College of Engineering

King Khalid University

Bachelor of Science (BSc.) in Mechanical Engineering

Program Study Plan
(Distribution of Courses over Different Levels)

With Effect from January 2017

Contents

Courses in First Year (Common Engineering Year):

First Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
011ENG-6	Intensive English Program 1	6	-	6	-
107CHEM- 4	General Chemistry	4	3	1	-
111GE-3	Engineering Drawing -1	3	-	3	-
119MATH-3	Differentiation And Integration -1	3	3	-	-
Total Number of Hours		**16**	**6**	**10**	

Second Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
012ENG-6	Intensive English Program 2	6	-	6	011ENG-6
101CMS-3	Computer Science	3	2	1	
111IC1-2	The Entrance to the Islamic Culture	2	2	-	
129MATH-3	Algebra and Geometry	3	3	0	
129PHYS-4	Physics -1	4	3	1	
Total Number of Hours		**18**	**10**	**8**	

Courses in Second Year:

Third Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
112IC1-2	Islamic Culture -2	2	2	-	
121ME-3	Production Technology And Workshop	3	1	2	111GE-3
201ARAB-2	Arabic Language Skills	2	2	-	
211ME-4	Engineering Mechanics	4	3	1	
212ME-3	Material Science -1	3	2	1	107CHEM-4 & 129PHYS-4
219MATH- 3	Differentiation And Integration -2	3	3	-	119MATH-3
Total Number of Hours		**17**	**13**	**4**	

Fourth Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
221GE-3	Computer for Engineers	3	2	1	101CMS-3
219PHYS-3	Physics-2	3	2	1	129PHYS-4
223ME-3	Thermodynamics -1	3	2	1	119MATH-3& 129PHYS-4
224ME-3	Engineering Drawing -2	3	1	2	101CMS-3 & 121ME-3
225ME-3	Strength of Materials & Testing	3	2	1	212ME-3
229MATH- 3	Differentiation And Integration -3	3	3	-	219MATH-3
Total Number of Hours		**18**	**12**	**6**	

Courses in Third Year:

Fifth Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
113IC1-2	Islamic Culture -3	2	2	-	
202ARAB- 2	Arabic Editing	2	2	-	
218EE-3	Electric Engineering -1	3	2	1	129MATH-3 & 129PHYS-4
311ME-3	Material Science -2	3	2	1	212ME-3
312ME-3	Thermodynamics -2	3	2	1	223ME-3
319MATH- 3	Differential Equations	3	3	-	219MATH-3
329STAT-2	Principles of Statistics And Probability	2	2	-	
Total Number of Hours		**18**	**15**	**3**	

Sixth Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
301NGL-2	Technical Reports Writing	2	2	-	012ENG-6
329MATH-3	Linear Algebra	3	2	1	129MATH-3
322ME-3	Fluid Mechanics -1	3	2	1	223ME-3
323ME-4	Theory of Machines	4	3	1	211ME-4 & 225ME-3
324ME-3	Production Engineering -1	3	2	1	121ME-3 & 212ME-3
328EE-3	Electric Engineering -2	3	2	1	218EE-3
400ME-3	Summer Training	0			#
Total Number of Hours		**18**	**13**	**5**	
# Students must undergo summer training after the completion of all courses till level six according to the study plan.					

Courses in Fourth Year:

Seventh Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
411ME-3	Machine Elements Design -1	3	2	1	323ME-4
412ME-3	Production Engineering 2	3	2	1	324ME-3
413ME-3	Fluid Mechanics -2	3	2	1	322ME-3
414ME-2	Mechanical Measurements Instrumentation	2	1	1	323ME-4
419MATH-3	Numerical Analysis	3	3	-	101CMS-3 & 319MATH-3
424IE-2	Engineering Economy	2	2	-	
Total Number of Hours		**16**	**12**	**4**	

Eighth Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
421ME-3	Machine Elements Design -2	3	2	1	411ME-3
422ME-3	Production Engineering -3	3	2	1	412ME-3
423ME-4	Heat Transfer	4	3	1	322ME-3
424ME-3	System Dynamics & Mechanical Vibrations	3	2	1	319MATH-3 & 323ME-4
425ME-2	Industry And Environment Pollution	2	2	-	
Total Number of Hours		**15**	**11**	**4**	

Courses in Fifth Year:

Ninth Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
114IC1-2	Islamic Culture-4	2	2	-	
511IE-2	Engineering Reliability & Maintenance	2	2	-	
511ME-3	Production Engineering-4	3	2	1	422ME-3
512ME-3	Hydraulic Machines & Fluid Power Systems	3	2	1	413ME-3
514ME-3	Graduation Project (*Continued to Next Sem.*)	3	-	3	
Total Number of Hours		**13**	**8**	**5**	

Graduation project special conditions:

- **As a prerequisite for registration, the number of hours remaining from graduation should not exceed 36 hours (sum of the hours for levels 9 and 10 + 7 hours)**
- **The work in the project extends over two semesters, and the student is granted a continued grade by the end of the first semester after registration. By the end of the second semester he is granted his final grade after presenting and defending his project.**
- **In case the student failed in the project his is given a chance for one more semester and will be eligible to present and defend the project by the end of that semester.**

Tenth Level:

Course Code	Course Title	Credit Hours	Weekly Distribution of Credit Hours		Prerequisites
			Lectures	Exercises/ Tutorials	
513ME-4	Automatic Control	4	3	1	424ME-3
522ME-3	Power & Desalination Plants	3	2	1	423ME-4 & 512ME-3
523ME-3	Refrigeration and Air Conditioning	3	2	1	423ME-4
528IE-2	Industrial Managements & Quality Control	2	2	-	
Total Number of Hours		**12**	**9**	**3**	

ENGINEERING EDUCATION REQUIREMENTS
(95 Credit Hours and 131 Weekly Contact Hours)

01 General Engineering Courses (15 Credits & 22 Cont Hrs)

Sl No.	Course Code	Course Title	Credit Hours	Contact Hours	Prerequisites
01	111GE-3	Engineering Drawing -1	3	6	
02	218EE-3	Electric Engineering -1	3	4	129MATH-3 & 129PHYS-4
03	328EE-3	Electric Engineering- 2	3	4	218EE-3
04	424IE-3	Engineering Economy	2	4	
05	511IE-3	Engineering Reliability & Maintenance	2	2	
06	528IE-3	Industrial Managements & Quality Control	2	2	

02 Mechanical Engineering Courses (64 Credits & 88 Cont Hrs)

Sl. No	Course Code	Course Title	Credit Hours	Contact Hours	Prerequisites
01	121ME-3	Production Technology and Workshop	3	5	111GE-3
02	211ME-4	Engineering Mechanics	4	5	
03	212ME-3	Material Science -1	3	4	107CHEM & 129PHYS
04	223ME-3	Thermodynamics -1	3	4	119MATH-3 & 129PHYS-4
05	224ME-3	Engineering Drawing -2	3	5	111GE-3 & 101CMS
06	225ME-3	Strength of Materials & Testing	3	4	212ME-3
07	311ME-3	Material Science -2	3	4	212ME-3
08	312ME-3	Thermodynamics -2	3	4	223ME-3
09	322ME-3	Fluid Mechanics -1	3	4	223ME-3
10	323ME-4	Theory of Machines	4	5	211ME-4 & 225ME-3
11	324ME-3	Production Engineering - 1	3	4	121ME-3 & 212ME-3
12	411ME-3	Machine Elements Design-1	3	4	323ME-3
13	412ME-3	Production Engineering -2	3	4	324ME-3
14	413ME-3	Fluid Mechanics -2	3	4	322ME-3
15	414ME-2	Mechanical Measurements Instrumentation	2	3	323ME-3
16	421ME-3	Machine Elements Design -2	3	4	411ME-3
17	422ME-3	Production Engineering -3	3	4	412ME-3
18	423ME-4	Heat Transfer	4	5	322ME-3
19	424ME-3	System Dynamics & Mechanical Vibrations	3	4	319MATH-3 & 323ME-4
20	425ME-2	Industry and Environment pollution	2	2	
21	514ME-3	Graduation Project *	3	6	*
	*Graduation project special conditions	1. As a prerequisite for registration, number of hours remaining for graduation should not exceed 36 hours (sum of the hours for levels 9 and 10 + 7 hours).			
		2. The work in the project extends over two semesters and the student is granted a continued grade by the end of the first semester after registration. By the end of the second semester he is granted his final grade after presenting and defending his project.			
		3. In case the student failed in the project he is given a chance for one more semester and will be eligible to present and defend the project by the end of that semester.			

03 Mechanical Engineering Advanced Courses 16 Credits & 21Cont Hrs)

Sl No	Course Code	Course Title	Credit Hours	Contact Hours	Prerequisites
01	511ME-3	Production Engineering -4	3	4	422ME-3
02	512ME-3	Hydraulic Machines & Fluid Power Systems	3	4	413ME-3
03	513ME-4	Automatic Control	4	5	424ME-3
04	522ME-3	Power & Desalination Plants	3	4	423ME-3 & 512ME-3
05	523ME-3	Refrigeration and Air Conditioning	3	4	423ME-3

NON ENGINEERING (MATH &BASIC SCIENCE)/GENERAL EDUCATION REQUIREMENTS (66 Credit Hours and 74 Weekly Contact Hours)

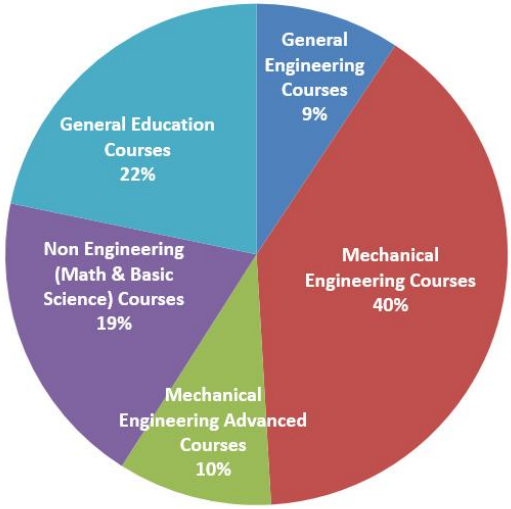
01 Non Engineering (Math & Basic Science) Courses (31 Credits & 35 Cont Hrs)

Sl No	Course Code	Course Title	Credit Hours	Contact Hours	Prerequisites
01	107CHEM-4	General Chemistry	4	5	
02	119MATH-3	Differentiation & Integration -1	3	3	
03	129PHYS-4	Physics -1	4	5	
04	219MATH-3	Differentiation & Integration -2	3	3	119MATH-3
05	219PHYS-3	Physics-2	3	4	129PHYS-4
06	229MATH-3	Differentiation & Integration -3	3	3	219MATH-3
07	319MATH-3	Differential Equations	3	3	219MATH-3
08	329MATH-3	Linear Algebra	3	4	129MATH-3
09	329STAT-2	Principles of Statistics & Probability	2	2	
10	419MATH-3	Numerical Analysis	3	3	101CMS-3 & 319MATH-3

02 General Education Courses (35 Credits & 39 Cont Hrs)

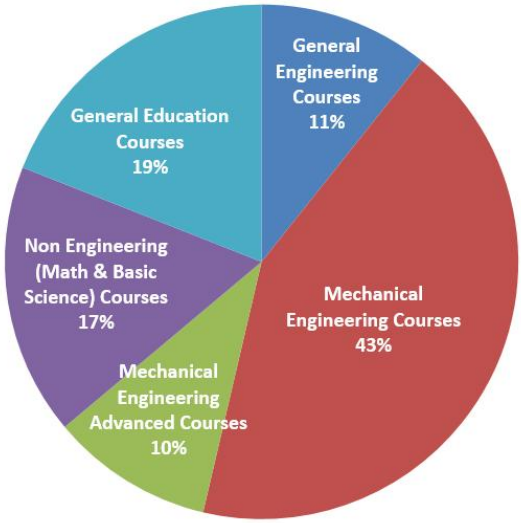
Sl No	Course Code	Course Title	Credit Hours	Contact Hours	Prerequisites
01	011ENG-6	Intensive English Program-1	6	12	
02	101CMS-3	Computer Science	3	4	
03	111IC1-3	The Entrance to the Islamic Culture -1	2	2	
04	129MATH-3	Algebra & Geometry	3	3	
05	012ENG-6	Intensive English Program-1	6	12	011ENG-6
06	112IC1-3	Islamic Culture -2	2	2	
07	201ARAB-2	Skills of Arabic Language	2	2	
08	202ARAB-2	Arabic Editing	2	2	
09	221GE-3	Computer for Engineers	3	4	101CMS-3
10	113IC1-4	Islamic Culture -3	2	2	
11	114IC1-5	Islamic Culture -4	2	2	
12	301NGL-2	Technical Report Writing	2	2	012ENG-6

Distribution of Credit Hours



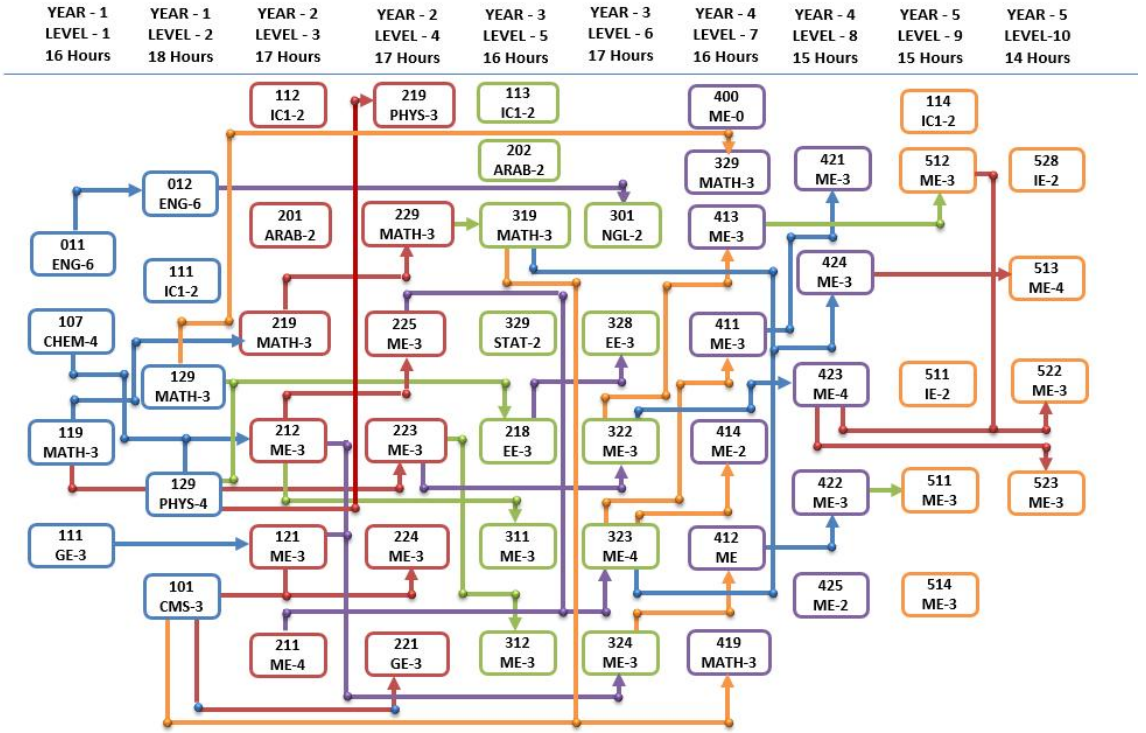
Total Credit Hours = 161

Distribution of Contact Hours



Total Weekly Contact Hours = 205

BSc. Mechanical Engineering Curriculum – Prerequisite Structure



ENG: English; CHEM: Chemical; PHYS: Physics; MATH: Mathematics; GE: General; IC: Islamic Culture; CMS: Computer; ARAB: Arabic; NGL: Language& Translation; STAT: Statistics; ME: Mechanical; EE: Electrical; IE: Industrial.

Distribution of Credit Hours and Contact Hours

Course Syllabi and Description
For
First year

	Level-1	
1	011ENG-6	Intensive English Program 1
2	107CHEM- 4	General Chemistry
3	111GE-3	Engineering Drawing -1
4	119MATH-3	Differentiation And Integration -1

	Level-2	
5	012ENG-6	Intensive English Program 2
6	101CMS-3	Computer Science
7	111IC1-2	The Entrance to the Islamic Culture
8	129MATH-3	Algebra and Geometry
9	129PHYS-4	Physics -1

Course Title	Intensive English Program 1
Course Code	011ENG-6
No. of Credit Hrs (Theoretical + Tutorial/Lab)	6 (0+6)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	12(0+12)
Level-Year	1-1
Prerequisite (if any)	None

1) Course Objectives:

- To prepare students to communicate in real life situations.
- To enhance students proficiency level in English.
- To enhance their aural comprehension and oral expression.
- To use the forms and constructions of basic grammatical structures.
- To enable students to write different forms of composition, such as letters, recommendations, paragraphs, e-mails etc.

2) Expected Learning Outcomes:

- To acquire the rules of spelling and pronunciation.
- To know different forms of writing.
- To acquire the basic grammatical structures of English.
- To identify different stress and intonation patterns.

3) Course Contents:

Unit 1:	• Listening skill focus: Reflecting on listening • Speaking skill focus: Asking for help with vocabulary
Unit II	• Listening skill focus: Activating background knowledge • Speaking skill focus: Reflecting on speaking • Topic: Plants; bees
Unit III:	• Listening skill focus: Activating background knowledge 2 • Speaking skill focus: Asking for clarification vocabulary
Unit IV:	• Listening skill focus: Predicting • Speaking skill focus: Taking time to think
Unit V:	• Listening skill focus: Listening for main ideas • Speaking skill focus: Clarifying
Unit VI	• Listening skill focus: Working out unknown vocabulary • Speaking skill focus: Asking for further information
Unit VII	• Listening skill focus: Identifying speculative language • Speaking skill focus: Using expressions to show interest
Unit VIII	• Listening skill focus: Listening for specific information • Speaking skill focus: Elaborating

Unit IX	• Listening skill focus: Identifying sequencers • Speaking skill focus: Saying percentages and fractions
Unit X	• Listening skill focus: Summarizing • Speaking skill focus: Giving presentations
Unit XI	• Listening skill focus: Listening for examples • Speaking skill focus: Giving opinions and responding to opinions
Unit XII	• Listening skill focus: Identifying important points • Speaking skill focus: Rephrasing to check understanding

4) Teaching Methods:

Following strategies can be applied in the classroom teaching:

- Activities-based teaching
- Writing Strategy : Guided, Controlled and Free
- Reading Strategy : Silent Reading, Model Reading, Reading Aloud and Shared Reading
- Listening Strategy: Listen-Think-Pair-Share, Questioning, Role-play.
- Speaking strategy: Students will be given opportunities to speak in the classroom

5) Mode of Evaluation:

- First written test:…… 25%
- Second written test: …… 25%
- Final Exam: …… 50%

6) Textbook(s):

- Blackwell, Angela. Open Forum (1) Academic Listening and Speaking. Oxford: Oxford University Press, 2007.
- Blass, Laurie. Well Read 1. Oxford: Oxford University Press, 2008.

7) References:

- McCarthy, Michael. Touchstone (1) Student's Book. Dubai: Cambridge and Obeikan, 2009.
- McCarthy, Michael. Touchstone (1) Workbook. Dubai: Cambridge and Obeikan, 2009.
- Rivers, Susan. Touchstone (2) Student's Book. Dubai: Cambridge and Obeikan, 2009. (Units 1-6)
- Rivers, Susan. Touchstone (2) Workbook. Dubai: Cambridge and Obeikan, 2009. (Units 1-6)

Course Title	General Chemistry
Course Code	107CHEM-4
No. of Credit Hrs (Theoretical + Tutorial/Lab)	4 (3+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (3+2)
Level-Year	1-1
Prerequisite (if any)	None

1) Course Objectives:

- Dealing with the concept of chemicals materials and evaluation of results in terms of accuracy of the measurement and so can understand the standard specifications.
- Understanding of material cases and thermal chemistry.
- Understanding of the electronic structure and linked to the periodic table of chemical and links.
- Gain some skills of practical experience in chemistry

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1	• Corn and molecule and ions.
Unit II	• Concentrations in chemistry and chemical calculations according to chemical equations weighted.
Unit III	• Gaseous state. • Electronic structure and the study of the periodic table.
Unit IV	• Covalent linkages. • Thermal chemistry.
Unit VI	• Liquid and solid state.

4) Teaching Methods:

- Lectures
- Training exercises
- Activities (Tutorial and Reports for different subjects in this field)

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (25 %)
- Practical Work and Assignments ……..…….. (25 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Masterton, W. L. and Saunders C. N. H., " Chemistry: principles and reactions ", Thomson Brooks / Cole Publication, USA, 5th ed., 2004.

7) References:

- Brown, T.L, Le May Jr, H.E., and Bursten, B.E, "Chemistry the Central Science" , Pearson Prentice Hall, 10th ed., 2006.

Course Title	Engineering Drawing-1
Course Code	111GE-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (0+3)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	6 (0+6)
Level-Year	1-1
Prerequisite (if any)	None

1) Brief Course Description:

This course is introducing engineering drawing 1 and its basics such as using of drawing tools, basics of engineering drawing, and training on engineering drawing reading of engineering drawing.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Know the principles of engineering drawing.
- Use mastering engineering drawing tools.
- Acquire imagination skills for projections of machine parts.
- Acquire skills of using the working drawings.

3) Course Contents:

Sheet Sizes, Scales, Lines and Lettering, Scales, Lettering – Engineering drawing tools and their using – Tangency operations – Projections – Isometric views – Free hand sketch – Dimensions – Missing views – Sectional Orthographic Projections – Surfaces intersections – Relations between point, line and surface.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Class work …….. (10 %)
- Home work …….. (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Simmons, C. and Maguire, D. "Manual of Engineering Drawing", 2nd ed., British and International Standards, 2004

7) References:

- Giesecke, F. E.; " Technical Drawing ", 2005.
- Griffiths, B. " Engineering Drawing for Manufacture (Manufacturing Engineering Modular Series)", 2002.

Course Title	Differentiation and Integration -I
Course Code	119MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
Level-Year	1-1
Prerequisite (if any)	None

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Recognize the importance of mathematics for basic science and engineering sciences
- Get used to the proper logical thinking.
- Build a strong mathematical basis of the basic concepts in the science of differentiation.
- Acquire a basic background in materials analysis and differential equations.
- Know the methods and strategies solution in many applications in the science of differentiation.

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1	• The real numbers, and inequalities, functions, differentiated function and its inversion, logarithmic and exponential functions, and hyperbolic and trigonometric functions and their inversion.
Unit II	• The definition of the limitation, the continuation, the properties of the periodic continues function, derivation, methods of derivation and derivation of serial functions.
Unit III	• Critical points, the absolute maximum values , local maximum values, the mean value theorem, increasing and decreasing, first derivative test, second derivative test, concavity, turning points, lines convergent.
Unit IV	• Drawing curves, applications of maximum value problems, correlated rates problems, L'Hôpital's rule, Taylor and Maclaurin unscrewed to function.

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Swokowski, E. W., Olinick, M. , Pence, D. and Cole, J. A. " Calculus ", PWS Publishing Company, 1994.

7) References:

Course Title	Intensive English Program 2
Course Code	012ENG-6
No. of Credit Hrs (Theoretical + Tutorial/Lab)	6 (0+6)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	12(0+12)
Level-Year	2-1
Prerequisite (if any)	011ENG-6

1) Course Objectives:

After the completion of this course, it is expected that the student be able:

- To introduce students to the basic terminology of technology.
- To prepare students to communicate in real life situations.
- To enhance students aural comprehension and oral expression.
- To use the forms and constructions of basic grammatical structures.
- To enhance students proficiency level in English.
- To enable students to write different forms of composition, such as letters, recommendations, paragraphs, e-mails etc.
- To enhance students level of reading comprehension

2) Expected Learning Outcomes:

- To acquire the rules of spelling and pronunciation.
- To know different forms of writing.
- To acquire the basic grammatical structures of English.
- To identify different stress and intonation patterns.

3) Course Contents:

Unit 1:	• Listening skill focus: Activating background knowledge
	• Speaking skill focus: Rephrasing on speaking
Unit II	• Listening skill focus: Reflecting on listening
	• Speaking skill focus: Elaborating to keep a conversation going
Unit III:	• Listening skill focus: Predicting
	• Speaking skill focus: Hesitating and taking time to think
Unit IV:	• Listening skill focus: Listening for main points
	• Speaking skill focus: Using imprecision
Unit V:	• Listening skill focus: Working out unknown vocabulary
	• Speaking skill focus: Asking for further information
Unit VI	• Listening skill focus: Identifying organizing phrases
	• Speaking skill focus: Expressing opinions
Unit VII	• Listening skill focus: Intensive listening for numbers
	• Speaking skill focus: Preparing for presentations
Unit VIII	• Listening skill focus: Identifying the purpose of a story or example

	• Speaking skill focus: Explaining a process
Unit IX	• Listening skill focus: Summarizing
	• Speaking skill focus: Checking for understanding
Unit X	• Listening skill focus: Identifying opinions and supporting arguments
	• Speaking skill focus: Using repetition for emphasis
Unit XI	• Listening skill focus: Identifying key words to understand details
	• Speaking skill focus: Managing conversation
Unit XII	• Listening skill focus: Using phrase to work out meaning
	• Speaking skill focus: Meaning a group discussion

4) Teaching Methods:

Following strategies can be applied in the classroom teaching:

- Activities-based teaching
- Writing Strategy : Guided, Controlled and Free
- Reading Strategy : Silent Reading, Model Reading, Reading Aloud and Shared Reading
- Listening Strategy: Listen-Think-Pair-Share, Questioning, Role-play.
- Speaking strategy: Students will be given opportunities to speak in the classroom

5) Mode of Evaluation:

- First written test:…… 25%
- Second written test: …… 25%
- Final Exam: …… 50%

6) Textbook(s):

- Blackwell, Angela. Open Forum (1) Academic Listening and Speaking. Oxford: Oxford University Press, 2007
- Blass, Laurie. Well Read 1. Oxford: Oxford University Press, 2008.

7) References:

- Rivers, Susan. Touchstone (2) Student's Book. Dubai: Cambridge and Obeikan, 2009. (Units 7-12)
- Rivers, Susan. Touchstone (2) Workbook. Dubai: Cambridge and Obeikan, 2009. (Units 7-12)
- McCarthy, Michel. Touchstone (3) Student's Book. Dubai: Cambridge and Obeikan, 2010.
- McCarthy, Michel. Touchstone (3) Workbook. Dubai: Cambridge and Obeikan, 2010.

Course Title	Computer Science
Course Code	101CMS-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	2-1
Prerequisite (if any)	None

1) Course Objectives:

After the completion of this course, it is expected that the student be able:

- To acquire and recognition computer and computer application
- To solve engineering problems through programming skills.

2) Expected Learning Outcomes:

- Identify the main parts of the computer.
- Recognition computer applications.
- Identify the way data is represented inside the computer.
- Identify the peripheral units and how they are used in the extraction and presentation of data.
- Acquisition of computers running skills and how to build computer networks.
- Acquire solve engineering problems through programming skills.
- Identification of artificial intelligence and its practical applications and engineering systems

3) Course Contents:

Unit 1 Theoretical Part and includes the following	• Computer definitions, different types of computers: digital computer, computer analogue, general-purpose computer, special purpose computer, the computer mixed, the fields of computer operation and engineering applications. • Computer architecture, the physical components of the computer: Modular I / O, and storage media, the types of computer memory, the unit of account and logic. • Knowledge of computer networks and communication systems. • Introduction to Artificial Intelligence and its practical applications and engineering systems. • Computer software, software development and programming languages. • Introduction to Algorithms, introduction to programming in a language of programming: arithmetic expressions, simple data

types, sentences input and output, control the conditional sentences, sentences repetition and its practical applications and engineering.

Unit II Practical Part	• The application includes programs and resolving issues in laboratories to deepen the understanding of theoretical lessons.
Unit III	• Project

4) Teaching Methods:

- Lectures
- Tutorial practical applications

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (20 %)
- Practical Work and Assignments ……..…… (30 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Yahia Habib &TalibSarie, "Introducing to Computers Science and Problem Solving", Dar WAEL, 2001, AmmanJordan, ISBN 9957-11-163-9.
- Greg Perry, “C++ by examples”, ISBN 1-56529-038-0, 2002.

7) References:

- Nell Dall, Chip Weems and Mark Headington, “Programming and Problem Solving With C++", ISBN 0-7637-1063-6, 2000.

Course Title	The Entrance to the Islamic Culture –I
Course Code	111IC1-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	2-1
Prerequisite (if any)	None

1) Course Objectives:

After the completion of this course, it is expected that the students can:

- Entrench correct doctrine derived from the Quran and Sunnah in the hearts of students.
- Understand the assets of Six faith.
- Realize what is contrary to faith or perfection.

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1	• The definition of culture and characteristics, and clarify the meaning of faith, and the call to faith, and faith assets.
Unit II	• Deism and the unification of divinity and their meaning and their relationship.
Unit III	• Methods of the Koran in calling for the unification of divinity, and photos of polytheism and dangerous
Unit IV	• Belief in the Angels and the position of the Koran and books of the previous books • Belief in the Messengers • The definition of heresy and kinds

4) Teaching Methods:

- Lectures

5) Mode of Evaluation:

- Mid-Term Test-1 ..... (25 %)
- Mid-Term Test-2 ..... (25 %)
- Final Exam ..... (50 %)

6) Textbook(s):

- Book guidance to the true belief and the response to the atheism -Dr.alfozan

7) References:

- Profiles in Islamic culture-Omar Khatib
- Unification-Mohammed Abdel Wahab
- The religion- Mohammed Draz

Course Title	Algebra and Geometry
Course Code	129MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
Level-Year	2-1
Prerequisite (if any)	None

1) Curse Objectives:

After the completion of this course, it is expected that the student be able to:

- Understand the basics of analytical geometry and algebra.
- Gain skills to imagine some regular objects in three dimensions.
- The acquisition of the application of these fundamentals to resolve issues related to previous topics skills.

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1	• Engineering: conical sectors, cylindrical and spherical coordinates, analytic geometry in three dimensions that include the straight and level surfaces of the second degree
Unit II	• Algebra: the theory of algebraic equations and the properties of the roots, matrices, operations on the matrices, some types of matrices, initial row transfer and its software applications, row reduction of matrices and its software applications, determinants and its computerized calculations, some limitations algebraic properties, inverse matrix, linear systems homogeneous and heterogeneous and its computerized solutions. Groups of linear equations, Cramer's Rule.

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Arthur Schultze; Frank Louis Sevenoak," Plane and Solid Geometry ", Adamant Media Corporation, 2004.
- David C. Lay, "Linear Algebra and its Applications ", 3rd ed., Addison-Wesley, 2005.

7) References:

Course Title	**Physics-1**
Course Code	**129PHYS-4**
No. of Credit Hrs (Theoretical + Tutorial/Lab)	**4 (3+1)**
No. of Contact Hrs (Theoretical + Tutorial/Lab)	**5 (3+ 2)**
Level-Year	**2-1**
Prerequisite (if any)	**None**

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Understanding the basics of material properties.
- Understand the basics of hydrostatics.
- Understand the basics of sound and light.
- The application of these basics to resolve problems related to previous topics.
- Perform some practical experiments

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1 Material properties:	Units and dimensions, the physical mechanics, include energy effort, rotational motion of inertia, elastic properties of the materials, hydrostatics and surface tension, viscosity and fluid dynamics.
Unit II Electrical:	Vector, the electric field, voltage, capacitors and insulating materials, magnetic field, magnetic force, the law of houses and wasvar, Ampere law, electromagnetic induction.
Unit III Sound:	The nature, types and phenomena of sound.
Unit IV Optics:	Refraction of light, the reflection of light, lenses and disadvantages.

4) Teaching Methods:

- Lectures
- Tutorials
- Practical experiments

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (20 %)
- Practical Work and Assignments ……. (30 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Richard Wolfson, " Essential University Physics", 2006.
- Hugh D. Young, " University Physics ", Volume 2, 2004.

7) References:

- Hugh D. Young and Roger A. Freedman, " University Physics with Modern Physics", 11th Ed., 2003.
- John D. Cutnell and Kenneth W. Johnson, " Physics ", 2003.

Course Syllabi and Description
For
Second year

Level-3		
10	112IC1-2	Islamic Culture -2
11	121ME-3	Production Technology And Workshop
12	201ARAB-2	Arabic Language Skills
13	211ME-4	Engineering Mechanics
14	212ME-3	Material Science -1
15	219MATH- 3	Differentiation And Integration -2

Level-4		
16	221GE-3	Computer for Engineers
17	219PHYS-3	Physics-2
18	223ME-3	Thermodynamics -1
19	224ME-3	Engineering Drawing -2
20	225ME-3	Strength of Materials & Testing
21	229MATH- 3	Differentiation And Integration -3

Course Title	Islamic Culture -2
Course Code	112IC1-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	3-2
Prerequisite (if any)	None

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Identify the implications of applying the Islamic regime the lives of individuals communities
- Knowledge of rights and rulers in Islamic law
- Recognition of human rights in the Islamic systems
- To identify the advantages of Islamic economy
- Identify the characteristics of the Islamic economy system

2) Expected Learning Outcomes:

3) Course Contents:

Unit I The political side	• Advantages of the political system in Islam • State concept in Islam • The purpose of the establishment of the state in Islam • Staff of the Islamic state • External relations of the Islamic countries in case of war and peace
Unit II	• The rules of the political system in Islam • Three authorities in the Islamic state • Aspects of the application of Islam in Saudi Arabia • Duties of the Guardian in the Islamic state • Definition of human rights in Islam • Human Rights in Islam • Muslims' relations with non-Muslims in Islam
Unit III The economic side	• The concept of Islamic economics • Islamic economic system properties • It targets the Islamic economic system.

Unit IV

- Mainstays in Islamic Economics
- Banks, its history, and its divisions
- Banking transactions
- Insurance and its divisions

4) Teaching Methods:

- Lectures

5) Mode of Evaluation:

- Mid-Term Test-1 …….. (25 %)
- Mid-Term Test-2 …….. (25 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- The political system in Islam-facilitation by Dr. Saad
- Economic System in Islam by Dr Omar Faihan

7) References:

- The relationship between the ruler and the ruled by Sheikh bin Baz
- Treatment of referees in the Quran and Sunnah by Dr. Abdul Salam Barjas

Course Title	Production Technology And Workshop
Course Code	121ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (1+2)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (1+4)
Level-Year	3-2
Prerequisite (if any)	111GE-3

1) Brief Course Description:

The overall aim of the present course is to explain the basics of production technology and workshop operations as well as a brief review of the engineering materials and the principals of automobile and electricity which may be useful in better understanding of the field of manufacturing technology.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Acquire a general knowledge about the Production technology.
- Understand the principals of the manufacturing processes.
- Handle the basics of production technology through the theoretical study and practical training at different workshops.

3) Course Contents:

The safety precautions – Classification the Engineering materials – Study the material properties – Dimensional measuring tools (Vernier caliper, Micrometer) – Principles of the sand casting - Wood working – Sheet metal forming – Fitting process – Basics of the metal machining – Fundamentals of welding process and its types – Electrical connections, circuits items and their rules, and electrical machines – Automobile components and basics of maintenance and repair.

4) Teaching Methods:

- Lectures
- Practical workshop training
- Interacting through E-learning

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams) ..... (30 %)
- Practical Work ..... (20 %)
- Final Exam. ..... (50 %)

6) Textbook(s):

- R. Thomas Wright, "Processes of Manufacturing", The Goodheart – Willcox Company 2004.
- John A. Schey, "Introduction to Manufacturing Processes", (McGraw-Hill Series in Mechanical Engineering & Materials Science), 2000.
- Chapman: "Workshop Technology". Volume: 1 , 2 & 3. Butterworth-Heinemann, 2003.

7) References:

- W. Scott Gauthier, "Automotive Encyclopedia", The Goodheart – Willcox Company, 2006.
- James, W. Nilsson. "Electric Circuits", Sixth Edition. Prentice-Hall, 2001.
- Charles Alexander and Matthew Sadiku, "Fundamentals of Electric Circuits", 2006.

Course Title	Arabic Language Skills
Course Code	201ARAB-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	3-2
Prerequisite (if any)	None

1) Course Objectives:

This course is

- For the development of Students Positive attitude towards the language regarding, reading ,writing, and Performance & the correctness of linguistic expression and avoiding error
- To provide the student with a glance at the language and its figure and the history of Arabic arts

2) Expected Learning Outcomes:

- To identify the types of words
- To know the sign of each type of words
- To differentiate noun, verb and particle
- To be acquainted with how to parse

3) Course Contents:

Unit 1: Introduction to Linguistic Skill + Types of words	• Introduce student to the course, its main goal and included scientific topics • Noun makers, Verb Makers etc
Unit II : Parsing of Noun and Verbs	• Apparent and non Apparent parsing of Nouns • Apparent and non Apparent parsing of Verbs • Major Parsing Sign of movement • Secondary Parsing Sign of movement
Unit III: Suffixation I	• Plural Masculine and Plural Feminine
Unit IV: Suffixation II	• Six Nouns
Unit V:	• Nouns Regularities

Case Ending	
Unit VI: Semantics	• Generalization and Specialization of words • Indication of Nouns and Verbs
Unit VII: Some Arab Figures	• Khalid bin Ahmed • Fareehidi • Sibawayh

4) Teaching Methods:

- Lectures & E Learning classes
- Dialogues and Discussion
- Self Learning

5) Mode of Evaluation:

- Mid-Term Test-1 …… (15 %)
- Mid-Term Test-2 …… (10 %)
- Assignments …… (25 %)
- Final Exam. …… (50 %)

6) Textbook(s):

- The concise of Arabic language grammer, Said AlAfghani ,Mustafa Ameen
- The philology and Arabic properties, Mohammad Almubarak
- The obvious syntax of Arabic Grammer

7) References:

- The Arabic Dictionary, D Raid Zaki Qasim
- The classical councils for Arabic language science and Arts

Course Title	Engineering Mechanics
Course Code	211ME-4
No. of Credit Hrs (Theoretical + Tutorial/Lab)	4 (3+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (3+2)
Level-Year	3-2
Prerequisite (if any)	None

1) Brief Course Description:

Engineering Mechanics is a study of the state of rest or motion of bodies under the action of forces. This course builds a foundation of analytic capability for the solution of a great variety of engineering problems. Topics covered include the statics and dynamics of particles and rigid bodies.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.
- Understand the principle of work and energy.
- Comprehend the effect of friction on equilibrium.
- Understand the laws of motion, the kinematics of motion and the interrelationship.
- Write the dynamic equilibrium equation.
- Understand the concepts and solve problems.

3) Course Contents:

Introduction to Engineering mechanics, Force vectors, Equilibrium of particles, Force system resultants, structure analysis, Friction, Center of gravity and centroid, Moment of inertia, Kinematics of a particle

4) Teaching Methods:

- Lectures
- Training exercises (Tutorial)
- Interacting through E-learning

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Hibbler R. C., "Engineering Mechanics", Vol 1: Statics and Vol 2: Dynamics, SI version, Prentice Hall, 2004.

7) References:

- Meriam, J. and L.G. Kraige , "Engineering Mechanics" , Vol. 1: Statics and Vol. 2: Dynamics , John Wiley and Sons Inc, 2001

Course Title	Material Science -1
Course Code	212 ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	3-2
Prerequisite (if any)	107 CHEM-4 & 129 PHYS -4

1) Brief Course Description:

This course covers and concentrates on the principles of material science such as atomic structure and interatomic bonding, crystal structure of materials, theory of diffusion, imperfections in crystals, mechanical testing and evaluation of materials, phase diagram and cooling curves of metals and alloys, iron-iron carbide diagram for steel and cast iron.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Use of new technology of material science.
- Understand the theory of atomic structure and interatomic bounding.
- Understand the theory of crystal structure of materials.
- Know of theory of diffusion.
- Analyze of imperfections in crystals.
- Acquire some skills of mechanical testing and evolution of materials.
- Determine of phase diagram and cooling curves of metals and alloys, iron-carbide diagram for steel and cast iron.

3) Course Contents:

Introduction to material science, atomic structure and type of inter atomic bonding, diffusion laws and mechanisms, type of crystal structure and type of defects in crystals, mechanical testing and evaluation of materials (tensile test, hardness (Vickers, Rockwell), impact etc.) and types of phase diagrams and iron-iron carbide diagram.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …… (50 %)

6) Textbook(s):

- Callister, W. D. Jr., “Material Science and Engineering: An Introduction”, Wiley, New York, 6th. Ed., 2006

7) References:

- William D. Callister, " Materials Science and Engineering", Wiley, 2007.

Course Title	Differentiation and Integration -2
Course Code	219MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
Level-Year	3-2
Prerequisite (if any)	119MATH-3

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Understand the basics of the limited and non-limited integration
- Recognize the relationship between differentiation and integration.
- Identify the different ways of integration.
- Understand serial functions and know how to deal with difficult integrals.
- Acquire the skill of calculating areas and volumes and resolve issues related to them.

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1	• Definition of limited integral using Riemann sum, the properties of the limited integration, the theory of average value in the integration, basic theory in calculus, the original function, the definition of unlimited integration, the substitute integration method, and integration methods : integration by parts, trigonometric substitutions, method of completing the square, the integrals of fractional functions , approximate methods of calculating limited integrations (trapezoidal method), integrals ailing,
Unit II	• Calculate areas and volumes of rotational objects, calculate the length of the curved arc, polar coordinates, draw some well-known curves in polar coordinates, area calculations by polar coordinates.

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Swokowski, E. W., Olinick, M. , Pence, D. and Cole, J. A. " Calculus ", PWS Publishing Company, 1994.

7) References:

Course Title	Computer for Engineers
Course Code	221GE-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	4-2
Prerequisite (if any)	101CMS-3

1) Brief Course Description:

This course covers and concentrates on the theory, methods of numerical analysis, study of Matlab software, and using the methods of numerical analysis and Matlab to solve some of Engineering Applications.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the necessary basics of using the computer in engineering applications.
- Gain the knowledge and experience of writing the algorithms for some engineering applications.
- Understand the basics of the methods of numerical analysis and solution of linear and nonlinear equations for some engineering applications.
- Gain the knowledge and experience for programming and drawing using the Matlab software.

3) Course Contents:

Vectors and Matrices Algebra – Solution of linear and nonlinear Algebraic equations – Data Analysis – Looping – Solution of Polynomials – Writing Algorithms to solve application problems using the tools of Matlab – Dealing with inputs and outputs and convert it to files – Using Matlab to plot 2-D and 3-D graphs – Understanding and writing the algorithms of matrices algebra – Determinates and analysis of matrices inverse. Using loops in matrix algebra – approximate solutions for different equations.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Stephen J. Chapman, "MATLAB Programming for Engineers", Cengage Learning; 5 edition, May 14, 2015.

7) References:

- Brian Hahn, Daniel T. Valentine "Essential MATLAB for Engineers and Scientists", 3rd Edition, Butterworth-Heinemann, Elsevier Ltd., 2007
- Steven C. Chapra, "Applied Numerical Methods with MATLAB for Engineers and Scientists", McGraw Hill, 2007.
- John H. Mathews and Kurtis D. Fink," Numerical Methods Using MATLAB ", Jones & Bartlett Pub, 3rd Ed, 2006.

Course Title	Physics-2
Course Code	219PHYS-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+ 2)
Level-Year	4-2
Prerequisite (if any)	129PHYS-4

8) Course Objectives:

This course aims to introduce basic knowledge of simple harmonic motion (SHM) - compute the frequency and period of simple harmonic oscillator (SHM) - the characteristics of waves- the nature of sound waves - factors affecting sound waves - Doppler effect. Study how light waves interfere - diffract (single slit), polarize. Study Black body radiation -Planck's quantum hypothesis. calculate the energy of photon, de Broglie wavelength of an electron. study the line spectra of atoms and Bohr model of atoms - specific heat of solid - the basic idea of Superconductivity.

9) Expected Learning Outcomes:

By the end of this course, the student should be able to:

- Recognize the condition for SHM.
- Compute the frequency and period of SHM.
- Determine the position, velocity and acceleration for SHM and to compute KE and PE of a simple harmonic oscillator.
- Define the characteristics of a wave.
- Determine the position equation for waves, the rate at which wave transport energy and the consequences of wave superposition.
- Describe the nature of sound waves, factors affecting sound waves
- Determine the intensity and level of sound waves and define Doppler effect.
- Explain how light waves interfere, diffract (single slit), polarize.
- Define Planck's quantum hypothesis and photoelectric effect.
- Calculate the energy of photon, de Broglie wavelength of an electron.
- Explain the Bohr model assumptions and to recall the formula of the wavelength for the different transition.
- Estimate specific heat of solids.
- Summarize the basic idea of Superconductivity.

10) Course Contents

1. Simple Harmonic Motion
2. Wave motion and Sound waves, Doppler Effect
3. Interference, Diffraction and Polarization of light
4. Plank's quantum theory of radiation
5. Photoelectric effect and photons
6. Compton Scattering
7. Wave properties of particles
8. Atomic Spectra and Bohr model of the atom
9. Lattice vibrations and specific heat of Solids
10. Superconductivity and introduction to Quantum Statistics

11) Teaching Methods:

- Lectures
- Tutorials
- Practical experiments

12) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work and Assignments ……..…… (20 %)
- Final Exam. …… (50 %)

13) Textbook(s):

- Richard Wolfson, " Essential University Physics", Pearson, 2006.
- Hugh D. Young, " University Physics ", Volume 2, Addison Wesley Longman, 2004.

14) References:

- Resnick and Halliday, "University Physics", Western and Crummet University
- Hugh D. Young and Roger A. Freedman, "University Physics with Modern Physics", Benjamin Cummings; 12 Ed., 2007.
- John D. Cutnell and Kenneth W. Johnson, "Physics ", Wiley, 6th Ed., 2003.

Course Title	Thermodynamics -1
Course Code	223ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	4-2
Prerequisite (if any)	129PHYS-4 + 119 MATH-3

1) Brief Course Description:

This course deals with the fundamental principles of thermodynamics such as heat, work, thermodynamic systems, and the first and second laws of thermodynamics and their applications on thermodynamics engineering problems. Also, this course presents a number of examples and problems concern to processes that occur in some equipments such as power plants, vapor compression refrigerators, thermoelectric coolers and rocket engines.

2) Expected Learning Outcomes:

Upon completing this course, it is expected that the students will be able to:

- Use of new technology for the treatment and synthesis of electric-generating power plant.
- Presents new concepts and definitions of statistical thermodynamics.
- Prepare the student to effectively use thermodynamics in the practice of engineering.
- Assist the student in gaining an understanding of thermodynamics.
- Provide an adequate preparation for study of more advanced topics in thermodynamics that the department might wish to have included in such course.
- Acquire some skills of designing steam power plants, gas turbine power plants, combined cycle power plant, desalination systems and the measurements that related to its operation.
- Understand the theory and application of the first law, second law, and steady flow and steady state applications.
- Present the material on the irreversibility and availability.

3) Course Contents:

Intorduction (some processes that occur in equipments; power plant, vapor compression refregirator) – **Fundametal concepts and defenitions** (Thermodynamic system and control volume – pocess and cycle – point and path function – specific properties) – **Properties and state of a Substance** (Pure substance – vapor, liquid, solid phase equilibium – Independent properties table) – **Work and Heat** (work done at moving boundary – work system – Heat transfer modes) – **First law of**

thermodynamics (mass and control volume and their conservations) – **Internal energy** and enthalpy – **The second low of thermodynamics** (heat engine and Refrigerators – reversible process – Carnot cycle – ideal gas) – **Entropy** system property – thermodynamic property relations – principle of increase of entropy) – **Irreversibility and Availability Processes** (available energy, reversible work, and availability and seond-law efficiency) – **Applications for steady state and steady flow** – **Uniform flow and some processes.**

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (20 %)
- Practical Work ……. (20 %)
- Experimental Tests …… (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Michael J. Moran and Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", Wiley, 6th Edn, 2007.

7) References:

- Richard E. Sonntag, "Fundamentals of Thermodynamics", 2004.
- Richard E. Sonntag, Claus. B. and Gordon J. Van Wylen, “Fundamentals of Thermodynamics", John Wiley & Sons, 2002.

Course Title	Engineering Drawing -2
Course Code	224 ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (1+2)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (1+4)
Level-Year	4-2
Prerequisite (if any)	101CMS-3 + 121ME-3

1) Brief Course Description:

The main objective of the study of the Engineering Drawing (2) course is to provide the future engineer with the means of reading and preparing the machine drawings and steel structural drawings using both manual and CAD techniques.

2) Expected Learning Outcomes:

Upon completing this course, it is expected that the students will be able to:

- Understand the different types of sections in machine drawings.
- Draw assembly machine drawings.
- Draw steel structural drawings.
- Use AutoCad software in machine drawing.

3) Course Contents:

General Concepts – sections in machine elements – assembly and working drawings. Basics of AutoCad – drawing commands – editing commands – hatching – layers – line types. Threaded joints. Fits and Tolerances. Welding Joints. Pipe Fittings. Steel Structure drawing

4) Teaching Methods:

- Lectures
- Practical manual drawing Labs
- AutoCAD Lab

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Class Work ……. (10 %)
- Home Work ……. (10 %)
- Final Exam. ……. (50 %)

6) Textbook(s):

- K.L. Narayana, P.Kannaiah, K. Venkata Reddy, “Machine Drawing” 3rd Edition, New Age international Publishers, 2015.
- S.S. Bhavikkatti, “Design and Drawing of Steel Structures”, I.K. International Publishing House, 2012.

7) References:

- Colin Simmons and Dennis Maguire, "Manual of Engineering Drawing Practice ", 2nd ed., 2004.
- Alan J. Kalameja, "The Autocad 2004 Tutor for Engineering Graphics with Autocad 2005 Update, Project Manual (AutoCAD)", 2005.
- Frederick E. Giesecke, "Technical Drawing", Prentice Hall/Pearson Education, 2003.

Course Title	Strength of Materials & Testing
Course Code	225ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	4-2
Prerequisite (if any)	212ME -3

1) Brief Course Description:

225ME-3 Strength of Materials and their testing is a 3-credit course designed to students at their fourth level in their respective colleges. This course is an initiation to the mechanical engineering design based on the general concept of stress and strain.
The objective of this course is that the student acquires the basis of Elasticity and Strength of Materials, such as general assumptions and hypothesis for strength of materials theories; different types of loading; normal stress and strain; mechanical properties of materials; Shear stress and strain; analysis of stress and deformation in axially loaded members, Trion formula in circular shafts; pure bending, shear force and bending moment diagram; stress and strain transformations, MOHR's circle.
The main purpose of studying strength of materials and their testing in mechanical engineering is to provide graduate engineers with the means of analyzing and designing various machines components and load-bearing structures. Both analysis and design of a given structure involve the determination of stresses and strain. Then, student - engineers will be able to select/calculate/define the suitable material/loads/dimensions for a given application under a given conditions. This course has been carefully designed to meet the student's basic needs at this level.

2) Expected Learning Outcomes:

Upon completing this course, it is expected that the students will be able to:

- Outline assumptions and general objective for strength of materials theories.
- Differentiate the relationship between internal loads and type of loading.
- Explain the difference between normal stress and shear stress.
- Solve problems of statically indeterminate.
- Calculate shear stress and twisting angle in torsion.
- Design thin-walled pressure vessels.
- Calculate the bending stresses in beams.
- Illustrate shear force and bending moment diagrams of simple beams
- Analyze stresses in two dimensions and understand the concepts of principal stresses and the use of Mohr circles to solve two-dimensional stress problems.

- Analyze and calculate simple problems involving stresses and strain in two dimensions.
- Manipulate simple experiments illustrating properties of materials in tension, HOOKE's law investigation, torsion and bending tests.

3) Course Contents:

CHAPTER 1: Introduction to Strength of materials and Static Review
CHAPTER 2: Tension, compression and shear
CHAPTER 3: Axially Loaded Members
CHAPTER 4: Torsion
CHAPTER 5: Thin-Walled Pressure Vessels
CHAPTER 6: Pure Bending
CHAPTER 7: Shear force and Bending Moment Diagram
CHAPTER 8: Stress and strain transformation

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……..……(20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- R.C. Hibbeler, "Mechanics of Materials", English edition in SI units, Prentice Hall, 2000.

7) References:

- Russel Hibbeler, "Engineering Mechanics, Statics and Dynamics", Pearson, 11th ed., 2015.
- Johnston Mazurek and Cornwell Sangli, "Vector Mechanics for Engineers", McGraw Hill, 10th ed., 2014.
- Ferdinand P. Beer, Jr., E. Russell Johnston, and John T. DeWolf , "Mechanics of Materials", 2005.

Course Title	Differentiation and Integration -3
Course Code	229MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
Level-Year	4-2
Prerequisite (if any)	219MATH-3

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Understanding the basics of sequences and infinite series.
- Learn how to apply these basics to represent different functions by series.
- Understand the basics of the integration of functions in more than one variable and their applications.
- Acquisition analysis, and inference skills and how to deal with integrals and series

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1
- Sequences, infinite series, and convergence tests. The representation of functions by power series. Taylor. Mc Leoran. Binomial theory with any power. Complex numbers, De Moivre. Cartesian, cylindrical, and spherical coordinates. Functions in two or three variables. Limitations.

Unit II
- Continuation, partial derivatives, chain rule, the maximum values of functions in two variables, LaGrange factors, bilateral integration and its applications, bilateral integration in polar coordinates, triple integration and applications, triple integration in cylindrical and spherical coordinates , integration on a curve and on the surface, Green theory.

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Swokowski, E. W., Olinick, M. , Pence, D. and Cole, J. A. " Calculus ", PWS Publishing Company, 1994.

7) References:

Course Syllabi and Description
for
Third year

	Level-5	
22	113IC1-2	Islamic Culture -3
23	202ARAB- 2	Arabic Editing
24	218EE-3	Electric Engineering -1
25	311ME-3	Material Science -2
26	312ME-3	Thermodynamics -2
27	319MATH- 3	Differential Equations
28	329STAT-2	Principles of Statistics And Probability

	Level-6	
29	301NGL-2	Technical Reports Writing
30	329MATH-3	Linear Algebra
31	322ME-3	Fluid Mechanics -1
32	323ME-4	Theory of Machines
33	324ME-3	Production Engineering -1
34	328EE-3	Electric Engineering -2

Course Title	Islamic Culture -3
Course Code	113IC1-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	5-3
Prerequisite (if any)	None

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Identify the characteristics of the Muslim community
- Acquainted with the teachings of Islam in the area of family formation
- Acquainted with the teachings of Islam and guidance
- The concept of the Muslim community

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1
- The concept of the Muslim community
- Rights in Islam
- The concept of an Islamic society

Unit II
- Muslim community properties
- And means of strengthening social ties
- The most important social problems

Unit III
- Family in Islam
- Introductions of marriage
- Marriage and his goals

Unit IV
- The impact of the marriage contract
- And means of strengthening family ties
- The most important family issues

4) Teaching Methods:

- Lectures

5) Mode of Evaluation:

- Mid-Term Test-1 …….. (25 %)
- Mid-Term Test-2 …….. (25 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Islam and society to Professor Hassan Abdul Ghani

7) References:

- Islam and society, Dr. Ahmed Mohammed El-Assal
- The assets of the social system in Islam, Dr. Muhammad Tahir Ashour

Course Title	Arabic Editing
Course Code	202ARAB-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	4-2
Prerequisite (if any)	None

1) Course Objectives:

- To write the correct spelling according to right rule
- To learn techniques of Arabic writing
- To avoid frequent errors
- To master the use of punctuation

2) Expected Learning Outcomes:

- Enable student to write according to writing rules
- Learn the techniques of Arabic writing

3) Course Contents:

Unit I: Introduction to Arabic Writing	• Introduce student to the course, its main goal and included scientific topics • Clarify the course learning
Unit II :Hamza	• Hamza at beginning, middle and end of words
Unit III: Punctuation	• Punctuation rules
Unit IV: Error	• Common errors
Unit V: Rules of Writing	• Essay • Research • Letter • Report • Summary

4) Teaching Methods:

- Lectures & E Learning classes
- Dialogues and Discussion
- Self Learning

5) Mode of Evaluation:

- Mid-Term Test-1 …… (20 %)
- Mid-Term Test-2 …… (20 %)
- Oral Participation…… (05 %)
- Assignment…… (05 %)
- Final Exam. …… (50 %)

6) Textbook(s):

- The Art of Arabic Writing- Mohammed Saleh Shanti

7) References:

- The rule of spelling-Abdul Salam Haroun
- Dictionary of Parsing and spelling-Amel Jacob
- Notebook-Abdul Hadi Harb

Course Title	Electric Engineering-1
Course Code	218EE-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	5-3
Prerequisite (if any)	129MATH-3 & 129PHYS-4

1) Course Objectives:

- Familiarize the students with basic electrical quantities, different components of electric circuits, basic laws: ohm's law and Kirchhoff's Law.
- To understand and apply the different methods to solve DC electric circuit.
- Understanding the concept of maximum power transfer.
- Familiarize with AC circuit components.
- Understanding the different methods to solve AC electric circuit.
- Increasing the student's ability to treat with experimental circuits.

2) Expected Learning Outcomes:

At the end of this course, the student should be able to

- Study DC and AC circuits
- Basic concepts, components of Electric Circuits
- Ohm's law & Kirchhoff's laws).
- Resistance and source combinations.
- Techniques for solving DC electric circuits.
- AC sinusoidal sources, time domain and frequency domain,
- Inductance and capacitance.

3) Course Contents:

Unit 1:	• Basic concepts, components of Electric Circuits.
Unit II :	• Laws (Ohm's law & Kirchhoff's laws).
Unit III:	• Resistance and source combinations. Voltage and current division.
Unit IV:	• Techniques for solving DC electric circuits.
Unit V:	• AC sinusoidal sources, time domain and frequency domain,
Unit VI:	• Inductance and capacitance.
Unit VII:	• Phasor, impedance and phasor diagram.
Unit VIII:	• Techniques for solving AC electric circuits and Steady state power.

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……..……(20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- "Electric Circuits", James W. Nilsson and Susan A. Riedel, Addison Wesley, 10th Edn.

7) References:

- "Basic Engineering Circuit Analysis", J. D. Irwin, Fourth edition, Macmillan

Course Title	Material science-2
Course Code	311ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	5-3
Prerequisite (if any)	212ME-3

1) Brief Course Description:

This course covers and concentrates on principles of material science, properties, manufacturing and applications of materials. Materials are polymers, ceramic ferrous and nonferrous, also technology of producing materials such as powder metallurgy.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Gain Knowledge of introduction to material science
- Gain Knowledge of polymer
- Gain Knowledge of ceramic.
- Gain Knowledge of ferrous and nonferrous material.
- Gain Knowledge of powder metallurgy
- Gain Knowledge of wear and corrosion of material.
- Gain Knowledge of , iron-carbide diagram for steel and cast iron and Heat-treatment of metals and alloys

3) Course Contents:

Introduction to material science, production, application of polymer manufacturing and properties of ceramic, wear and corrosion behavior of metals and alloys, powder metallurgy technology. Properties, applications of ferrous and nonferrous materials. Heat treatment of metals and alloys

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Callister, W. D. Jr., “Material Science and Engineering: An Introduction”, Wiley, New York, 6th. Ed., 2006

7) References:

- William D. Callister, " Materials Science and Engineering", Wiley, 2007.

Course Title	Thermodynamics -2
Course Code	312ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	5-3
Prerequisite (if any)	223ME-3

1) Brief Course Description:

This course covers and concentrates on the theory, design, performance and operation principles of the heat engine, including a number of examples and problems to which thermodynamics can be applied, problems refer to processes that occur in equipment such as steam power plant, vapor compression refrigerator.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the performance and operation principles of the heat engine and their applications on thermodynamics problems.
- Design of the power plant system.
- Analyze of the power plant system.

3) Course Contents:

Introduction &Review: First law of thermodynamics- reversible thermodynamic processes- Second Law of Thermodynamics: Kelvin-Planck Statement- Calusius Statement- Heat engine – Reversed engine (Refrigerator-heat pump)- Carnot cycle-Entropy: Clausius inequality-Entropy-Entropy changes in reversible processes-principle of increase entropy -Availability &Irreversibility-Steam Cycle: Simple steam cycle (Rankine cycle)- Reheat cycle- Regenerative cycle-Air standard cycle: Otto cycle- Diesel Cycle- Dual Cycle-simple gas turbine cycle - Refrigeration cycle-Gas mixtures General considerations and mixtures of ideal gases--simplified model of mixture involving gases and vapor- the first law applied to gas-vapor mixture Thermodynamic relations: The Clapeyron Equation- Maxwell relations-Some thermodynamic relation involving Enthalpy, internal energy and entropy- Chemical reaction: Fuels-Combustion process

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (20 %)
- Practical Work …….. (20 %)
- Experimental Tests …….. (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Yunus A. Cengel and Michael A. Boles, “Thermodynamics: An Engineering Approach”, McGraw-Hill; 7th ed., 2010.

7) References:

- Claus Bargnakke, Richard E. Sonntag, “Fundamentals of Thermodynamics”, 7th ed., 2012.
- Michael J. Moran and Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 2007.

Course Title	Differential Equations
Course Code	319MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
Level-Year	5-3
Prerequisite (if any)	219MATH-3

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Understand the types of differential equations of the first degree, second and their applications.
- Recognize the importance of differential equations in engineering sciences.
- Understand the basics of solving these equations using the series.
- Understand the basics of Fourier series and Fourier transformations and their applications.
- Acquire the skills to solve differential equations and to address different applications.

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1
- Delete constants, ordinary differential equations of the first degree (separation of variables, homogeneous, full, linear, integral factor, Bernoulli, Rakata, linear coefficient)

Unit II
- Differential equations of the second degree (linear independence and dependence of functions, Runsky.

Unit III
- The equations of the upper class with constant coefficients , heterogeneous rates, demotion method (method unknown coefficients (specified), method of differential effects and their properties, how to change the parameters, differential equations applications, the solution using the series (near regular points, near the anomalous points)

Unit IV
- Electrical circuits and networking applications. Laplace transforms and its applications to solve differential equations. Fourier series and Fourier transformations, unscrewed Fourier compound, Fourier integrals

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- William E. Boyce, Richard C. Diprima, "Elementary Differential Equations and Boundary Value Problems", John Wiley & Sons, 2004.

7) References:

Course Title	Principles of Statistics and Probability
Course Code	329-STAT-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	5-3
Prerequisite (if any)	None

1) Course Objectives:

After the end of this course the student is expected to be able to:

- Acquire the skill to organize statistical data and summarized the ways the tabular, guardian of numerical, graphical and related mathematical metrics and descriptive.
- Knowledge of the principles of statistics and probability.
- Understand the views of statistical inference by: assessment and selection of hypotheses

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1 • Methods of presentation of statistical data, measures of central tendency.

Unit II • Measures of dispersion, regression and correlation and their applications

Unit III • An initial introduction to the theory of probability

Unit IV • Random variables and functions related to the probability and probability distributions.

4) Teaching Methods:

- Lectures
- Tutorials
- Computer applications

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Donald Harnett, “Introduction to Statistical Methods ", Addison Wesley Longman Publishing Co., latest Edition.

7) References:

Course Title	Technical Reports Writing
Course Code	301NGL-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	6-3
Prerequisite (if any)	012ENG-6

1) Course Objectives:

- To help develop communicative writing skills
- To enrich the understanding of the roles that writing and reading play in activities outside and inside the university.
- To offer a structured approach to writing.
- To familiarize students with the process of writing.
- To develop their grammar and mechanical writing skills.
- To enable students to write technical reports.

2) Expected Learning Outcomes:

After studying this course, the students will be able to:

- Rules of Capitalization
- Use of punctuation
- Understanding the concept of paragraph
- Three basic types of paragraph
- Chronological process
- Spatial description
- Listing
- How to use examples
- How to express and support their opinions
- How to write brief technical reports

3) Course Contents:

Unit 1:
- Warming up/ Orientation
- Organization
- Grammar & Mechanics
- Sentence Structure
- The Writing Process

Unit II
- Prewriting Brainstorming Part 1: Organization
- Sentence Structure
- Grammar & Mechanics
- The Writing Process

Unit III:
- Prewriting Descriptive Details Part 1 Organization
- Grammar & Mechanics
- Sentence Structure
- Writing process

Unit IV:
- Prewriting Part 1 Organization
- Part 2 Sentence Structure Part 3 Grammar & Mechanics & Part 4 The Writing Process

4) Teaching Methods:

Following strategies can be applied in the classroom teaching:

- Modeling
- Repeated practice
- Guided, Controlled and Free Writing

5) Mode of Evaluation:

- First written test:…… 25%
- Second written test: …….. 25%
- Final Exam: …… 50%

6) Textbook(s):

- Hogue, Ann. First Steps in Academic Writing

7) References:

- Academic Journals
- New inventions
- Situation based material

Course Title	Linear Algebra
Course Code	329MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	6-3
Prerequisite (if any)	129MATH-3

8) Curse Objectives:

The aim of the course is to acquaint students with selected notions and problems of linear algebra.

9) Expected Course Learning Outcomes:

By the end this course, it is expected that the student be able to:

1- Understand and apply matrix and vector algebra, and relate matrices to linear transformations.
2- Solve systems of linear equations using methods like Gauss Elimination etc.
3- Calculate the determinant of square matrices
4- Perform basic matrix operations
5- Determine whether the matrix is positive definite, negative definite or indefinite by finding Eigen values
6- Understand and apply fundamental concepts of vector spaces such as span, linear independence, basis, and dimension.

10) Course Contents:

- **Algebra of Matrices:** Matrices, Matrix Addition and Scalar Multiplication, Matrix Multiplication, Transpose of a Matrix, Square Matrices, Diagonal and Trace, Powers of Matrices, Invertible (Nonsingular) Matrices, - Cofactors and Inverses ,Diagonal and Triangular Matrices, Symmetric matrices.

- **Determinants:** The definition of the determinant of a square matrix. The calculation of the determinant by cofactor expansion, the determinant by elementary operations. Properties of the determinant function. Inverse of Matrix.

- **Systems of Linear Equations**: Basic Definitions, Equivalent Systems, Elementary Operations, Systems in Triangular, Gaussian elimination, Echelon Matrices, Row Canonical Form, Row Equivalence, Matrix Equation of a System of Linear equations - Homogeneous Systems of Linear equations, Cramer's rule.

- **Vectors in Two and Three Dimensions:** Algebraic Notation**,** The geometric Notation, The Standard Basis Vectors Parametric Equation of line, Symmetric Equation of Lines
  The Dot Product: Dot Product of Two Vectors, Orthogonal Vectors, Angle Between Vectors, Vector Projections.
  The Cross Product: The Cross Product of Two Vectors in R^2 and R^3, Coordinate Formula, Areas and Volume Independence, Spanning Set and Basis - Coordinate and Dimension - Null Space, Row space and Column Space - Change of Basis
- **Linear Transformations:** Definition of Linear Transformations in R^2 and R^3, related Matrices to linear Transformations – Eigenvalues and Eigenvectors and their geometric meaning

11) Teaching Methods:

- Lectures
- Tutorials

12) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams) ……..……(50 %)
- Final Exam. ……..(50 %)

13) Textbook(s):

- Howard, Anton, Chris Rorres, “Elementary Linear Algebra”, ISBN 978-1-118-43441-3

14) References:

- S. Leon, "Linear Algebra with Applications", Pearson, 8th edition, 2008
- Shafarevich, Igor R., Remizov, Alexey ,“Linear Algebra and Geometry” 2013.

Course Title	Fluid Mechanics -1
Course Code	322ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	6-3
Prerequisite (if any)	223ME-3

1) Brief Course Description:

The course aims to provide the student with the basic concepts required to understanding and solving the fluid mechanics problems applied on engineering.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand and differentiate between different types of fluid.
- Measure pressure using U tube pressure and bourdon tube pressure,
- Calculate the hydrostatic forces on plane areas.
- Study the stability of floating bodies.
- Determine the flow type and calculating the flow velocity and acceleration.
- Calculate the energy losses in flow through pipes.
- Use Bucking ham's theorem to make dimensional analysis.

3) Course Contents:

Introduction: Fluid definition, **Dimensions and units-Fluid properties**: Density, specific volume, specific weight, compressibility and bulk modulus of elasticity, surface tension , vapor pressure and viscosity- **Fluid Static** : Basic equation of pressure variation of fluid in statics, Manometers, hydrostatic force on plane surface-**Buoyancy and Stability of floating body**- **Fluid Kinematics**: fluid under linear motion (velocity and acceleration), stream line, vortices and circulation; concept of control volume, integral from continuity, Differential form of continuity equation-stream function, potential function- **Fluid Dynamics**: Momentum equation-application of momentum equation (force water exerted by jet on surfaces- force on reducing bend) - **Energy Principles**: Bernoulli's equation- Hydraulic gradient line-energy gradient line flow measurements (pito tube-venturimeter- orifice meter)- **Flow through Pipes**: Laminar and turbulent flow- losses of energy in pipe-Dimensional analysis and similarity: Bucking ham's theorem.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs).
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……..…….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Clayton T. Crowe, Donald F. Elger and John A. Roberson, Engineering Fluid Mechanics", John Wiley& Sons, Inc., 8th Ed., 2006.

7) References:

- Frank M. White, "Fluid Mechanics" McGraw Hill Comp. 2003.
- Robert W. Fox, Alan T. McDonald and Philip J. Pritchard “Introduction to Fluid Mechanics", 2005.

Course Title	Theory of machines
Course Code	323ME-4
No. of Credit Hrs (Theoretical + Tutorial/Lab)	4 (3+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (3+2)
Level-Year	6-3
Prerequisite (if any)	211ME-4 & 225ME-3

1) Brief Course Description:

This course covers and concentrates on the theory, design, performance, and principles of the Kinematics and Kinetics which deal with motion; position; velocity and acceleration (Dynamics of machines).

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic concepts of machines and mechanisms.
- Compute the velocity and acceleration diagrams of all basic mechanisms.
- Draw velocity and acceleration diagrams of basic link mechanism.
- Understand the types of cam & follower.
- Draw the follower displacement and came profile.
- Understand the basic concepts of the rotating masses
- Apply different formulae to compute the balancing forces
- Understand the functions, types and characteristics of governors.
- Apply the theory of governors to solve numerical problems.

3) Course Contents:

Definition of Mechanisms and Machines – Degree of Freedom and Inversion – Displacement, Velocity and Acceleration Analysis of Mechanisms – Cam Design – Gear Theory – Governor – Balancing.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- R. S. Khurmi and J. K. Gupta, “Theory of Machines”, S. Chand Co, 14th ed., 2014.

7) References:

- Charles E. Wilson and J. Peter Sadler, "Kinematics and Dynamics of Machinery" Pearson, 3rd ed., 2008.
- Mabie H. and Reingoltz C. F., "Mechanisms and Dynamics of Machinery", John Wiley and Sons, New York, 4th ed., 1987.

Course Title	Production Engineering-1
Course Code	324ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	6-3
Prerequisite (if any)	121ME-3 & 212 ME-3

1) Brief Course Description:

This course covers the principles of the conventional machining processes. The different conventional machining operations, the tool and workpiece fixation methods, the machine specifications and the kinematic systems represent main items in this course. Furthermore, the course includes finishing operations and engineering metrology.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic knowledge needed for engineers in the fields of conventional metal cutting, finishing operations, dimensional measurements, and surface roughness assessment.
- Develop his information in the conventional machining operations, the different parts and kinematic systems of the machine tools, and evaluation of product quality.

3) Course Contents:

General Introduction: Manufacturing Processes – Types of machining, **Principles of conventional machining:** (Independent and dependent variables in conventional metal cutting, chip types, tool geometry, cutting – tool materials, cutting fluids, **Conventional Machining Processes: Turning Processes:** Principles, operations, The machine (centre lathe) components, Specifications of the machine, fixation of tools and workpieces, Kinematic systems, roughing and finishing operations, **Drilling Processes:** Principles, operations, The machine components, Specifications of the machine, fixation of tools and workpieces, Kinematic systems, **Milling Processes:** Principles and types, operations, The machine components, Specifications of the machine, fixation of tools and workpieces, Kinematic systems, **Planning and shaping Processes:** Principles, operations, The machine components, Specifications of the machines, fixation of tools and workpieces, Kinematic systems, **Grinding Processes:** Principles, abrasives, grinding wheels, fixation of grinding wheels, process types, temperature in grinding, grinding fluid, operations, machines, work piece fixation, **Finishing Operations:** Principles, examples (coated abrasives, honing, lapping, and polishing – principles and applications, and **Engineering Metrology: Introduction** -

Linear Measurements (Direct and indirect reading), - Angle Measurements, Gage Blocks, Fixed Gages, Surface Texture, Roughness Measurements, Dimensional Tolerances.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Phillip F. Ostwald & Jairo Munoz, "Manufacturing Processes and Systems", John Wiley & Sons. Inc., New York, 9th Edition, 1997.

7) References:

- E. Paul Degormo, J.T. Black, and Ronald A. Kohser, “Materials and Processes in Manufacturing", John Wiley & Sons. Inc., New York, 9th Edition, 2003.

Course Title	Electric Engineering-2
Course Code	328EE-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	6-3
Prerequisite (if any)	218EE-3

1) Course Objectives:

At the end of the semester, students should be able to:

- Learn the basics of the magnetic (principle of generation)
- Discuss the different types of transformers
- List transformer symbols and formulas
- Know how DC machine works
- Use the equivalent circuit of DC Motors to investigate it
- Know how AC machine works
- Can determine the equivalent circuit parameter from tests

2) Expected Learning Outcomes:

3) Course Contents:

- Magnetic Circuits: (Magnetic circuit definition, Magnetic circuit concept and analogy, Magnetization curves of ferromagnetic materials, Magnetic circuit losses)
- Transformers: (Introduction and construction, Theory of operation, Equivalent circuit, Equivalent circuit parameter determination from tests, Voltage regulation and efficiency)
- Direct Current (DC)Machines (Introduction and construction, Generation of unidirectional voltage, Inducted EMF equation, DC machines classification, Equivalent circuit of DC generator, DC generator characteristics, Equivalent circuit of Dc Motor, DC Motor characteristics)
- AC Machines (Introduction and construction, Three-phase Induction Motors, Equivalent circuit and performance calculation, Power and torque calculation, Torque-Speed characteristics)
- Synchronous Machines (Introduction and construction, Generation EMF equation, Equivalent circuit, Equivalent circuit parameter determination from tests)

4) Teaching Methods:

- Lectures
- Tutorials

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Quizzes and Assignments……..…… (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- ''D P Kothari and I J Nagrath, Basic Electrical Engineering, Prentice Hall, 2nd Ed., 2004

7) References:

- ''Allan R. Hambley, Electrical Engineering principles and Applications, Prentice Hall, 4th Ed., 2007.

Course Syllabi and Description
for
Fourth Year

Level-7		
35	411ME-3	Machine Elements Design -1
36	412ME-3	Production Engineering 2
37	413ME-3	Fluid Mechanics -2
38	414ME-2	Mechanical Measurements Instrumentation
39	419MATH-3	Numerical Analysis
40	424IE-2	Engineering Economy

Level-8		
41	421ME-3	Machine Elements Design -2
42	422ME-3	Production Engineering -3
43	423ME-4	Heat Transfer
44	424ME-3	System Dynamics & Mechanical Vibrations
45	425ME-2	Industry And Environment Pollution

Course Title	Machine Elements Design -1
Course Code	411ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	7-4
Prerequisite (if any)	323ME-3

1) Brief Course Description:

The first part of the course is the application of basic engineering fundamentals (materials, mechanics of deformable bodies, statics, dynamics, kinematics, etc.) to designing mechanical elements. This portion of the course will develop enough understanding of failure so that mechanical members can be designed to satisfy specified needs. The second part of the course applies basic principles to the design of common mechanical devices. The design principles and equations used for predicting satisfactory performance are presented.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Apply engineering analysis principles and methods to the proper analysis of a variety of common mechanical system components.
- Design these mechanical system components so as to perform safely their intended functions in harmony with other components of the system.
- Use information resources to identify appropriate and elegant component solutions for mechanical system design problems, locate sources for these components, and understand the analysis and design methods for these components.

3) Course Contents:

Introduction to mechanical engineering design; Material properties, Stress types and their calculations, Generated stress from other forms of loading (Bending, Torque), Principal stress, Failure theories, Riveted joints design, Welded joints design, Shaft and shaft components design

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Shigley , J.E. and Mischke , C.R., "Mechanical Engineering Design", McGraw Hill, 2004.

7) References:

- Avallone , E.A. & Maumeister , T. B., "Marks Standard Handbook for Mechanical Engineers", McGraw-Hill , 10th ed., 1997.
- Lingaiah, K., " Machine Design Data Handbook", McGraw Hill, USA., 1994.

Course Title	Production Engineering -2
Course Code	412 ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	7-4
Prerequisite (if any)	324ME-3

1) Brief Course Description:

This course covers the different ways for materials manufacturing processes through forming techniques. It concentrates on the technology of casting and welding processes. Also the plastic deforming processes such as forging, rolling, and extrusion are included in this course whatever it is hot or cold. Moreover, it involves the sheet metal working processes.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the principles of the material forming properties such as fusibility, plasticity, and ductility and the processes depending on them.
- Gain the skills about the procedures of the casting processes especially the sand casting.
- Obtain the attitudes of permanent metal joining processes such as welding techniques.
- Get the information about the different methods of plastic deformation operations.
- Know the technology of the sheet metal working processes.

3) Course Contents:

Theoretical Part:
Casting technology – Different casting techniques – Molding materials and their properties – Melting furnaces – Charging materials and their calculations – Pouring system design – Metals and alloys solidification – Casting defects and methods of detection – Welding process (Fusion, Electric, Gas) – Soldering – Brazing - Hot and cold plastic deformation processes (Rolling, Forging, Extrusion, Drawing) – Sheet Metal working processes.

Practical Part:
It includes practical exercises on forming some machine elements through sand casting, welding, forging, and sheet metal working processes.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Kalpakjian, S & Schmid, S. R., "Manufacturing Engineering and Technology", Pearson, 5th Edition, 2005.

7) References:

- Tlusty G., "Manufacturing Processes and Equipment", Prentice Hall, 2000.

Course Title	Fluid Mechanics-2
Course Code	413ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	7-4
Prerequisite (if any)	322ME-3

1) Brief Course Description:

This course covers and concentrates on the theory, the basic meanings of fluids flow, types of fluid flow and its different engineering applications, and hydraulic machines principles and their performance.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic principles of fluid flow dynamics,
- Know the common engineering applications in the fluid dynamic field,
- Know the basic principles of hydraulic machines and their practical applications in thermal, hydroelectric, and gas turbine power stations,
- Gain the skills of different fluids measurements and their applications.

3) Course Contents:

Surface flow resistance – Boundary layer for laminar and turbulent flows - Laminar and turbulent flows through pipes and calculation of friction and secondary losses – Different piping systems – Shock waves of compressible fluids – One dimensional compressible flow – Isentropic flow – Fluid flow measurements – Introduction to hydraulic machines.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Clayton T. Crowe, Donald F. Elger, and John A. Roberson, "Engineering Fluid Mechanics", John Wiley & Sons Inc., 8th Ed., 2006.

7) References:

- Munson, Okiishi, Huebsch, Roth Mayer, "Fluid Mechanics", Wiley, 7th ed., 2015.
- Muralidhar, K. and Gautam Biswas, "Advanced Engineering Fluid Mechanics", 2nd Ed., 2005.
- Frank M. White, "Fluid Mechanics", McGraw Hill, New York, 2003.
- Robert Long Daugherty, Joseph B. Franzini, E. John Finnemore, "Fluid Mechanics with Engineering Applications", McGraw Hill, New York, 1985.

Course Title	Mechanical Measurements Instrumentation
Course Code	414ME-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (1+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (1+1)
Level-Year	7-4
Prerequisite (if any)	323ME-3

1) Brief Course Description:

This course covers and concentrates on the theory, design, and performance, operation principles of the mechanical measuring devices used in the different engineering applications, the correct methods of measurement, the devices calibration, determination of the zero and standard error, and avoiding the common errors in measurement operations.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic principles of measurement and devices usage.
- Know the different measurement ways in the mechanical engineering field.
- Gain the skills of using the different measuring devices in the mechanical engineering field.
- Gain the accuracy skills in the different measurement operations.

3) Course Contents:

The basic principles and experimental results analysis – Electrical measurement equipments and devices – Mechanical measurements such as pressure and flow-Temperature and thermal properties – Measurement of length, displacement, area, velocity, force, torque, power, and stress - Gauge limits design – Surface roughness – Roundness – Engineering elements (Screw, gears, etc).

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Beckwith and Marangoni Lienhard, “Mechanical Measurements”, Pearson, 6th ed., 2014.
- Thomas T. R., “Rough Surfaces" Longman Inc. New York, 1999.

7) References:

- Farago, F. T., and Curtis, M., Handbook of Dimensional Measurement, Industrial Press Inc., New York, 1994.
- Anthony, D. M., “Engineering Metrology”, Pergamon Materials Engineering Practice Series , 1986.
- Galyer, J. F. W. and Shotbolt, C. R., “Metrology for Engineers”, Cassell & Co. Ltd, London, 1964.

Course Title	Numerical Analysis
Course Code	419MATH-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (3+0)
Level-Year	7-4
Prerequisite (if any)	101CMS-3 & 319MATH-3

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Identify the numerical solution methods
- Acquire the skills of numerical analysis and numerical methods to solve the differential equations in the area of specialization.
- The acquisition of skills in the functions approximation and calculation errors

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1	• Approximate method to solve equations in one variable,
Unit II	• Interpolation by polynomial and Sibling functions, approximation of functions, methods of numerical integration,
Unit III	• Numerical methods to solve the primary values of differential equations,
Unit IV	• Numerical methods to solve algebraic equations linear and nonlinear systems.

4) Teaching Methods:

- Theoretical lectures.
- Computer Applications

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Ward Cheney and David Kincaid "Numerical Methods and Computing", Brooks / Cole publishing Company, 2004.

7) References:

- Richard Hammin,"Numerical Methods for Scientists and Engineers ", Dover Publications; 2nd Revised ed., 1987.
- Conte and Boor, "Elementary Numerical Analysis", Purdue University, Indiana, U. S.A., last Edition.

Course Title	Engineering Economy
Course Code	424IE-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	7-4
Prerequisite (if any)	None

1) Course Objectives:

- Understanding basic concept of Engineering Economy
- Understanding fundamental concept of Time value relationship
- Understanding different measures used in comparing alternatives and economic decision making
- Develop skills of estimating cost exchange rate, budget and revenues.

2) Expected Learning Outcomes:

- Acquire a general knowledge about the Engineering Economy
- Acquire the fundamental concept of Time value relationship
- Achieve knowledge of different alternatives and economic decision making
- Acquire knowledge to work on different engineering project.

3) Course Contents:

Unit 1
- Introduction to engineering Economics
- Cost concept and design Economics

Unit II :
- Money time relationship and equivalence

Unit III:
- Calculating present and future worth and equivalent uniform Annual series
- Comparing alternatives and decision making criteria

Unit IV:
- Method of depreciation
- Evaluation and analysis of engineering project and feasibility study
- Dealing with risk and uncertainty

Unit V:
- Cost estimating techniques
- Market research and exchange rate
- Balance sheet and trading account

4) Teaching Methods:

- Lectures.
- Training Exercises

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (50 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- William G Sullivan, Ellin M Wicks and James Luxhoj, “Engineering Economy”, Prentice Hall, 13th Ed., 2005

7) References:

- White Agee and Case, Principle of Engineering Economics analysis, 4th Ed., 2001

Course Title	Machine Elements Design-2
Course Code	421ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	8-4
Prerequisite (if any)	411ME-3

1) Brief Course Description:

The course deals with studying of transmission line, different types of bearings, rolling contact bearings, lubrications and journal bearings. Analysis of forces on the supports. Study of gears, spur, helical and bevel. Force analysis on gears and design of gear boxes. Design of couplings, clutches and brakes. Selection of flexible machine elements (belts-robes-chains).

Practical part involved with the applications on design with respect to result analysis in statistical and dynamic cases, the strength of rotating shafts, force analysis on bearing supports and design of different types of gear boxes.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the concepts, procedures, and data to analyze machine elements in power transmission systems.
- Develop competency in sizing and selecting mechanical components for mechanical systems.

3) Course Contents:

Stress Analyses – Shafts – Design of keyed jointed & splines – Belts and Flat Belts – Flat Belts – V Belts – Bearing selection & maintenance – Rolling contact bearings applications – Plain surface bearings – Plain surface bearings – Gear kinematics – Spur Gears – Helical & bevel Gears.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Budynas, Nisbeit, “Shigley’s, Mechanical Engineering Design", McGraw – Hill, 10th ed., 2015.
- Bhandari, “Design of Machine Elements”, McGraw Hill, 4th ed., 2016.

7) References:

- Shigley , J.E. & Mischke , C.R., "Mechanical Engineering Design", McGraw – Hill, 2004.
- Lingaiah, K., " Machine Design Data Handbook", McGraw Hill Inc., 1994

Course Title	Production Engineering -3
Course Code	422ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	8-4
Prerequisite (if any)	412ME-3

1) Brief Course Description:

This course covers the general principles of the conventional metal cutting processes. The gear manufacturing by milling represents an important subject in this course. Furthermore, the course includes estimation of the machining times and planning of the suitable technological procedures for some machining operations.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic knowledge needed for engineers in the field of conventional metal cutting.
- Develop his information in estimation of machining times and planning of the suitable technological procedures for some machining operations.

3) Course Contents:

General introduction: Principle, definition, and purpose of machining, Machining requirements, Basic functions of Machine Tools, and d) Machine, Tool–definition.

Basic working principle, configuration, specification and classification of Machine tools: Basic functional principles of machine tool operations, Configuration of basic machine tools and their use: (Centre lathes, Shaping machine, Planing machine, Drilling machine, Milling machine), Specification of machine tools, and Broad classification of machine tools.

Principles of metal cutting: Geometry of single point cutting tools, Mechanism of chip formation, Orthogonal and oblique cutting, Use of chip breaker in machining, Machining forces and Merchant's Circle Diagram (MCD), Cutting temperature, Cutting fluid application, Machinability, Failure of cutting tools and tool life, and Cutting tool materials of common use,

General purpose machine tools and operations: Operations of lathes, Operations of drilling machines, Operations of milling machines, Applications of shaping , planing, and slotting machines, Gear Milling, Applications of grinding machines.

Estimation of machining time: Estimation of machining times in different conventional machining processes, and Technological procedures of machining operations**.**

Non-conventional Machining of non-metallic materials: Electro discharge machining – Plasma jet machining – Electron beam machining – Laser beam machining - Electro chemical machining – Electro chemical grinding – Ultra sonic machining – Water jet machining – Electro plating process.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…..... (30 %)
- Practical Work ……..…….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- S. Kalpakjian "Manufacturing Processes for Engineering Materials", Prentice Hall, 4th ed., 2003.

7) References:

- K. Schmid "Manufacturing Engineering & Technology", Pearson Higher Education, 4th ed., 2014.
- Degormo E. P., Black , J.T., and Kohser, R. A., "Materials and Processes in Manufacturing", John Wiley & Sons, 9th ed., 2003.

Course Title	Heat Transfer
Course Code	423ME-4
No. of Credit Hrs (Theoretical + Tutorial/Lab)	4 (3+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (3+2)
Level-Year	8-4
Prerequisite (if any)	322ME-3

1) Brief Course Description:

This course addresses the methods of heat transfer by conduction,convection,and radiation and their applications in heat exchangers-thermal circuits of the previous methods.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Represent the thermal circuit of any heat transfer problem
- Design any thermal system
- Estimate the heat transfer rates through thermal geometry

3) Course Contents:

Introduction to methods of heat transfer by conduction,convection,and radiation-steady state conduction-free convection and forced convection in internal and external flow-heat exchangers-radiation.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Frank P. Incropera and David P. DeWitt, “Introduction to Heat Transfer”, John Wiley and Sons, 4th ed., 2002.

7) References:

- Thomas, L.C “Heat Transfer” - Professional Version, Capstone Pub. Corp. , 2nd ed., 1999.
- Adrian Bejan , "Heat Transfer ", John Wiley & Sons , 1999.

Course Title	**System Dynamics and Mechanical Vibrations**
Course Code	**424ME-3**
No. of Credit Hrs (Theoretical + Tutorial/Lab)	**3 (2+1)**
No. of Contact Hrs (Theoretical + Tutorial/Lab)	**4 (2+2)**
Level-Year	**8-4**
Prerequisite (if any)	**319MATH-3 & 323ME-4**

1) Brief Course Description:

This course deals with mathematical modeling, response analyses and simulation of dynamic systems. These include mechanical, electrical, pneumatic and hydraulic systems. The course also deals with the mechanical vibrations of such systems and the ways of its isolation. Vibrations measuring instruments have been included in the course. Some experimental work is also included.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the analysis of mechanical systems.
- Gain the modeling skills of various mechanical systems.
- Gain the evaluation skills of mechanical systems' response.
- Understand the principles of vibrations of mechanical systems.
- Understand the ways of vibrations isolation.
- Gain the skills of measuring the variables related to vibrations.

3) Course Contents:

Introduction to dynamic systems – modeling of mechanical, electrical, thermal and hydraulic systems – methods of solving differential equations – Laplace transform – state-space – numerical solution by computer – system response of first and second order systems – vibrations of single degree of freedom systems – Vibrations of multi degree of freedom systems – numerical methods and its application to vibration – vibration measuring instruments – vibration isolation – design of vibrations absorbers – using Matlab in vibration analysis.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Singiresu Rao, “Mechanical Vibrations, Pearson, 4th ed., 2010.
- Ogata, “System Dynamics”, Prentice Hall, 4th, ed., 2004.

7) References:

- Rao, S., and Wesley, A., "Mechanical vibrations", Prentice hall, 4th ed., 2003.
- Cochin, I. and Plass JR J., “Analysis and Design of Dynamic Systems", HarperCollins College Div., 4th ed., 2003.
- William Thomson, Marie D. Dahleh, “Theory of Vibrations with Applications, Prentice Hall, 5th ed., 1998.

Course Title	Industry and Environment Pollution
Course Code	425ME-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	8-4
Prerequisite (if any)	None

1) Brief Course Description:

This course addresses the fundamentals of the natural environment and addressing the sources of industrial pollution and hazardous waste is also interested in ways that the environmental control.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Study the problems of pollution in the environment and the risks.
- Understand the types of pollution and how to control pollutants and disposal.

3) Course Contents:

The basics of environmental systems - industrial environment - the causes of environmental problems and the role of industry in environmental pollution - types of pollution - air pollution - pollution of water - soil pollution - hazardous waste solid and liquid - industrial pollution - pollution Noise - Methods of control and treatment of environmental pollutants - environmental studies for industrial projects.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (40 %)
- Practical Work ……. (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Davis, M. L. and Cornwell, D.A., "Introduction to Environmental Engineering ", McGraw-Hill Science / Engineering / Math., 4th Ed, 2006.

7) References:

- Graedel, T and Allenby, B. " Safety, Health and Environment Protection" Industry Ecology, McGraw-Hill , 2004.

Course Syllabi and Description
for
Fifth Year

	Level-9	
46	114IC1-2	Islamic Culture -4
47	511IE-2	Engineering Reliability & Maintenance
48	511ME-3	Production Engineering 4
49	512ME-3	Hydraulic Machines & Fluid Power Systems
50	514ME-3	Graduation Project (*Continued to Next Sem.*)

	Level-10	
51	513ME-4	Automatic Control
52	522ME-3	Power & Desalination Plants
53	523ME-3	Refrigeration and Air Conditioning
54	528IE-2	Industrial Managements & Quality Control

Course Title	Islamic Culture -4
Course Code	114IC1-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	6-3
Prerequisite (if any)	None

1) Course Objectives:

After the completion of this course, it is expected that the student be able to:

- Identify intellectual invasion of the Islamic world methods
- Understanding the contemporary Muslim world challenges
- Prevention of destructive ideologies

2) Expected Learning Outcomes:

3) Course Contents:

Unit 1
- Colonization
- Secularism
- National

Unit II
- Christianization
- Orientalism
- Freemasonry

Unit III
- Zionism
- Globalization
- Cognitive and technical challenge

Unit IV
- Economic challenge
- Political challenge
- Unit Muslim world
- Economic development

4) Teaching Methods:

- Lectures

5) Mode of Evaluation:

- Mid-Term Test-1 …….. (25 %)
- Mid-Term Test-2 …….. (25 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Methods of intellectual invasion, Dr. Ali Abu Gereshsa
- Secular, Dr. Mohamed Kotb.

7) References:

- Critique of Arab nationalism, Sheikh bin Baz
- Orientalism and the intellectual background of the conflict of civilization, Dr. Mahmoud Zaqzouq

Course Title	Engineering Reliability and Maintenance
Course Code	511IE-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	9-5
Prerequisite (if any)	None

1) Brief Course Description:

This course presents the basic concepts related to reliability engineering, modeling techniques and prevision of reliability, fault tree analysis and decision table. . Also, it gives knowledge on maintenance types, maintenance tactics, maintenance cost, maintenance planning and scheduling and materials management.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic concepts of reliability engineering.
- Comprehend the different maintenance type and its mathematical models.
- Develop skills of managing materials and spare parts

3) Course Contents:

Course Introduction, Reliability Engineering, Reliability Models, Fault Tree Analysis, Table Decision, Maintenance objectives, Maintenance types and strategies, Maintenance planning, Maintenance cost, Maintenance scheduling, Maintenance control, Materials planning and management, Replacement Models, Industrials applications.

4) Teaching Methods:

- Lectures.
- Training exercises
- Case study reports

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (40 %)
- Assignments ……. (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Nakagawa, Toshio, "Maintenance Theory of Reliability", Springer, 2005.

7) References:

- Joel A. Nachlas, " Reliability Engineering: Probabilistic Models and Maintenance Methods ", CRC Press, 2005.

Course Title	Production Engineering -4
Course Code	511ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	9-5
Prerequisite (if any)	422ME-3

1) Brief Course Description:

This course covers the different ways for manufacturing the non-metallic materials processes through forming and nontraditional machining techniques. It concentrates on the polymers, ceramics, and composite materials forming and machining them with non-conventional methods such as electro-discharge machining, and Laser beam machining.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the principles of the forming and machining for the non-metallic materials.
- Gain the skills of the polymers manufacturing methods such as extruding, blowing, vacuuming, and injecting.
- Obtain the attitudes of the ceramics forming techniques such as pressed, extruded, cementing, sintering, and heat treatment.
- Get the information about the different ways for forming the composite materials such the open and closed die, continuous casting, and vacuumed pocket methods.
- Know the technology of the non-traditional machining processes for the non-metallic materials.

3) Course Contents:

Theoretical Part includes two main items such as:

Forming the non-metallic materials

Polymers. Heat transfer and polymers flow – Rheology– Extrusion - Blowing – Vacuuming – Injecting and reaction with injection.

Ceramics. Compressing – Casting – Extruding – Heat treatment – Drying – Sintering.

Composite Materials. Open and closed die – Continuous forming – Casting the metallic and ceramic phase's composite materials – Forming in vacuumed pocket.

Practical Part:-

It includes practical exercises on forming some products from Polymers, ceramics, and composite materials as well as the investigation of their crystal structure. The practical training on the polymers forming machines is stressed in this part. Moreover, there is exercises concern the electroplating of some components.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Degormo E. P., Black , J.T., and Kohser, R. A., "Materials and Processes in Manufacturing", John Wiley & Sons , 9th Edition, 2003.

7) References:

- Kalpakjian, S. & Schmid, S. R., "Manufacturing Engineering and Technology", Prentice Hall, 5th ed., 2005.
- Tlusty G. , "Manufacturing Processes and Equipment", Prentice Hall, 2000.
- Ostwald, P. F. & Munoz, J., "Manufacturing Processes and Systems", 9th Edition, 1997.

Course Title	Hydraulic Machines & Fluid Power Systems
Course Code	512ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	9-5
Prerequisite (if any)	413ME-3

1) Brief Course Description:

This course provides the student with in-depth explanation of the hydraulic machines and the vast field of fluid power to understand the design, analysis, operation, maintenance, and application of fluid power systems. The student learns not only the "why" but also the "how" of fluid power systems operation, components, and hydraulic circuits.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Specify the basic components of fluid power system, such as pumps, actuator, valves, filters, and reservoirs.
- Apply Bernoulli's equation to determine the energy transfer within a hydraulic system.
- Determine the head losses in a pipeline undergoing laminar or turbulent flow.
- Perform an energy analysis of a complete hydraulic circuit.
- Evaluate the performance of pumps by determining the volumetric, mechanical, and overall efficiencies.
- Describe the sequence of operations used to select a pump for a given application.
- Describe the construction and design features of hydraulic cylinders.
- Analyze the operation and performance of hydraulic transmissions.

3) Course Contents:

Concepts and general definitions (Classifications of Hydraulic machines – Performance curves of Pumps and Turbines – Performance and system curve). **Types of Pumps** (Axial – Centrifugal – Positive displacement Pumps (Screw – Gear – Vane – Piston pumps)). Types of Turbines (Propulsion – axial). **Introduction to Fluid Power System and its applications** (Standard symbols and the basic circuits – Compressibility and hydraulic force – Hydrostatic transfer – Basic components of Hydraulic Circuit of fluid power system (valves, Pumps, and Motors) – Performance of Positive Displacement pump – Hydraulic Cylinders types – Filters – Reservoirs – Circuit Performance evaluation and applications of different Fluid Power Systems.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- R.K. Rajput, “Fluid Mechanics and Hydraulic Machines”, S. Chand and Co., 6th, ed., 2014.
- Esposito, A., "Fluid Power with Application”, Prentice Hall Inc., 6th ed., 2003.

7) References:

- Dixon, S.L., "Fluid Mechanics and Thermodynamics of Turbo-machinery", Butterworth Heinemann, 5th ed., 2005.
- Crowe, T.C., et al. "Engineering Fluid Mechanics", 8th ed., 2004.
- Lewis, R. L., "Turbo-machinery Performance Analysis", Arnold, London, Butterworth-Heinemann, 2001.
- Krivchenko, G. I. , “Hydraulic Machines: Turbines and Pumps", Lewis Publishers, 2nd ed., 1994.
- Pinches, M. J. & Ashby, J. G., "Power Hydraulics", Prentice Hall, 1988.
- Ernst W., "Oil Hydraulic Power and its industrial Applications", McGraw-Hill, 1960.

Course Title	Graduation Project
Course Code	514ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (0+3)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	3 (0+3)
Level-Year	9-5
Prerequisite (if any)	Department approval (Student should have no more than 38 credits of coursework) & Consent of supervisor

1) Brief Course Description:

Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills required in earlier course work and incorporating engineering standards and realistic constraints that take into account considerations such as: economic; environmental; safety; manufacturability; ethical; and social aspects. The objectives of this course where student can:

- Select and plan an engineering project involving analysis and design tasks
- Perform a literature survey
- Formulate, as a team, civil engineering design
- Perform the relevant calculations, analysis, and implement his design.
- Understand economic, environmental issues related to technology.
- Evaluate the impact of engineering on societal issues.
- Communicate technical information in writing.
- Communicate in oral and critically evaluate technical information

2) Expected Learning Outcomes:

Upon completing this course, it is expected that the students will have the:

- Ability to perform a literature survey
- Ability to formulate design an engineering project, by setting objectives that are appropriate for the project purpose and scope and that take into account the following aspects: economic; environmental; manufacturability; ethical; safety; social; and political.
- Ability to plan an engineering project involving multiple tasks and contributors.
- Ability to identify, formulate and solve an engineering problem.
- Ability to work effectively on a team to complete the project.
- Ability to implement, evaluate, and document a project design.
- Ability to communicate technical information in writing.
- Ability to communicate technical information in oral presentations.
- Recognize the need for a lifelong learning.
- Ability to use modern tools in engineering solving problems

3) Course Contents:

1. Literature survey 2. Engineering design 3. Proposals 4. Project planning, budgeting, and management 5. Professionalism, ethics 6. Technical reports 7. Oral presentations

4) Teaching Methods:

Independent study/research, group discussion, meetings are scheduled with the supervisor for the particular project. Each students' group will meet together weekly, keeping detailed minutes of the meetings.

5) Mode of Evaluation:

- Student progress and project product:(Assessed by the supervisor(s)):…… 25
- Log book (Assessed by the supervisor (s))…….. 5
- Professional Conduct includes (Assessed by the supervisor(s)): …… 20
    a) Cooperation with the project group
    b) Alignment with the code of ethics
    c) Attendance in discussion sessions with supervisor
- Project Report…… 20
- Presentation and defense…… 30
  (assessed by at least two panel members and the supervisor(s)

6) Textbook(s):

- It is indicated according to the specialization field which will be chosen for the project.

7) References:

- It is prepared by the student himself and determined by the subject specialization which will be chosen for the project.

8) Ground Rules

The following department rules will be applied:

- The deadline for submitting a hard copy of the project report is one week before the presentation.
- If student does not submit the report on time, a 25% of the report grade will be deducted for every day delay.
- If no report is submitted 24 hours before the presentation, a grade F will be given to the whole project.
- Other additional rules by the supervisor

Course Title	Automatic Control
Course Code	513ME-4
No. of Credit Hrs (Theoretical + Tutorial/Lab)	4 (3+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	5 (3+2)
Level-Year	9-5
Prerequisite (if any)	424ME-3

1) Brief Course Description:

The purpose of the course is to serve as an introduction to feedback control system properties, representation, analysis and design in time and frequency domain. Strong emphasis will be given to the demonstration of the theoretical material with examples drawn from real life. Application cases will be discussed during the lectures, and will be further illustrated with simulation studies during the tutorials and with real examples during the laboratories.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the analysis and modeling of physical system dynamics responses.
- Analyze the feedback control systems, including determining stability, transient performance, and steady-state error. The student should also have a mastery of the relationship between closed loop poles and system performance.
- Design control system using proportional, derivative, and integral control.
- Use of the root locus design methodology. The student should be able to use root locus to design proportional control, add zeros to influence transient behavior, and apply root locus to selecting general control parameters.
- Use Frequency response techniques including Bode plots, the Nichol's chart, the phase margin, and the gain margin.
- Design and case studies Control system: P, PD, PID, lead compensator, and lag compensator design using time and frequency domain techniques.
- Apply of control system implementation using computer simulation by Matlab and Simulink.

3) Course Contents:

Review of physical system mathematical modeling, governing equation, and Analysis of the system response performances. **Introduction to Automatic Control Concepts: (**Basic components of a control system **-**Examples of control system Applications **-** Definitions and Notations **-** Open loop and Closed loop Control Systems (Non feedback and Feedback Control Systems) **-** Modeling of Systems with Block Diagram **Required Mathematical Foundation:** Review of Complex Variable and Laplace Transform **-Transfer Function(TF) and Block Diagram Algebra - Feedback**

Control - First and Second Order Time Domain Response And steady state error - Stability of Linear Feedback Control Systems: Routh Stability Criterion - **Root's Locus Method:** Rule for Plotting the Root Locus - **System design Using the Root locus - Response and Stability In Frequency Domain:** Nyquist Diagrams from TF Nyquist Stability Criterion - **Bode Diagram:** Bode diagram of simple TF, Bode Diagram of Compound TF - Elemental Bode Diagram - Bode Analysis and Stability - **Multimode Controllers:** Proportional Control (P) - Proportional-plus- Integral Control (PI) - Proportional-plus- Derivative Control (PD) -Proportional-plus- Integral-plus-Derivative Control (PID).- Lab. Practical work **– Practical work using MATLAB.**

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……..…….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Farid Golnaraghi, Benjamin C. Kuo, “Automatic Control Systems”, John Wiley and Sons, 9th ed., 2015

7) References:

- Dorf, R. C. and Bishop, R. H., "Modern Control Systems", 10th ed., Prentice Hall, 2004.
- Driels, M. , "Linear Control System Engineering", McGraw Hill, Inc., 1996.
- Thompson, S., "Control System Engineering and Design", Longman Scientific and Technical, 1989.

Course Title	Power & Desalination Plant
Course Code	522ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	10-5
Prerequisite (if any)	423ME-4 & 512ME-3

1) Brief Course Description:

This course covers and concentrates on the theory, design, performance, and operation principles of the power plants (steam and gas turbines) components and combined cycle (steam/gas). Also, the course concentrates on problems of energy supply, demand, conservation and economics and on different techniques of desalination.

2) Expected Learning Outcomes:

Upon completing this course, it is expected that the students will be able to:

- Use of new technology for the treatment and synthesis of electric-generating power plant.
- Acquire some skills of designing steam power plants, gas turbine power plants, combined cycle power plant, desalination systems and the measurements that related to its operation.
- Understand the theories of work and methods of desalination plants to remove salt.
- Analyze of most power plant systems.
- Compare the fossil-fired power plants of the Rankine, Brayton, combined types, and the fusion-power plants.
- Plan power plants that rely upon renewable energy sources, such as geothermal solar, wind, tidal, and ocean temperature difference.
- Determine new solutions to efficient power-generation problems

3) Course Contents:

Types of Power Stations (Rotary engine, Steam and Gas turbines, Solar energy concentrators, Ocean thermal energy conversion, Wind energy, Non thermal energy). **Steam power plants** (Analysis of steam cycles (Rankine cycle, End conditions, Reheat cycle, Regenerative cycle, Power plant development, and Cogeneration) – Plant components (Turbines – Steam generators – Ancillary Systems) – Thermal analysis and power plant performance – Plant Operation and Control. **Gas turbine power plant** (simple plant components **–** Thermal Analysis and performance of each component (Inetrcooling – Reheat – Regenerative – Water injection). **Steam/Gas turbine power plant** (Combined Cycle)**. Desalination Plants**

(Principles of Sea water desalination – Operational techniques of thermal desalination – Desalination process categories – Multi-Effect Distillation (MED) – Multi-Stage Flash Distillation (MSF) – Reverse Osmosis (RO) – Forward Reverse Osmosis (FRO) – Plant economy and selection)

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial/Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- El-Wakil, M. M. , " Power Plant Technology ", McGraw Hill , NewYork, 2002.
- El-Dessouky, H.T. and Ettouney, H.M., "Fundamentals of Salt Water Desalination", Elsevier Science, 2002.

7) References:

- Raja, A.K., "Power Plant Engineering", New age International ltd, 2006.
- Gill, A. B., "Power Plant Performance", Butterworth-Heinemann, 1404 AH.
- Skrrotizki, B.G.A & Vopat, W.A. , "Power Station Engineering and Economy ", Mc-Graw Hill , NewYork, 1972.
- Howe, E.D. ,"Fundamentals of Water Desalination", M. Dekker Publisher, 1974.

Course Title	Refrigeration and Air-Conditioning
Course Code	523ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	10-5
Prerequisite (if any)	423ME-4

1) Brief Course Description:

This course addresses the methods of refrigeration-refrigeration cycles: Vapor compression refrigeration cycle absorption refrigeration cycle-refrigerants, evaporators, condensers, compressors, expansion devices, Air conditioning: basics, human comfort, properties of air water vapor mixture, psychrometric processes, psychrometric cycles, psychrometrics.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Predict the COP of refrigerators and heat pumps,
- Design evaporators,
- Design condensers,
- Select and sizing expansion devices,
- Estimating the cooling load,and
- Estimating the air-conditioning load.

3) Course Contents:

Introduction to refrigeration methods-refrigeration cycles: single vapor compression refrigeration cycles and multi stage cycles-absorption refrigeration cycles-refrigerants-compressors-condensers-evaporators –basics of air conditioning-human comfort-properties of water vapor air mixture-psychrometrics-psychrometric processes-psychrometric cycles.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (20 %)
- Practical Work …….. (20 %)
- Experimental Test …….. (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- McQuiston, Parker, Spitler, "Heating Ventilation & Air Conditioning Analysis and Design", Wiley., 6th ed., 2016.
- Wilbert F. Stoecker, Jerold W. Jones, "Refrigeration & Air Conditioning", McGraw Hill., 2nd ed., 1882.

7) References:

- Wang, S.K. "Handbook of Air Conditioning and Refrigeration", McGraw Hill, 2001.
- ASHRAE Handbook: Refrigeration Systems and Applications, American Society of Heating, 2006.
- Kuehn, T.H, Ramsey, J.W., and Threlkeld, J.L, "Thermal Environmental Engineering, Prentice Hall Inc. 1998.
- Jeffus, L, " Refrigeration and Air Conditioning: An Introduction to HVAC ", Prentice Hall, 4th ed., 2003.

Course Title	Industrial Management & Quality Control
Course Code	528IE-2
No. of Credit Hrs (Theoretical + Tutorial/Lab)	2(2+0)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	2 (2+0)
Level-Year	10-5
Prerequisite (if any)	

1) Brief Course Description:

This course teaches about basic principles of industrial and scientific management. It includes quality definitions and standards, control charts, quality levels, total quality management concepts.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the principles of industrial organization and industrial project mangement management.
- Understand the principles for quality, quality tools, statistical techniques, and quality control charts.
- Apply quality control, use, and apply quality control charts.

3) Course Contents:

- The principles of industrial/scientific management
- The management of industrial organizations.
- Industrial organization and personnel, resources, and time management.
- Introduction to quality, definitions and standards.
- Probability frequency distributions.
- Control charts, types, objectives, and objectives.
- Variable and attribute control charts.
- Sampling, definitions, advantages and disadvantages.
- Operating characteristic curves.
- Quality levels.
- Reliability, definition and achievement.
- Quality control by computers.
- Total Quality Management (TQM) concept.
- ISO9000-9004 Standards.
- Case studies.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (40 %)
- Practical Work ……. (10 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Harrison, M. (1996) Principles of Operations Management, Prentice Hall.
- Montgomery, C.D. (1997) Statistical Quality Control, John Wiley.

7) References:

- Russel, S.R. (2000) operations management, Prentice-Hall.
- Besterfield, H.D. (1991) Quality Control, Prentice-Hall.

Complementary Courses

01	400ME-0	Summer Training

Course Title	Summer Training
Course Code	400ME-0
No. of Credit Hrs (Theoretical + Tutorial/Lab)	0
No. of Contact Hrs (Theoretical + Tutorial/Lab)	0
Level-Year	8-4
Prerequisite (if any)	95 credit hours

1) Brief Course Description:

After the successfully completion of 6 level (6h semester), student has directed to attend a compulsory Professional Internship (Full time summer Training) in an industrial institution. Requirement for professional internship, as per the prerequisite for registration, the number of hours should be completed 95 hours. The student will be trained in an appropriate environment for not less than eight weeks (five days per week). A report will then be submitted to the department, and will be a graduation requirement. The evaluation will be undertaken at department level, alongside confidential feedback from the organizations concerned.

2) Expected Learning Outcomes:

Upon completing this course, it is expected that the students will be able to:

- Acquire the skill of application engineering in the field specialization.
- Self-management and work within a cooperative team work in any engineering organization.
- Understand the rules and steps of design, planning, and implementation of engineering projects and become eligible to exercise the same in his career.

3) Course Contents:

Selecting a training area that relates to the student's specific discipline – Collecting of required information (theoretical and experimental) in training – enhancement of skills, Preparing periodical reports that includes introduction about the training, its objectives, description of the organization, skills and services, writing a complete final report – Presenting the report and defending it in front of an evaluation committee.

4) Teaching Methods:

- The supervision and guidance and follow-up during the implementation stages of the training.

5) Mode of Evaluation:

- Periodic Reports and final report of internship…….. (50 %)
- Final discussion of Internship …….. (50 %)

6) Textbook(s):

- It is indicated according to the specialization field which will be chosen for the project.

7) References:

- It is prepared by the student himself and determined by the subject specialization which will be chosen for the project.

Course Syllabi and Description For Courses Taught in other Departments

01	218ME-3	Static & Dynamics
02	228ME-3	Thermodynamics and Hydraulics
03	328ME-3	Thermodynamics and Fluid Mechanics
04	418ME-3	Principles of Engineering Design

Course Title	Static & Dynamics
Course Code	218ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	3-2
Prerequisite (if any)	129PHYS-4 & 119MATH-3

1) Brief Course Description:

Engineering Mechanics is a study of the state of rest or motion of bodies under the action of forces. This course builds a foundation of analytic capability for the solution of a great variety of engineering problems. Topics covered include the statics and dynamics of particles and rigid bodies

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.
- Understand the principle of work and energy.
- Comprehend the effect of friction on equilibrium.
- Understand the laws of motion, the kinematics of motion and the interrelationship.
- Write the dynamic equilibrium equation.
- Understand the concepts and solve problems.

3) Course Contents:

Introduction to Engineering mechanics, Force vectors, Equilibrium of particles, Force system resultants, structure analysis, Friction, Center of gravity and centroid, Moment of inertia, Kinematics of a particle

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work ……. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Hibbler R. C., "Engineering Mechanics" , Vol 1: Statics and Vol 2 : Dynamics , SI version, Prentice Hall, 2004.

7) References:

- Meriam, J. and L.G. Kraige , "Engineering Mechanics" , Vol. 1: Statics and Vol. 2: Dynamics , John Wiley and Sons Inc, 2001

Course Title	Thermodynamics and Hydraulics
Course Code	228ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	4-2
Prerequisite (if any)	129PHYS-4 & 229MATH-3

1) Brief Course Description:

This course addresses the basic definitions-Energy-Heat-Work-The perfect gas relationships-Properties of pure substance-The first law of thermodynamics: the non-flow energy equation and the steady-flow energy equation-Reversible and irreversible processes-The second law of thermodynamics: Carnot cycle and reversed Carnot cycle-Entropy-Steam cycles: Rankine cycle, Reheat cycle and Regenerative cycle-Gas turbine cycles-Fluid properties-Fluid statics-The basic equations of fluid mechanics: Continuity equation-Bernoulli equation-momentum principle-Hydraulic machines: pumps and turbines.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the energy transformations,
- Predict the efficiency of heat engines,
- Predict the COP of refrigerator and heat pump,
- Predict the efficiency of gas turbines,
- Design the condenser and boiler of steam power plant
- Cover the performance of pumps and turbines.

3) Course Contents:

Basic definitions-systems-energy-heat-work-the perfect gas-properties of pure substances-the first law of thermodynamics-reversible and irreversible processes-the second law of thermodynamics: Carnot cycle-entropy-steam cycles-gas turbine cycles-fluid properties-fluid statics-continuity equation - Bernoulli's equation-momentum equation-hydraulics machines.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Yunus A. Cengel, Michael A. Boles, Thermodynamics : An Engineering Approach, McGraw-Hill; 7th edition, 2010.

7) References:

- Sonntag, R. E., and G.J. Van Wylen : ”Introduction to Thermodynamics,”2d ed., John Wiley & Sons. Inc., New York,1982.
- “Thermodynamics and Transport Properties of Steam,” The American Society of Mechanical Engineers, New York, 1967.

Course Title	Thermodynamics and Fluid Mechanics
Course Code	328ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	6-3
Prerequisite (if any)	129PHYS-4

1) Brief Course Description:

The course aims to provide the student with the basic concepts in thermodynamics and its applications on some thermal cycles and machines. Also, to provide the student with the basic concepts in fluid statics, fluid dynamics and its engineering applications.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Understand the basic concepts in thermodynamics and fluid mechanics.
- Understand the common engineering applications in thermodynamics and fluid mechanics fields.
- Get experimental skills in engineering applications in thermodynamics and fluid mechanics fields.

3) Course Contents:

The first part deals with the basic concepts for thermodynamics science: Introduction and basic concepts- properties of pure substance. Thermodynamic tables- work and heat- The first law of thermodynamics- The second law of thermodynamics. Carnot cycle and its applications on heat engines.

The second part deals with the basic concepts for fluid mechanics science: Introduction- Fluid properties **-** Fluid Statics and its applications**: -**Fluid Kinematics**:** description of the types of fluid flow and continuity equation**- -**Fluid Dynamics and Energy equation**:** Bernoulli's equation and its applications

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Michael J. Moran and Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 2007.
- Clayton T. Crowe, Donald F. Elger and John A. Roberson, Engineering Fluid Mechanics", John Wiley& Sons, Inc., 8th Ed., 2006

7) References:

- Moran, MJ and Shapiro, H.N., " Fundamentals of Engineering Thermodynamics", John Wiley& Sons, 1994

Course Title	Principles of Engineering Design
Course Code	418ME-3
No. of Credit Hrs (Theoretical + Tutorial/Lab)	3 (2+1)
No. of Contact Hrs (Theoretical + Tutorial/Lab)	4 (2+2)
Level-Year	7-4
Prerequisite (if any)	225ME-3 + 224CHE-3

1) Brief Course Description:

This course covers and concentrates on reviewing material properties, moments and force analysis, how to calculate principal stresses and their applications in designing machine members – studying different design theories and their applications in designing different machine parts such as: driving shafts, keys and couplings, springs, riveted joints, welded joints, screwed joints and power screw.

2) Expected Learning Outcomes:

At the end of this course, the students should be able to:

- Recognize the difference between theory and the applied design.
- Know different design theories and their applications.
- Analyze forces and calculate principal stresses.
- Acquire skills in designing simple machine parts.
- Acquire skills in using computer in design and drawing.

3) Course Contents:

Introduction to design processes, stress analysis and calculating principal stresses, factor of safety and working stress for different engineering materials, design of riveted joints, design of welded joints, design of screwed joints, design of driving shafts, design of keys and couplings, spring design, gears design, use of computer in design and calculation.

4) Teaching Methods:

- Lectures.
- Training exercises (Tutorial + Labs)
- Interacting through E-learning.

5) Mode of Evaluation:

- Mid-Term Tests (Not less than two Exams)…….. (30 %)
- Practical Work …….. (20 %)
- Final Exam. …….. (50 %)

6) Textbook(s):

- Khurmi, R.S. & Gupta, J.K., "Machine Design", Eurasia Publishing House, 2005.
- Shigley, J.E., "Mechanical Engineering Design", McGraw Hill, Inc., 2004.

7) References:

- Avallone, E.A., Baumeister, T., "Marks Standard Handbook for Mechanical Engineers", 11th Edition, McGraw Hill, 2007.