crystalline structure of metals, allotropy. Crystallographic planes, mechanisms in metals, slip and slip systems, dislocation, twinning, yield phenomenon and strain aging, Bauchinger effect.
Metals and Alloy Systems: Production of iron, wrought iron, cast iron. Production of steel and its classification ferrite, austenite, S-iron, cementite, pearlite, martensite, bainite, etc. Iron-carbon phase diagram, alloying elements and their effect on the properties of alloy steel. Refining of copper, aluminum and zinc. Aluminum alloys, zinc alloys, copper alloys, brass and bronzes. Metals and alloys for special application. Corrosion of metals anti-corrosive coatings and paints.
Material Forms and Designation: Heat treatment critical temp, transformation on heating/cooling, annealing, normalizing, tempering, quenching, austempering, hardening,

rolling processes and production of various steel sections such a billet, bar, rod, channel, Roll load calculation, British standards and ASTM standard specification on iron/steel.
Non Metals Composition, properties and uses of plastics, rubber, ceramics, fiberglass, composite materials and polymers.
Polymers: Molecular structure, bonding & classification of polymer compounding, forming operations etc., plastics.
Ceramics and refractories: Ceramic bonding, properties, ceramics material, crystalline and amorphous, silica, glass etc., refractory materials and their types, Introduction to Composite Materials, Material failure analysis.

ELECTRONICS ENGINEERING (EE-201)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Electronic Devices by Floyd , 9th Edition

REFERENCE BOOK(S)

Micro-Electronic Circuits by Sedra / Smith , 5th Edition

COURSE OBJECTIVES

To acquire fundamental knowledge for semiconductor devices.
To acquire fundamental knowledge for Digital Electronics.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** and **explain** the basic construction, operation and characteristics of semiconductor devices like diodes and transistors	C2	01
2	**Describe** and **explain** the basics of combinational and sequential circuits in digital electronics	C2	01

COURSE CONTENTS

Conduction in Solids:
Introduction, Mechanics of conduction, Mobility, Bohr's model for the elements, Energy level diagrams for solids, Conductors, Intrinsic and extrinsic semiconductors, Electron-hole pairs in an intrinsic semiconductor, Distribution of electron and hole in conduction and valence bands, Recombination and lifetime.

Semiconductors and Diodes:
Donor and acceptor impurities, Zero biased, Forward biased and reverse biased junction diodes, Junction diode current equation, Depletion barrier width and junction capacitance,

Diffusion capacitance, Zero and Avalanche break down, Hall effect, Fabrication of pn junction, Diodes.

Simple Diode Circuits and Applications:
The half wave rectifier, The inductance filter, The inductance capacitance filter circuits, Zener and gas diode, Voltage regulator circuits, Clamping and DC restorer circuits, Voltage doubler circuits, Clipping and limiting circuits.

Bipolar and Field Effect Transistors & Amplifier Circuits
Introduction to BJTs and Amplifier Circuits

Introduction to Digital Electronics:
Number Systems, Boolean Algebra, Logical Gates

Combinational Logic (Half Adder, Full Adder)

Sequential Logic (Introduction, Latches, Flip Flops)

BASIC ELECTRONICS LAB (EE-201 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Electronic Devices by Floyd, 9 th Edition

REFERENCE BOOK(S)

Micro-Electronic Circuits by Sedra / Smith, 5 Th edition

COURSE OBJECTIVES

The objective of this lab is to verify the working principles, and to implement the basic concepts of different electronics components in practical form including transistors, diodes, Gates and rectifiers. How to use basic level concepts of electronic devices in practical life.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Execute** sensing techniques of basic electronic components.	P4	01
2	**Operate** electronic components using transistor.	P3	02
3	**Present** a complete electronic system by using different electronic concepts.	A2	09

COURSE CONTENTS

Operation of all gates:
To check the operation of AND, OR, NAND, XOR, NOR, NOT Gates according to Truth Tables.

Combinations of different gates:
Implement NOR gate as an AND gate by gate diagram given and make its truth table.
Diode's types and their working principle:
To become familiar with the characteristics of a Silicon & Germanium diode.
Behavior of diodes in series and parallel connection:
To develop the ability to analyze networks with diodes in a series configuration.
To develop the ability to analyze networks with diodes in a parallel configuration.
AC to DC conversion by using rectifiers:
To analyze the half-wave rectifier.
To analyze the Full-wave rectifier.
Concepts of transistor and its implementation in circuit:
To test the transistors, find there EBC pins and to find either NPN Or PNP, by using DMM & construct transistor biasing circuit & plot its IC vs VCE curve.
To use transistor as switch.
Basic circuit designing using Proteous software:
Draw all the circuits of course by using Proteous software.

STATISTICS & PROBABILITY FOR ENGINEERS (GS-201)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Miller & Freund's Probability and Statistics for Engineers by R.A. Johnson, 7th Edition

REFERENCE BOOK(S)

Probability and Statistics (Jay L Devore) 7th Edition
Probability & Statistics for Engineering & Sciences (William W. Hines, Douglas C. Montgomery)
Introductory Statistics (Neil A Weiss) 4th Edition
Introduction to Probability and Statistics (J S Milton, J. C. Atnold)
Probabilities, Random Variables, & Random Processes Michel O'Flynn.

COURSE OBJECTIVES

The course will provide knowledge and skills for the students to apply statistical techniques to complex engineering problems 2. This course will provide knowledge regarding Probability Theory, Random Variables, Distributions and Estimation, emphasizing the link between Statistics and Engineering. 3. Students are expected to develop a statistical way of thinking and ability for the successful usage of the statistical concept, theory and notations.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** the use of descriptive techniques to describe the statistical data	C2	01

2	**Use** the concepts and methods of probability theory for solving problems in engineering sciences	C3	01
3	**Analyze** the population parameters on the basis of sample study using the techniques of inferential statistics.	C4	02

COURSE CONTENTS

Statistics: Introduction, Types of data & variables, presentation of data, object, classifications, Tabulation, Frequency Distribution, Graphical Representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types.

Measures of Central Tendency and Dispersion:

Statistics Averages, Median, Mode, Quartiles, Range, Moments, Skewness &Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance& its coefficient, Practical Significance in related problems. Curve Fitting: Introduction, fitting of a first and second degree curve, fitting of exponential and logarithmic curves, related problems, Principle of least squares, Second order Statistics &Time series.

Simple Regression & Correlation:

Introduction, Scatter diagrams, Correlation &its Coefficient, Regression lines, Rank Correlation & its Coefficient, Probable Error (P.E), related problems.

Sampling and Sampling Distributions:

Introduction, Population, Parameter & Statistics, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling &Non-

Sampling Errors, Random Sampling, Sampling with &without replacement, Sequential Sampling, Central limit the error with practical significance in related problems.

Statistical Inference and Testing of Hypothesis:

Introduction, Estimation, Types of Estimates, Confidence interval, Tests of Hypothesis, Chi-Square distribution/test, one tails & two tails tests. Application in related problems.

Probability:

Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability, Conditional probability, Baye's rule. Related problems impractical significance.

Random Variables:

Introduction, Discrete &Continuous random variables, Random Sequences and transformations, Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (M.G.F.), Markove random walks chain/Related problems.

Probability Distributions:

Introduction, Discrete probability distributions, Binomial, Poisson, Hypergeometric &

Negative binomial distributions. Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

MECHANICS OF MATERIALS-II (ME-215)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Mechanics Of Materials 5th Edition By Ferdinand P. Beer & Russel Johnston Jr. H T Mc Graw-Hill.

Strength of Materials: Andrew Pytel, Ferdinand L. Singer

REFERENCE BOOK(S)

Mechanics of Engineering Materials by P.P. Benham &R.J. Crawford Longman Sc& Tech (Jul 1987)
D. L. Logan, Mechanics of Materials, Harper Collins, 1991
Gere and Timoshenko, Mechanics of Materials, PWS/ITP Publishing, 1997

COURSE OBJECTIVES

Analysis of stress and strain in two and three dimensions, principal stresses and strains, Mohr‟s circle for stress and strain, thick walled cylinders, symmetrical and asymmetrical loading, introduction to fracture mechanics, impact loading, fatigue and creep, virtual work, theories of failure. Theory of columns.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Analyze** beam for safety in terms of both strength and deflection limits.	C4	02
2	**Evaluate** and **Compare** different design options for practical engineering structures and select suitable materials and/or configurations for such structures.	C4,C6	03
3	**Design** a real life structure or component, putting skills gained in the course to actual use.	C5	03

COURSE CONTENTS

Deflection of beams
Transformations of stresses
Principal stresses under a given loading
Columns
Impact loading and thick wall cylinder
Introduction to fatigue fracture creep

MECHANICS OF MATERIALS-II LAB (ME-215L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Mechanics of Materials Laboratory Manual

COURSE OBJECTIVES

To improve students' cognitive and psychomotor skills. To understand the basic principles of Mechanics of Materials and Laws of Mechanics. Mechanics of Materials Laboratory gives the student basic tools for stress, strain and deformation analysis, methods for determining the stresses, strains and deformations produced by applied loads.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Demonstrate** basic engineering knowledge related to mechanics of material.	P4	01
2	**Perform** fatigue experiments to study relevant graphs (such as SN curve, load displacements curve etc.) with confidence and proficiency.	P5	01
3	**Conduct** experiments to find hardness number, impact strength and normal strength deflection.	P4	01

COURSE CONTENTS

Find Brinell hardness Experiment on a Specimen
Find Rockwell Hardness Experiment on a Specimen
Find Impact test strength of high carbon steel specimen
Find Impact test of Plastic specimen
Find compression test on a spring specimen on hydraulic universal testing machine
Find deflection of simply supported Brass beam
Find deflection of overhang Brass beam
Sketch and Perform fatigue test on a mild steel specimen
Sketch and Perform fatigue test on a brass specimen
Analysis of creep test on a nylon specimen
Analysis of creep test on a lead specimen
Analysis of thin walled cylinder experiment
Analysis of Universal Truss 1
Analysis of Universal Truss 2
Analysis of Universal Truss 3

FLUID MECHANICS-II (ME-223)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Fundamentals of Fluid Mechanics, Bruce R, Munson,

REFERENCE BOOK(S)

Hydraulics, Fluid mechanics and Hydraulic machines by Khurmi

Fluid Mechanics, Frank M. White. McGraw Hill. Lates Edition.

Fluid Mechanics, J. M. Cimbala Y. Cengel. McGraw Hill,

COURSE OBJECTIVES

At the end of this course students will be able
To understand the working and performance of Turbo-machinery (Pumps, Turbines, etc.) and hydraulic systems of earth moving machinery.
To determine the parameters that act in hydrostatic devices and on immersed surfaces.
To understand and use boundary layer and differential equations to different flows.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** the external flow devices/turbo machinery by using the analytical relation	C2	01
2	**Analyze** the compressible flows by solving problems related to transonic flows through varying area ducts.	C4	02
3	**Apply** boundary layer and differential equations to determine parameters in internal and external flows.	C3	01

COURSE CONTENTS

Flow in pipes and ducts (incompressible internal flow)
Boundary layer theories
Drag and lift (incompressible external flow)
Open channel flow
Compressible flow
Fluid machinery

FLUID MECHANICS-II LAB (ME-223L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Fluid Mechanics Lab Manual

COURSE OBJECTIVES

To demonstrate and develop understanding among the students about working principles of Fluid Mechanics with hands-on experience and to improve the psycomotor skills

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Conduct** experiments to measure and sketch relevant graphs of key variables of interest (such as flow measurement, discharge coefficient, coefficient of velocity and coefficient of contraction, coefficient of drag & lift, boundary layer etc.).	P4	04
2	**Respond** for answering the questions related to experiments.	A2	09

COURSE CONTENTS

Flow measurement by Rota-meter.
Flow measurement in venture-meter
Flow measurement in orifice meter
Stability of floating body.
Demonstration of laminar and turbulent flow
Co-efficient of (discharge cd, velocity cv and contraction cc) of different mouth pieces
Impact of jet
Variable speed centrifugal pump
Reciprocating pump
Pelton wheel
Francis turbine
Kaplan turbine
Co-efficient of drag and of lift produced by aero-foil & different samples bodies.
Boundary layer on a smooth, roughened and highly roughened plate.

ISLAMIC STUDIES/ETHICS (GR-202)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Hameed ullah Muhammad, "Emergence of Islam", IRI, Islamabad

Hameed ullah Muhammad, "Muslim Conduct of State" Hameed ullah Muhammad, 'Introduction to Islam

Mulana Muhammad Yousaf Islahi,"

Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.

REFERENCE BOOK(S)

Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research

Institute, International Islamic University, Islamabad (1993)

Mir Waliullah, "Muslim Jurisprudence and the Quranic Law of Crimes"

Islamic Book Service (1982)

H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)

Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

COURSE OBJECTIVES

To provide Basic information about Islamic Studies
To enhance understanding of the students regarding Islamic Civilization
To improve Students skill to perform prayers and other worships
To enhance the skill of the students for understanding of issues related to faith and religious life**.**

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** the basic concept of Islam (faith, pillars and moral value systems etc.)	C2	08
2	**Discuss** differences between religion, shahri'ah and fiqh.	C2	08
3	**Present** Islam as complete code of life (emphasizing ethical standards defined by it	A2	08

COURSE CONTENTS

Introduction to quranic studies
Basic Concepts of Quran
History of Quran
Uloom-ul–Quran
Study of selected text of holy Quran
Verses of Surah Al-Baqra Related to Faith (VerseNo.284-286)2)
Verses of Surah Al- Hujrat Related to Adab Al Nabi(VerseNo-1-18)
Verses of Surah Al-Mumanoon Related to Characteristics of faithful (VerseNo-1-11)
Verses of urahal-Furqan Related to Social Ethics(VerseNo.63-77)5)
Verses of Surah Al-Inam Related to Ihkam(VerseNo.152-154)

Verses of Surah Al-Ihzab Related to Adabal-Nabi(VerseNo.6,21,40,56,57,
Verses of Surah Al-Hashar (VerseNo.18,19,20)Related to thinking, Day of Judgment
Verses of Surah Al-Saf Related to Tafakar, Tadabar(VerseNo.1,14)
Seerat of holy prophet(S.A.W)
Life of Muhammad Bin Abdullah (Before Prophet Hood) Life of Holy Prophet (S.A.W) in Makkah
Important Lessons derived from the life of Holy Prophet in Makkah
Seerat of holy prophet (S.A.W) II
Life of Holy Prophet (S.A.W) in Madina
Important Events of Life Holy Prophet in Madina
Important Lessons derived from the life of Holy Prophet in Madina
Introduction to sunnah
Basic Concepts of Hadith History of Hadith
Kinds of Hadith
Uloom–ul-Hadith
Sunnah & Hadith
Legal Position of Sunnah
Selected study from text of hadith
Introduction to Islamic law and jurisprudence
Basic Concepts of Islamic Law & Jurisprudence
History & Importance of Islamic Law & Jurisprudence
Sources of Islamic Law & Jurisprudence
Nature of Differences in Islamic Law
Islam and Sectarianism
Islamic culture & civilization
Basic Concepts of Islamic Culture & Civilization
Historical Development of Islamic Culture & Civilization
Characteristics of Islamic Culture & Civilization
Islamic Culture & Civilization and Contemporary Issues
Islam & science
Basic Concepts of Islam & Science
Contributions of Muslims in the Development of Science
Quran & Science
Islamic economic system
Basic Concepts of Islamic Economic System
Means of Distribution of wealth in Islamic Economics
Islamic Concept of Riba
Islamic Ways of Trade & Commerce
Political system of Islam
Basic Concepts of Islamic Political System
Islamic Concept of Sovereignty
Basic Institutions of Govt. in Islam
Islamic history
Period of Khlaft-e-Rashida
Period of Ummayyads
Period of Abbasids
Social system of islam
Basic Concepts of Social System of Islam
Elements of Family
Ethical Values of Islam

Semester/Term 5

MACHINE DESIGN AND CAD-I (ME-311)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Mechanical Engineering Design, *By J.E. Shigley*, McGraw Hill.

REFERENCE BOOK(S)

Machine Design, an Integrated Approach, By R L Norton, McGraw Hill.
Design of Machine Elements, By M.F. Spotts, Prentice Hall

COURSE OBJECTIVES

To design common machine elements and to gain experience in solving design problems. To prepare professional quality solutions and effectively communicate the results of analysis and design.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	To know the different criteria of design to **solve** the problems of machine elements like keys, couplings, brakes, clutches, fly wheels and screws.	C3	01
2	**Analyze** the behavior of machine element like keys, couplings, brakes, clutches, fly wheels and screws.	C4	02
3	Ability to **evaluate** a design problems related to fasteners	C6	04

COURSE CONTENTS

Basic criteria of design of machine parts, determination of permissible and actual stress, factor of safety.
Design of keys, cotters, and couplings.
Design of brakes, clutches and flywheel.
Design of welded, riveted and bolted joints.
Design of translation screws.
Design codes and standards, tolerances, standards of fits & tolerances.
Fundamentals of CAD

MACHINE DESIGN AND CAD-I LAB (ME-311L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Related CAD software users guide

COURSE OBJECTIVES

Understanding of fundamentals of CAD. 2D and 3D modeling of machine component using Modelling software.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Practice** their ability to design a system, component, or process to meet desired needs.	P3	05
2	**Demonstrate** their ability to use existing new computer-based software's for Designing of mechanical components	P4	05

COURSE CONTENTS

Two & Three Dimensional modeling of machine components using CAD software.

MECHANICS OF MACHINES (ME- 312)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Theory of Machines, by R.S. Khurmi, J: K. Gupta, Eurasia Publishing House, 2005

REFERENCE BOOK(S)

Theory of Machines and Mechanisms, By J. E. Shigley & Uicker, McGraw-Hill
Mechanism Design, *By Erdman and Sanders*, McGraw-Hill.
Principles of Mechanisms, *By F. Dyson*, Oxford University Press.
Theory of Machines, *By W.G. Green* Blackie & Son.
Design of Machinery, 2nd Ed, Norton

COURSE OBJECTIVES

To understand the mechanics and mechanisms involved in various machine elements
To learn the application of various machine components.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** the fundamental knowledge of the functional principles of machines and mechanisms	C1	01
2	Ability to **explain** mechanisms being used in various machines like Quick return mechanisms, Straight line mechanisms, Cam/Follower, gear trains etc	C2	02
3	Ability to **solve** simple problems regarding belts & ropes, brakes, governors, gear trains, flywheels etc	C3	03

COURSE CONTENTS

Simple mechanism, screw threads and efficiency, friction of pivot, collar and conical bearing, cone, plate and centrifugal clutch, belts and rope drives, chains and sp rockets, controlling bands and shoe brakes, governors, effort and power, sensitivity, force and stability, gyroscope, geometry of gears, gear trains, dynamometers. Linkages: synthesis and analysis, position, velocity and acceleration analysis, turning moment diagram, flywheels, cam and follower, steering gears, balancing.

MECHANICS OF MACHINES LAB (ME- 312 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Theory of Machines, by R.S. Khurmi, J:K. Gupta, Eurasia Publishing House, 2005

REFERENCE BOOK(S)

Theory of Machines and Mechanisms, *By J. E. Shigley*&*Uicker*, McGraw-Hill
Mechanism Design, *By Erdman and Sanders*, McGraw-Hill.
Principles of Mechanisms, *By F. Dyson*, Oxford University Press.
Theory of Machines, *By W.G. Green* Blackie & Son.
Design of Machinery, 2nd Ed, Norton

COURSE OBJECTIVES

To understand the mechanics and mechanisms involved in various machine elements
To learn the application of various machine components.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Analyze** problems related to the mechanics of machines and data from the experiments in relation to the theoretical aspects	C4	02
2	**Conduct** experiments in groups according to the standard operating procedure	P4	04

COURSE CONTENTS

Demonstration of the following
Spur Gear, Helical Gear
Demonstration of the following
Bevel Gear, Helical Bevel Gear
To study the characteristics of four bar mechanism.
Apply Grash of conditions on a slider crank mechanism
To study the variation in velocity and acceleration of the slider when the crank is rotated with a constant angular velocity in a slotted link slider-crank mechanism.
To study the variation and acceleration of the Whitworth's quick return Mechanism.
To verify the Gyrosopic effect
To study the motion of Governer

Static and Dynamic Balancing apparatus
Find out the velocity, Mechanical Advantage and efficiency of worm and worm wheel
Internal Gear Apparatus
Epicyclical Gear Train Model
Whirling of Shaft Apparatus
Study the effects of Journal Bearing.

MANUFACTURING PROCESSES (ME-313)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Fundamentals of Modern Manufacturing, By M. P. Groover John Wiley & Sons
Manufacturing Engineering and Technology ByKalpakjian Prentice Hall
Process and Materials of manufacture By F. A Lindberg.
Introduction to Manufacturing Process by John Aschey.

REFERENCE BOOK(S)

Materials and Processes in Manufacturing by E. P Degarmo Prentice Hall
Manufacturing Process by B. H Amstead, P. F Ostwald

COURSE OBJECTIVES

State basic properties of materials and apply these properties to manufacturing process and product design. Compare and contrast the design and production advantages of traditional mechanical manufacturing processes (casting, forming, machining, and joining). Evaluate material-process-geometry relationships in manufacturing processes. Differentiate advanced mechanical manufacturing processes e.g. micro-scale and Nano-scale technologies

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Define and **describe** the fundamentals and principals of advanced manufacturing processes.	C2	01
2	**Explain** manufacturing processes via experimental and theoretical analyses	C2	02
3	**Differentiate** products simply in terms of their basic shape.	C4	04

COURSE CONTENTS

Forming & shaping processes and equipment, material removal, cutting tools, machining processes for producing various shapes, extrusion and drawing, sheet metal forming, forming & shaping plastics & composite materials, joining process & equipment, solid state welding process, metal casting process & equipment: powder metallurgy, surface treatment, non-conventional machining process, jigs & fixtures

MANUFACTURING PROCESSES LAB (ME-313L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Workshop Technology, Latest Edition by W. A. J. Chapman.

REFERENCE BOOK(S)

Mechanical Workshop Practice, By K. C. John, PHI Learning.
Reference and Instruction Sheets Given by Course Instructor during the course.

COURSE OBJECTIVES

To get familiar with basic operations of spot welding, oxyacetylene welding, foundry, power press, bending machine, roller machine and rivet gun.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** foundry, Spot, oxy-acetylene welding operations, basic operations of power press, bending machine, roller machine and rivet gun.	C2	01
2	**Copy** basic foundry, Spot, oxy-acetylene welding operations, basic operations of power press, bending machine, roller machine and rivet gun.	P3	04

COURSE CONTENTS

To make wood pattern for sand mold casting
To prepare sand mold
To perform Aluminium casting
To perform Drilling, boring operations using lathe machine
To perform threading operation using lathe machine
To perform Contour and form turning using lathe machine
To perform sheet rolling operation using rolling machine
To perform spot welding on bended part
Cutting of sheet metal using oxy-acetylene
Welding of sheet metal by oxy-acetylene
To perform V-bending of sheet metal using bending machine
To make a cone of thin sheet metal by riveting operation
To perform blanking operation on thin sheet metal using power press machine
To perform punching operation on thin sheet metal using power press machine

INTRODUCTION TO MECHATRONICS (ME-314)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Mechatronics by W. Bolton.

REFERENCE BOOK(S)

Mechatronics An integrated approach By Clarence W. Desilva

COURSE OBJECTIVES

To acquire fundamental knowledge for electro mechanical design.

To develop synergistic integration of mechanical, electrical, electronic engineering applications

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** the primary elements involved in mechatronics systems, working principles and application of sensors and actuators.	C2	01
2	**Explain** working principles and application of microcontrollers and PLCs	C2	01

COURSE CONTENTS

Introduction
Sensors and transducers, transducer characteristics, sensors for measuring displacement, strain, force, pressure, temperature and motion, encoders.

Computer architecture
Microprocessor, micro-programming, Bus systems, assembly language programming

Motors with drivers
Stepper and servo motors, introduction to programmable logic controller (PLC).

Interfacing
Ports, input/output, analog to digital converter, sampling theory, digital to analog converter, sample and hold, multiplexer, interfacing switches, LEDs, stepper motors and DC motors to micro-controllers.

INTRODUCTION TO MECHATRONICS LAB (ME-314 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Mechatronics: Electronic control systems in mechanical and electrical engineering (5th Edition) [*W.* Bolton]

REFERENCE BOOK(S)

Mechatronics: An Introduction [Robert H. Bishop]

COURSE OBJECTIVES

The objective of this course is to verify the working of different types of electronic devices including PLC, Arduino, Gates combinations, Strain gauges, Flexible Manufacturing System, Transistors and Rotational speed and position measure devices. How to use electronic and mechanical devices at same place to control mechanical system automatically.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Perform** sensing techniques of basic mechanical quantities.	P5	01
2	**Operate** mechanical devices using Adriano and PLC Microcontroller.	P3	02
3	**Present** a complete automated system by using different sensors and Microcontroller /PLC.	A2	09

COURSE CONTENTS

Half adder circuit:
To Design Half Adder Circuit Using XOR AND GATE according to truth table.
Design Half Subtractor:
To Design Half Subtractor Circuit Using XOR , AND &NOT GATE according to truth table.
Design Full Adder circuit:
To Design Full Adder circuit using OR,AND& OR gate according to truth table.
Design Full subtractor:
TO Design Full subtractor circuit using XOR,AND,NOT& OR Gate according to truth table.
Flexible Manufacturing System:
Demonstration of Flexible Manufacturing System.
Slotted opto Transducer:
Characteristics of slotted opto Transducer.
Reflective opto Transducer:
Characteristics of Reflective opto Transducer.
Control of DC Motor through Transistor:
To check the operation of DC Motor Control through Trainer using Transistor.

Strain Gauge & Calibration of strain:
Characteristics of Strain Gauge & Calibration of strain using different weights.
PLC:
Demonstration of PLC.
Demonstration of Arduino:
Control of LED by using Arduino.
Control of stepper motor by using Arduino.

APPLIED MATHEMATICS – III VECTOR CALCULUS AND PDES (GS-301)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Advanced Engineering Mathematics, Erwin Kreyszig, 8th Edition

REFERENCE BOOK(S)

Calculus and Analytical Geometry By Thomas Finney John 11th Ed.

COURSE OBJECTIVES

The successful completion of this course would help students in achieving the following objectives: • Model the problems arising in different areas of science and engineering in the form of differential equations • Solve the linear 1st order differential equations that appear in circuit analysis, electronics, motion, electric machines etc. • Solve second order differential equations using different techniques • Apply 2nd order differential equations to the variety of theoretical problems • Understand the meaning, use and applications of the partial differential equations

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Use** the knowledge of calculus to solve the 1st order ordinary differential equations.	C3	02
2	**Use** various techniques to solve higher order ordinary differential.	C3	02
3	**Apply** the knowledge of differential equations to solve the problems arising in different areas of science and engineering.	C3	02

COURSE CONTENTS

Definition and properties of vectors in 1-D, 2-D and 3-D.
Limits of vector valued functions.
Differentiation of vector valued functions.
Integration of vector valued functions.
Gradient, Divergent and curl of vectors and vector fields

Greens theorem.
Line integral.
Stokes Theorem
Guass Divergent Theorem
Laplician operation and 3D Geometry.
Introduction and classification of DDE's
Initial and Types of boundary condition
Solution of single dimensional heat Equation by separation of variable method
Solution of ID wave equation by separation of variable method
Solution of 2D laplace Equation by separation of variable method

Semester/Term 6

MACHINE DESIGN AND CAD-II (ME-315)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Mechanical Engineering Design, *By J.E. Shigley,* McGraw Hill.

REFERENCE BOOK(S)

Machine Design, An Integrated Approach, By R L Norton, McGraw Hill.
Design of Machine Elements, By M.F. Spotts, Prentice Hall

COURSE OBJECTIVES

To design common machine elements and to gain experience in solving design problems. To prepare professional quality solutions and to effectively communicate the results of analysis and design.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	To know the different criteria of design to **solve** the problems of machine elements like gears, bearings, shafts, belts and chains	C3	01
2	**Analyze** the behavior of machine element like gears, bearings, shafts, belts and chains	C4	02
3	Ability to **evaluate** a design problems related to transmission.	C6	04

COURSE CONTENTS

Kinematics, force analysis and design of spur, helical, bevel & worm gears.
Design of rolling contact bearings, hydrodynamic theory of lubrication, journal bearings.

Design of mechanical springs, design of belts, ropes and chains, design of shafts.
Introduction to experimental stress analysis.
Introduction to Finite Element Analysis.

MACHINE DESIGN AND CAD-II LAB (ME-315L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Related CAD software users guide

COURSE OBJECTIVES

Understanding of fundamentals of assembly modeling, drawing generation and FEM analysis of machine component using Modelling software.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Demonstrate** their ability to use existing CAD software for modeling mechanical systems	C3	05
2	**Show** grasp over existing CAD software for designing mechanical components	P5	05
3	**Contribute** to experiment by working individually and in a group	A5	09

COURSE CONTENTS

Assembly modelling and generation of engineering drawings using related CAD software. Use of Finite Element Analysis software to solve related engineering problems.

ENGINEERING MANAGEMENT AND ECONOMICS (ME-323)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Foundations Of Engineering Economy, Leland Blank, Anthony Tarquin, McGraw Hill.Engineering Management: Meeting the Global Challenges, Second Edition 2nd Editionby C. M. Chang Startup Engineering Management, 2nd Edition – 2014 by Piaw Na , Harper Reed.

COURSE OBJECTIVES

Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio. Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions. Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems Compute the depreciation of an asset using standard depreciation techniques to

assess its impact on present or future value. Develop and demonstrate teamwork, project management, and professional management skills.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.	C1	01
2	**Identify** the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.	C1	02
3	**Compare** the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.	C4	04

COURSE CONTENTS

Introduction to engineering economy and management, the economics envirnmenmt, cost concepts and analysis, fixed cost, sink cost, opportunity cost, present, future value of money, break even analysis, time value of money, depreciation. Depletion, comparing alternatives, capital financing and budgeting, industrial relations and management techniques.

CONTROL ENGINEERING & INSTRUMENTATION THEORY (ME-316)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Automatic Control Systems, By B. C. Kuo, F. Golnaraghi, John Wiley & Sons.
Modern Control System, By Richard C. Dorf, Prentice Hall.
Automatic Control, By J. J. Distofano et al.
Automatic Control, By Francis H. Raven.

COURSE OBJECTIVES

To gain basic understanding and implementation of various control systems
To learn mathematical modeling of various systems

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Make** mathematical models of different physical systems	P4	03
2	**Analyze** complex engineering systems to examine different characteristics/properties of the systems	C4	02

3	**Develop** a controller to achieve desired system response.	C5	03

COURSE CONTENTS

Basic concepts:
System, control system, input, output, open-loop and closed loop control systems, elements of a general control system, examples of control system.
Mathematical modeling of physical system:
Operational notation, grounded chair representation, series parallel, laws, equations of motion for spring mass damper systems, levered system, rotational system, geared system, electrical components and R. L. C circuits, electrical analogies for mechanical systems, scale factors, thermal systems and fluid system.
Transfer functions and systems response:
Review of Laplace transform, impulse, step and ramp functions, concept of transfer functions of common components, block diagram algebra, signal flow graphs, impulse, step, and ramp response of first and second order systems, characterization of response (time constant, gain, overshoot, rise time, settling time, steady state error, etc.) Relation of system response to location of system poles and zeros.
Stability of control system:
Concept of stability, Routh Hurwitz criterion, root locus methods and its use in control System design, digital control.

CONTROL ENGINEERING & INSTRUMENTATION LAB (ME-316)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Lab Manual

COURSE OBJECTIVES

To gain basic understanding and implementation of various control systems
To learn mathematical modeling of various systems

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Practice** MATLAB/Simulink to study PID controller and to find stability, steady state error and root locus of control systems	P2	05
2	**Demonstrate** knowledge of different parameters (such as transfer function, stability, steady state error) of control systems and basic parameters of controllers	C2	04
3	**Contribute** to experiment by working individually and in a group	A2	09

COURSE CONTENTS

Basic concepts:

System, control system, input, output, open-loop and closed loop control systems, elements of a general control system, examples of control system.
Mathematical modeling of physical system:
Operational notation, grounded chair representation, series parallel, laws, equations of motion for spring mass damper systems, levered system, rotational system, geared system, electrical components and R. L. C circuits, electrical analogies for mechanical systems, scale factors, thermal systems and fluid system.
Transfer functions and systems response:
Review of Laplace transform, impulse, step and ramp functions, concept of transfer functions of common components, block diagram algebra, signal flow graphs, impulse, step, and ramp response of first and second order systems, characterization of response (time constant, gain, overshoot, rise time, settling time, steady state error, etc.) relation of system response to location of system poles and zeros.
Stability of control system:
Concept of stability, Routh Hurwitz criterion, root locus methods and its use in control System design, digital control.
Lab Outline:
Experiments related to the course outline mentioned above will be covered in the Lab class.

APPLIED MATH-IV (COMPLEX VARIABLE TECHNIQUE AND FOURIER TRANSFORMATION) (GS-302)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Erwin Kreyszig, "WIE Advanced Engineering Mathematics," Ninth Edition, 2005, International

COURSE OBJECTIVES

To discuss the complex number system, different types of complex functions, analytic properties of complex numbers, theorems in complex analysis to carryout various mathematical operations in complex plane, roots of a complex equation. To discuss limits, continuity, differentiability, contour integrals, analytic functions and harmonic functions. Cauchy–Riemann equations in the Cartesian and polar coordinates, Cauchy's integral formula, Cauchy–Goursat theorem, convergence of sequence and series, Taylor series, Laurents series. Integral transforms with a special focus on Laplace integral transform. Fourier transform

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Define** the complex number system, complex functions, integrals of complex functions and fourier transformation.	C1	01
2	**Explain** the concept of limit, continuity, differentiability of complex valued functions.	C2	01
3	**Apply** the results/theorems in complex analysis to complex valued functions.	C3	02

COURSE CONTENTS

Introduction to complex number systems, Arg and's diagram, modulus and argumen to fa complex number, polar form of a complex number, De Moivre's theorem and its applications, complex unctions, analytical functions, harmonic and conjugate, harmonic functions, Cauchy- Riemann equations, line integrals, Green's theorem, Cauchy'stheorem, Cauchy's integral formula, singularities, poles, residues, contourinte gration and applications; Laplace transform definition, Laplace transforms of elementary functions, properties of Laplace transform, periodic functions and their Laplace transforms, inverse Laplace transform and its properties, convolute on theorem, inverse Laplace transform by integral and partial fraction methods, Heaviside expansion formula, solutions of ordinary differential equations by Laplace transform, applications of Laplace transforms; series solution of differential equations, validity of series solution, ordinary point, singular point, For benius method, indicial equation, Bessel's differential equation, its solution of first kind and recurrence formulae, Legendre differential equation and its solution, Rodrigues formula; Fourier transform definition, Fourier transforms of simple functions, magnitude and phase spectra, Fourier transform theorems, inverse Fourier transform, solutions of differential equations using Fourier transform.

HEAT AND MASS TRANSFER (ME-321)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Fundamentals of Heat Transfer by Incropera & DeWitt, John Wiley & Sons

REFERENCE BOOK(S)

Heat Transfer, a Practical Approach by Y. A. Cengel, McGraw-Hill
Heat Transfer by J. P. Holman, McGraw-Hill
Elements of Heat Transfer by Frank Keith, International Text Books Co

COURSE OBJECTIVES

The course covers the Basic and advance Heat and Mass Transfer. Understanding of basic principles of heat & mass transfer involved in thermo- fluids as well as another related fields. To design main mechanical component of industries e.g. heat exchanger, boilers, condensers, evaporators.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** the impact of materials properties on heat transfer.	C2	02
2	**Use** modes and processes of heat transfer and apply them to solve basic heat transfer problems.	C3	02
3	**Analyze** and relate the relevant heat transfer phenomena	C4	03

for a given problem and quantify the heat transferred.

COURSE CONTENTS

Conduction:
Heat equation, Fourier‟s law, one dimensional steady state heat conduction through plane and composite walls, cylinders and spheres with and without heat generating sources, critical thickness of insulation, heat transfer through extended surfaces, transient conduction, lumped capacitance method.
Convection:
Newton‟s law of cooling, boundary layer, natural (free) and forced convection heat transfer. coefficient of heat transfer for free and forced convection, effects of laminar, transition and turbulent flow on coefficient of heat transfer, flow over flat plates, heat transfer for flow through pipes and ducts, non-dimensional parameters related to heat transfer and their applications. Shear stresses, friction coefficient for fully developed flow, Reynolds analogy, heat transfer with phase change, boiling, condensation.
Radiation:
Stefan Boltzmann‟s law, black body radiation, absorptivity, reflectivity, transmissivity.
Wien‟s Displacement law, Kirchoff‟s law, gray body radiation. Radiation shape factor and its applications.
Mass transfer:
Ficks law and its application, analogy between momentum, heat and mass transfer.
Heat exchangers:
Classification, overall heat transfer coefficient. LMTD and NTU methods.

HEAT AND MASS TRANSFER LAB (ME-321 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Heat and Mass Transfer Lab Manual

REFERENCE BOOK(S)

Heat Transfer, a Practical Approach By Y. A. Cengel, McGraw-Hill

COURSE OBJECTIVES

The course covers the Basic and advance Heat and Mass Transfer using experimental approach to understand the Fourier law for conduction and convection. The course also covers the experimental determination of the log mean temperature difference for different types of heat exchanges.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Perform** experiment on multiple Heat Transfer testing units and their control System to determine heat transfer properties of materials and observe effect of changing materials and temperatures on heat transfer phenomenon.	P2	04
2	**Explain** parameters related to Lab from the experiments in relation to the theoretical aspects.	C2	04

3	**Contribute** to experiment by working individually and in a group.	A2	09

COURSE CONTENTS

Fourier's law study for linear conduction of heat along a homogenous bar
Conduction of heat and overall heat transfer along a composite bar
The effect of a change in cross sectional area on the temperature profile along a thermal conduct
Temperature distribution for steady state conduction of heat through the wall of a thick disk
Fourier's rate equation in determining the rate of heat flow through wall of a thick disk
Determination of the relationship between power input and surface temperature in free convection for flat type heat exchanger
Determination of the relationship between Input velocity and surface temperature in force convection for flat type heat exchanger
Determination of the relationship between power input and surface temperature in free convection for pinned heat sink type heat exchanger
Determination of the relationship between Input velocity and surface temperature in force convection for pinned heat sink heat exchanger
Determination of the relationship between power input and surface temperature in free convection for fin type heat exchanger
Determination of the relationship between Input velocity and surface temperature in force convection for fin type heat exchanger
Determination of logarithmic average of the temperature difference for double pipe type heat exchanger for parallel flow
Determination of logarithmic average of the temperature difference for double pipe type heat exchanger for counter flow
Determination of logarithmic average of the temperature difference for flat plate type heat exchanger for parallel flow
Determination of logarithmic average of the temperature difference for flat plate type heat exchanger for counter flow
Determination of logarithmic average of the temperature difference for shell and tube type heat exchanger for parallel flow
Determination of logarithmic average of the temperature difference for shell and tube type heat exchanger for counter flow
Determination of thermal conductivity of liquids and Gases

ETHICAL & LEGAL DIMENSIONS FOR ENGINEERS (GR-301)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

COURSE OBJECTIVES

This course introduces contemporary and controversial ethical issues facing the business community. Topics include moral reasoning, moral dilemmas, law and morality, equity, justice and fairness, ethical standards, and moral development. Upon completion, students

should be able to demonstrate an understanding of their moral responsibilities and obligations as members of the workforce and society.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** ethical and legal decision-making frame work, Social Responsibility, and International Ethics.	C2	08
2	**Demonstrate** ethical and legal decision-making, social responsibility, and moral obligations as an Engineer	P4	08
3	**Express** Ethical behavior as an Engineer	A3	08

COURSE CONTENTS

An Overview of Engineering Ethics: Ethics Defined, Social Responsibility, and Ethics, The Development of Ethics, Why study Ethics? Framework for Studying Ethics.
Ethical issues in Engineering: Foundation of Ethical Conflict, Classifications of Ethical, Issues, Ethical Issues Related to Participants and Functional Areas of Engineering, Recognizing an Ethical Issue.
Applying Moral Philosophies to Engineering Ethics: Moral Philosophy Defined, Moral Philosophy Perspectives
Social Responsibility: The Economic Dimension, The legal Dimension, The Ethical Dimension, the Philanthropic Dimension
An Ethical Decision-Making Framework: Ethical Issue Intensity, Individual Factors: Stages of Cognitive Moral Development, Corporate Culture, Significant others, Opportunity, Engineering Ethics Evaluations and Intentions, Using the Ethical Decision-Making Framework to Improve Ethical Decisions
How the Organization Influences Ethical Decision Making: Organizational Structure and Engineering Ethics, the role of Corporate Culture in Ethical Decision-Making, Group Dimensions of Organizational Structure and Culture, Implications of Organizational Relationships for Ethical Decisions.
The Role of Opportunity and Conflict: Opportunity, Conflict.
Development of an Effective Ethics Programmed: An Effective Ethical Compliance, Programmed, Codes of Ethics and Compliance Standards. High-Level Manager's Responsibility for Ethical Compliance Programmed and the Delegation of Authority, Effective Communication of Ethical Standards. The Influence of Personal Values in Engineering Ethics Programmers, the Ethical Compliance Audit.

Semester/Term 7

I.C ENGINES (ME-421)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Internal Combustion Engine BY R.K Rajpoot
Internal Combustion Engine Fundamentals (McGraw-Hill) by John Heywood

COURSE OBJECTIVES

To learn fundamentals of I.C Engines and basic terminologies.
To learn automobiles systems and technologies.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Apply and **analyze** various thermodynamic cycles related to internal combustion engines and analyze combustion processes in engines	C4	02
2	Specify and **interpret** engine design parameters as well as performance data for a variety of internal combustion engine systems	C6	03
3	**Explain** pollutant formation, its effect on environment and control.	C3	07

COURSE CONTENTS

Under graduate thermodynamics and combustion review
Introduction and basic engine operation processes
Engine components, operating parameters and characteristics
Ideal and real models of engine cycles
Gas exchange processes, supercharging and turbocharging
Combustion in SI and CI engines
Dual fuel system engines Role of Lubricants in SI and CI engines
Pollutant formation and control
Project presentations

I.C. ENGINES LAB (ME-421L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

I.C Engines Lab Manual

COURSE OBJECTIVES

To learn fundamentals of I.C Engines and basic terminologies.
To learn automobiles systems and technologies.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO

1	**Analyze** the variation in mixture of air and fuel and its resultant impact on efficiency of combustion process	C4	04
2	**Analyze** PV diagram as generated by varying the torque and rpm of diesel and petrol engine apparatus.	C4	04

COURSE CONTENTS

Study of two stroke petrol engine.
Study Of four stroke petrol engine.
Difference b/w two stroke & four stroke engine.
Ignition system of four stroke petrol engine.
Fuel system of four stroke petrol engine.
Lubrication system of four stroke petrol engine.
Cooling system of four stroke petrol engine.
Air intake & exhaust system of four stroke petrol engine.
Study of four stroke diesel engine.
Fuel injection system of four stroke diesel engine.
Lubrication system of four stroke diesel engine.
Cooling system of four stroke diesel engine.
Air intake and exhaust System of four stroke diesel engine.
Studay of turbo charger.
Understanding of Valve timing.

NUMERICAL ANALYSIS & COMPUTATION THEORY (GS-401)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Numerical Analysis by Richard L Burden and J Douglas Fairs
Numerical Analysis by Francis Scheid, Schaum‟s outline series, McGraw Hill
Applied Numerical Analysis by Curtis F Gerald, Addison-Wesley
Introduction to Numerical Analysis by F B Hillbrand, Tata McGraw Hill

COURSE OBJECTIVES

To provide understanding of main sources of numerical errors and the power of numerical methods that minimize these errors
To understand the implementation of numerical methods to the solution of engineering problems

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** main sources of numerical errors.	C2	01`
2	**Apply** appropriate numerical methods to the engineering and science problems to reduce numerical errors	C3	02

COURSE CONTENTS

Introduction, basic ideas, concepts and terminology, , essential elements of numerical analysis, continuum formulation, solution domain, discretization, solution algorithm,

polynomials and finite differences, round-off and solution errors, introduction to Least-square, Min-max, cubic splines, and piece-wise osculating polynomials, collocation polynomials and finite differences, round-off and solution errors, introduction to Least-square, Min-max, cubic splines, and piece-wise osculating polynomials, collocation polynomials with advantages and disadvantages, Newton forms of linear interpolation and quadratic interpolation polynomials, Progression of forward, backward and central differences in tabular form, and construction of polynomials, operator algebra, solution of equation with one, two and three variables, III-conditioning of equations set, direct methods of solution, Gaus elimination method, LU decomposition method, matrix inversion, iterative methods of solution, Eign-value problems, characteristics polynomial and the stability criterion, solution of first order ordinary differential equations, initial value and boundary value problems, Euler predictor method and Euler predictor cum corrector method of solving and ordinary differential equation, one-step solution methods second order Runge-Kutta method.

NUMERICAL ANALYSIS & COMPUTATION LAB (GS-401L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Lab Manual

COURSE OBJECTIVES

To provide understanding of main sources of numerical errors and the power of numerical methods that minimize these errors

To understand the implementation of numerical methods to the solution of engineering problems

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Manipulate** MATLAB from numerical analysis perspective	P3	02
2	**Make** MATLAB algorithms for various numerical analysis techniques.	P4	02
3	**Design** MATAB algorithm for given engineering/sciences problems.	C5	03

COURSE CONTENTS

Introduction, basic ideas, concepts and terminology, , essential elements of numerical analysis, continuum formulation, solution domain, discretization, solution algorithm, polynomials and finite differences, round-off and solution errors, introduction to Least-square, Min-max, cubic splines, and piece-wise osculating polynomials, collocation polynomials and finite differences, round-off and solution errors, introduction to Least-

square, Min-max, cubic splines, and piece-wise osculating polynomials, collocation polynomials with advantages and disadvantages, Newton forms of linear interpolation and quadratic interpolation polynomials, Progression of forward, backward and central differences in tabular form, and construction of polynomials, operator algebra, solution of equation with one, two and three variables, III-conditioning of equations set, direct methods of solution, Gaus elimination method, LU decomposition method, matrix inversion, iterative methods of solution, Eign-value problems, characteristics polynomial and the stability criterion, solution of first order ordinary differential equations, initial value and boundary value problems, Euler predictor method and Euler predictor cum corrector method of solving and ordinary differential equation, one-step solution methods second order Runge-Kutta method.

Lab Outline:

According to course outline

REFRIGERATION AND AIR CONDITIONING (ME-422)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Heating, Ventilating, and Air-Conditioning Analysis and Design, by Mc Quiston, Parker and Spitler John Wiley & Sons
Heating and Cooling of Buildings, By Ed. Kreider, Curtiss &Rabl McGraw-Hill.
Principles of Refrigeration, By Dossat, R. J., John Wiley
HVAC Systems Design Handbook, By Haines, Roger W. Wilson, Lewis McGraw-Hill Companies

COURSE OBJECTIVES

To understand refrigeration systems.
To develop basic ideas about cycle analysis and designing parameters pertaining to refrigeration and air conditioning systems
To deal with the problems related to architectural, building services, HVAC, equipment

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Apply** basic principles of thermodynamics on processes and systems of air-conditioning.	C3	02
2	**Analyze** the parameters involved in human comfort and health	C4	02
3	**Design** the solution by applying the skills gained to estimate the space heating and cooling loads	C5	03

COURSE CONTENTS

Refrigeration cycles:
Reversed Carnot and Joule Cycles, vapor compression and vapor absorption systems, COP, pressure- enthalpy chart, types of refrigerants, air cycle refrigeration, multiple effect compression, multi-stage compression, heat pump
Air conditioning:
Indoor and outdoor air conditions, comfort conditions and comfort zone, indoor air quality, psychometric.
Central air-conditioning system:
Essential components of central air-conditioning plant, water chiller and water heater, air handling unit, chilled water and hot water recirculation system, return air supply system, fresh air supply system air mixture chamber, supply fan, air dust cleaning and bacteria removal, air supply and air return terminals, diffusers and grilles, CFM rating and tons of air-conditioning of a central air-conditioning plant.
Load calculation and system design:
Cooling and heating load calculation procedures, duct sizing and piping design, pumps and fans selection, and air ventilation: calculation of fresh air supply of a multi- story building, air handling unit for untreated fresh air, forced convection based air ventilator design.

REFRIGERATION AND AIR CONDITIONING LAB (ME-422 L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Refrigeration and Air Conditioning Laboratory Manual

COURSE OBJECTIVES

To demonstrate and develop understanding among the students about the basic working principles of HVAC with hands-on experience and to improve the psychomotor skills

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Operate** multiple RAC testing units to observe different properties of air and refrigerants after heating and cooling processes.	P3	04
2	**Manipulate** different settings and parameters of RAC units and their control systems to investigate the effect of changing different parameters on refrigeration, cooling and heating.	P3	04
3	**Respond** for answering the questions related to experiments. Answers confidently on direct questioning.	A2	09

COURSE CONTENTS

To carry out the thermodynamic analysis of the Simple Compression Refrigeration Cycle
Study of characteristics of automotive refrigeration cycle and to find coefficient of performance.

Demonstration and Working of reverse air conditioning system and to find coefficient of performance.
Demonstration and working of Vapour Absorption Refrigeration System
Demonstration and working of Air Conditioning Laboratory Unit
Study of characteristics of air on psychrometric chart and to draw refrigeration cycle
Study of characteristics of air on psychrometric chart and to draw refrigeration cycle in recirculating air conditioning unit
General Observation of the Forced Draught Cooling Tower.
Investigation of the Effect of Cooling Load on Wet Bulb Approach.
Investigation of the Relationship between Cooling Load and Cooling Range.
Determination of power input, heat output and coefficient of performance of Mechanical Heat Pump
Production of heat pump performance curves over a range of source and delivery temperatures of Mechanical Heat Pump

Semester/Term 8

MECHANICAL VIBRATIONS (ME-411)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Mechanical Vibrations, 5/E by Singiresu S. Rao, Prentice Hall

REFERENCE BOOK(S)

Mechanical Vibrations: Theory & Applications by W. T. Thompson, Prentice Hall
Elements of Vibration Analysis by L. Meirovitch, McGraw Hill
Vibration for Engineers by Endrew Dimargonas, Prentice Hall

COURSE OBJECTIVES

Students will have a good understanding of the modelling of vibratory motion of mechanical systems using both single and multiple degree of freedom concepts. Students will be able to design simple vibration isolation systems. They will understand the concepts of natural frequencies and mode shapes and their significance in the solution of multiple degree of freedom problems. Students will have an introduction to the use of Laplace Transforms as a solution to differential equations of motion. They will be able to complete basic system modelling tasks. Students will acquire the ability to: Formulate mathematical models of problems in vibrations using Newton's second law or energy principles. Determine a complete solution to the modelled mechanical vibration problems. Correlate results from the mathematical model to physical characteristics of the actual system. Design of a mechanical system using fundamental principles developed in the class.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO

1	**Analyze** the type of vibration (desirable or undesirable) its attributes	C4	02
2	**Apply** the knowledge to different mechanical translational, rotational and other applications	C3	04
3	**Design** and analyze the system response by using the different techniques of Mechanical Vibrations with the application of mathematical modeling.	C5	03

COURSE CONTENTS

Introduction to vibrations, history and its importance, Basic concept of vibrations, its classification and terminology, vibration analysis procedure**,** Elements of vibration systems, Harmonic Motion, Harmonic Analysis, Free vibration of an undamped translational system, Free vibrations of damped Systems, Undamped harmonically excited vibrations, Damped harmonically excited vibrations, Forced harmonic vibrations, Vibration isolation, Vibration measuring instruments, Free vibration Analysis of 2DoF undamped system, Free vibration Analysis of 2DoF damped system, Vibration Absorber and dampers, Vibration measurements and applications, Free and forced vibration of uniform bar and thin beam, Torsional Vibration of shaft and critical speed, Machine condition monitoring

MECHANICAL VIBRATIONS LAB (ME-411L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

RECOMMENDED BOOK(S)

Mechanical Vibrations Laboratory Manual

COURSE OBJECTIVES

To study and visualize the different ways of vibration occurrences in mechanical equipment and how to control it, i.e. whirling of shafts, spring damper systems etc.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Operate** different apparatuses to find key variables of interest such as period of oscillations, natural frequency and inertia etc.	P3	04
2	**Explain** different parameters related to lab in relation to the theoretical aspects	C2	04
3	**Contribute** to experiment by working individually and in a group	A2	09

COURSE CONTENTS

Determination of the period of oscillation for bifilar suspension system.
Determination of the period of oscillation and mass moment of inertia for trifilar suspension.
Determination of the rotational inertia of point masses and rod.
Determination of the rotational inertia of disc.

Determination of the rotational inertia of ring.
To demonstrate universal vibration apparatus.
To demonstrate natural undammed free vibration on universal vibration apparatus.
To demonstrate dammed forced vibration on universal vibration apparatus.
To illustrate the experimental method of scientific investigation by finding how the period of a pendulum depends on various factors.
Determination of the period of torsional vibration as a function of: Torsion wire diameter And Torsion wire length.
Determination of the natural frequency, of a spiral spring-rotating mass system.
To determine whirling speed of shaft theoretically and experimentally.
Determination of static and dynamic unbalances.
Balancing the apparatus statically and dynamically.

TECHNICAL ELECTIVES

RENEWABLE ENERGY RESOURCES (ME-423)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Renewable Energy, By Godfrey Boyle, Oxford University Press
Renewable Energy Resources, by john Twidell, Tony Weir, Spon Press
Renewable Energy Conversion, Transmission and Storage, By Bent Sorensen

COURSE OBJECTIVES

To understand exploration of various energy sources.
To understand the concepts of energy conversion systems
To implement the ways of energy conservation and management.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** the fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels.	C2	01
2	**Describe** the main components of different renewable energy systems	C2	01
3	**Design** renewable/hybrid energy systems that meet specific energy demands are economically feasible and have a minimal impact on the environment	C5	04

COURSE CONTENTS

Introduction to types of renewable energy, solar energy, tidal wave and geothermal energy, biomass energy, fuel cell and heat pump systems, energy efficiency issues and energy storage, potential of using renewable energy resources as supplement of conventional energy resources.
Renewable and non-renewable energies used as hybrid energy systems, modern
Renewable energy plants.
Wind energy, wind turbine design specifications, compatible electric generators and major operational, wind mills design usage for pumping water.
Biomass energy conversion methods, detailed description of synthetic gas, biodiesel, biomass and biogas, operational and maintenance problems and their remedies.

TRIBOLOGY (ME-412)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Principles of Tribology (Third Edition), by Wen Shizhu and Huang Ping

REFERENCE BOOK(S)

Tribology, Principles and Design Applications, by Arnell et al.
Principles and Applications of Tribology, by B. Bhushan
Fluid Film Lubrication, By B. Hamrock
Tribology, by I.M. Hutchings Engineering Tribology, by G. Stachowiak and A.W. Bachelor

COURSE OBJECTIVES

Tribology & lubrication is an interdisciplinary course which deals with fundamentals of surface contact, friction, wear and lubrication. Topics include description and modeling of engineering surfaces, popular surface contact theories, major modes of friction, wear, lubrication and adhesion. The tribology challenges in micro system will be discussed as well.Design of surfaces in contact is a critical problem for mechanical engineering.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** basic knowledge of surface topography.	C2	01
2	**Explain** the theoretical background about processes in tribological system, mechanisms and forms of interaction of friction surfaces, hertz contact and rough surface contact.	C2	01
3	To Identify the methods to reduce the friction for engineering surface.	C1	01

COURSE CONTENTS

Fundamental topics include: geometric, chemical, and physical characterization of surfaces; Friction and wear mechanisms for metals, polymers, and ceramics, including abrasive wear, Delamination theory, tool wear, erosive wear, wear of polymers and composites; lubrication and solid-film lubrication. The course also and boundary considers the relationship between Nano-tribology and macro-tribology, rolling contacts, tribological problems in magnetic recording and electrical contacts, and monitoring and diagnosis of friction and wear.
Case studies are used to illustrate key points.

COMPUTATIONAL FLUID DYNAMICS (ME 424)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

JiyuanTu, Guan HengYeoh and Chaoqun LIU, Computational Fluid Dynamics: A Practical Approach, Butterworth-Heinemann/Elsevier.
J. D. Anderson, Jr., Computational Fluid Dynamics: The Basic with Applications, McGraw-Hill.
H. Versteeg and W. Malalasekera, An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Prentice Hall/Pearson.
Suhas V. Patankar, Numerical Heat Transfer and Fluid Flow, Taylor & Francis.

COURSE OBJECTIVES

Computational Fluid Dynamics Course provides an introduction to the Methods and analysis techniques used in computational solutions of fluid mechanics and heat transfer problems.
This course introduces the students to the finite difference and finite volume method as a means of solving different type of differential equations that arise in fluid dynamics.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** governing equations of fluid Dynamics and Turbulence.	C2	01
2	**Analyze** convection-diffusion equations using finite volume methods.	C4	02
3	**Solve** convection-diffusion problems using discretization schemes.	C3	02

COURSE CONTENTS

Introduction to Computational Fluid Dynamics, Problem solving strategy using CFD, Governing Equations of Fluid Flow, Discretization of Governing equations, Finite difference

method, Introduction to the Finite Volume Method , Numerical solution of governing equations, Solution analysis and accuracy, Introduction to advanced topics.

GAS DYNAMICS (ME-425)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Gas Dynamics, By M. J. Zucrow and J. D. Hoffman, Wiley.
John Wiley & Sons, 1976

COURSE OBJECTIVES

To understand the application of mechanics and thermodynamics to a variety of compressible fluid problems, both practical and theoretical.
Emphasis is place donunder standing physical mechanisms and the use of computers imulations to understand unsteady compressible flows and pressure waves in fluids.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Student should be able to **apply** the fundamental flow equations and basic solution techniques in solving compressible one dimensional flow.	C3	01
2	Students shall be able to **evaluate** first order solutions for compressible internal flows for variable geometry ducts with friction and heat transfer.	C6	02

COURSE CONTENTS

Basic governing laws of conservation of mass, momentum and energy, limitations. Sub-sonic and supersonic gas flow. Mach number and Mach angle. Isentropic Flow and Applications; Operation of nozzles under varying pressure ratios. Normal and oblique shocks, Prandtl-Meyer compression and expansion with applications. Rayleigh flow and Fanno flow, Busemann's shock polar diagram.

AERODYNAMICS (ME-426)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Aerodynamics for Engineering Students, by El. Houghton & A. E. Brock St Mortin
Cambridge University Press, 2003
Aerodynamics, By L. J. Clancy, Hallstead Pr.

COURSE OBJECTIVES

To understand the concepts in incompressible airfoil theory, including symmetric and cambered airfoils using analytical and numerical approaches.
To understand the incompressible wing theory, including down wash, lifting-line theory, elliptic wings, general twisted wings, application of fundamentals to the design of a wing to meet given performance criteria.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** governing equations of aero dynamics and turbulence.	C2	01
2	**Analyze** convection-diffusion equations using finite volume methods.	C4	02
3	**Solve** convection-diffusion problems using discretization schemes.	C3	01

COURSE CONTENTS

Introduction, aerodynamics of incompressible flow, compressible and ideal fluid flow, airfoils theory, finite wing aerodynamics, blade element theory and aircraft propellers, Cascade aerodynamics, jet propulsion, intake and nozzle performance, aircraft performance measurement.

AUTOMATION AND ROBOTICS (ME-416)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Craig John J, Introduction to Robotics: Mechanics and Control, 3rd Edition, Prentice-Hall, 2005. (TJ211.C886 2005).

REFERENCE BOOK(S)

Schilling Robert J, Fundamentals of Robotics: Analysis and Control, Prentice-Hall, 1990. (TJ211.S334)
Niku Saeed B, An Introduction to Robotics Analysis, Systems, Applications, Prentice-Hall, 2001. (TJ211.N694)

COURSE OBJECTIVES

The module provides an understanding of the principles of operation of automated equipment with particular reference to industrial robots. It focuses on the knowledge needed to select and use such equipment effectively. However, some design aspects will be presented. There is an emphasis on the use of sensors to make robots behave "intelligently".

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** in detail how industrial robot systems are used, computer-aided production tools and data communication within an industrial robotics network.	C2	01
2	**Identify** fundamental issues within sustainable industrial development from an automation perspective	C1	07
3	**Implement** and **present** a basic automation task with an industrial robot, including pilot study, online and offline programming and evaluation of the results, based on a given specification.	P2	04

COURSE CONTENTS

Robotics: Basic concepts in robotics, classification and structure of robotic system, drive and control system, coordinate transformation, kinematics dynamic analysis and trajectory interpolation, interfaacing with micro controllers and PLCs, applications of robots. Robotics and Automated Guided Vehicles. Basic robot motion, path control, robot drive system sensors, robot-computer interface, robot programming, Automated Guided Vehicles (AGV) types. Programmeable logic controller (PLC). Basics components and terminologies, ladder diagram elements, relay sequencing, processor input and output modules, programming unit and programming procedures with machines or assembly language. Microcontroller. Basic elements of microcontroller, types of microcontroller, micro processor and PLC, overview of architecture and principles of operations, assembly, machine and high level programming languages for microcontroller, input and out put peripherals for specific application in mechanical engineering with interfacing techniques. Actuators, sensor, input signals, output signals, signal conditioning. Automations: Introduction to automations, automation strategies, economics of automations, partial automations, group technology and flexible manufacturing. Use of sensors and actuators in automations

Finite Element Method (ME-431)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

A First Course in the Finite Element Method, Daryl Logan, Fifth Edition, Cengage Learning

REFERENCE BOOK(S)

Finite Element Procedures, K. J. Bathe, Prentice Hall.
The Finite Element Method in Engineering, S.S. Rao.
Fundamentals of Finite Element Analysis, David V. Hutton

COURSE OBJECTIVES

At the completion of the course, students must be able to: 1. Comprehend the basic Finite Element Methods used in solid Mechanics, Fluid Mechanics and Heat Transfer Problems 2. Explain the general methodology used in solving FEM based problems 3. Analyze the Solid Mechanics, Fluid Mechanics and Heat Transfer problems using FEM.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** key concepts of idealization, discretization (element formulation), assembly (Mesh and Boundary conditions) and solution.	C2	01
2	**Analyze** appropriate choices for discretization strategy, method of assembly and method of application of boundary conditions	C4	02
3	**Apply** FEM for computing key variables of interest for variety of mechanical engineering problems.	C3	02

COURSE CONTENTS

Introduction to Stress Analysis by FEM:
Basic concepts of FEM, Types of Elements, Linear Static Analysis, Review of the basic Continuum Theory
One Dimensional Elements:
Different types of one dimensional elements like Linear Elements, Quadratic Elements, Cubic Elements, Types of Coordinates like Global, Local and Natural Coordinates and Numerical Integration
Analysis of One Dimensional Problems:
Analysis of One Dimensional Solid Mechanics, Heat Transfer and Fluid Mechanics Problems
Two Dimensional Elements:
Two Dimensional Elements like Rectangular, Quadratic Quadrilateral, Linear triangular and quadratic triangular elements, Two-Dimensional Integration.
Analysis of Two Dimensional Problems:
Analysis of Two-Dimensional Solid Mechanics, Fluid Mechanics and Heat Transfer Problems, Coordinate transformation and Introduction to finite Volume Method.

Finite Element Method Lab (ME-431L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Students will be able to use ANSYS tools to setup engineering problems for different boundary conditions	P4	05
2	Students will be able to analyze result of simulations based on their engineering knowledge.	C4	05
3	Students shall analyze a given problem using ANSYS and discuss their findings.	C4	05

INTRODUCTION TO COMPOSITE MATERIALS (ME-434)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

An Introduction to Composite Materials, 2nd Edition, by D. Hull and T.W. Clyne, Cambridge University Press (1996). \
S. Suresh and A. Mortensen, Fundamentals of Functionally Graded Materials K.K. Chawla. Composite Materials A. Kelly and N. H. MacMillan, Strong Solids.

REFERENCE BOOK(S)

Composite Materials Science and Engineering by **Chawla**, Krishan K.
Composite Materials by Chung, Deborah D. L.

COURSE OBJECTIVES

The course covers the description and properties of fiber and matrix materials in composites, the micromechanics and macro mechanics governing composite materials, laminated composites and their behaviors under loads.
It discusses analysis, design and applications of laminated and fiber-reinforced composites, micro- and macro-mechanical analysis of elastic constants, failure and environmental degradation, and design project.
This course aims to gain advanced knowledge and analyzing skills on the linear elastic analysis of fiber-reinforced composite materials. It includes concepts such as anisotropic material behavior and the analysis of laminated composites.
The students will undertake a design project involving application of fiber reinforced laminates.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** basic properties of fiber and matrix materials used in commercial composites, as well as some common manufacturing techniques.	C2	01
2	Analyze and **design** elastic properties of both long and short fiber composites based on the constituent properties.	C5	02
3	**Analyze** the failure strength of a laminated composite plate.	C4	02

COURSE CONTENTS

The concepts covered in this course include:
An introduction to composites materials.
An introduction to tensors, stress, strain and elasticity theory, Elastic behavior of continuous fiber composites, Elastic behavior of short fiber composites.
A description of the nature and importance of interfaces ,Fracture strength of composites Fracture toughness of composites ,Thermal behavior and creep ,Plastic deformation of

composite materials, Expanding to other properties of composite materials, New types of composite materials: Functionally Graded and Architecture Materials, Fabrication routes of composite materials.

PRODUCTION ENGINEERING (ME-422)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Fundamentals of Modern Manufacturing: Materials, Processes, and Systems by Mikael P. Groover, John Wiley & Sons, 2nd edition 2001.
Manufacturing Processes for Engineering Materials, Fourth Edition, Serope Kalpak jian, Steven R. Schmid, Prentice Hall

REFERENCE BOOK(S)

Metal Cutting and High Speed Machining by D. Dudzinski, A. Molinari, H. Schulz, Plenum Pub Corp, 2002.
Applied Manufacturing Process Planning: With Emphasis on Metal Forming and Machining by Donald H. Nelson, George, Jr. Schneider, Prentice Hall, 1st edition, 2000.

COURSE OBJECTIVES

The course will cover the fundamental concept of Manufacturing. It is designed as a course that will give students a necessary foundation for a comprehensive understanding of manufacturing processes and production systems. The objective of the course is to provide detailed information to the students about the processes and machines involved in different material removal processes like conventional machining, abrasive machining, non-conventional machining processes and numerically controlled machining. Furthermore the course introduces the students to the concept of metrology, production planning, flexible manufacturing systems, group technology and Computer integrated manufacturing (CIM).

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Analyze** processing operations (Machining, Grinding, surface processing) with their process dynamics and performance.	C4	03
2	**Analyze** machining operations with their process dynamics and performance.	C4	03
3	**Compare**, organize, and select appropriate manufacturing processes, equipment, and process parameters.	C4	04

COURSE CONTENTS

Material Removal. Calculation of material removal rate for different machining processes

Machine Processes for Producing Various Shapes. Milling operation, milling machines, planning and shaping, broaching and broaching machines, gear manufacturing by machining.
Abrasive Machining & Finishing Operations. Abrasive, bonded abrasives (grinding wheels), grinding process, grinding fluids, design considerations for grinding, ultrasonic machining.
Non-Conventional Machining Process. Machining, electrochemical, electrical – discharge machining, wire E D M
Control of Machine Tools. Machine tools control, numerical control system, Computerized Numerical Control.(CNC), programming for numerical control
Jigs & Fixtures. General design principle, elements of jig, locating devices and clamping devices.
Computer Integrated Manufacturing System. Manufacturing system, Computer Integrated Manufacturing (CIM), Flexible Manufacturing System (FMS), Cellular manufacturing.
Metrology. Specification and standardization limit and fits tolerances and allowances.
Precision measurements: Standards; optical projection straightness and flatness testing, surface finish measurement.
Introduction to Process Planning

ENGINEERING OPTIMIZATION (ME-419)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

S. S. Rao: Engineering Optimization, New Age International.

REFERENCE BOOK(S)

E. J. Haug and J.S. Arora, Applied Optimal Design, Wiley, New York.
Kalyanmoy Deb, Optimization for Engineering Design, Prentice Hall of India.
Ravindran and K.M. Rogsdeth, Optimization G.V. Reklaites, Wiley, New York.

COURSE OBJECTIVES

To introduce the fundamental concepts of Optimization Techniques;
To make the learners aware of the importance of optimizations in real scenarios;
To provide the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
2	Explain and **apply** the concept of optimality criteria for various type of optimization problems.	C3	01
3	**Solve** various constrained and unconstrained problems in single variable as well as multivariable;	C3	02

4	**Apply** the methods of optimization in real life situation.	C3	01

COURSE CONTENTS

Optimization methods, nonlinear optimization under constraints, multi objective optimization, multidisciplinary design, incorporating different disciplines simultaneously, single and multi-objective optimization under constraints, Different approaches to Multidisciplinary Design

FRACTURE MECHANICS (ME-414)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

E.E. Gdoutos, Fracture Mechanics, Kluwer Academic Publishing, Boston, 1993

REFERENCE BOOK(S)

R.W. Hertzberg, Callister, Deformation and Fracture Mechanics of Engineering Materials, Fourth Edition, John Wiley and Sons, Inc., 1996

COURSE OBJECTIVES

The focus of this course is to develop an understanding of the mechanics of fracture of engineering materials and structures under static and dynamic loading.
Students will be taught the principles of linear elastic and elastic-plastic fracture mechanics and their application to engineering design.
This course will also introduce key applications of fracture mechanics in industry including damage detection, failure analysis, and experimental techniques.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** mechanics of fracture of engineering materials and structures under static and dynamic loading	C2	01
2	**Explain** principles of linear elastic and elastic-plastic fracture mechanics and their application to engineering design	C2	02
3	**Evaluate** materials from a fracture mechanics point of view.	C6	04

COURSE CONTENTS

Fatigue and Fracture Analysis of metallic components including welded joints.
Review of test and design procedures.
Sources of cyclic loading.
Cyclic counting procedures and cumulative damage.
S-N curves and effects of mean, residual and multiracial stressing.
Stress Concentrations; scatter and fatigue life distributions. Transition temperature concepts.
Linear elastic fracture mechanics analysis of fatigue crack propagation and fracture initiation.
Crack arrest.

HYDRAULICS & PNEUMATICS (ME-433)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Hydraulics and Pneumatics, Andrew Parr, BH Elsevier, 2006.

REFERENCE BOOK(S)

Pneumatic Handbook, Anthony Barber, Elsevier Science & Technology Books, December 1997.

COURSE OBJECTIVES

To introduce the industrial hydraulics and pneumatics, their parts, functions and their structure.
To give the required information about hydraulics and pneumatics and to teach the fundamentals of hydraulic and pneumatic circuit design.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** the basic components and applications of the hydraulic and pneumatic system, and elements of hydraulic installations	C2	01
2	**Analyze** the problems of failures and their elimination on hydraulic and pneumatic devices and systems	C4	02
3	**Analyze** the basic physical values and parameters in hydraulics - pressure and flow, forces and momenta of executive elements, and necessary power of powering aggregate	C4	02

COURSE CONTENTS

Hydraulic and pneumatic systems. Hydraulic pumps, models and classification, hydraulic pump regulation, hydraulic cylinders. Driving mechanisms, damping elements, hydraulic distributors, pressure and flow control valves, proportional valves and distributors. Hydraulic drives with open and closed recirculation, and their control. Calculation of mobile hydraulics. Servo systems. Oil physical and chemical properties, keeping the purity of hydraulic oil.

Sealing of movable and fixed elements. Hydraulic storage batteries. Hydraulic pipes, elements of a hydraulic installation on motor vehicles. Pneumatic braking and supporting devices. Energy control devices, distributors, pressure valves, circulating valves. Pneumatic control, characteristics and control modes. Design of pneumatic systems of control - drawing of pneumatic schemes.

INTRODUCTION TO NUCLEAR ENGINEERING (ME-428)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Basic Nuclear Engineering Author: Foster and Wright

REFERENCE BOOK(S)

Nuclear Chemical Engineering Author: Benedict, Pigford, Levi

COURSE OBJECTIVES

This course provides students with an introduction to the key elements of nuclear engineering. The course will introduce a variety of themes including nuclear fission, reactor physics and engineering, the historical context of nuclear engineering, the impact of radiation on matter, fuel fabrication and the fuel cycle, radioactive wastes and storage methods, reactor accidents, and nuclear policy.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** and perform basic calculations related to nuclear fissions including binding energy, the fission process and energy release and actinide yields.	C2	01
2	**Describe** reactor physics and calculate fundamental parameters: the harnessing of energy, the roles of the moderator and the coolant, reactor dynamics, neutron life cycle, criticality and reactor transients	C2	01
3	Understand and **describe** the effects of radiation on matter including alpha, beta, gamma and neutrons, material defects, the origin of swelling and material degradation mechanisms	C2	01

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COURSE CONTENTS

Nuclear Physics Review:
Nuclear structure; Nuclear stability; Binding energy and mass-energy equivalence; Radioactivity (natural and artificial); Decay rate; Mean-life and half-life; Radioactive

equilibrium; Nuclear Reactions; Q value; Fission reaction; Elastic and inelastic scattering reactions.

Reactor Physics:

Neutron reaction; Neutron flux; Cross section for scattering, absorption and fission; Neutron diffusion Neutron leakage; Solution of diffusion equation for a bare reactor; Albedo and reflector saving, Neutron slowing down; Continuous slowing down model' Lethargy; Slowing down power; Moderation ratio, Fermi age.

Reactor Theory:

Nuclear chain reactors; Criticality; The four factor formula; One group critical equation; The critical size, Non-leakage probability; Neutron life cycle.

Reactor Kinetics:

Excess reactivity and reactor-period; Xenon poisoning.

Types of Nuclear Reactors:

Introduction, Pressurized Water Reactor (PWR), and Primary Loop, Pressurize, Chemical Shim Control a PWR Power plant, Boiling Water Reactor (BWR), and Load Following Control, Current BWR System High Temperature Gas-Cooled Reactor (HTGR), Advanced Gas Cooled Reactors (AGR).

Fast Breeder Reactor and Power plants:

Introduction, Nuclear Reactions, Conversion and Breeding, Liquid Metal Fast Breeder Reactor (LMFBR) Plant arrangements, LMFBR, Gas Cooled Fast Breeder Reactor (GCFBR).

Reactor Materials:

Choice of a moderator; the fuel; the coolant; nuclear fuels.

Allied Topics:

Nuclear power economics; Fuel reprocessing; Health hazard due to reactions; Shielding; Nuclear applications for peaceful purposes.

MAINTENANCE ENGINEERING (ME-413)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Maintenance Engineering Handbook by R. K Mobley, L. R. Higgins, D. J. Wikoff, McGraw-Hill

Maintenance Engineering & Management by R.C. Mishra, K. Pathak, Prentice Hall of India

Engineering Maintenance, A Modern Approach by B. S. Dhillon, CRC Press London

COURSE OBJECTIVES

To understand the significance of maintenance engineering.
To understand the concepts of maintenance engineering.
To implement the ways of maintenance engineering.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** different statistical methods available for analysis of different processes	C2	01

2	**Describe** the importance of the maintenance and process improvement functions within industry	C2	01
3	**Analyze** the various methodologies used in industry to estimate the level of reliability and remaining life of a critical component at a certain point in time, using statistical and mathematical techniques where appropriate	C4	02

COURSE CONTENTS

Introductory management aspects concerning engineering maintenance, Maintenance and control, Preventive maintenance (PM), Various aspects of corrective maintenance (CM) maintenance processes, Modern system life cycle. Reliability-centered maintenance, Quality maintenance.

MODELING AND SIMULATION (ME-418)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(S)

Theory of Modeling and Simulation 2nd Edition Authors: Bernard Zeigler Tag Kim Herbert Praehofer

COURSE OBJECTIVES

To study basic concepts in modeling and simulation, simulation models and gives practical examples for each category, parallel and distributed simulation methods. To analyze output data produced by a model and test validity of the model

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
3	**Construct** a model for a given set of data and motivate its validity	C5	03
4	**Generate** and test random number variates and apply them to develop simulation models	C5	03
5	**Analyze** output data produced by a model and test validity of the model	C4	02

COURSE CONTENTS

Basic mathematical tools for kinematics and dynamics modeling of planar and spatial rigid multi body dynamic systems, Absolute and relative kinematic constraints and driving constraints, virtual work and the generalized force concepts, equations of motion for

constrained rigid multi body systems, inverse dynamics of kinematically driven systems, equilibrium conditions, and constant reaction forces, Euler parameters for the orientation of rigid bodies in space, numerical considerations in solving spatial differential-algebraic equations of motion, Methods of coordinate transformations with the help of Euler angles, Direction cosines and Quaternion, Attitude dynamics (dynamics of angular motion), Failure mode analysis, Robustness analysis, Monte Carlo Simulations, ANSYS / COMSOL MULTIPHYSICS for analysis

POWER PLANT (ME429)

Pre-requisite: None
Credit Hours: 02
Contact Hours: 32

RECOMMENDED BOOK(s)

Power Plant Technology By M. M. El-Wakil.

REFERENCE BOOK(S)

Power Plant By F.T. Morse

COURSE OBJECTIVES

The general objective is to provide students with a broad understanding of electricity generation process and equipment. The student should be able to understand conversion of coal, oil, gas, nuclear, hydro, solar, geothermal etc. energy to electrical energy.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	Students will apply the concepts of working cycle/principles of power plants to **solve** thermal efficiency	C3	01
2	Students will **develop** understanding of component level operation and **design** of thermal power plants.	C5	03
3	Students will **demonstrate** their commitment to share contemporary development in power plant engineering.	C3	12

COURSE CONTENTS

Review of thermodynamics
Rankine Cycle
Fossil-Fuel Steam Generators
Fuel and Combustion
Turbines
Gas-Turbines and Combined Cycles
Nuclear Power Plants

Geothermal Energy
Solar Energy
Wind Energy
Energy Storage
Environmental Aspects of Power Generation

POWER PLANT Lab (ME429L)

Pre-requisite: None
Credit Hours: 01
Contact Hours: 48

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Perform** experiment to find power output stirling engine and efficiencies of different components of gas and steam power plant	P2	04
2	**Explain** parameters related to lab and data from the experiments in relation to theoretical aspects	C2	04
3	**Contribute** to experiment by working individually and in a group	A2	9

Management Electives

BUSINESS AND ENTREPRENEURSHIP (MS-406)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Rober D. Hisrich and Michael P. Peter, Entrepreneurs/lip5 th Edition, McGraw- Hill
S. S. Khanka, Entrepreneurial Development
Irving Burstiner, the small Businesses Handbook
Bruce A. Kirchhoff, Entrepreneurship and Dynamic Capitalism
Modern Business Management, A System & Environment Approach by McGraw- Hill
William D. Bygrave, The Portable MBA in Entrepreneurs/lip Entrepreneurship CEFE, Germany, Development Manual

COURSE OBJECTIVES

To understand the philosophy of Business and Entrepreneurship
To implement the tools and techniques in the organizations.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO

2	**Apply** knowledge of leadership concepts in an integrated manner.	C3	11
3	**Analyze** the internal/external factors affecting a business/organization to evaluate business opportunities	C4	02

COURSE CONTENTS

Evolution of the concept of entrepreneur, Characteristics of an entrepreneur, Distinction between an entrepreneur and a Manager , in Economic Development, Factors affecting entrepreneurial growth (economic, Non-Economic and Government factors)
Critical factors for stalling a new enterprise. Ingredients for a successful new business. Self-assessment and feedback, Personal entrepreneurial competencies.
Goal setting.
Creativity and sources of new business ideas, the difference the difference between ideas and opportunity and creativity. Assessing business opportunities in Pakistan.
Screening and evaluating opportunities Product planning and development process. Creating parallel competition by developing a similar product or service,
Product life cycle, Finding sponsorship. Acquiring a going concern, E-Commerce and business start-up and growth.
Marketing as a philosophy, marketing management: Creating a marketing plan, Analyzing the environmental situation and the market opportunity, Setting marketing objective, Formulating a marketing strategy.
The business plan as selling document, reasons for writing a business plan your company: What's your identity, Field work started, Marketing issues: Who are your buyers?., Product issues: What are you selling?, Production exercise, Sales and Promotion: Financial issues: Targeting and writing the plan: Business Plan compilation exercise.
Franchising, becoming a franchisees versus starting a stand-alone business, the franchisee contract, Non -contractua l considerations of buying a franchise,
Limitations of franchising.

INDUSTRIAL MANAGEMENT (MS-401)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Production & Operations Management by Evert E. Adam Jr and Ronald.
Prentice Hall
Production Management byKieth &Loekyer.
Operations Management by Jay Heizer & Barry Render, Prentice Hall

COURSE OBJECTIVES

Optimization of organizational resources
To understand the tools/techniques related to Project Management
To develop efficient relations with supplier and customers.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** the most well-known theories and perspectives on management	C2	11
2	**Explain** the relationship between organizational structure, technology and the conditions of the organizational environment	C2	11
3	**Describe** the dynamics of change management	C2	11

COURSE CONTENTS

Plant management
Management systems Role & functions of management. Productivity, basic concepts, classification, measurement and improvement. Role of work study, work Measurement and work sampling.

Facilities planning and design
Plant location, material handling systems, types of production, MRP-II, group Technology, make or buy decisions, demand forecasting, material requirement planning, inventor y models and just in time (JIT) technique, production planning, scheduling problems & models, project management, techniques for PERT & CPM, Network scheduling, activity crashing and resource leveling.

Human resource management
Recruitment process, job evaluation, performance appraisal, non-financial and Financial incentives, training, labor relations, management theories.

OPERATIONS MANAGEMENT (MS-405)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Operations Management by Nigel Slack, Stuart Chambers and Robert Johnston.
Operation Management by Jay Heizer and Barry Render

COURSE OBJECTIVES

To understand the philosophy of Operations management
To implement the tools and techniques in the organizations.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Identify** and articulate how operations management contributes to the achievement of an organization's strategic objectives	C1	11
2	Critically **evaluate** the operations function in manufacturing and service production settings.	C6	04
4	**Evaluate** approaches to problem solving and process improvement in production settings.	C6	04

COURSE CONTENTS

Basics of managing manufacturing and service or ganizations; strategic decision making; facility location and layout; job design and work compensation; demand forecasting; capacity and material planning; scheduling in various environments; emerging trends in managing operations. Use of quantitative management tools after introducing fundamental concepts

OPERATIONS RESEARCH (MS-403)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Operations Research by H. A. Taha, Prentice Hall
Operation Management-Strategy and analysis by Krajewsky and Ritzman
Operations Research by S. Kalavathy, Vikas Publishing House.
Operations Research: Applications and Algorithms by Wayne L. Winston

COURSE OBJECTIVES

To understand the Operations Research tools and techniques.
To understand working and application of computer software packages.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Develop** operational research models from the verbal description of the real.	C5	03
2	Understand the mathematical tools that are needed to **solve** optimization problems.	C3	01
3	**Use** mathematical software to solve the proposed models.	C3	02

COURSE CONTENTS

Operation Research Techniques and basics, Linear programming, graphical method, simplex method dynamic programming, sensitivity and post-optimal analysis,

transportation models, Queuing theory (weighting live models). Replacement Models. Simulation. Basic principles, discrete models vs. continuous system simulation, Markov Chain.

PRODUCTION MANAGEMENT (MS-408)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Factory & Production Management by K. G. Lockyer, Pitman. Publishing

COURSE OBJECTIVES

To awareness of the importance of facility layouts. To measure quality control.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Demonstrate** an awareness of the importance of facility layouts.	C3	01
2	**Apply** techniques to measure quality control.	C3	01
3	**Demonstrate** an understanding of the principles of just-in-time systems, the problems involved in inventory management.	C3	11

COURSE CONTENTS

Essentials of production management. Productivity Analysis, Forecasting Techniques, Regression and correlation analysis, Inventory models techniques and project management analysis. Computer solutions with excel spreadsheets

PROJECT MANAGEMENT (MS-402)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S):

A Systems Approach to Planning, Scheduling, and Controlling by Harold Kerzner , John Wiley
Case studies in project management, 2nd Edition, by Harold Kerzner, JohnWiley.
Project Management Body of Knowledge (PMBOK) 4th Edition, by P. M.I.

COURSE OBJECTIVES

To understand modern project management techniques related government regulations. To implement modern project management techniques using software.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Describe** a project life cycle, and can skillfully map each stage in the cycle	C2	11
2	**Identify** the resources needed for each stage, including involved stakeholders, tools and supplementary materials	C1	11
3	**Describe** the time needed to successfully complete a project, considering factors such as task dependencies and task lengths	C2	11

COURSE CONTENTS

Fundamental principles, project proposals and feasibilities, project life cycle; project organization and human resource management; PM planning; Work breakdown structure; Estimating time and cost; Precedence relationships; Project scheduling and control techniques; Project risk analysis; Time compression and resource leveling; Computerized project management; special software packages

SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT (MS-407)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Safety at Works 4th Edition by John Ridley, Butter Worths Publishers

COURSE OBJECTIVES

To understand the philosophy of Safety Health and Environment
To implement the concepts in the organizations

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Identify** hazards in the home or workplace that pose a danger or threat to their safety or health, or that of others	C1	06
2	**Discuss** the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, supervisors	C2	11
3	**Identify** the decisions required to maintain protection of the environment, home and workplace as well as personal health and safety.	C1	07

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COURSE CONTENTS

Introduction of Health and Safety, Industrial Safety: introduction objectives of

Safety, Importance of Safety in an industry, Industrial accidents, Effects of accidents, Types of accidents incidence of fire. Fir e prevention and control.
Principles of accident prevention, hazard analysis. Legal, humanitarian and economic reason for action. Safety inspection procedures. Safety training, First aid and emergency procedures, Introduction: importance of clean environment, Scale of Environmental Pollution.
Environmental Act. Health and Safety Act.
Atmospheric Pollution: Types of Atmospheric pollution, Their Causes and Effects on Human Health, Available Technologies for Controlling Pollution.
Industrial Waste: Solid Waste, Industrial Effluents and Waste Gases, waste treatment plants. Noise Pollution: Measurement of Noise level, Effect of excessive noise on human health. Remedial Measures.
ISO Standards for Safety and Health and Environment

TOTAL QUALITY MANAGEMENT (MS-404)

Pre-requisite: None
Credit Hours: 03
Contact Hours: 48

RECOMMENDED BOOK(S)

Total Quality Management with text cases by John. S. Oakland, Butterworth- Heinemann
Total Quality Management by Bester fields, Prentice Hall.
Statistical Quality Control by D.C. Montgomery

COURSE OBJECTIVES

To understand the philosophy of total quality management
To implement the tools and techniques in the organizations.

S. No.	CLO/PLOS MAPPING	DOMAIN	PLO
1	**Explain** the different meanings of the quality concept and its influence.	C3	11
2	Describe, **differentiate** and use the several techniques and quality management tools	C4	11
3	Explain and **differentiate** the normalization, homologation and certification activities.	C4	11

COURSE CONTENTS

Fundamental principle, Current Standards, ISO and others Techniques for quality analysis and improvement. Seven improvement tools. Statistical process control. Accepting sampling. Benchmarking, QFD, Six sigma, Control charts, Customer satisfaction, Management tools, Leadership.