

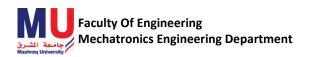


# Faculty of Engineering Department of Mechatronics Engineering

# **Undergraduate Programs Curriculum**

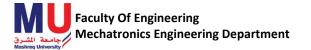
- 1. د. فتح الرحمن محمد عمر
  - 2. د.جهاد عبدالعزيز
- 3. د.عبدالناصر محمد زين
- 4. د. أحمد حسن محمد حسن

النسخه الثانية 2018



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# **1** Introduction

Mechatronics is a synergistic hybrid field of mechanical engineering, electronic engineering, computer engineering and control engineering. Mechatronics is centred on mechanics, electronics, control, software computing, embedded processing, communications, electromagnetism, electro-mechanism, micro- and nano-technologies. The synergy leads to generation of simpler, more economical, reliable and versatile systems. the department of mechatronics engineering has excellent laboratory facilities such as robotics and CAD/CAM, microprocessor, microcontroller, sensors, signal processing, avionics, PLC & SCADA, applied mechatronics laboratories provide an ambiance of learning even beyond the curriculum and involve in research activities to the faculty and students. Autonomous status of the institution is an added advantage to incorporate the latest subjects having great demand in the industries and research centres.

# 2 Programs Objectives

The programs of the department of Mechatronics Engineering are designed to achieve the following:

- 1- To supply the candidates with the necessary knowledge to design and implement the planned and needed engineering projects as a part of the development of the society.
- 2- To improve the education and training methods and techniques used in electronic, mechanical and computer engineering.
- 3- To provide a suitable academic environment for teaching and research areas to help in finding solutions by using the appropriate technologies.
- 4- To be effective inter-disciplinary engineers and problem solvers.
- 5- To be well educated in the basic engineering sciences and fundamentals of mechanical, electrical, and computer engineering.
- 6- To be able to use engineering tools that will enhance their productivity.
- 7- To be able to design, analyse, and test "intelligent" products or processes that incorporate suitable computers, sensors, and actuators.

# 3 Study Period

The period of study of all programs in the department is five years, ten semesters. Each academic year consist of two semesters.

## **4** Teaching in the Department

Undergraduate programmes offer flexibility, allowing interdisciplinary combinations. The syllabus is continually under development and review, in line with the requirements of various professional bodies that accredit our courses, and the latest technological needs of industry.

The quality of teaching is achieved by recruiting the most qualified teaching staff together with providing a suitable teaching environment built on an appropriate infra structure for the college.

# **5** Facilities

Extensive teaching laboratories and networked computer suites are available to all undergraduate students in the Department.



All electronics, communication, and computer labs are available in the college, which consist of the most efficient equipment needed to satisfy the requirements of the study.

Students of the department have the opportunity to improve their skills and capabilities in their interested engineering fields through the scientific societies available in the department and the college.

Continuous seminars and prese

ntations are held in the department regularly to achieve these goals.

## 6 Courses Codes

 $C_{1}C_{2}C_{3}C_{4}C_{5}C_{6} \\$ 

 $C_1C_2$  Field of study

C<sub>3</sub> Year of study

C<sub>4</sub> Semester (1 or 2)

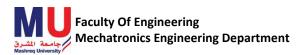
 $C_5C_6$  The serial number of the course (01, 02, 03,.....)

المستحق	المعيار	نوع الساعات
4290	لا تقل عن 4000	عدد ساعات الاتصال
35%	ما يعادل %35	نسبة العملي والتدريب والمتابعة للساعات المعتمدة
196	180-200	الساعات المعتمدة
10	10	ساعات التدريب
6	6	مشروع التخرج

#### نسب مكونات البرنامج:

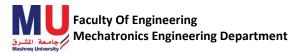
المستحق	المعيار	النوع
26%	%30 - %25	رياضيات وعلوم بحته
30%	%35 - %25	علوم هندسة أساسية
33%	%35 - %25	علوم تطبيقية وتصميم
11%	%15 - %10	علوم انسانية
4000/		

المجموع



# 7 Syllabus Components and Coding

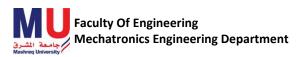
Com	Code	
	Mathematics	EM
<b>Basic Sciences</b>	Basic Sciences	PH, CH
	Computer System	CS
	Electrical Eng.	EE
<b>Engineering Science</b>	Mechanical Eng	ME
	General Engineering	GE
Social and Human	Economics & Admin.	AD
Sciences	Studies & Languages	AR, IS, EN
	Project	PR
Engineering Design and Applied	Electronic Eng.	ECE
	Mechatronics Eng.	MEM



# 8 Degree Components and Credit Hours

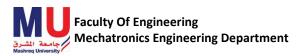
# 8.1 Basic Scienceand Math (26%)

Code	Title	Credit Hours
EM1101	Calculus I مسبان 1	3
EM1102	جبر خطي Linear Algebra	3
PH1103	Physics I 1 الفيزياء	3
CH1104	Chemistry کیمیاء	3
CS1105	مبادئ الحاسوبFundamentals of Computer Science	3
EM1201	Calculus II 2 حسبان	3
PH1202	فيزياءPhysics II2	3
CS1203	Programming LanguageI الغة برمجه	2
EM1204	الهندسة التحليليةAnalytical Geometry	3
EM2101	معادلات تفاضلية Differential Equations	3
CS 2102	لغة برمجة Programming Language II 2	2
ME2108	Engineering Mechanics-I 1- ميكانيكا الهندسة	3
EM2201	طرق رياضية Mathematical Methods	3
ME2208	Engineering Mechanics-II 2- ميكانيكا الهندسة	3
EM3101	احصاء واحتمالات Probabilities and Statistics	3
EM3201	طرق عددية Numerical Methods	3
EM3202	متغیرات مرکبة Complex Analysis	3
CS3206	تطبيقات الحاسوب Computer Application	2
	Total	51



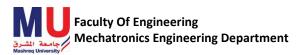
# 8.2 Basic Engineering Science (30%)

Code	Title	Credit Hours		
ME1109	مبادئ الهندسة الميكانيكية Fundamentals of Mechanical Engineering	2		
EE1205	مبادئ الهندسة الكهربائةFundamentals of Electrical Engineering	3		
ECE2104	تصميم الدوائر الرقمية-11 Digital Circuits Design			
ECE2105	مبادئ الاجهزة الالكترونية Principles of Electronic Devices	2		
EE2106	تحليل الدوائر الكهربائية -Electrical Circuits Analysis II	3		
ECE2204	تصميم الدوائر الرقمية2 Digital Circuits Design I1	3		
ECE2205	الدوائر التماثلية الالكترونية Analog Electronic Circuits-I	3		
EE2206	تحليل الدوائر الكهربائيةElectrical Circuits Analysis II 2	3		
ME3103	مقاومة المواد Strength of Materials	3		
ME3104	هندسة المواد Engineering Material	3		
ECE3105	الدوائر التماثلية الالكترونية2 Analog Electronic Circuits-II	3		
EE3106	اشارات ونظم Signals and Systems	3		
ME3107	ميكانيكا الموائع Fluid Mechanics	3		
ECE3203	المقاييس والمتحسسات Measurements and Sensors	3		
EE4102	انظمة التحكم Control Systems I1	3		
ME4105	عمليات التصنيع Manufacturing Processes	3		
ECE4105	معالجة الأشارة الرقميةDigital Signal Processing	3		
EE4106	الكترونيات القدرة Power Electronics	3		
EE4202	Control SystemsII2 انظمة التحكم	3		
GE 4204	موثوقية النظم الهندسيةReliability of Engineering System	2		
GE 5101	مناهج البحثResearch Methods	2		
	Total	59		



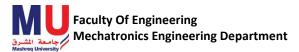
# 8.3 Applied Science and Design (33%)

Code	Title	Credit Hours
MEE1209	مقدمة هندسة الميكاترونكس Introduction to Mechatronics	2
ME2202	الديناميكا الحرارية وانتقال الحرارة Thermodynamics and Heat Transfer	3
GE2207	رسم هندسي Engineering Drawing	3
ECE3102	المعالجات الدقيقة ولغة التجميعMicroprocessors & Assembly Language	3
ME3204	الاهتزازات الميكانيكية Mechanical Vibrations	3
ME3205	Machine Theory نظرية الالات	3
ME4101	تصميم ماكينات Machine Design	3
MEE4107	المتحكمات الدقيقة والتطبيقاتMicrocontrollersand Applications	3
MEE4201	مقدمة الروبوتات Introduction to Robotics	3
MEE4203	المتحكمات القابلة للبرمجة والتطبيقاتPLC and Applications	3
MEE4205	ماكينات التحكم الرقمي بالحاسوب Computer Numerical Control Machines	3
MEE4207	اوتورنکس Autoronics	3
ME5102	أنظمة الهايدروليك الصناعية Industrial Hydraulic System	3
MEE5103	التصميم لانظمة الميكاترونكسMechatronics Systems Design	3
MEE5104	Automation الاتمته	3
PR5105	مشروع التخرج Final Project I1	3
MEE51xx	كورس اختياريElective Course11	3
	Mechatronics System Modeling and Simulation	
MEE5201	النمذجة والمحاكاة لانظمة الميكاتر ونكس	3
MEE5202	مقدمة الشبكات العصبية والمنطق الضبابيIntroduction to ANN and FL	3
MEE52xx	كورس اختياري Elective Course II2	3
MEE5204	التصميم والتصنيع باستخدام الحاسوبCAD / CAM	3
PR5205	مشروع التخرج 2 Final Project II	3
	Total	65



# 8.4 Social and Human Sciences (11%)

Code	Title	Credit Hours
AR1106	Arabic Language I الغة عربيه Arabic Language I	2
EN1107	English Language I 1 لغة انجليزية	2
IS1108	تقافة اسلامية Islamic Studies 1 1	2
AR1206	لغة عربية Arabic Language II2	2
EN1207	English Language II2 لغة انجليزية	2
EN 2103	لغة انجليزية English Language III 3	2
SD2107	در اسات سودانیة Sudanese Studies	2
IS1208	ثقافة اسلامية Islamic Studies II 2	2
EN2203	لغة انجليزية متخصصة (ESP) English for Special Purpose	2
AD 4103	أدارة صناعيةIndustrial Management	2
AD 4206	اقتصاد هندسي Engineering Economic	2
	Total	22



# 9 Mechatronics Engineering Degree Structure

# 1<sup>st</sup> Year: Semester 1:

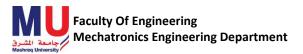
Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM1101	Calculus I 1 حسبان	3	2	2	-
EM1102	جبر خطي Linear Algebra	3	2	2	-
PH1103	الغيزياء Physics I 1 الغيزياء	3	2	-	3
CH1104	Chemistry کیمیاء	3	2	-	3
CS1105	مبادئ الحاسوبFundamentals of Computer Science	3	2	-	3
AR1106	Arabic Language I لغة عربيه	2	2	-	-
EN1107	لغة انجليزية English Language I 1 الغة	2	2	-	-
IS1108	ثقافة اسلامية Islamic Studies 1 1	2	2	-	-
ME1109	Fundamentals of Mechanical Engineering مبادئ الهندسة الميكانيكية	2	2	-	-
	Total	23	18	4	9

# 1<sup>st</sup> Year: Semester 2:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM1201	Calculus II 2 حسبان	3	2	2	-
PH1202	فیزیاء Physics II 2	3	2	-	3
CS1203	لغة برمجهProgramming Language I 1	2	1	-	3
EM1204	الهندسة التحليليةAnalytical Geometry	3	2	2	-
EE1205	Fundamentals of Electrical Engineering مبادئ الهندسة الكهربانية	3	2	-	3
AR1206	لغة عربية Arabic Language II2	2	2	-	-
EN1207	لغة انجليزية English Language II 2	2	2	-	-
IS1208	ثقافة اسلامية 2 Islamic Studies II	2	2	-	-
MEE1209	مقدمة هندسة الميكاترونكسIntroduction to Mechatronics	2	2	-	-
	Total	22	17	4	9

1<sup>st</sup>Year C.H = 45hrs

	<b>Basic Training</b> (Practical Duration→ 6 weeks)						
WS1210	Basic Training	التدريب الاساسي	-	-	-	150	



# 2<sup>nd</sup> Year: Semester 3:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM2101	معادلات تفاضلية Differential Equations	3	2	2	-
CS 2102	لغة برمجة Programming Language II 2	2	1	-	3
EN 2103	لغة انجليزية English Language III 3	2	2	-	-
ECE2104	تصميم الدوائر الرقمية-1 Digital Circuits Design I	3	2	-	3
ECE2105	مبادئ الاجهزة الالكترونية Principles of Electronic Devices	2	2	-	-
EE2106	تحليل الدوائر الكهربائية -Electrical Circuits Analysis I 1	3	2	-	3
SD2107	در اسات سودانيةSudanese Studies	2	2	-	-
ME2108	ميكانيكا الهندسة -1 Engineering Mechanics-I	3	2	2	-
	Total	20	15	4	9

# 2<sup>nd</sup> Year: Semester 4:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM2201	طرق رياضية Mathematical Methods	3	2	2	-
ME2202	Thermodynamics and Heat Transfer				
11112202	الديناميكا الحرارية وانتقال الحرارة	3	2	2	-
EN2203	لغة انجليزية متخصصة (ESP) لغة انجليزية متخصصة	2	2	-	-
ECE2204	تصميم الدوائر الرقمية2 Digital Circuits Design-II	3	2	-	3
ECE2205	الدوائر التماثلية الالكترونية-Analog Electronic Circuits-I 1	3	2	-	3
EE2206	تحليل الدوائر الكهربائية2 Electrical Circuits Analysis II	3	2	-	3
GE2207	رسم هندسي Engineering Drawing	3	2	-	3
ME2208	ميكانيكا الهندسة -Engineering Mechanics-II 2	3	2	2	-
	Total	23	16	6	12

2<sup>nd</sup>Year C.H = 43 hrs

	Advance Training ( <b>Practical Duration → 6 weeks)</b>					
WS2209	Advance Training	تدريب متقدم	3	-	-	150

3<sup>rd</sup> Year: Semester 5:



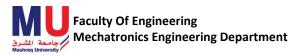
Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM3101	احصاء واحتمالات Probabilities and Statistics	3	2	2	-
ECE3102	Microprocessors & Assembly Language				
Leline	المعالجات الدقيقة ولغة التجميع	3	2	-	3
ME3103	مقاومة المواد Strength of Materials	3	2	2	2
ME3104	هندسة المواد Engineering Material	3	2	2	2
ECE3105	الدوائر الالكترونية - Analog Electronic Circuits-II	3	2	-	3
EE3106	اشارات ونظم Signals and Systems	3	2	-	3
ME3107	ميكانيكا الموائع Fluid Mechanics	3	2	2	2
	Total	21	14	8	15

# 3<sup>rd</sup> Year: Semester 6:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM3201	طرق عددية Numerical Methods	3	2	2	-
EM3202	متغیرات مرکبة Complex Variables	3	2	2	-
ECE3203	المقاييس والمتحسسات Measurements and Sensors	3	2	2	2
ME3204	الاهتزازات الميكانيكية Mechanical Vibrations	3	2	2	-
ME3205	Machine Theory نظرية الالات	3	2	2	-
CS3206	تطبيقات الحاسوب Computer Application	2	1	-	3
	Total	17	11	10	5

3<sup>rd</sup>Year C.H = 38 hrs

Industrial Training ( <b>Practical Duration —&gt; 8 weeks)</b>							
WS3207	Industrial Training	تدريب صناعي	2	-	-	200	



# 4<sup>th</sup> Year: Semester 7:

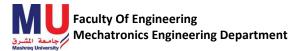
Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
ME4101	تصميم ماكينات Machine Design	3	2	2	-
EE4102	انظمة التحكم Control Systems I1	3	2	2	2
AD 4103	أدارة صناعية Industrial Management	2	2	-	-
ME4104	عمليات التصنيع Manufacturing Processes	3	2	2	-
ECE4105	Digital Signal Processing				
ECE4105	معالجة الاشارة الرقمية	3	2	-	3
EE4106	الكترونيات القدرة Power Electronics	3	2	-	3
MEE4107	Microcontrollers and Applications				
10112124107	المتحكمات الدقيقة والتطبيقات	3	2	-	3
	Total	20	14	6	11

# 4<sup>th</sup> Year: Semester 8:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
MEE4201	مقدمة الروبوتات Introduction to Robotics	3	2	2	-
EE4202	انظمة التحكم Control SystemsII2	3	2	2	2
MEE4203	PLC and Applications				
	المتحكمات القابلة للبرمجة والتطبيقات	3	2	-	3
GE 4204	Reliability of Engineering System				
	موثوقية النظم الهندسية	2	2	-	-
MEE4205	Computer Numerical Control Machines				
WIEE4203	ماكينات التحكم الرقمي بالحاسوب	3	2	-	3
AD 4206	اقتصاد هندسيEngineering Economic	2	2	-	-
MEE4207	اوتورنکس Autoronics	3	2	2	-
	Total	19	14	6	8

th.
$4^{\text{tm}}$ Year C.H = 39 hrs

On Job Training ( <b>Practical Duration</b> -> 4 weeks)						
WS4208	On Job Training	تدريب خارجي	2	-	-	100



# 5<sup>th</sup> Year: Semester 9:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
GE 5101	مناهج البحث Research Methods	2	2	-	-
ME5102	Industrial Hydraulic Systems				
11110102	أنظمة الهايدر وليك الصناعية	3	2	2	2
MEE5103	Mechatronics Systems Design				
WILL5105	تصميمأنظمة الميكاترونكس	3	2	-	3
MEE5104	Automation الاتمته	2	2	-	-
PR5105	مشروع التخرج Final Project I 1	3	-	-	-
MEE51xx	كورس اختياري1 Elective Course1	3	2	-	3
	Total	16	10	2	8

#### MEE51xx:

<u>06</u> Mechatronics Systems Interfacing<u>06</u> Industrial Hydraulic Control

ربط بيني لانظمة الميكاترونكس تحكم انظمة الهايدروليك

### 5th Year: Semester 10:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
MEE5201	Mechatronics System Modeling and Simulation النمذجة والمحاكاة لأنظمة الميكاترونكس	3	2	-	3
MEE5202	Introduction to ANN and FL				
WIEE5202	مقدمة الشبكات العصبية والمنطق الضبابي	3	2	2	2
MEE52xx	كورس اختياري Elective Course II 2	3	2	-	3
MEE5204	التصميم والتصنيع باستخدام الحاسوب CAD / CAM	3	2	2	2
PR5205	مشروع التخرج 2 Final Project II	3	-	-	-
	Total	15	8	4	10

#### MEE52xx:

O3Embedded Systems Designتصميم الانظمة المدمجةO3Medical Mechatronics System

5<sup>th</sup>Year C.H = 31hrs

TotalCreditHours (All Sem.) = 196 hrs



# **10** Courses Description

# 1<sup>st</sup> Year:

**Calculus I:** 3(2, 2, 0)

Course code EM1101			H	ours	
Course Name Calculus-I		L	Т	Р	С
Prerequisites None		2	2	-	3
Level /semester 1/1					
Objective(s):	Outcomes				
<ul> <li>Understand limits, and continuous functions</li> <li>Plot the graphs of the elementary function.</li> <li>Find Derivatives.</li> <li>Integrate by part and substitution.</li> <li>Apply improper integrals.</li> </ul>	To impart analytica mathematical problem respective branches of Engineering.		oility app	in lied	solving to the

#### **Course Descriptio:**

Functions: graphs of elementary functions, limits, continuous functions. Derivatives of algebraic, logarithmic, exponential inverse trigonometric. High order derivatives, mean value theorem. Taylor theorem. Indefinite integral, integration by part, and by substitution. Solid volumes, Arc length and coordinates. Unbounded functions. Geometric and physical application of improper integrals.

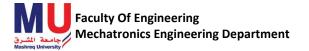
- 1. Advanced Engineering Mathematical, by alan Jeffrey, 1 edition (June 27, 2001)
- 2. Engineering Mathematical, by K.A. Stroud, 2007
- 3. Calculus, by Earl W. Swokowski, 6 edition



## **Linear Algebra:** 3(2, 2, 0)

Course code	EM1102			Hours					
Course Name	Linear Algebra		L	Т	Р	С			
Prerequisites	None		2	2	-	3			
Level /semester	1/1			•					
<b>Objectives:</b>		Outcomes							
- To study '	Vectors and matrices	To impart analytic	al at	oility	in :	solving			
- Solution of Linear equation mathematical problems as applied to the						to the			
- Using Ga	auss method for linear	respective branches of	Engine	ering	•				
systems.		1	U	U					
J									
<b>Course Descript</b>	ion								
-	ion, Space Vector.								
	a of matrices, determinants	s. matrix and inverse of	matrix	. Cran	nmer r	ule and			
-	n method for solution of l								
	igen Value and Eigen Vect	-		mou	equu	ions of			
myerse maura. El	igen value and Ligen vee								

- Advanced Engineering Mathematical, by alan Jeffrey, 1 edition (June 27, 2001)
   Engineering Mathematical, by K.A. Stroud , 2007
- 3. Linear Algebra and it's application, 4th ed, by G.strong, 2006



**Physics-I:** 3(2, 0, 3)

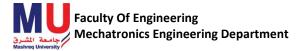
Course code	PH1103			He	ours	
Course Name	Physics-I		L	Τ	P	С
Prerequisites	None		2	-	3	3
Level /semester	1/1					
<b>Objectives</b> :		Outcomes				
student w further theorems • The cour student w of mechar To ensur	end of this course the ill build a good base for heat and mechanics and topics. se aims to provide the rith the elementary laws hics and heat theorem. re the basic laws of s and heat practically.	The purpose of this scientific temper and through learning phys applications in engin Comprehension of som will enable the study engineering problems.	d ana sical c eering e basic	alytica concep and c phys	l capa ts and techno ical cor	ability their plogy. ncepts

#### **Course Description**

Physics and Measurements ,Physical Quantity, Derived quantities, Dimensional Analysis, Vector and Scalar, Properties of Vectors, Vector addition and subtraction, ,Components of a vector, ,The scalar and vector product, Kinematics Description of Motion, The position and the displacement vector, The average and Instantaneous velocity, The average and Instantaneous acceleration, One-dimensional motion with constant acceleration and its Application, Free Fall, Motion in Uniform Circular Motion, The law of motion, The concept of force, Newton's laws of motion, Newton's first and second law, Newton's third law, Weight and tension, Work and Energy, heat.

#### References

1. Physics for Scientists and Engineers 9th Edition, by Raymond A. Serway, 2013



**Chemistry:** 3(2, 0, 2)

Course code	CH1104	Hours					
Course Name	Chemistry			L	Т	Р	С
Prerequisites	None			2	-	2	3
Level /semester	1/1						
<b>Objectives:</b>	·	Outcomes					
-To make the s	-To make the students conversant with			wledg	ge on	the print	nciples
basics of polymer	r chemistry.	of chemistry i	involving	the o	liffere	nt appl	ication
-To make the	student acquire sound	oriented topic	cs requir	ed f	or al	l engir	neering
knowledge of	knowledge of second law of branches.						
thermodynamics	and second law based						
derivations of in	nportance in engineering						
applications in all	l disciplines.						
-To acquaint the	student with concepts of						
important j	photo-physical and						
photochemical	processes and						
spectroscopy.							
-	nderstanding of the basic						
	e rule and its applications						
U	component systems and						
	rpose and significance of						
alloys.							
-	students with the basics						
	lls, their properties and						
applications.							
Course Descript	<u>ion</u>						

## Polymer Chemistry

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting.

Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

#### **Chemical Thermodynamics**

Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore(problems).

#### **Photochemistry and Spectroscopy**

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination- Photo processes - Internal Conversion, Intersystem crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only).

#### Phase Rule and Alloys

Phase rule: Introduction, definition of terms with examples, One Component System- water system - Reduced phase rule - Two Component Systems- classification – lead-silver system, zincmagnesium system. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze.

Nanochemistry



Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications.

- 1. Jain P.C. and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010
- 2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009
- 3. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
- 4. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
- 5. Gowariker V.R., Viswanathan N.V. and JayadevSreedhar, "Polymer Science", New Age International P (Ltd.,), Chennai, 2006.
- 6. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.



## **Fundamental of Computer Science:**3(2, 0, 3)

Course code	CS1105			H	lours	
Course Name	Fundamental of Compu	iter Science	L	Τ	P	С
Prerequisites	None		1	-	2	2
Level /semester	1/1		•	•		
knowledge necessa their future courses applications and in	students with skills and ary for using computers in a. Emphasis will be given to adependent work. Also the ats to pass ICDL exams.	<ul> <li>Outcomes</li> <li>At the end of this course s</li> <li>i. Understand and distimilestones in the escience.</li> <li>ii. Understand the impassociety in the past and</li> <li>iii. Understand and d solving strategies implemented through</li> <li>iv. Understand general internet and world with</li> </ul>	inguislevolution act of d in the lescribe and l comp princ	h the r on of compu- e futur e sim how to outers.	main hi the co uter sci e. pple p these o	istorical omputer ence in roblem- can be
History of compu Introduction of ho system. Introdu	ion anized into six modules ating systems, modern con ow computer work: basic of ction to problem solving t and World Wide Web	of computer architecture. g, algorithm and progra	Introc ammin	duction ng. In	n to op troduc	erating tion to

- 1. J.GlennBrookshear, computer Science an overview, 11ed ISBN:0132569035
- 2. Peter Norton's, "Introduction to Computers", McGraw-Hill/Irwin; 6<sup>th</sup> edition, 2004.



### **Fundamentals of Mechanical Eng.**2(2,0,0)

Course code	ME1109		Hours			
Course Name	Fundamentals of Mech	nanical Eng.	L T P C			
Prerequisites	None		2	-	-	2
Level /semester	1/1					
Objectives: Understanding o Mechanical Engi various field of eng	ineering is required in	<ul> <li>Outcomes</li> <li>After learning the course t to: <ul> <li>To understand the free systems.</li> <li>To understand and mechanical engineer engineering.</li> </ul> </li> </ul>	undam appre	entals ciate s	of mea	chanical

#### **Course Description**

UNIT - 0 Centroids and centre of mass; Centroids of lines and areas; Rectangular, circular, triangular areas by integration, T section, I section, - Angle section, Hollow section by using standard formula,

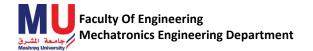
**UNIT** – **I** Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity.

**UNIT** – **II** Heat Engines: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency;Combustion Engines: Introduction, Classification, Engine details, four- stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.

**UNIT** – **III** Pumps: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming Air Compressors: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage.

**UNIT** – **IV** Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc). Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive. Engineering Materials: Types and applications of Ferrous & Nonferrous metals

- 1. Basic Mechanical Engineering / Pravin Kumar/ Pearson
- 2. Introduction to Engineering Materials / B.K. Agrawal/ Mc Graw Hill
- 3. Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI
- 4. Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria

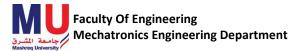


### **Calculus-II** 3(2,2,0)

Course code	EM1201			Hours			
Course Name	Calculus-II		L	Т	Р	С	
Prerequisites	None		2	2	-	3	
Level /semester	1/2		<u>.</u>				
<b>Objectives:</b>		Outcomes					
- Study integrat	this course as follow: tion technique g partial derivative caraculs	The outcomes of	this course a	s follo	w:		
<b>Course Descript</b>	ion	1					

Integral technical, Parametric equations and polar coordinates, vectors and geometry in space, multivariable functions, partial derivatives and multiple integrals with applications, vector valued functions, vector calculus.

- 1. Advanced Engineering Mathematical, by alan Jeffrey, 1 edition (June 27, 2001)
- 2. Engineering Mathematical, by K.A. Stroud, 2007
- 3. Calculus, by Earl W. Swokowski, 6 edition



**Physics-II** 3(2,0,3)

Course code	PH1202			H	lours	
Course Name	Physics-II		L	Τ	Р	С
Prerequisites	None		2	-	3	3
Level /semester	1/2					
<b>Objectives:</b>		<b>Outcomes</b>				
<ul> <li>student wir further el topics.</li> <li>The course student wir of elect theorem.</li> <li>To ensur</li> </ul>	nd of this course the ill build a good base for ectricity theorems and se aims to provide the ith the elementary laws ricity and charges e the basic laws of practically.					

## **Course Description**

Electric force ,coulombs law, Electric force for many charges and resultant force , electric field for a point charge .electric field for many charges and resultant electric field.electic field for continuous distribution, electric flux, electric potential , guess's law and its applications, capacitance, ohms law.

- 1. Physics for Scientist and Engineering, 9th Edition by Raymond A. Serway, 2013
- 2. Fundamental of physics, 10 edition (August 5, 2013) by David Halliday



### **Computer Programming-I:**2(1, 0, 3)

Course code	CS1203		Hours			
Course Name	<b>Computer Programmin</b>	Computer Programming-I		Т	P	С
Prerequisites	Fundamental of Computer Science		2	-	3	3
Level /semester	1/2					
fundamental con- language which	ne student with the cepts of C programming is necessary for most agineering courses.	C – programming	langu	0		

#### Course Description:

Introduction to Computers and Programming. The C Language, Compilers, Numbers Systems. Program Structure, Comments and Printing. Formatting Output, Escape Sequences, Program Debugging. Variables, Constants, Arithmetic Operators and Expressions. Reading Data, Writing to Files, Single Character Data. IF Statements, Logical Operators and Expressions. Switch and IF-ELSE-IF Control Structures, Applications and Review. WHILE and FOR Loops, Applications. Function Prototypes, Definitions, and Call. Address and Pointer Variables, Applications. One Dimensional Arrays, Array I/O. Multidimensional Arrays, Arrays and Functions, Applications and Review. Strings and Pointers. Applications and Review.

- 1. H.H. Tan and T.B. D'Orazio, "C Programming for Engineering & Computer Science", McGraw-Hill Science/Engineering/Math; 1<sup>st</sup> edition (September 17, 1998)
- 2. B.W. Kernighan and D.M. Ritchie, "The C Programming Language", 2<sup>nd</sup> edition, Prentice-Hall, 1988.
- 3. P.J. Plauger, "The Standard C Library", Prentice-Hall, 1992.
- 4. A.I. Holub, "The C Companion", Prentice-Hall, 1987.



# Analytical Geometry:3(2,2,0)

Course code	EM1204			H	ours	
Course Name	Analytical Geometry		L	Τ	P	С
Prerequisites	1- Calculus-I		2	2	-	3
_	2- Linear Algebra					
Level /semester	1/2					
coordinates, the of the axes, the segments and the equation of the variables and th their relation to the second class in the of Triple Space. Of spherical coordinates	at studying the Cartesian withdrawal and rotation e study of the conical er relation to the general second degree in two he conical surfaces and he general equation of the hree variables. The Study Cylindrical coordinates of rdinates and their artesian coordinates.	Outcomes To impart analytica mathematical problem respective branches of	ns as	11	olied t	olving o the
Circle (parametric condition of or tangent and not and its asymptote General equation straight lines, condition of t	geometry:Transformation ric form, tangent and thogonality of circles), rmal). Ellipse (tangent s. n of second degree and parabola, an ellipse and tangency of a line,	normal, pole and pole equation of parabola and normal, conjugate d the conditions for nd a hyperbola, the	olar, (its e diat repre equ n to	ortho para meters senting ation stan	gonal metric s), hyp g a p of ta dard	circle form perbola air of angent forms

2. Calculus with analytic Geometry, by E.W SWOkowski 6<sup>th</sup> ed.



## **Fundamentals of Electrical Engineering:**3(2,0,3)

Course code	EE1205			Н	ours	
Course Name	<b>Fundamentals of Electrical En</b>	gineering	L	Т	P	С
Prerequisites	None		2	-	3	3
Level /semester	1/2					
<ul> <li>be able to:</li> <li>Explain t current, v propertie including current understar real element</li> <li>Perform s find the n a source.</li> <li>Describe storage e</li> </ul>	nding of how these differ from ents. simple power calculations and naximum power available from the behavior of ideal energy lements (inductor, capacitor).	Outcomes To familiarize basics of cir principles of and application Machines.	cuit a workir	analys ng, ch	is and aracter	the ristics
<b>Course Descript</b>	ion					

### <u>Sourse Description</u>

D.C. Circuits: Resistive Networks: Ohm's law, Kirchoff's laws/ Source transformations. Power matching. Magnetic Fields and Circuits: Magnetizing force and flux density. MMF, reluctance and design of simple magnetic circuits. Electromagnetic Energy Conversion: Force on a conductor. Faraday's law; motional and transformer e.m.f. The Ideal Transformer: Voltage, current and flux relationships. Referred impedance. Power balance and impedance matching. Design considerations; importance of frequency. Imperfections and introduction to real transformer equivalent circuit.

### References

V. Fundamentals Of Electrical Engineering, By Giorgio Rizzoni, 2009



# **Introduction to Mechatronics:** 2(2,0,0)

Course code	MEE2109			Hours				
Course Name	Introduction to Mecha	tronics		L	Т	Р	С	
Prerequisites	Non.			2	-	-	2	
Level /semester	1/2							
<b>Objective(s)</b>		<u>Outcomes</u>						
	e students with the basic	To familiarize t					•	
concepts of mech	atronics engineering.	Mechatronics	system			ronics	for	
		Mechanical engineering, Mechanical system				m For		
		Electronics Eng	gineering	and C	CNC			
Course Descript	ion							
What is Mechatr								
Basic Def								
	ents of Mechatronics							
•	Mechatronics							
-	Perspective							
	lopment of the Automobi	le as a Mechatro	nic Syster	m				
	onics? And What's Next?		~ <b>j</b> ~ · · ·					
Basic Concepts in	Mechatronics :							
Historical	Development and Defini	tion of Mechatro	nic Syste	ms.				
• Functions	of Mechatronic Systems							
Division of the second se	of Functions Between Me	chanics and Elec	tronics					
• Ways of I	ntegration:							
• Integration	n of Components (Hardw	are)						
• Integration	n of Information Processi	ng (Software)						
	echanical engineering:							
•	m For Electronics Engine	0						
Introduction to M	odern CNC Machine and	Manufacturing	Systems.					
References								
	Bolton, Mechatronics,	Electronic cont	rol syste	ms i	n me	chanica	and	



# **Basic Training:**0(0,0,3)

Course code	WS1210		Hours					
Course Name	Basic Training		L	Т	Р	С		
Prerequisites	None		-	-	3	0		
Level /semester	1/2							
used in fitting welding and s	f tools and equipment's g, carpentry, sheet metal, mithy. on of simple models in	Outcomes To provide the s experience on differ like fitting, carpentry, metal.	ent tra	des of	f engir	neering		
joints, Key Makin CARPENTARY Tools and equip joints, a mini moo SHEET METAI Tools and equipm WELDING Tools and equipm Gas welding, TIC SMITHY	ment's- Planning practice del ofa single door window ment's - Fabrication of a sm nent's - Arc welding of b	e. Making Half Lap, o frame. all cabinet, Rectangula utt joint, Lap Joint, Te	dovetai r Hopp æ Fille	ll, Mo er, etc t. Den	rtise & nonstra	Tenon		
Theory, p 2. Kannaiah Chennai, 3. Venkatacl	V., Kumar, T., and Mur ractice andwork book", Su P. &Narayanan,K.C. Mar 1999. nalapathy, V.S. First ye ns, Madurai,1999.	ma Publications, 2005. nual on Workshop Prac	ctice, S	citech	Public	ations,		



# 2<sup>nd</sup> Year:

### **Differential Equations:** 3(2, 2, 0)

Course code	EM2101			H	ours	
Course Name	<b>Differential Equations</b>		L	Т	Р	С
Prerequisites	Calculus		2	2	0	3
Level /semester	2/3		•		•	
<ul> <li>able</li> <li>1. To apply adv to Engineerin,</li> <li>2. To improve geometrical ap calculus problem</li> <li>3. To equip ther functions of se</li> <li>4. To familiarized differential equiparts</li> </ul>	their ability in solving pplications of differential lems. nselves familiar with the everal variables. e with the applications of juations.	<b>Outcomes</b> To impart analytics mathematical problem respective branches of	ns as	app	lied 1	solving to the
-	o the concept of three nalytical geometry.					
Description:-	order of ordinary dif				1:00	

Degree and order of ordinary differential equations. Formation of differential equations. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant coefficients. Solution of homogeneous linear equations. Solution of differential equation of the higher order when the dependent or independent variable is absent. Solution of differential equation by the method based on the factorization operators. Frobenius method. of the Wave \*Partial differential equations: equations. Particular solutions with boundary and initial conditions.

- 1. Edwards, C., and D. Penney, Elementary Differential Equations with Boundary Value Problem, Pearson; 6<sup>th</sup> edition, 2007.
- 2. Dennis G. Zill and Michael R. Cullen, Differential equations with boundary value problems, 7<sup>th</sup> edition, Publisher: Cengage Learning, May 2009.



### **Computer Programming-II:** 2(1,0,3)

Course code	SC2102			H	lours	
Course Name	Programming language	-II	L	Т	Р	С
Prerequisites	Programming Language-	Ι	1	0	3	3
Level /semester	2/3					
<ul><li>should be able to:</li><li>1. Appreciate why for further study in general.</li><li>2. Describe the i characters, string</li></ul>	this course, the students C++ provides a foundation of programming languages nternal representation of gs, records, and arrays. cills of programming using	Outcomes To provide hands-on tra programming language Mechanical Engineering	•			
<ol> <li>Write complete, programs.</li> <li>Convert ideas</li> <li>which can be c that can easily language.</li> <li>Define and man</li> </ol>	properly structured, C++ into organized algorithms converted into flow charts be interpreted into C nipulate arrays, characters natted input/output and data r C++ programs.					

#### **Course Description**

Introduction to History of computers, Principles of designing a program, C Basics (Usage of Conditional statements, Looping and iteration, Arrays and strings, Functions and Procedures) **Introduction to computers**: History, types of programming languages for problem solving.

**Designing Programs:** Requirements gathering, Specifications & Design, meaning of algorithm, usage of pseudo code and flowcharts, Coding & Testing, Documentation, Maintenance.

C++ **Basics** : History of C++, Characteristics of C++, C++ program structure, Variables, Definition global variables, Printing out and Inputting variables (Scanf, Printf, getchar, putchar, getch, getche), Constants, Arithmetic operations , Comparison operators, Logical operators, Order of precedence .

**Conditionals:** If statement, If.....else statement, If statement with logical operators, the switch statement.

**Looping and iteration:**The for statement, the while statement, the do-while statement, Nested loop, Infinite loop, break and continue.

Arrays and strings: single dimensional arrays, Multi dimensional arrays, Strings.

**Functions and Procedures:** Function declarations, definitions, & prototypes, pass-by-value and pass-by-reference parameters, local and global variables, scope, function calls, recursion.

### References

#### Textbook

1. Deital&Deital, "C++ How to program", 2nd Edition, Prentice Hall, 2001.

- 2. Kernighan & Ritchie, "The C++ Language", 2nd Edition, Prentice Hall, 1988
- 3. Miller & Quilici, "Joy of C", Wiley, 1993

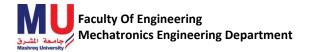


### **Digital Circuit Design-I** 3(2,0,3)

Course code	ECE2104			Н	ours	
Course Name	Digital Circuit Design-I		L	Т	Р	С
Prerequisites	Electronics Principles				3	3
Level /semester	2/3		•			•
<ul><li>implementation</li><li>To study to</li></ul>	arious number systems and n of combinational Circuits. he design of various nd Asynchronous Circuits.	Outcomes To introduce the concept building blocks in ICs fundamentals of Digita circuit.	s, appl	ication	n of I	C and
<b>Course Description</b>						
	aracteristics of digital syst table revision. Combination	e e			•	

operation and truth table revision. Combinational logic circuits, simplification techniques, Algebra and Karnaugh map simplifications, parity checker and complement circuits, half and full binary adders, multiplexers and de-multiplexers, coders and decoders.

- 1. RamakantA.Gayakward, Op-amps and Linear Integrated Circuits, IV edition, Pearson Education, 2003 / PHI.
- 2. D.RoyChoudhary, SheilB.Jani, Linear Integrated Circuits, 11Editions, New Age, 2003.
- 3. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India, 2008



# **Principle of ElectronicsDevices:** 2(2,0,0)

Course code	ECE2105			H	ours	
Course Name	Principle of Electronic	sDevices	L	Т	Р	С
Prerequisites	Non		2	-	-	3
Level /semester	2/3		•			•
<b>Objective</b> (s)		Outcomes				
		The students can be deal v	vith PN ju	inction	construc	tion and
This course is desig	gned to help the student to	layers.	-			
learn about origin of	electronics starting from the	-				
	d state theory, components,					
circuits, and the use of	of electronics.					
Course Descript	<u>ion</u>					
semiconductors. H	al, atomic theory. Charge and loles and energy. PN junc se biasing. The barrier poter	ction. Formation of dep	letion la	yer. B	ulk res	
References						

- Electronic devices edition 9 , Floyd
   Microelectronic Circuits by Sedra Smith,5th edition



### **Electrical Circuits Analysis-I:** 3(2,0,3)

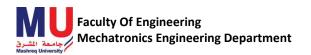
Course code	EE2106			H	ours	
Course Name	<b>Electrical Circuits An</b>	alysis-I	L	Т	Р	С
Prerequisites	ECE1205		2	-	3	3
Level /semester	2/3		·			
<b>Objective</b> (s)		Outcomes				
circuits. 2. Ability to pe analysis. 3. Ability to apply	ly basic laws to resistive erform mesh and nodal y circuit theorems yze first-order circuits.					

#### **Course Description**

Basic circuit laws, Ohm's Law, Nodes, Branches and Loops, Kirchoff's Laws, Series and Parallel Resistor Networks, Voltage and Current Dividers, Wye-Delta Transformations, Circuit Analysis: Linear Equations, Nodal Analysis, Super Nodes, Mesh Analysis, Super Meshes. Circuit Theorems: Linearity, Superposition, Source Transformations, Thevenin and Norton's Theorems, Maximum Power Transfer.

#### References

1. Fundamentals Of Electrical Engineering, By Giorgio Rizzoni, 2009



## **Engineering Mechanics-I:** 3(2,0,3)

Course code	ME2108	ME2108 Hours						
Course Name	<b>Engineering Mechanic</b>	es -I	L	Т	Р	С		
Prerequisites	ME1109		2	-	3	3		
Level /semester	2/3							
Objective(s)		Outcomes						
To develop the capacity to predict the effects of force while carrying out the creative design function of engineering Students are also exposed to the plane trusses and their solution by different methods which help them analyzing the structures and designing new structures. The students are introduced to the concentrated and distributed forces of friction which enables them to understand the design of a machine.					l force s vo-dime	systems		
2. Moment and res <b>Equilibrium</b>	ion ctangular and oblique axis c ultant couple (two and thre ems, isolation and equilibri	e dimensional systems).						
1. Plane trusses.		ints and method of sections						
	oeler, Engineering Mecha am, Engineering Mechan		Editio	1				



### Mathematical Methods: 3(2, 2, 0)

Course code	EM2201			He	Hours		
Course Name	Mathematical Method	S	L	Т	Р	С	
Prerequisites	EM1101,EM1201		2	2	-	3	
Level /semester	2/4						
Objective(s) To study transforms topics.	used in many engineering	<u>Outcomes</u>					
Course Description:							

Fourier Series, Even and odd functions, Convergence, Fourier transforms, Delta- Functions, Parseval's Theorem, Convolution theorem, Laplace transform, Applications of integral transforms: Wave Equation (Fourier Transform), LCR circuit (Laplace Transform), Bessel's Equation for n=0 (Laplace Transform).

#### **References**

1. Advance engineering Methods by alanJehhery



## **Thermodynamics and Heat Transfer:** 3(2, 2, 2)

Course code	ME2202			He	ours	
Course Name	Thermodynamics and H	Thermodynamics and Heat Transfer L			P	С
Prerequisites	Physics		2	2	-	3
Level /semester	2/4					
of thermo	modes of heat transfer	<u>Outcomes</u> - This course provid about thermodynam I.C. Engines, steam - Turbines and introd	nics a and g	and its as	s appli	ication
•	d analysis of Boilers, nd heat exchangers					

### **Course Description**

**Introduction and Basic Concepts:** Application areas of thermodynamics, Systems and Control volumes, Properties of system, Continuum, State and equilibrium, Processes and cycles, Temperature and Zeroth law of thermodynamics, Heat and thermodynamic concept of work.

### First Law of Thermodynamics:

Statement, Heat and work calculations, Application of first law to non-flow and flow systems, steady flow energy equation as applied to boiler, condenser, nozzle and turbine.

#### Second Law of Thermodynamics:

Statements and their equivalence, thermal energy reservoirs, concept of heat engine, refrigerator, heat pump and perpetual motion machines, Carnot cycle and principles.

**Entropy:** Concept of entropy, Temperature- entropy plot, Clausius inequality, Principle of Increase of entropy, entropy balance.

### Introduction to:

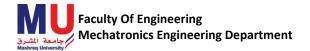
Steam Turbines, Internal Combustion Engines, Gas Turbines

#### Heat Transfer

Typical heat transfer situations, Modes of heat transfer

### Conduction, Convection, Radiation

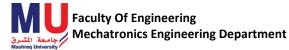
- 1. Introduction to Thermodynamics and Heat Transfer, YunusCengel, 2nd ed, McGraw-Hill
- 2. Fundamentals of Thermodynamics, Sonntag, Borgnakke, Van Wylen, Wiley India Pvt. Ltd.
- 3. Applied Thermodynamics, Onkar Singh, 3rd ed, New Age International
- 4. Basic Engineering Thermodynamics, Rayner Joel, Longman Publishers
- 5. Heat Transfer, S P Sukhatme, University Press



# **Digital Circuit Design-II**3(2,0,3)

Course code	ECE2104			H	ours	
Course Name	Digital Circuit Design-II	[	L	Т	Р	С
Prerequisites	Digital Circuit Design-I		2	-	3	3
Level /semester	2/4					
<b>Objective</b> (s)		Outcomes				
- To study and E	Design Sequential Logic	To introduce the concep	ts for	realisi	ng fun	ctional
circuits.		building blocks in ICs	, appli	ication	of I	C and
- To link these d	esigns with applicable	sequential circuit.	••			
electronic circu	uits.	-				
Course Descriptio	n:					
<u>course Description</u>	<u></u>					
FF, D FF, and JK I		rison. Multi-vibrators circuit el Shift Register. Counters, A				

- 1. RamakantA.Gayakward, Op-amps and Linear Integrated Circuits, IV edition, Pearson Education, 2003 / PHI.
- 2. D.RoyChoudhary, SheilB.Jani, Linear Integrated Circuits, II edition, New Age, 2003.
- 3. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India, 2008



# AnalogElectronic Circuits-I 3(2,0,3)

Course code	CS2205			H	lours	
Course Name	Analog Electronic Cire	cuits-I	L	Т	Р	C
Prerequisites	ECE2105		2	0	0	3
Level /semester	2/4					
electronic circuit techniques with sp to the operation ar transistors includin	course is to introduce analysis and design becial consideration given ad use of bipolar junction g the analysis and design cuits that utilize these	<u>Outcomes</u>				

Introduction to amplifier circuits, class A, class B, and class C circuits. Common Emitter circuit, analysis and design, circuit gain, alpha and beta calculations, common collector circuit and analysis, common base circuit. FET amplifiers, common source circuit analysis and design.

- 1. Electronic devices edition 9, Floyd
- 2. Microelectronic Circuits by Sedra Smith,5th edition



# Electrical Circuits Analysis-II 3(2,0,3)

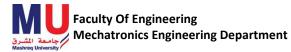
Course code	EE 3106			H	lours	
Course Name	<b>Electrical Circuits Ana</b>	alysis-II	L	Т	Р	С
Prerequisites	ECE2106	•	2	0	3	2
Level /semester	2/4					
<b>Objective</b> (s)		Outcomes				
Electric circuit II	is a second course on					
electric circuits.	It is intended both to					
enhance the know	wledge of students with					
regard to electric	circuits and to develop					
skills in analysis.	Although the focus is					
electric circuits, the	e theory and skills learned					
are useful in other	areas as well.					
Course Descript	ion	•				

# **Course Description**

Frequency Response, Filters, and Resonance: Frequency response. High-pass and low-pass networks. Half-power frequencies. Frequency response from pole-zero locations and Bode plots. Band pass filters and resonance. Natural frequency and damping ratio. RLC series circuit; series resonance. Quality factor. RLC parallel circuit; parallel resonance. Practical LC parallel circuit. Series-parallel conversions. Locus diagrams. Mutual Inductance and Transformers. Mutual inductance. Coupling coefficient. Analysis of coupled coils. AC Power: Power in time domain. Power in sinusoidal steady state. Average or real power. Reactive power. Summary of AC power in R, L, and C. Exchange of energy between an inductor and a capacitor. Complex power, apparent power, and power triangle. Parallel-connected networks. Power factor improvement. Maximum power transfer.

### **References**

1. Fundamentals Of Electrical Engineering, By Giorgio Rizzoni, 2009



# **Engineering Drawing:** 4(2, -, 6)

Course code	GE2207			H	lours	
Course Name	Engineering Drawing		L	Τ	Р	С
Prerequisites	None		2	-	3	3
Level /semester	2/4					
experience constructi 2. To provid principles projection	de the student with the e of geometrical on and sketching. de the student with the of orthographic , sectional views, views, and writing is.	Outcomes 1. To draw and interpre 1D, 2D and 3D objects. 2. To prepare and in buildings.	•		0	

# **Course Description**

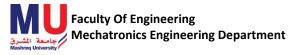
Engineering drawing introduction, types of lines, size of drawing papers, layouts of drawing sheets, graphics instruments, scales, geometrical construction, orthographic projection, sectioning, dimensioning, pictorial drawing, conventions. Descriptive geometry locus of a point, Mange's projection, straight line (particular positions), the plane, auxiliary planes, the positional problems, projection of circle, curved surfaces, intersection of surfaces of revolution, perspective projection.

- 1. Thomas, E.E., Charls, J.V., and Robert J.F., Engineering Drawing and Graphic Technology, 14<sup>th</sup> edition, McGraw-Hill, 1993.
- 2. Colin H., Simmons and Dennis E. Maguire, Manual of Engineering Drawing, 2<sup>nd</sup> edition, 2004, Elsevier Newnes, Linacre House, Jordan Hill, Oxford OX2 8DP, 200 Wheel Road, Burlington MA 01803.



# **EngineeringMechanics-II:** 3(2,2,0)

Course code	ME2208			H	lours	
Course Name	<b>Engineering Mechanic</b>	es-II	L	Т	Р	С
Prerequisites	ME2107		2	2	0	3
Level /semester	2/4					
<b>Objective</b> (s)		Outcomes				
	is course is to develop the					
capacity to predict	t the effects of force and	The students can be	able to:	solve	the dif	ferent
motion while ca	rrying out the creative	Kinematics problems				
6	engineering. The concepts					
-	particle motion in various					
	s as well as relative and					
	are given to the students.					
-	understanding the forces					
	n a system in motion.					
	her exposed to particles nclude the force mass					
	x - energy and impulse					
	help students in making					
	onger about dealing with					
the bodies in motio						
the bodies in motio	11.					
<b>Course Descript</b>	ion					
Kinematics of Par						
1. Rectilinear moti	ion.					
2. Plane curvilinea	r motion.					
3. Rectangular coo	ordinates.					
	gential coordinates.					
5. Polar coordinate						
Kinetics of Partic						
1. Force, mass, and		- <b>f</b>				
	d law of motion, equations of curvilinear motion.	of motion.				
	gy, potential energy.					
-	omentum, conservation of n	nomentum				
Plane Kinematics		nomentum				
	relations, absolute motion.					
2. Relative velocit						
	entre of zero velocity.					
4. Relative acceler						
Plane Kinetics of	Rigid Bodies					
1. Force, mass, and	d acceleration, general equa	tion of motion.				
2. Translation, fixe						
3. Work and energy						
4. Impulse and mo	mentum equation.					
References						
1. J. L. Meri	am, Engineering Mechan	ics, Dynamic				



# 3<sup>rd</sup> Year:

# **Probability and Statistics**3(2,2,0)

Course code	EM3101			Ho	ours	
Course Name	<b>Probability and Statistics</b>		L	Т	Р	С
Prerequisites	Calculus &Liner Algebra		2	2	-	3
Level /semester	3/5					
	ent with the concept of the concept	Outcomes This core course is int general background in pr will form the basis of statistics.	obabil	ity and	statistic	s that
Correlation & regree ✓ Correlation	tendency and measure of dis ession between two variables Simple linear regression, Tim	(Pearson-spearman), Cor	ntingen	cy tab	les (no	ominal

✓ Fundamentals of the basic theory of probability, Sample spaces, events, basic axioms, Set theory and a set of axioms for probability, Condition probability.

Random variables

✓ Random variables (type-expected-variance), Probability density functions (pdf), Continuous distribution (normal distribution), Discrete distribution (binomial distribution-poisson distribution).

Estimation and hypothesis testing

- $\checkmark$  t-student distribution , f-distribution
- ✓ Simple analysis of variance

- 1. Walpole, Myers, Myers & Ye, Probability & Statistics for Engineers and Scientists; Pearson; 9<sup>th</sup> edition, 2011.
- 2. Engineering mathematical by K.A stword 2007



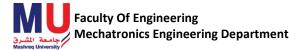
# Microprocessors & Assembly Language 3(2,0,3)

Course code	ECE 3202			H	lours	
Course Name	Microprocessor and A	ssembly Language	L	Т	P	С
Prerequisites	Introduction to compu	iter science	2	0	3	2
Level /semester	6					
<b>Objective</b> (s)		Outcomes				
This course	aims to introduce the					
organization of a n	nicroprocessor system and					
	age for programming the					
	Students will learn the					
1 0 0	niques, design techniques					
	and input/output system					
	oprocessor system. Upon					
completion, stude	ents are equipped with					
fundamental know	wledge to program a					
microprocessor	system for specific					
application.						

### **Course Description**

Basic computer architecture: CPU, input/output, memory systems and buses; Structure of a CPU: ALU, accumulators, registers, stack, control unit and buses; Instruction execution, sequence and data flow, instruction cycle; Concept of address bus, data bus, control bus and bus arbitration; ASCII code; Instruction formats, operands, types and addressing modes; 8086 Assembly language programming, assembler directives and assembler operation.

- 1. Computer architecture and Organization ,William Stalling.
- 2. Microprocessor Fundamentals by K.John



# **Strength of Materials 3(2,2,0)**

Course code	ECE 3103			H	lours	
Course Name	Strength of Materials		L	Т	P	С
Prerequisites	<b>Engineering Mechanic</b>	s	2	2	-	3
Level /semester	3/5				•	
Objective(s) Study of the understanding o springs, columns	f principal stress, strains,	<ul> <li>Outcomes</li> <li>At the end of the course,</li> <li>Determine stresser Torsion</li> <li>Understand the c stresses</li> <li>Understand the c beams.</li> </ul>	es in the	e memt of direc	er subj et and b	ected to ending

### **Course Description**

Simple stresses, strains, deformation due to external loads, deformation of bars under axial loads. Transversely loaded beams and shafts with various support conditions. Beams bending stress and shearing stress. Torsion, Shaft design for power transmission and rotational speed. Double integration method, moment method, Macaulay method, Moment area method. Mohrs Circle and principle stresses.

- 1. Mechanics of Materials Ferdinand P. Beer et al., Tata McGraw Hill Education Pvt. Ltd 5th edition 2009.
- 2. Strength of Materials R. Subramanian, Oxford University Press 2010
- 3. Strength of Materials by B.S. Basavarajaiah, B.S. Mahadevappa, Universities Press 3rd Edition 2015.
- 4. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd
- 5. Introduction to Strength of Materials by U. C. Jindal, Galgotia Publications Pvt. Ltd.
- 6. Mechanics of Materials by R. C. Hibbeler, Pearson Education
- 7. Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd.
- 8. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
- 9. Strength of Materials by S.S Bhavikatti, Vikas Publishing House Pvt. Ltd.



# **Engineering Material** 2(2,0,0)

Course code	ME3104			H	ours	
Course Name	<b>Engineering Material</b>		L	Т	Р	С
Prerequisites	Physics		2	0	0	2
Level /semester	3/5					
fundamental kr materials, their characteristics, engineering des give a theoretic analysis of b materials by relationships be and properties. I of modifying a microstructures properties (tous	the course is to give nowledge about type of usage, properties and which are important in ign. It is also aimed to cal background about the ehavior of engineering emphasizing important etween internal structure t attempts to present ways and control the material and especially mechanical ghness, strength, fatigue stance) by suitable heat ion.	est rating, through wo on literacy and c ials science and c	critical	thinkin	g skills	

Classification of materials, general criteria of materials selection, atomic bonding and crystalline structure, phase equilibria and transformation in metallic systems, Heat treatment and strengthening methods of materials, mechanical and physical properties, failure of materials in services, electrical, thermal, magnetic, optical properties, engineering properties of ceramics, polymer, and composites

- 1. Engineering materials technology, by William Bolton, 1993
- 1. Material for Engineering, by dohn martin, 2003
- 2. William D. Callister, Jr. Materials Science and Engineering: An Introduction, 5<sup>th</sup>, John Wiley and Sons, 2000.
- 3. William F. Smith, Foundations of Materials Science and Engineering, 3<sup>rd</sup> Ed., McGraw-Hill, 2004.
- 4. James F. Shackelford, Introduction to Materials Science for Engineers, 5<sup>th</sup> Ed., Prentice Hall, 2000.
- 5. Larry D. Horath, Fundamentals of Material Science, 3<sup>rd</sup> Ed., Prentice Hall, 2006.



# AnalogElectronic Circuits II 3(2,0,3)

Course code	ECE3205			Н	lours	
Course Name	Analog Electronic Circ	cuits II	L	Т	Р	С
Prerequisites	ECE2205		2	0	3	3
Level /semester	6					
<b>Objective(s)</b> To focus on the desi filters.	gn of operational amplifiers,	<u>Outcomes</u>				
<b>Course Descript</b>	ion					

Feedback in Amplifier & Circuit Design. Loop gain determination Stability analysis. Ideal op-amp, Op-Amps circuits, inverting and non-inverting op-amps, voltage follower and other op-amps, summing op-amp, differential op-amp, differentiation op-amp, comparator op-amp, integrator op-amp. passive filters: high pass filter, low pass filter, band pass filter. Active Filters: Active Low Passive Filter, Active High Pass Filter, Active Band Pass Filter, Band Stop Filter.

# **References**

- 1. Electronic devices edition 9, Floyd
- 2. Microelectronic Circuits by Sedra Smith,5th edition

# Signals and Systems3(2,0,3)

Co	ourse code	ECE 3106			H	ours	
Co	ourse Name	Signals and Systems		L	Т	Р	С
Pr	erequisites			2	-	2	3
	vel /semester	3/5					
Le Ol At	vel /semester <u>pjective(s)</u> the end of this c Understand the l time and discrete Understand line their characteriz Be able to o continuous-time invariant syster integral or sum f Understand Fou representation signals. Understand the n a countably infin Understand the	course, students should: basic concepts for continuous- e-time signals and systems. ar time-invariant systems and ation using impulse response. compute the output of a or discrete-time linear time- n using convolution in the form. rier series for the analysis and of periodic continuous-time representation of signals using hite orthogonal basis. actual meaning of the Fourier	<ul> <li>Outcomes The students will demonstra <ol> <li>The knowledge of how time, frequency, Laplac</li> <li>The knowledge of how continuous convolution</li> <li>The ability to design, b invariant systems.</li> </ol> 4. The ability to program Mat lab.</li></ul>	w to re e, andZ to perf uilds, an	domain form bo nd analy	ns. oth discre yzes line	ete and ar time
7. 8. 9.	Fourier transform understand relate convolution the uncertainty prim the Fourier oper- Understand the transform and its Understand the	levelop the continuous-time m from the Fourier series and ed topics such as time scaling, eorem, Parseval's relation, ciple and Eigen functions of ator. he discrete-time Fourier					

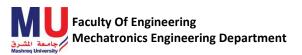


### **Course Description**

Signals and system mathematical definition, the types, characteristics and properties of signals Time domain analysis, and convolution integral for LTI systems, properties and characteristics. Frequency domain representation of signals, aperiodic signals and Fourier transform, Fourier Transform properties, conversion tables, inverse Fourier transform. Frequency domain representation of continuous time systems, definition, properties, inverse Laplacetransforms.

Z-transforms properties, duality properties, region of convergence, stability. Application: Analog filters, frequency separation, ideal filter, Butterworth filter, cross over frequency, bandwidth, and design limitations.

- 1. Continuous and Discrete Time Signals and Systems by MrinalMandal, Amir Asif
- 2. Signals and Systems (2nd Edition) by Alan V. Oppenheim, Alan S. Willsky with S. Hamid
- 3. Signals and Systems using MATLAB (2nd Edition) by Luis Chaparro
- 4. Transforms in Signals and Systems by Peter Kraniauskas



# **Fluid Mechanics** 3(2,0,3)

Course code	ME3107			H	lours	
Course Name	Fluid Mechanics		L	Т	Р	С
Prerequisites	<b>Engineering Mechanic</b>	s, Calculus	2	2	0	3
Level /semester	5					
fundamentals of engineers. The em fluid statics an application in a va The basic idea of of static fluids, th for fluids in motio mass, time and te greatly simplify th illustrated. With th of flow through o	course introduces the fluid mechanics for phasis is on the basics of d fluid motion, with riety of engineering fields. what fluids are, the study e use of control volumes n, and the uses of length, emperature dimensions to e description of fluids are ese tools practical aspects hucts and around objects f compressibility are also	<ul> <li>Outcomes</li> <li>At the end of the course <ul> <li>Apply conservated equations of flution</li> <li>Compute hydroof forces.</li> <li>Analyze and de <ul> <li>Apply principled design experiment</li> </ul> </li> </ul></li></ul>	ion law d flows tatic an ign sim s of dim	s to der d hydro ple pipe	ive gov dynami e systen	erning ic ns.
	<u>n</u> : Definition and properties bsolute, Gauge, Atmospheri	• •			of press	sure in a
<ul> <li>Fundamentals static fluid, A</li> <li>Fluid statics: Buoyancy, ce determination</li> <li>Kinematics a dimensional H</li> <li>Flow of real equation.</li> <li>Fluid flow in</li> <li>Dimensional a</li> <li>Impact of jet:</li> <li>Hydraulic tur working prince</li> </ul>	: Definition and properties	ic and Vacuum pressure I htte of Pressure on vertic entre and Meta-centric h ability of floating and sul w : Types of fluid f and Bernoulli's energy ec- er, Laminar flow in circ ation. Losses in pipes - M ethods of dimensional an stationery vanes and mo cis turbine and Kaplan t erning mechanisms and s	fanome il and in ight. -mergeco ow, con uation. ilar pip inor and ilysis, si ring van irbine (f imple pi	ters. Analyti I bodies ntinuity es. Ha I major militud es. Constru roblems	plane s cal met s. equati- agen po losses. le. ctional	urfaces thod fo on, on biseuille feature



### Numerical Analysis 3(2,2,0)

Course code	EM3201			H	lours	
Course Name	Numerical Analysis		L	Т	Р	С
Prerequisites	Computer Programming		2	2	-	3
Level /semester	3/6					
<ul> <li><b>Objective(s)</b></li> <li>Find acceptal when exact solor so arduous be impractical;</li> <li>Devise altern better suited computers;</li> <li>Formulate progresearch as of defining the variables, the the governing of the governing of the solution to optimization periodic starting point;</li> <li>Formulate the general optimis their duality gar and weak dualities of the number of the solution to the solution the so</li></ul>	ble approximate solutions utions are either impossible and time-consuming as to ate methods of solution to the capabilities of oblems in their fields of optimization problems by underlying independent proper cost function, and constraint functions; ow to assess and check the optimality of a particular a general constrained roblem; hality conditions to search or global solution from a e dual problem of some ization types and assess ap using concepts of strong ity; he computational details merical methods discussed they apply, and what their	Outcomes The aim of the course analyzing, and impleme - Obtaining nume of calculus; - Selection of a be some criteria) fr alternatives.	ntatior rical s est ele	n algor olution ment (	ithms fonds to pr with re	or oblems gard to

#### **Course Description**

The course emphasizes the underlying fundamental ideas behind numerical methods and covers important topics, such as the basics of the analysis of algorithms and computational complexity. The first part of the course introduces the necessary mathematical background, the digital representation of numbers, and different types of errors associated with numerical methods. The second part explains how to solve typical problems using numerical methods. Focusing on optimization methods, the final part presents basic theory and algorithms for linear and nonlinear optimization.

- 1. M. S. Bazaraa, J. J. Jarvis, and H. D. Sherali. Linear Programming and Network Flows. John Wiley & Sons, 4th edition, 2010, ISBN 978-0-470-46272-0.
- D. Bertsimas and J. N. Tsitsiklis. Introduction to Linear Optimization. Athena Scientific, Belmont, MA, 1997, ISBN 1886529191.
- S. Boyd and L. Vandenberghe. Convex Optimization. Cambridge University Press, 2004, ISBN 0-521-83378



# Complex Variables3(2,2,0)

Course code	EM 3202		Hours					
Course Name	<b>Complex Variables</b>		L	Т	Р	С		
Prerequisites	Calculus I, II		2	2	-	3		
Level /semester	3/6							
<b>Objective(s)</b>		Outcomes						
1								
<b>Course Descripti</b>	ion							

Complex number system. Geometry of the complex plane, General functions of a complex variable. Limits and continuity of a function of a complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function Cauchy integral formula. Liouville's theorem. Taylor's and Laurent's expansions. Singular points. Residue, Cauchy's residue

theorem.

- 1- Complex variables and application 7<sup>th</sup> ed. By James word Brown/RuelV.charchiodl
- 2- Advance Engineering mathematical by alanJelfey.



# **Measurement and Sensors** 3(2,2,2)

Cou	urse code	ECE3203			H	ours		
Cou	urse Name	Measurement and Senso	asurement and Sensors			Р	С	
Pre	requisites	ECE2106, ECE2205 and EC	1 ECE3106 2 2 2					
Lev	vel /semester	3/6						
Ob	jective(s)		Outcomes					
2.	and sensors. Identify ar measurements		To lay a foundation different measurements sensors and its application	requir				
	Select appropriations.	priate sensors for various						
4.	Understand th &Macrobiotic	e science of micro actuators						

### **Course Description**

### LINEAR AND ANGULAR MEASUREMNTS

General concepts of measurements – Definition, Standards of measurement – Errors in measurement, Accuracy, Precision. Length standard – Line and end standard – Slip gauges, Micrometers, Vernier, Dial gauges – comparators, types, principle and applications – interferometry – Angular measuring instruments – bevel protractor, levels, clinometers – Sine bar, angle dekkor – auto collimator.

### FORM MEASURMENTS AND COMPUTER AIDEDMETROLOGY

Straightness, Flatness and roundness measurement, surface finish measurements, Tool makers microscope, various elements of threads -2 wire and 3 wire methods - gear elements - various errors and measurements. Co-ordinate measuring machine - construction features - types - application of CMM - Computer aided inspection - Machine vision - Non contact and in-process inspection, Laser Interferometer and its application

### SENSOR

Principles and Applications of displacement sensor – position sensors, linear and angular – velocity sensors – Torque sensors. Principle and applications of pressure sensor, flow sensors, temperature sensors, acoustic sensor and vibration sensors.

### MICRO ACTUATORS AND MICRO VALVES

Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles. Micro valves: Electromagnetic, Piezoelectric, Electrostatic, Thermo pneumatic, Bimetal. Linear actuators-magnetic, electrostatic, piezoelectric.

### MICRO SENSORS AND MICROBOTICS

Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Microbotics: Drive principle, classification, application, micro assembly with the help of microbots, flexible microbots, Automated desktop station using micromanipulation robots.

- 1. Jain .R. K., Engineering Metrology, Khanna Publishers, 1994.
- 2. Patranabis.D, Sensors and Transducers, Wheeler publisher, 1994.
- **3.** SergejFatikow and Ulrich Rembold, Microsystem Technology and Microbotics First edition, springer –VerlagNEwyork, Inc, 1997.



# Mechanical Vibrations 3(2,2,0)

Course code	ME3204			Ho			
Course Name	Mechanical Vibrations	5		L	Т	Р	С
Prerequisites	<b>Engineering Mechanic</b>	s, Calcı	ılus I, II	2	2	-	3
Level /semester	3/6						
and make of 2. Learn to a	ad noise in automobiles lesign modifications. reduce the vibration and improve the life of the	<u>Outco</u> 1. 2.	mes Translate a Mechanical vib mathematical mod Make engineer problem of r required and th design of mechan	ration del. ing ju reducing e role	to an udgeme g vib of vi	n appr ent or pration bration	opriate n the when
<ol> <li>Harmonic Motio</li> <li>Single Degree of</li> </ol>	Classifications, Procedures	ibrations	3	ng Elem	ents.		

6. Torsional vibration

- 1. W T Thomson, Theory of Vibration with Applications, Fourth Edition, Chapman & Hall.
- 2. Singiresu S. Rao- Mechanical Vibrations- Pearson Education, 4th Edition, 2007...
- 3. KewalPujara Vibrations and Noise for Engineers, Dhanpat Rai & Sons, 1992.
- 4. Bernard Challen and RodicaBaranescu Diesel Engine Reference Book Second edition -SAE International ISBN 0-7680-0403-9 1999.
- 5. Julian Happian-Smith An Introduction to Modern Vehicle Design- Butterworth-Heinemann, ISBN 0750-5044-3 2004
- 6. JohnFenton-Handbook of Automotive body Construction and Design Analysis- Professional Engineering Publishing, ISBN 1-86058-073- 1998.



# Machine Theory 3(2,2,0)

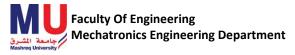
Course code	ME3205				H	Iours	
Course Name	Machine The	eory		L	Т	Р	С
Prerequisites	Engineering	Mechanic	cs, Calculus I, II	2	2	0	2
Level /semester	3/6		· · ·				
<b>Objective(s)</b> The objective of t the preliminary con to present methods and force transmis course provides the of displacements, and static and dyn the proper design	ncepts of mechan of analysis for t ssion in mechan e foundation for velocities, acco namic forces rec	nisms and he motion isms. The the study elerations, quired for	Outcomes To expose the various laws go motions. To stu balancing of mecha	verning rig dy vibratio	gid bo n char		and it
lynamics. Covera levelopment metho palanced use of b ools. This course lesigning robots.	able to under independent exist in the ematics, and age of all ana hods is provid both analytic an also helps the s	stand the technical field of machine lysis and ded, with d graphic					
<ul><li>Velocity A</li><li>Acceleration</li></ul>	ypes of Mechani nalysis on analysis dynamic balanci n		Characteristics and a	oplications			
<ol> <li>Shigley J.E</li> <li>SingiresuS</li> <li>Thomas Be</li> <li>Ghosh .A West Pvt.</li> </ol>	E, Theory of Mac .Rao, Mechanica even, Theory of I	chines and a al Vibration Machines, A.K Theory i, 1998.	McGraw Hill Publish Mechanisms ,McGray Is, Nem Chand and B CBS Publishers and I y of Mechanisms an	v Hill 1998. ros, 1998. Distributors, nd machine	3 <sup>rd</sup> edit	ion, 198	

1999.



# **Computer Application** 2(2,0,3)

Course code	CS3206			He	ours	
Course Name	<b>Computer Application</b>	l	L	Т	Р	С
Prerequisites	Computer language		2	0	3	2
Level /semester	3/6					
<b>Objective</b> (s)	·	Outcomes				
The objectives o	f this course is	At the end of the course	-			
1. to teach		to: Master the usage of				
0	ndamentals in various	drawing 2D & 3D ma				•
	l engineering applications,	required for different	mecha			neering
1 2	in machine elements	applications. Also the	student	s will	be f	amiliar
MATLAB	Using computerto use program in some	MATLAB program				
	program in some g Applications					
Course Descriptio	<u> </u>					
		Sections And Sectional	Views	Deve	elonme	nt Of
		Geometrical construction. S				
		ns, pyramids, cylinders and				
		nt of surfaces of right regul				
cylinders a		it of suffaces of fight fegul	ai son	us pris	ins, pyr	annus,
		on of solids: Intersection of	of prist	n vs n	rism c	vlinder
	cylinder vs cylinder and cyli		n prisi	n vs p		ymaei
		ric projections: Principles	of is	ometrio	e proie	ctions.
		ventions. Isometric views o				
		bjects having spherical part		, prano		
		Transformation of projectio		iversio	on of isc	metric
		onventions for simple				
	ic projections for given ison		5			
<b>U</b>		ve projections: Perspective	view o	f point	s, lines	, plane
figures and	l simple solids, vanishing po	oint method and visual ray n	nethod.	•		
UNIT -VI MATL	AB program					
References:				~ ~		
		by M. N. SeshaPraksh& I	Dr. G.	S. Ser	rvesh –	Laxmi
Publication		- Duraniu - " Chanatan Dahl	: -1- :		664h T	
	it, Elementary Engineerin	g Drawing", Charotar Publ	Isning	House,	, 55th E	dition,
2015.	wana and D. Kannaiah "En	ain aaring Drawing" Saitaah	Dubli	otiona	<b>7</b> 2#4 T	dition
5. K. L. Ivara 2010.	yana and P. Kannalan, Eng	gineering Drawing", Scitech	1 Public	ations,	, 23fa E	annon,
	"Engineering Graphics"	Prentice Hall of India, 1st Ed	ition 7	000		
		d Graphics, New Age, 2nd E				
		awing", Tata Mc Graw Hill,			2008	
		d Engineering Drawing", I.				lishers
3rd Editior		a Engineering Drawing, I.	1x. IIIU	mation	iui i uU	nonero,
		gineering graphics with A	uto C	4D" 1	Phi Le	arning
1st Edition	<b>.</b>	Successing Braphics with A	U	, I		"
		ogramming and Problem So	olving	By Sto	ormv At	tawav
2012						
<b>-</b>						



# 4<sup>th</sup> Year:

# Machine Design 3(2,2,0)

Course code	ME4101				H	ours	
Course Name	Machine Design			L	Т	Р	С
Prerequisites	<b>Engineering Mechanic</b>	s, Calc	ulus I, II	2	2	0	3
Level /semester	4/7						
<b>Objective(s)</b>		Outcon	mes				
The students will	l:						
1. Review conce	epts of statics and strength	The stu	idents will be able to	<b>):</b>			
of materials used	d to determine the stress,	1.	Determine the stre	ess, stra	ain and	d deflec	ction of
strain and defle	ction of onedimensional	simple machine elements.					
structure.		2.	Estimate safety fa	actors	of sim	ple str	uctures
2. Learn fund	amental approaches to		exposed to static an	nd repe	eated lo	oads.	
failure prevention	on for staticand repeated						
loading.			selection of comm	nercial	y avai	lable n	nachine
3. Consider th	ne design of common		elements.				
machine eleme	ents such as shafts,	4.	Solve simple, open	n-ended	l desigi	n proble	ems.
fasteners, springs	s, bearings, and gears.				_	_	
4. Solve an ope	en-ended design problem						
involving cost,	drawings, and structural						
analysis.	-						
-							

### **Course Description**

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – curved beams – crane hook and 'C' frame-Factor of safety Fatigue Cycle and Failures, Endurance Limit, -theories of failure – Design based on strength and stiffness – stress concentration – Design for variable loading. design of shafts and associated parts, threaded fasteners, springs, selection of rolling bearings, design of belts, chains, wire ropes, couplings, gears, brakes and clutches.

- 1. Shigley's Mechanical Engineering Design, McGraw-Hill, 9/e
- 2. Hamrock, B.J., Schmid, S.R., Jacobson, B., Fundamentals of Machine Elements, Elizabeth A. Jones, 2/e.
- 3. Norton, R. L., Machine Design: An Integrated Approach, Pearson Education, 3/e



# Control System-I 3 (2,2,3)

Course code	EE4102			H	ours	
Course Name	Control System-I		L	Т	Р	С
Prerequisites	Signal and System		2	2	3	3
Level /semester	4/7					
1 To understand	the different ways of	Outcomes	urse tł	ne studi	ents sho	uld be
<ul> <li>system representations function representations dynamic responses the stime domain for improving i</li> <li>To assess the stream for improving i</li> </ul>	ystem performance using analysis and methods t ystem performance using omain analysis and improving the various controllers and	<ol> <li>Upon completion of the collable to:</li> <li>Derive the transfermechanical and electri</li> <li>Determine the time resecond-order systems</li> <li>Understand reduction of</li> <li>Use Routh-Hurwitz stability of a linear system</li> <li>Calculate steady-state</li> <li>Sketch the root-locus via root locus.</li> <li>Sketch Bode Plots and</li> <li>Determine stability,</li> </ol>	r fun cal sys respons of mult Criteri tem. errors and de Nyqui gain	tetion tems. se of f tiple su on to for con sign co st Diag margin	model First-orde Ibsystem analyz trol syst ontrol sy grams. n and	s for er and us. ze the tems. ystems phase
performance		<ul> <li>margin via Bode Plots</li> <li>9. Understand PID contr controller.</li> <li>10. Use MATLAB/Simuli systems.</li> </ul>	ol and	how	to tune	a PID

### **Course Description**

Introduction, control system, Open loop, Closed loop Mathematical Modeling representation, Differential equations (t-domain). Laplace transforms (s-domain). Transfer function, block diagram and state variable systems. Control System types and effects of feedback. Time Domain analysis: transient response, steady-state error, Stability of the control systems. Routh-Hurwitz Criterion. Frequency response analysis of linear systems, Poles and zeros, Root-locus Gain and phase margin. Methods of Nyquist and Bode. Trade-off between stability and performance, PID Control. Introduction to Digital Control systems:Discrete-time systems (z-domain). Mappings between t, s, and z domains. MATLAB/Simulink and its Control Toolbox.

- 1. "I. J. Nagrath and M. Gopal", "Control Systems Engineering", New Age International (P) Limited, Publishers, 5th edition, 2009
- 2. "B. C. Kuo", "Automatic Control Systems", John wiley and sons, 8th edition, 2003.
- 3. "N. K. Sinha", "Control Systems", New Age International (P) Limited Publishers, 3rdEdition, 1998.
- 4. "NISE", "Control Systems Engineering", John wiley, 6th Edition, 2011.
- 5. "Katsuhiko Ogata", "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.



# **Industrial Management**2(2,0,0):

Course code	MEE4103	Hours						
Course Name	Industrial Management	t	L	Т	P	С		
Prerequisites	None.		2	0	3	3		
Level /semester	4/7			•	•			
<b>Objective</b> (s)		Outcomes						
1.Principles	of organizational	To become familiarized abo	out Eng	gineerii	ng			
management		Management Principles.						
	human at organizations							
with modern m	nanagement concepts.							
Course Descript								
		ement-Science or Art-Mana						
		t Thought–Contribution of T	aylor a	and Fay	/ol-Fu	nctions		
e	ypes of Business Organiza							
		in Planning – Objectives – S						
	ojectives – Strategies, Poli	cies & Planning Premises- F	orecas	ting –	Decisio	n-		
making.								
		d informal organization-O						
		ence strategies-Line and						
		Delegation of Authority-S	Staffin	g–Sele	ction	Process		
	D – Managerial Effectiven		1	т.				
		ndInnovation–HarmonizingO						
		fneeds–Motivationtheories–Mess of Communication – Ba						
	ication – Electronic media		amers	and E	пеакио	wii –		
		ng– Requirements for effect	ive co	ntrol_'	The Bu	daet as		
		y in Controlling– Use of						
		nagement– Control of Overa						
		al Environment– Globaliz						
	gement and Global theory		auton	una	Lietiun	Zurion		
References:								
	.R. and Mc Kay, G. Energ	gy Management Butterworths	s. Lond	lon.				
		eviours, Vikas Publishing H			d New	Delhi.		
1994.		· · · · · · · · · · · · · · · · · · ·			, =	,		
	e, Management Theory a	nd Practice, International Stu	udent	edition	, McGr	aw Hill		
blushing		,						
U	engineering and manageme	ent by O.P Khanna						



# **Manufacturing Processes** 3(2,3,0)

Course code	ME4104			Н	lours	
Course Name	Manufacturing Proces	ses	L	Т	Р	С
Prerequisites	Material Science and S	Strength of Material	2	3	0	3
Level /semester	4/7	0	1			
Objective(s)		Outcomes				
	students with major	Account for how rawmate	rials f	for com	nmon in	dustrial
manufacturing j	÷	products are produced.	Explai	in the	princip	les for
. Correlate the	material type with the	manufacturing of differen				
possible fabrica	tion processes.	alloys, ceramics, polymer	s, pap	ber). U	nderstai	nd how
	operations and tools for	the properties of mater	ials i	nfluenc	ce the	choice
6	uring processes.	welding methods of with				
	process design parameters	types of materials. Unders				
to eliminate def	-	methods of forming, dep		-		
•	ty assurance principles and	given material judge what				
techniques.		manufacturing, forming a				
		large scale production re	-	•		
		influence of economical,			enviror	imental
Course Description		aspects when choosing a m	netnoc	•		
manufacturing proce process to be success UNIT I CASTING: machine moulding, permanent mould ca UNIT II WELDING arc welding, resistar	ng. It will also discuss how the sesses that can be utilized and we sful. Casting types, procedure to special moulding processes sting, pressure die casting, center classification of welding processes are welding, submerged arc we thermit welding, electron bear	<ul> <li>/ill highlight major design guid</li> <li>make sand mould, types of</li> <li>CO2 moulding; shell mo</li> <li>crifugal casting, continuous cas</li> <li>bcesses. Principles of Oxy-ace</li> <li>elding, tungsten inert gas wel</li> </ul>	delines core n ulding, ting, c tylene ding, 1	for eac naking, , invest asting d gas wel netal in	h manuf mouldin ment m efects. lding. A. ert gas v	acturing ng tools, oulding, C metal welding,
performed operation drilling machine, Cy UNIT IV FORMING shaping processes – molding — Blow m Thermosets – Worki UNIT V METAL Fo processes: Forging,	VING: General principles (w s in the following machines: I lindrical grinding machine, Ca G AND SHAPING OF PLAS Molding of Thermoplastics - olding – Rotational molding – ng principles and typical applic ORMING AND POWDER M Rolling, Extrusion, Wire dra , disadvantages and limitations	Lathe, Shaper, Planer, Horizon pstan and Turret lathe. Basics of FICS: Types of plastics - Cha - Working principles and typi Film blowing – Extrusion - T cations ETALLURGY: Principles and awing and Spinning, Powder	tal mil of CNC racteris cal ap hermo	ling ma C machin stics of plication forming cations	chine, U nes. the form ns of - I g – Proce of the fo	iniversal ning and injectior essing of ollowing
UNIT VI ADVANO processes: Abrasive	CED MACHINING PROCES jet machining, Ultrasonic n rc machining, and Electron bea	SES: General principles and nachining, Electric discharge	machi	ining, E		
References 1. Manufactur 2. Fundamenta 2010.	ing Engineering and Technolog als of Modern Manufacturing,	gy, Kalpakjian and Schmid, Pro	entice ley &	Hall, Ne Sons, I	nc, New	Jersey

3. Materials and Processes in Manufacturing, DeGarmo, Black, and Kohser, John Wiley & Sons, Inc, New York, 2011.



## **Digital Signal processing** 3(2,0,3):

Course code	ECE4105			H	Iours			
Course Name	Digital Signal processing		L	Т	Р	С		
Prerequisites	Signal s and systems		2	0	3	3		
Level /semester	4/7		•					
<b>Objective(s)</b>		Outcomes						
1. Basic concept	of signals and systems.	The purpose of this course is to introduce						
2. How to design				asics of Signal and Systems,				
IIR and FIR filters		Digital Signal	-					
3. About the arch	itecture of the DSP	Processing and intr	oduction to	DSP pi	ocesso	r. The		
processor.		main objective of t	his subject is	s to hel	p stude	nts to		
•		design	5					
		The digital filters and Implementation of digital						
		filters using variou			0			

### Course Description

### SIGNALS AND SYSTEMS

Introduction to continuous, Discrete and Digital signals, Classification of continuous and Discrete Time signal – Periodic, Even and Odd, Energy and Power, Deterministic and Random, Complex exponential signals, Elementary signals – UNIT step, Ramp, Impulse, Classification of systems : Linear, Time invariant, Causal, Stable, Invertible systems, BIBO Stability criterion.

### TRANSFORMATION OF DISCRETE TIME SIGNALS

Spectrum of discrete time signal, Discrete Time Fourier transform and its properties, Discrete Fourier Transform and its properties, Linear and circular convolution, Linear convolution using DFT, Fast Fourier Transform, Z-transform and its properties, Inverse Z-transform using partial fraction and residue methods.

### IIR FILTERS

Design of analog filters using Butterworth and Chebyshev approximation, Frequency transformation, Design of digital IIR filters-Impulse Invariant and Bilinear transformation methods, Structures for IIR digital filters.

### FIR FILTERS

Design of digital FIR filters – Fourier series, Frequency sampling and windowing methods, Structure for FIR filters, Comparison of IIR and FIR filters.

- 1. Alan V. Oppenheim, Ronald W. Schaffer, Discrete Time Signal Processing, PHI, 1999.
- 2. John G. ProakisandDimitris C. Manolakis, Digital Signal Processing Principles, Algorithms and Applications, Prentice Hall of India, 3rd edition, 1996.
- 3. Digital Signal Processing computer based approach by Sanjit K. Mitra, 1997



**Power Electronics** 3(2,0,3):

Course code	EE4106				Hours			
Course Name	Power Elec	etronics			L	Т	Р	С
Prerequisites	Applied El	ectrical and	d Ele	ectronics Engineering	2 0 3 3			3
Level /semester	4/7							
Objective(s)1. To learn	the char	acteristics	of	Outcomes To enable the students				
different Devices	types of	Semiconduc	ctor	characteristics and applied devices	cations	s of po	ower el	ectronic
2. To under controlled		operation	of					
3. To under choppers a	stand the nd invertors	operation	of					

### **Course Description**

### **SEMICONDUCTOR DEVICES**

Basic structure & Switching characteristics of Power diode, Power transistor, SCR, Triac, GTO, MOSFET &IGBT, ratings of SCR, series parallel operation of SCR, di/dt& dv/dt protection Introduction of ICT, SIT, SITH & MCT.

### **CONTROLLED RECTIFIERS**

Operation of 1-phase half wave rectifiers with R, RL, & RLE load. 1-phase FWR with R, RL & RLE load (Fully controlled & half controlled) operation & analysis of rectifiers using R & RL loads (RMS, average & PF) operation 3-phase HWR & FWR with R & RL loads for continuous. current, Effect of source inductance in 1-phase FWR, 1-phase dual converter operation – simple problems.

### CHOPPERS

Types of forced commutation, classification & operation of choppers (A, B, C, D, E),. Control strategies, operation of voltage, current & load commutated choppers. Multiphase chopper operation – applications of choppers

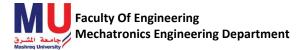
### INVERTERS

Types of inverters, operation of 1-phase ,3 phase ( $120^{\circ} 180^{\circ}$ ) modes Y &  $\Delta$  'R' loads operation of CSI with ideal switches, 1-phase ASCSI operation basic series inverter, modified series & Improved series inverter – 1-phase parallel inverter operation (with outfeed back diodes) 1-phase basic McMurray inverter.

### AC CHOPPER

Types of control (phase & Integrated cycle control) operation 1-phase voltage regulator with R, RL loads. Operation of 3-phase AC voltage controls (with Anti parallel SCR configuration) with R load operation 1-phase step up & step down cyclo converters. 1-phase to 3-phase C.C with R, RL loads.

- 1. Bhimbra. Dr.P.S., Power Electronics Khanna Publishers, 2001
- 2. Muhammad H. Rashid, Power Electronics Circuits, Devices & Applications, Prentice Hall of India, New Delhi, 1995.



# **Microcontrollers and Applications** 3(2,0,3)

Course code	MEE4107			Hours				
Course Name	Microcontrollers and A	Applications	L	Т	Р	С		
Prerequisites	Microprocessor		2	0	3	3		
Level /semester	4/7							
<b>Objective(s)</b>		Outcomes						
Course Descript	ion							

### **Course Description**

Introduction to microcontroller, types of microcontrollers, input and output ports description, comparison between microcontroller and microprocessor, applications of microcontroller, main units of microcontroller, internal architecture (CISC vs RISC) architecture, clock instruction cycle, pipelining process, interrupt request, interfacing of microcontroller, types of oscillators, MCLR and its function, analog to digital conversion, pulse width modulation (PWM).

### References

1. Analog and Digital Circuits for Electronic Control System Applications. By: Jerry Luecke.

2. Interfacing PIC Microcontrollers Embedded Design by Interactive Simulation. By : Martin Bates.



# **Introduction to Robotics** 3(2,0,2):

Course code	MEE 4201			H	lours	
Course Name	Introduction to Robotic	S	L	Т	Р	С
Prerequisites	ECE3202, ECE4107		2	2	-	3
Level /semester	4/8					
<b>Objective(s)</b>		Outcomes				
1. The Robot	fundamentals	To provide engineerir	ig aspe	cts of	robots	, robot
2. The Robot	s various components parts	programming and its ap	plicatio	ns.		
and the ro	botic internal and external		-			
sensors.						
3. Robot tran	sformation system and its					
application	to a robots Kinematic					
structure.						
4. The Ro	bot programming and					
application	IS.					
<b>Course Descriptio</b>	<u>n</u>					
INTRODUCTION	N TO ROBOTICS					
RIA definition -	History of Robotics - Justi	fication - Anatomy - C	Classific	ation ·	- Appli	cations,
Configurations of	Manipulator - Cartesian -	Cylindrical - Polar -	Joint a	arm, V	Nork V	<sup>7</sup> olume,
Spatial resolution	- Accuracy and Repeatabili	ty of Robotics.				
COMPONENTS	OF ROBOTICS					
Linckged and Joi	nts of manipulators, drive	systems, feed back de	vices, l	Degree	s of fr	reedom,
end effectors - gr	ippers, wrist configurations,	motion - roll - Pitch - Ya	aw, sens	sors - s	sensor a	reas for

robots - contact and non contact sensors - Machine vision - introduction.

#### INTRODUCTION TO MATRIX FORMULATIONS

Descriptions - Positions - Orientations, frames, Mappings - Changing descriptions from frame to frame. Transformation arithmetic - translations - rotations - transformations - transform equations - rotation matrix, transformation of free vectors. Introduction to manipulations – Forward Kinematics and inverse Kinematics.

### **ROBOT PROGRAMMING**

Methods of Robot Programming - on-line/off-line - Show and Teach - Teach Pendant - Lead and Teach. Explicit languages, task languages - Characteristics and task point diagram. Lead Teach method - robot program as a path in space - motion interpolation - WAIT - SIGNAL - DELAY Commands - Branching - capabilities and Limitations. 1st and 2nd generation languages - structure - Constants, Variables data objects - motion commands - end effectors and Sensor commands.

### **ROBOT APPLICATIONS**

Robot cell layout - work cell design and control, robot cycle time analysis. Application - Machining - Welding - Assembly - Material Handling - Loading and Unloading in hostile and remote environment.

- 1. John J. Craig, Introduction to Robotics, Addison Wesley, ISE 1999.
- 2. Mikell P. Groover, Industrial Robotics, McGraw Hill, 2nd Edition, 1989.
- 3. Deb. S.R., Robotics Technology and Flexible Automation, Tata McGraw Hill Publishing company Limited, 1994.



# Control System-II 3(2,2,2)

Course code	EE 4102				H	ours	
Course Name	Control System-II			L	Т	P	С
Prerequisites	Control system-I			2	2	2	3
Level /semester	4/8			•	•	•	•
<u><b>Objective(s)</b></u> The objective of	this course is to apply	Outcon After c	<u>mes</u> ompletion of this co	ourse fl	ne stud	ent is al	ble to:
knowledge of math to analyze and de meet desired special learn to analytical system's functional tests to demonstrat and finally design a set of required understanding of the control theory as aircraft and sp understand: the con- properties; the co- stability margins; a	hematics and engineering sign a control system to fications. Students should lly determine a control lity and select appropriate te system's performance a control system to meet a ements. Develop an the elements of classical applied to the control of acecraft. In particular ncept of feedback and its oncept of stability and and the different tools that analyze the previous		Improve the system a suitable controlle a specific applicati Apply various time domain techniques system performanc Apply various com applications (exam systems, electrical Test system Contro using state space re and applications of to various systems.	n perfo er and/ on e doma s to ass ce trol str pple: Po drives ollabili epresen f state	ormanc or a co iin and ess the ategies ower etc) ity and ntation	e by set mpensa frequent to diff Observ	lecting ttor for ncy erent rability

### **Course Description**

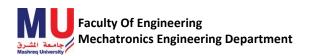
Continuous systems: DynamicsSystem modeling;State-space representation. Multi-input multi-output systems.;Design specifications; relationship between gain and phase margins and closed loop response; Simulation of dynamics systems.; Root-locus analysis and design, Control design using Bode and Nyquist plots; Compensation techniques, Phase lead and phase lag compensators. Discrete systems: Sampled signals, the z-transform and relation between the s and z-planes; Discrete-time transfer functions and the unit pulse response; Frequency response; The zero order hold; Stability analysis; Design by emulation

- 1. "I. J. Nagrath and M. Gopal", "Control Systems Engineering", New Age International (P) Limited, Publishers, 5th edition, 2009
- 2. "B. C. Kuo", "Automatic Control Systems", John wiley and sons, 8th edition, 2003.
- 3. "N. K. Sinha", "Control Systems", New Age International (P) Limited Publishers, 3rdEdition, 1998.
- 4. "NISE", "Control Systems Engineering", John wiley, 6th Edition, 2011.
- 5. "Katsuhiko Ogata", "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.



# **PLC and Applications** 3(2,0,3):

Cours	e code	ECE 4103			H	lours	
Cours	e Name	PLC and Applications		L	Τ	Р	C
Prere	quisites	Control System-1		2	2	2	3
Level	/semester	4/8					
Object	tive(s)		Outcomes				
1.	Understand	d the basic of data	To provide students the fu	ndame	ntals o	f PLC a	nd
		and data acquisition	Data acquisition system				
2.	Understand	d the fundamental of PLC.					
Course	e Descriptio	n					
٠	Electromag	gnetic Control Circuit(ECC)	elements and basic applica	tions			
•	Principles	of PLC and system compon	ent				
•	Interfacing	input/output devices and op	peration				
•	CPU Confi	iguration					
٠	Memory co	oncepts, addressing, and dat	a types.				
•	Industrial s	sensors and actuators,					
•	PLC gener	al Programming languages.					
•	Programm	ing techniques for various ty	ypes of PLC.				
•	Basic indu	strial process problems, inst	allation and safety,				
•		g program execution and dia	•				
	· · · ·		0				
Refere	nce						
1.	Petrezeulla	, Programmable Controllers	s, McGraw Hill , 1989.				
2.	Hughes .T.	, Programmable Logic Cont	rollers, ISA Press, 1989.				
3.	G.B.Clayto	on, Data Converters The Ma	c Millian Press Ltd., 1982.				
4.	Curtis D. J	ohnson Process Control Inst	trumentation Tech 8TH Edi	tion Pi	entice	Hall Ju	ne
	2005.						



# **Reliability of Engineering system** 2(2,0,0)

Course code	ourse code GE4204 Hours					
Course Name	Reliability Engineering S	ystems	L	Т	Р	С
Prerequisites	None		2	-	-	2
Level /semester	4/8					
<b>Objective(s)</b>		Outcomes				
1. Meaning of	of TQM and Theories about	To provide knowledge			- •	
TQM		Management (TQM), To	-			-
U	and manufacturing for	applied to Manufacturing	-			ability
<b>1</b>	s and techniques	and maintainability of dif	ferent	system	ns.	
	nvolvement to improve					
quality and	the development and					
	due to such involvement.					
	ilure models, component					
	stem reliability					
5. About	mean down time,					
•	of systems & condition					
monitoring.						
supplier chain, and retention, and Servi Herzberg theory,, E sheets, Histograms, <b>NEW SEVEN M</b> diagram, Tree diagra diagram. <b>Advanced QC to</b> proofing (poka-yok analysis (FMECAs) <b>RELIABILITY</b>	<b>ES &amp; BASIC TOOL:</b> Cus customer perception of Qua ce quality. Employee involvem mpowerment & Team work. Ba Control charts, Pareto diagran <b>IANAGEMENT TOOLS</b> am, matrix diagram, Matrix dat <b>ols:</b> Advanced QC tools like e), Failure mode and effects and Fault tree analysis (FTAs) e	ality Customer feed back, cu ent – Employee motivation, asic Tools: Introduction to m, Cause & effect diagram, St & ADVANCED TOOLS a analysis diagram, Process of e QFD, Root cause analysis analysis (FMEAs), failure etc. Quality Management Systemet	stomer Maslo Seve rratifica <b>S:</b> ffir decisio , Tag mode ems.	r compl w's Hie n basic ation, So ity dia n progra uchi m and e	aints, C erarchy e c tools catter di gram, 1 am char nethod, ffects c	Custome of needs –Checl agrams. Relation t, Arrov Mistake criticalit
	istic nature of failures, Mean fa del- System reliability improven					e, hazaro
-	ITV. Inter duration shall of	maintenance strategy. Mea	n tim	e-to F	2enair	
Factors contributing faults. Factors con	tributing to Mean Maintenan g, continuous condition monito	T), fault diagnosis, and rouce Time- (MMT) on con	outine dition	testing	for ur	nrevealed



# **Computer Numerical Control Machines**3(2,0,3):

course code	MEE4205			H	lours	
Course Name	Computer Numerical Con	ntrol Machine	L	Т	Р	С
Prerequisites	ME4101, ECE4107, ECE32	203	2	-	3	3
Level /semester	4/8					
CNC technology 2. To understand CAD/CAM sys Programmes, in models. 3. To understand an	he importance of NC and in manufacturing industry. If the application of tems in generating Part in particular for complex and apply the use of various oders and feedback devices.	Outcomes1. Understand the p Control (NC) techr range of machine tool2. Outline the various ro NC and CNC.3. Explain the applicatio Turning Centers.	nology ls to wl uts for	and hich it part p	descrit is applie rogram	be the ed. ning in
4. Identify and sele	ect proper NC toolings.					

### **Course Description**

**INTRODUCTION TO CNC MACHINE TOOLS:** Evolution of CNC Technology, principles, features, advantages, applications,CNC and DNC concept,classification of CNC Machines – turning centre, machining centre, grinding machine, EDM, types of control systems, CNC controllers, characteristics, interpolators– Computer Aided Inspection

**STRUCTURE OF CNC MACHINE TOOL:** CNC Machine building, structural details, configuration and design, guide ways – Friction, Anti frictionand other types of guide ways, elements used to convert the rotary motion to a linear motion – Screwand nut, recirculating ball screw, planetary roller screw, recirculating roller screw, rack and pinion, spindle assembly, torque transmission elements – gears, timing belts, flexible couplings, Bearings.

**DRIVES AND CONTROLS:** Spindle drives – DC shunt motor, 3 phase AC induction motor, feed drives –stepper motor, servoprinciple, DC and AC servomotors, Open loop and closed loop control, Axis measuring system –synchro, synchro-resolver, gratings, moiré fringe gratings, encoders, inductosysn, laser interferometer.

**CNC PROGRAMMING:** Coordinate system, structure of a part program, G & M Codes, tool length compensation, cutter radiusand tool nose radius compensation, do loops, subroutines, canned cycles, mirror image, parametricprogramming, machining cycles, programming for machining centre and turning centre for well. known controllers such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAMpackages.

**TOOLING AND WORK HOLDING DEVICES:** Introduction to cutting tool materials – Carbides, Ceramics, CBN, PCD–inserts classification- PMK,NSH, qualified, semi qualified and preset tooling, tooling system for Machining centre and Turning centre, work holding devices for rotating and fixed work parts, economics of CNC, maintenance of CNC machines.

- 1. James Madison, "CNC Machining Hand Book", Industrial Press Inc., 1996.
- 2. Ken Evans, John Polywka& Stanley Gabrel, "Programming of CNC Machines", Second Edition Industrial Press Inc, New York, 2002
- 3. Peter Smid, "CNC Programming Hand book", Industrial Press Inc., 2000



# **Engineering Economics** 2(2,0,0):

Course code	AD 4206		Hours			
Course Name	Engineering Economics		L	Т	Р	С
Prerequisites	ME4104		2	-	-	2
Level /semester	4/8					
<ul> <li>principles a</li> <li>2. Principles manageme</li> <li>3. Behavior of</li> </ul>	ent engineering economic and strategies of organizational nt of human at organizations rn management concepts.	Outcomes To become familia Economics	rized	about	Engir	neering
Importance of E Analysis – Law of curves – Factors af <b>SUPPLY, COST</b> - Cost and Supply 2 Pricing methods	<u>n</u> ECONOMICS: Introductio Economics in Engineering of Demand - Demand Forect fecting Demand – Demand E AND OUTPUT: Supply – So Analysis – Types of Costs - 1 - Pricing Policies – Factor k-Even Point - Usefulness of	- Economic optimiza asting –Methods of De lasticity - Production Ana apply schedule – Law of Price and output Detern s governing Pricing Poli	tion- E mand F Ilysis - Supply ninatior cies – H	Demand Forecast simple – Elasti n – Prie Break-E	and Ro ing - D problem city of the city of	evenue emand ns. Supply ttion –

- 1. Chandran. J.S., Organizational Beheviours, Vikas Publishing House Pvt. Ltd., New Delhi, 1994.
- **2.** Ernest Dale, Management Theory and Practice, International Student edition, McGraw Hill Publishing Co.,



# Autoronics3(2,0,3)

Course Name       Autoronics       L         Prerequisites       Thermodynamics and heat transfer       2         Sensor and Actuator       2         Level /semester       4/8         Objective(s)       Outcomes	T 2	P -	C 3
Sensor and Actuator       Level /semester       4/8	2	-	3
Level /semester 4/8			
Objective(s) Outcomes			
1. Fundamentals of automotive To provide knowledge a	bout a	pplicati	ion of
electronics electronics in Automobile en	ngineeri	ng	
2. Sensors and actuators for various			
engine applications			
3. Electronic fuel injection and			
ignition systems			
4. Automobile control system			

### **Course Description**

### FUNDAMENTAL OF AUTOMOTIVE, SENSORS AND ACTUATORS

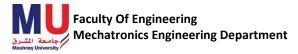
Introduction, basic sensor arrangement, types of sensors such as -oxygen sensors, Crank angle position sensors -Fuel metering, vehicle speed sensor and detonation sensor - Altitude sensor, flow sensor. Throttle position sensors, solenoids, stepper motors, relays. **ELECTRONIC FUEL INJECTION AND IGNITION SYSTEMS** 

Introduction, Feed back carburetor systems (FBC), Throttle body injection and multi point fuel injection, Fuel injection systems, injection system controls. Advantages of electronic ignition system. Types of solid-state ignition systems and their principle of operation, Contact less electronic ignition system, Electronic spark timing control.

### DIGITAL ENGINE CONTROL SYSTEM

Open loop and closed loop control systems -Engine cranking and warm up control - Acceleration enrichment - Deceleration leaning and idle speed control. Distributor-less ignition -Integrated engine control system, Exhaust emission control engineering.

- 1. William B.Riddens, Understanding Automotive Electronics, 5th Edition, Butterworth, Heinemann Woburn, 1998.
- 2. Tom Weather Jr and ClandC.Hunter, Automotive Computers and Control system, Prentice Hall Inc., New Jersey.
- 3. BOSCH, Automotive Handbook, 6th Edition, Bentley publishers.
- 4. Young. A.P. and Griffths.L. Automobile Electrical Equipment, English Language Book Society and New Press.
- 5. Crouse.W.H., Automobile Electrical equipment, McGraw Hill Book Co Inc., New York, 1955.
- 6. Robert N Brady., Automotive Computers and Digital Instrumentation, A Reston Book. Prentice Hall, Eagle Wood Cliffs, New Jersey, 1988.
- 7. Bechtold., Understanding Automotive Electronics, SAE, 1998.



# 5<sup>th</sup> Year:

# **Research Methodology** 2(2,0,0):

Course code	GE5101			H	ours	
Course Name	Research Methodology		L	Τ	Р	С
Prerequisites	None		2	-	-	2
Level /semester	5/9					
practice and know analyses of data	ve is to prepare student for research work, vledge about research methods, statistical within environmental science, a way of ing problems. Also focus on papers and yles.	Outcom To enlig various	ghten t			

### **Course Description**

Communication skills, The Nature of Communication, Barriers to Effective Communication, Informative presentations, Persuasive presentations, Organizing Presentations, Types of Deliveries. Making an effective PowerPoint Slides. Objective of research, Research Motivations, Outcomes of Research. Stages of Research, Research Problem, Meaning of research problem, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Literature survey Overview: What is literature survey, Functions of literature survey. Developing a Research Proposal, Format of research proposal, Individual research proposal, Institutional proposal and presentation. Research Design, Actual Investigation, Research Report, Research ethics, Legal issues, copyright, plagiarism General advice about writing technical papers in English, Tips for writing correct English

### References

1. Ranjitkumar (2014).Research Methodology: A Step-by-Step Guide for Beginners.4th edition

2. Heidi A, Danille (2007).Digital Writing Research: Technologies Methodologies and Ethical Issues. Stuart Melville, Wayne(2004). Research methodology: an introduction.2nd edition



# Industrial Hydraulic Systems 3(2,2,2)

Course code ME5102 Hours					ours		
Course Name	Industrial Hydrologic S	ystems	L T P				
Prerequisites	Fluid Mechanics	•	2	2	2	3	
Level /semester	5/9						
<b>Objective</b> (s)		Outcomes					
	nentals of fluid power	To expose the learner	to tl	ne fui	ndamen	tals of	
	& characteristics of the	hydraulic and pneumatic					
fluid powe	r components	circuits with industrial ap					
3. Circuit bui	lding and interpretation	-	•				
	rols and trouble shooting						
graphical switches, fr PNEUMATIC SY Construction treatment application HYDRAULIC / P speed cont circuits, ci feedback co DESIGN OF FLU	perties, selection and applic symbols of hydraulic ilters, seals, fiitings and other <b>STEMS:</b> Introduction, compon, operation, characteristics – principles and component s. Introduction to fluidics and <b>NEUMATIC CIRCUITS:</b> Introduction to fluidics and <b>NEUMATIC CIRCUITS:</b> Introduction to fluidics and trol circuits, pilot operated reuits using accumulator, to ontrol circuits. <b>JID POWER SYSTEMS:</b> S nd pressure drop across c	components – pumps r accessories. parison with hydraulic syst s & symbols of pneu ponents. Sensors – d MPL. Reciprocating circuits, pr circuits, simple sequenci time delay circuits, logic	s, actu tems ar matic types ressure ing cir circui alculati	ators/r nd elec com , char deper cuits, ts,casc	notors, etrical sy ponents acteristi ndant c synchro cading c Calculat	valves ystems c. Air ics and circuits onizing circuits tion o	

- 1. Anthony Esposito, Fluid Power with applications, Prentice Hall international 1997
- 2. Majumdar S.R., Oil Hydraulics, Tata McGraw Hill, 2002
- 3. Majumdar S.R., Pneumatic systems principles and maintenance, Tata McGraw Hill 1995.
- 4. Werner Deppert / Kurt Stoll, Pneumatic Application, Vogel verlag 1986
- 5. John Pippenger, Tyler Hicks, Industrial Hydraulics, McGraw Hill International Edition, 1980.
- 6. Andrew Parr, Hydraulics and pneumatics, Jaico Publishing House, 2003
- 7. FESTO, Fundamentals of Pneumatics, Vol I, II, III
- 8. Hehn Anton, H., Fluid Power Trouble Shooting, Marcel Dekker Inc., NewYork, 1984
- 9. Thomson, Introduction to Fluid power, Prentcie Hall, 2004



# Mechatronics Systems Design 3(2,0,3):

Course code	MEE5103			H	lours	
Course Name	Mechatronics Systems Desig	ems Design L T		Р	С	
Prerequisites	ECE3203, ECE4107, ME41	01	2	0	3	3
Level /semester	5/9					•
<b>Objective</b> (s)		Outcomes				
<ul> <li>able to understand:</li> <li>1. The mech their struct and safety.</li> <li>2. Theoretical computer i acquisition</li> </ul>	he course the students will be atronics system design and ture, mechanism, ergonomic and practical aspects of nterfacing and real time data and control. ntrol of driver and motion	The students will be a the aid of mechanical in mechatronics using r	and el	lectron	ic com	ponents
converter Course Descriptio	n					

SYSTEMS AND DESIGN: Mechatronic systems – Integrated design issue in mechatronic – mechatronic key element, mechatronic approach – control program control – adaptive control and distributed system – Design process – Type of design – Integrated product design – Mechanism, load condition, design and flexibility – structures – man machine interface, industrial design and ergonomics, information transfer, safety.

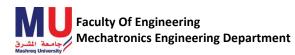
**CONTROL AND DRIVES**: Control devices – Electro hydraulic control devices, electro pneumatic proportional controls – Rotational drives – Pneumatic motors : continuous and limited rotation – Hydraulic motor : continuous and limited rotation – Motion convertors, fixed ratio, invariant motion profile, variators.

**REAL TIME INTERFACING**: Real time interface – Introduction, Elements of a data acquisition and Control system, overview of I/O process, installation of I/O card and software – Installation of the application software – over framing.

**CASE STUDIES**: Case studies on data acquisition – Testing of transportation bridge surface materials – Transducer calibration system for Automotive application – strain gauge weighing system – solenoid force – Displacement calibration system – Rotary optical encoder – controlling temperature of a hot/cold reservoir – sensors for condition monitoring – mechatronic control in automated manufacturing. Case studies on data acquisition and Control – thermal cycle fatigue of a ceramic plate – PH control system. Deicing temperature control system – skip control of a CD player – Auto focus Camera.

Case studies on design of mechatronic product – pick and place robot – car park barriers – car engine management – Barcode reader.Mini Project.

- 1. Devdasshetty, Richard A. Kolk, "Mechatronics System Design", 2nd Edition ,Cengage Learning 2011.
- 2. Georg pelz, "Mechatronic Systems: Modeling and simulation" with HDL's, John wiley and sons Ltd, 2003
- 3. Bolton, Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, ndEdition, Addison Wesly Longman Ltd., 1999.
- 4. Bradley, D. Dawson, N.C. Burd and A.J. Loader, Mechatronics : Electronics in products and Processes, Chapman and Hall, London, 1991.



Automation 2(2,0,0)

	MEE5104			H	ours	
Course Name	Automation L		Т	Р	С	
Prerequisites	Control System I, Sens	sor and Actuator	2	-	-	2
Level /semester	5/9					
<b>Objective(s)</b> To lay foundationautomating factory	on on the principles of operations.	Outcomes1. Many of the automaticcontrol techniques.2. Material handling tech3. Manufacturing system4. Manufacturing support	nolog s and	ies	tals and	
Definition, levels, plant layout – type methods of transpo <b>GROUP TECHN</b> Introduction, part Production flow ai – Introduction, fun <b>COMPUTER CO</b> – Introduction, A factory networks, manufacturing aut shop floor contro requirement, CAP <b>COMPUTER CO</b> NC machines – Machine centers, Conveyors, Indust <b>COMPUTER IN</b> benefits, elements Business Process Resource Plannin (SCM).	<b>OPERATIONS AND</b> need, strategies principle es, organization and information ort, transfer mechanisms, AS <b>OLOGY &amp; FLEXIBLE M</b> families, parts classification nalysis, cellular manufactur workstations, scope, con- ction of FMS computer Co <b>PNTROL SYSTEMS &amp; AN</b> architecture, Factory Com- open system interconnec- omation protocol, Data Bass 1. Automated process P, application, programs in <b>NTROLLED MACHINES</b> Part Programming, CN Automated inspection sy- rial Robots, Automated Gu <b>TEGRATED MANUFAC</b> 5, CIM cycle or wheel. Re-engineering (BPR), M	IANUFACTRUING SYST and coding system – OPI ing – advantages, disadvant mponents, types, benefit ntrol System, FMS data files UTOMATED PROCESS: munication, Local Area N ction model. Network to a Management System – In planning – introduction CAPP. S & MATERIAL HANDLM IC, DNC, Adaptive Con ystems. Material handling	EXAMPLE A COMPANY A COMPAN	ns in , Type ; Group d MI C and app pical uter co rks - 0 ork in ction. C ructure <b>EYSTE</b> Pallets ems - n, defi T), Ka MRP),	manufa s of flo o Techn CLASS lication FMS ontrol Charact terconn Compute , info <b>MS</b> : & F Introd nition, anban a Manufa	cturing, w lines, ology – system. us. FMS layout systems eristics, er aided rmation fixtures, duction, scope, System, acturing
	over .P, Automation, ring", Prentice Hall of India an .N, Navahari .Y "Pe Prentice Hall of India Pvt. I	a Pvt. Ltd., 2001.		Comput		egrated



### Mechatronics System Interface 3(2,0,3)

Course code	MEE51xx					H	lours	
Course Name	06 Mecha	tronics Syst		L	Т	P	С	
Prerequisites	Digital	Circuits,	Analogue	electronics,	2	0	3	3
	-		mbly language					
		rollers; Digita	Signal Process	sing				
Level /semester	5/9							
<b>Objective(s)</b>			<u>Outcomes</u>					
This course studies knowledge and skills The students will be able to design systems with the								
required to interf				chanical and				
Mechatronic syst			mechatronic	s using moder	n softv	vare pa	ickages.	
hardware sequencing								
On completion o	f this mod	lule, students						
should be able to:								
1. Understand inte								
2. Understand in	terface circ	uits functions						
and Services.								
3. Understand Me	echatronic ir	L						
Techniques.								
Course Descriptio		Mianashin	Interface conc	antas Daviana	ariata		nont du	to the
Mechatronics Syste interface process;								
sensors types and s								
classification; analo								
international stand					ponen	15 101 11	nerrace	system
international stand	aru anu spec	incation, inte	frace protocors.					
References								
	tty. Richard	l A. Kolk. "I	Mechatronics S	System Desig	n". 2r	nd Ed	ition .C	Cengage
Learning 2		,			,	ia Da	,c	engage
2. Georg pelz		nic Systems:	Modeling and	simulation" w	vith H	DL's. J	John wi	ley and
sons Ltd, 2	-	jari i	0			- , -		
,		– Electron	ic Control S	vstems in N	Aecha	nical	and El	ectrical
			esly Longman I					
			and A.J. L		atroni	cs :	Electro	nics in
			nd Hall, Londo					
	l System Int				f			
J. Micchanica	i bystem mt	chacing by D	avid M. Ausian	luel, Call J. Ke	empi			



#### **Mechatronics System Modelling and Simulation** 3(2,0,3):

Course code	MEE5201	Hours				
Course Name	Mechatronics System Modeling and	L	Т	Р		
	Simulation					
Prerequisites	ECE4107	2	0	2		
Level /semester	5/10					
<b>Objective</b> (s)		Outcomes				
1. Understand	and develop mathematical models for	To int	roduce	the fundamentals of		
different systems	_	mathematical modeling of engineering				
uniterent systems		mathematic	ationi ii	iouching of engineering		
•	tion experiments.			imulation.		
2. Design simula	tion experiments. commonly used systems			<b>U U U</b>		

#### **Course Description**

Definitions. Types of models, physical modeling, mathematical modeling, Continuous in Time vs. Discrete in Time Models, Verification and validation, Variables and Parameters, Techniques needed in modeling. Poisson theory. Markov chain, Queue theory.

historical overview of computer simulation. Simulation languages. Simulatin examples using matlab.

#### **References**

- 1. Bankds J. Carson. J.S. and Nelson B.L. Discrete Event System Simulation, Prentice Hall of India, New Delhi, 1996.
- 2. Gottfried B.S., Elements of Stochastic Process Simulation, Prentice Hall, London, 1984.
- 3. R.E. Shanol, Systems Simulation, the art and Science Prentice Hall, 1993.



### Introduction to ANN and Fuzzy Logic:3(2,2,2)

Course code	MEE5202 Hours						
Course Name	Introduction to ANN and	d Fuzzy Logic	L	Τ	P	С	
Prerequisites	Control System-I		2	2	2	3	
Level /semester	5/9						
Objective(s)       Outcomes         1. Fundamental of expert system, fuzzy       Iogic and neural controllers with their case studies.       This course is designed to make the students familiarized with the existing intelligent controllers and their applications.							
Course Description INTRODUCTION         Definition – architecture – difference between conventional and expert system.         FUZZY MODELING AND CONTROL: Fuzzy sets – Fuzzy set operators – Fuzzy Reasoning – Fuzzy propositions – Linguistic variable – Decomposition and Defuzzification – Fuzzy systems: case studies.         NEURAL CONTROLLERS         Introduction: Neural networks – supervised and unsupervised learning-neural network models – single and multi layers – back propagation – learning and training. Learning rules. Case studies.         Tools: Matlab         References         1. Neural Network: comprehensive foundation by Simon Hykin, 1999							



#### **Embedded System Design**3(2,0,3):

Course code	MEE52xx		Hours						
Course Name	04Embedded System De	sign	L	Т	Р	С			
Prerequisites	•	2	-	3	3				
Level /semester	5/10		•						
Objective(s)		Outcomes							
The aim of this mo	dule is to enable students a	t							
a final year level	to design and realize an	1							
embedded system.	In practice the students	8							
will work in teams	of 3 to 5. On completion of	f							
the course the	students will have	A							
demonstrated:									
- Individual and C	Group ability to decompose	e							
a specified task.									
- Simulate the par	titioned problem								
- Identify proce	esses and data flows	S							
continued within th	e application.								
- Make technolog	gical recommendations for	r							
implementing the a	pplication.								
- Implement the r	ecommendations.								
- Test the system									
-									
<b>Course Descriptio</b>	n:								

route.Embedded system structure and standard basics components, layer approach and needs for software supports and services; Fundamentals of control and executive automation. Basics of measurement equipment. Types of sensors, the principles of it's operation. Sensors classifications; actuators types and operation process; system interface and interaction protocols

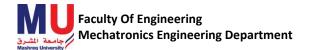
#### References

- 1. Embedded Systems: Architecture, Programming and Design, By Raj Kamal, 2nd ed, 2008
- 2. Embedded Systems: Hardware, Design and Implementation, By Krzysztof Iniewski



### Medical Mechatronics System3(2,0,3):

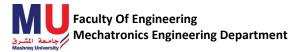
Course code		_	AEE5															lours		
Course Name							atronic								L		Т	Р		С
Prerequisites		I	Aach	ine	Desi	gn a	nd Sen	sor a	and	l Ac	tua	tor			2		-	2		3
Level /semest	er	5	/10																	
<ul> <li>Objective(s)</li> <li>To teach signal and signal</li> <li>To educe mechanismedifferent being different being the supervised of th</li></ul>	I the ate n to ioma y dif n as c and stude a c a to dev MI /	e c s edi ffe d p der abo les vico /R]	halle tuden mea cal p rent patho rosth nts i but ign es an FI pr	nges nts sure aram type logi etic n e diff of d tl otec	the an neter s of cal, device enhar erent the he m ted of	picki diag bior diag ces. ncing t in elec niniar cabin	ing the ifferent nonitor nedical gnostic, g their maging ctrodes, ture as net is a	•	S H H I a H t I a	liffer Expla Designed a Expla echr Dem	ct p rent ain nedic gn s appl ain niqu hosp	mea the cal ec suital icatio the es in trate	pri quip ble ons Bic the info	eme inci omer orth orth orth sigr	nt of j ple a nt notic ing d dical nifical	par and and of En nce	amet l wo l pro diff ginee e of sa	orking sthetic erent	of c de im tele	f any evices aging metry
<ul> <li>Differ Biom</li> <li>The o and at</li> <li>Recon heart</li> <li>Blood</li> <li>Blood</li> <li>Thera</li> <li>Cardi Venti Defin</li> <li>Gait</li> </ul>	velecc stand ent t edica igin nplif ding rate r flow gas gas tion c Cycl	tri d g typp al I n of fier s mo an ac s, N le,	enera es of nstru bio- s s stem nitor eters alyse alyse alyse und P emak Infar eed a Bior	atior Electrone pote s fo Mea , Ca rrs, c rrost ters, c rost ters, int innd (	n of e ctrod ts Bi ential or the asure rdiac oxime hetic Car incut Class erials	electr les, F iopot l, EC e bio e bio e bio e bio e bio e bio e bio e ters e Equ rdiac pator sifica	rical sig Electrol ential A G, ENG -potent t and as put mea , Blood ipment defibi , drug ttion, N efinition	gnal i ytes Ampl G, EN ial li nalys sure cell s cell s tillato del orma n, N	in h and lifie MC iste sist con cors, elive al H Need	uuma d the ers a 3, EI ed ab techn ent, p unte , He ery Huma d an	an co eir s ind r EG, bove niqu bulm ers, A emo dev an I nd	ignif recor MEC e and les honan Audio diali vices Locon	ican ders G, E I pa ry fu ome sis ,Ort moti sific	tien unct mac hoti ion catio	Biose etc. 7 t mor ion ar chine. c an on, B	ens The nito naly , E nd	ors C e sigr oring ysers Electr Pros ogica	lassifi nal con syster osurgi thetic l Tes	icat ndit m, ] cal da ting	ioners Foetal unit, evices g and
device References 1. Khane	e <u>s, St</u> lpur	tuc R.	<u>y of</u> S., F	vario	ous b	oioma	ower li aterials Biomed	and	apj	plica	ation	is								thotic
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	edde	es	and I				ief), Ha inciples							-		-				



#### CAD/CAM 3(2,2,2):

Course code	MEE5204				ours		
Course Name	CAD/CAM		L	Т	Р	С	
Prerequisites	Manufacturing and Assen	nbly drawing	2	2	2	3	
Level /semester	10						
<b>Objective</b> (s)		Outcomes					
1. Understand th	ne role of hardware and	To introduce the concept	ots and	techni	iques us	ed in	
software.		CAD and CAM					
2. Understand the graphics display							
techniques.							
	ne role of computers in						
CAD/CAM and	d its Integration.						
<b>Course Descriptio</b>							
	N: Introduction of CAD/CAN						
•	- sequential and Concurre	ent Engineering – Role of	f comp	uter in	n CAD/	CAM.	
Benefits of CAD/CAM.							
	COMPUTER GRAPHICS:						
	ces – Creation of Graphic						
	D and 3D – viewing transfor						
U	structure – Data structur	e organization – Engine	ering	Data N	Manufac	turing	
Systems.							
	NG AND GRAPHICS SYS						
	G and B-Rep techniques -						
	ation of Graphics System, F		kages,	Graphi	c standa	ırds –	
e	tion – Introduction to Finite	5					
	DED MANUFACTURING:	· · · · · · · · · · · · · · · · · · ·					
elements, Manufac	turing planning and control	– Principles of Computer	Integr	ated N	Manufac	turing	
	twork of computers - Loo		ocess F	lannin	g – Con	nputer	
	nning – Retrieval and Generat						
	LANNING AND SHOP FL						
	ed Production Management						
	ning – Inventory Managemer			ata Ba	se – Caj	pacity	
Planning – Shop Fl	loor Control – Functions – O	order release – Order schedu	ıling.				
References			·	1. 1			
	gh. "Computer Aided Design	and Manufacturing", Khan	ina Pub	lishers	, New D	elhı,	
1998.							

2. Ibrahim Zeid, CAD/CAM, Theory and Practice, Tata McGraw Hill Ed, 1998.



#### **Final Project-I 3**(0,0,3):

#### Final Project-II 3(0,0,3):

L	Т	Р	С
-			
2	2	2	3
	d through y	d through various	d through various theorem

- 1. Enable students to implement the knowledge & skills gathered through various theoretical and laboratory courses
- 2. Introduce students to conduct independent literature survey for contemporary problems and issues related to implementation of the allotted project.
- 3. Encourage the students to acquire a comprehensive understanding about design, operation, simulation, data collection and analysis on the important areas of the project.

#### **Course Description**

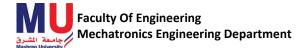
Choose a project that makes usage of the acquired knowledge& skills and in line with current needs of prospective employers. Projects shall incorporate the technological advancements while applying Information Communication Technology (ICT) extensively.

#### **Suggested Fields:**

- Robotics
- Industrial Automation& Machinery

#### • References

• The students should select recent references depend on the project area



### Languages & Studies

اتصال	عدد ساعات الا			
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	IS1108	الثقافة الاسلامية 1

#### الهدف العام:

ان يتعرف المتعلم على مفهوم الثقافة الإسلامية ، مصادر ها ، خصائصها . ،عناصر الثقافة الاسلامية و آثار ها في الفرد و المجتمع، مفهوم العبادة في الإسلام.

# مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد در اسة المقرر) ان يطبق المتعلم ثقافته الاسلامية في شؤون حياته

#### مفردات المقرر (المحتوى – الموضوعات)

- الوحدة الأولى : مقدمات في الثقافة الإسلامية: تعريف الثقافة الإسلامية - مصادر ها- خصائصها - موقف المسلم من الثقافات الأخرى.
- الوحدة الثانية : العقيدة الإسلامية: مُعهوم العُقيدة الإسلامية – أهميتها – أركان الإسلام الخمسة – أثر هذه العقيدة على الفرد والمجتمع . عقيدة أهل السنة والجماعة في السمع والطاعة لولاة الأمر – خطورة الخروج عليهم وعقوبة ذلك – أهمية
  - الجماعة ووجوب لزومها.
    - الوحدة الثالثة : العبادة في الإسلام:
- الغلو مفهومة -أنواعه حكمه و خطره المنهج النبوي في معالجة الغلو مصير الغلاة نماذج من 0 الغلاة (الخوارج).

#### توصيف المهام والتكاليف:

الاسبوع	الوصف	المهمة
الرابع	موضوع في مفردات المقرر	سمنار
السابع		ورقة بحثية
نهاية الفصل		اختبار نهائي

## استراتيجيات تدريس المقرر

المحاضرة

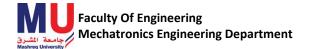
#### استراتيجيات (طرق) التقييم

بحث 10%

اختبار فصلى 10%

اختبار نھائى80%

- 1 الثقافة الإسلامية الشيخ عبدالمجيد بن عزيز الزنداني إدارة المطلوبات جامعة الخرطوم،
  - 2 الوسطية والاعتدال وأثرها على حياة المسلمين للشيخ صالح بن عبد العزيز أل الشيخ.
    - 3 الموافقات للإمام الشاطبي.
    - 4 مقاصد الشريعة للشيخ الطاهر بن عاشور.



ىال	د ساعات الاتص	21		
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	AR1106	لغة عربية 1

ان يتعرف المتعلم مسائل في اللغة و آدابها لتوظيفها في استعمالاته اللُغوية ، وتدريبه على بعض قواعد النحو الأساسية، وبعض قواعد الضبط الإملائي وتنمية مهارات الطلاب اللغوية من خلال ( الاستماع، والكلام، والقراءة، والكتابة ) .

### مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

ان يطبق المتعلم مهارات اللغة العربية في شؤون حياته

#### مفردات المقرر (المحتوى - الموضوعات)

المسائل النحوية:

- مراجعة لبعض القواعد النحوية التالية: .1
- الإعراب والبناء ( الأسماء، والأفعال، والحروف ) . الجملة الاسمية ( المبتدأ والخبر ، والأفعال الناسخة، والحروف الناسخة ) .
- الجملة الفعلية ( ألفاعل ونائبه، وبناء الفعل للمجهول،والأفعال اللازمة والمتعدية، والمفاعيل ) .
  - العدد وأحكمه ( صياغته، وإعرابه ) .
  - المعاجم العربية ( التعريف، والأهمية، والأنواع، وطريقة الاستخدام ).

#### توصيف المهام والتكاليف:

الاسبوع	الوصف	المهمة
الرابع	موضوع في مفردات المقرر	سمنار
السابع		ورقة بحثية
نهاية الفصل		اختبار نهائي

### استراتيجيات تدريس المقرر

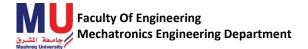
المحاضرة (الكتروني)

#### استراتيجيات (طرق) التقييم

الكتروني

#### المراجع:

- 1 النحو الجامعي، محمد شريف أبو الفتوح، مكتبة الشباب، مصر، 1974 م.
  - 2 فن التحرير العربي، محمد صالح الشنطي، دار النفائس، بيروت، 2004 م.
     3 المنجد في اللغة والاعلام المكتبة الشرقية، بيروت.



لاتصال	عدد ساعات ا	•		
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	IS1208	الثقافة الاسلامية 11

ان يتعرف المتعلم على العقيدة السليمه ضد انحر افات وشبهات المذاهب الفكرية والاجتماعية المعاصرة للقيام بواجبه الديني في بناء ذاته وأسرته ووطنه المشاركة في النهضية المعاصرة للأمة في مختلف مجالات الحياة.

#### مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

ان يطبق المتعلم ثقافته الاسلامية في شؤون حياته

مفردات المقرر (المحتوى - الموضوعات)

#### مسائل و قضايا معاصرة:

**أولا: الجهاد:** تعريفه – حكمه – أنواعه – الرد على الجماعات الجهادية المعاصرة – بيان ما جنته هذه الجماعات على الأمة الإسلامية من الشرور.

#### ثانيا: محاسن الإسلام و أبرز مزاياه:

التمام و الكمال – الاتساع والشمول – الصلاحية لكل زمان و مكان – الوسطية والاعتدال– اليسر والسعة ورفع الحرج – العدل – الرحمة – المحبة – الوفاء بالعهود و المواثيق – الأمر بالصلاح والإصلاح والنهي عن الفساد والإفساد – حسن الخلق – الحكمة والبصيرة في الدعوة

#### توصيف المهام والتكاليف:

الاسبوع	الوصف	المهمة
الرابع	موضوع في مفردات المقرر	سمنار
السابع		ورقة بحثية
نهاية الفصل		اختبار نهائي

استراتيجيات تدريس المقرر

المحاضرة

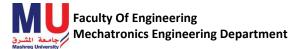
استراتيجيات (طرق) التقييم

بحث 10%

اختبار فصلي 10%

اختبار نهائي80%

- 1 الثقافة الإسلامية الشيخ عبدالمجيد بن عزيز الزنداني إدارة المطلوبات، جامعة الخرطوم
  - 2 الوسطية والاعتدال وأثرها على حياة المسلمين للشيخ صالح بن عبد العزيز آل الشيخ.
    - 3 الموافقات للإمام الشاطبي.
    - 4 مقاصد الشريعة للشيخ الطاهر بن عاشور.



ن	ساعات الاتصا	عدد		
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	AR1206	لغة عربية 11

ان يتعرف المتعلم مسائل في اللغة وآدابها لتوظيفها في استعمالاته اللُغوية ، وتدريبه على بعض قواعد النحو الأساسية، وبعض قواعد الضبط الإملائي وتنمية مهارات الطلاب اللغوية من خلال ( الاستماع،و الكلام،والقراءة،والكتابة )

### مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

ان يطبق المتعلم مهارات اللغة العربية في شؤون حياته

مفردات المقرر (المحتوى - الموضوعات)

أولاً: التحريـر العـربي:

- ضوابط عامة حول التحرير والكتابة العربية .
- كتابة التلخيص ( التعريف، والأهمية، والخطوات، والمبادئ، والتطبيق ) .
- كتابة التقرير ( التعريف، والأهمية، والأنواع " الإداري، والطبي، والهندسي "، والتطبيق ).
  - كتابة الرسالة ( التعريف، والمقومات، والأنواع " الأدبية، والرسمية "، والتطبيق ) .

ثانياً : التدريبات اللغوية :

- تدريبات على مهارات اللغة ( السماع، والحديث، والقراءة، والكتابة ) .
  - تدريبات على استعمال قواعد اللغة، والمعاجم اللغوية .
    - تدريبات على استعمال الهمزات وعلامات الترقيم .
  - تدريبات على الأخطاءاللغوية الشائعة، وكيفية معالجتها.

توصيف المهام والتكاليف:

الاسبوع	الوصف	المهمة
الر ابع السابع	موضوع في مفردات المقرر	سمنار ورقة بحثية
نهاية الفصل		اختبار نهائي

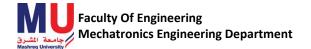
استراتيجيات تدريس المقرر

المحاضرة (الكتروني)

استراتيجيات (طرق) التقييم

الكتروني

- 1 محمد عيد ،النحو المصفى، مكتبة الشباب، مصر ، 2000 م.
- 2 عبد العليم إبراهيم، الإملاء و الترقيم في الكتابة العربية، مكتبة غريب، القاهرة، 1995م.



عدد ساعات الاتصال				
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	SD2107	الدر اسات السودانية

**الهدف العام :-**ان يتعرف المتعلم على القضايا الاجتماعية والسياسية والاقتصادية للمجتمع السوداني.. وتعميق الإحساس بالسودانية عند الطالب. وتقديم رؤية فكرية عن السودان بوصفه جزء من العالم العربي والأفريقي والإسلامي.

## مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

ان يناقش المتعلم في مكونات الثقافة السودانية.

مفردات المقرر (المحتوى – الموضوعات)

### يشتمل المقرر على الآتى:

البلاد وسكانها وعصور ها التاريخية وتشمل الجغر افية الطبيعية والبشرية والحضارات السودانية (النوبة – المسيحية – الإسلام) العلاقات الدولية – المهدية والقومية السودانية – السودان والحكم الثنائي – الحركة الوطنية والاستقلال. الأداب والفنون – جمعيات القراءة والمناقشة – المجلات – أشهر الأدباء والفنانين – الفنون التشكيلية – الثقافة الشعبية السودانية والفلكلور السوداني (الأغاني – الأمثال الشعبية – الأحاجي). التعليم الأهلى (فلسفته - مؤسساته - بنيانه).

يستعان ببعض الشخصيات لمناقشة القضايا مع زيارة المعالم الوطنية والمتاحف، كتابة بحوث ومقالات قصيرة بواسطة الطلاب.

#### توصيف المهام والتكاليف

الاسبوع	الوصف	المهمة
الرابع	موضوع في مفردات المقرر	سمنار
السابع نهاية الفصل		ورقة بحثية اختبار نهائي

### استراتيجيات تدريس المقرر

المحاضرة(الكتروني)

#### استراتيجيات (طرق) التقييم

الكتروني

#### المراجع:

- 1 بروفيسور محمد عمر بشير ، در اسات سودانية معاصرة،
  - 2 معتصم محمد الحاج ،در اسات سودانية معاصرة ،
- 3 زينب الزبير الطيب، الدر اسات السودانية ،جامعة الخرطوم ،2010م
- 4 أماني الطويل : مستقبل السودان : واقع التجزئة وفرص الحرب المركز العربي للأبحاث ودراسة السياسات201م



عدد ساعات الاتصال				
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	EN1107	English Language I
	·			يدف العام :-

This course aims to enable students to realize the basic skills of language.

مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

After this course the student may able to read some simplified book or benefit the media the student also can practice speaking English to his /her teacher classmates or other English speakers.

مفردات المقرر (المحتوى - الموضوعات)

- 1. Family and family tree, vocabulary +exercise
- 2. Simple present +form and use +exercises
- 3. Vocabulary concern job and career +speaking (talking about your job and occupation).
- 4. Application letter writing +Drill
- 5. Exercise +5-Future simple tense
- 6. Conditional 0,1,2, and 3
- 7. Vocabulary of Nationalities , languages, countries and rigors
- 8. Simple past g) present continues.

متطلبات المقرر

Suitable classroom, microphone, chalk or marker

توصيف المهام والتكاليف

الاسبوع	الوصف	المهمة
الرابع السابع نهاية الفصل	موضوع في مفردات المقرر	سمنار ورقة بحثية اختبار نهائي

استراتيجيات تدريس المقرر

- Lecture

- Exercises and drills

#### استراتيجيات (طرق) التقييم

- Exercises and drills 10%
- Mid-term test 20%
- Final examination 70%

- 1. C-E- Eckersley ,J-M-Eckersley,(1985), comprehensive English Grammar , Longman ,Hong Kong .
- 2. A-J-Thomson , A-V-Martinet, (1982) A practical English Grammar ,third edition ,Oxford University press ,Oxford.
- 3. Romand Murphy, Ronan Altman, (1998), Grammar in use-Reference and practice for intermediate students of English, Cambridge University press, Cambridge.
- 4. Michael McCarthy, Felicity O'Dell ,(1998), English Vocabulary in use, Cambridge university press, Cambridge.



1	Mechatronics Engineering Department
	عدد ساعات الاتصال

المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	EN1207	English Language II

This course aims to enable students to realize the basic skills of language.

#### مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

After this course the student may able to read some simplified book or benefit the media the student also can practice speaking English to his /her teacher classmates or other English speakers.

#### مفردات المقرر (المحتوى – الموضوعات)

- 1. Vocabulary, Word used in grammar.-parts of speech; Noun, verb, adverb .prepositions and yet. For and since +Practices.
- 2. Present Perfect; Definition and use Just
- 3. Past Perfect Tense; form and use +past participle form-Reported speech –direct and indirect speech +conditional3.
- 4. How to use preposition correctly; some tips in preposition in place expression and in time expression +Exercises.

#### متطلبات المقرر

Suitable classroom, microphone, chalk or marker

#### توصيف المهام والتكاليف

الاسبوع	الوصف	المهمة
الرابع	موضوع في مفردات المقرر	سمنار
السابع		ورقة بحثية
نهاية الفصل		اختبار نهائي

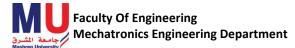
#### استراتيجيات تدريس المقرر

- Lecture
- Exercises and drills

#### استراتيجيات (طرق) التقييم

- Exercises and drills 10%
- Mid-term test 20%
- Final examination 70%

- 1. C-E- Eckersley ,J-M-Eckersley,(1985), comprehensive English Grammar , Longman ,Hong Kong .
- 2. A-J-Thomson , A-V-Martinet, (1982) A practical English Grammar ,third edition ,Oxford University press ,Oxford.
- 3. Romand Murphy, Ronan Altman, (1998), Grammar in use- Reference and practice for intermediate students of English, Cambridge University press, Cambridge.
- 4. Michael McCarthy ,Felicity O'Dell ,(1998), English Vocabulary in use, Cambridge university press ,Cambridge.



	ت الاتصال			
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	EN2103	English Language III

This course aims to enable students to realize the advance skills of language.

### مخرجات التعلم (ما يتوقع من المتعلم اكتسابه بعد دراسة المقرر)

After this course the student may able to read some advanced book also can practice speaking English to his /her teacher classmates or other English speakers.

مفردات المقرر (المحتوى – الموضوعات)

- Extensive scientific and technical reading texts that deal with a wide range of topics, e.g. electricity, telecommunication, computer, energy.
- Grammar: The Passive, the Conjunctions, and the Conditional Sentences.
- Word Formation, Parts of Speech.
- Writing: Reports, Instructions, communications

متطلبات المقرر

Suitable classroom, microphone, chalk or marker

توصيف المهام والتكاليف

الاسبوع	الوصف	المهمة
الر ابع السابع نهاية الفصل	موضوع في مفردات المقرر	سمنار ورقة بحثية اختبار نهائي

استراتيجيات تدريس المقرر

- Lecture
- Exercises and drills

### استراتيجيات (طرق) التقييم

- Exercises and drills 10%
- Mid-term test 20%
- Final examination 70%

- 1. C-E- Eckersley ,J-M-Eckersley,(1985), comprehensive English Grammar , Longman ,Hong Kong .
- 2. A-J-Thomson , A-V-Martinet, (1982) A practical English Grammar ,third edition ,Oxford University press ,Oxford.
- 3. Romand Murphy, Ronan Altman, (1998), Grammar in use-Reference and practice for intermediate students of English, Cambridge University press, Cambridge.
- 4. Michael McCarthy ,Felicity O'Dell ,(1998), English Vocabulary in use, Cambridge university press ,Cambridge.



عدد ساعات الاتصال				
المعتمدة	تطبيقات	نظري	رمز المقرر	اسم المقرر
2	-	2	EN2203	اللغة الانجليزية المتخصصة ESP

#### **Objectives:**

- 1- To enable the students to handle simple conversations in Engineering Topics.
- 2- To train the students to comprehend authentic listening material of various kinds such as daily conversations, telephone calls and people talking about locations.

توصيف المهام والتكاليف

الاسبوع	الوصف	المهمة
الرابع	موضوع في مفردات المقرر	سمنار
السابع		ورقة بحثية
نهاية الفصل		اختبار نهائي

- مفردات المقرر (المحتوى الموضوعات) دراسة المصطلحات الانجليزية الخاصة بالمجالات الهندسية المختلفة.
  - در اسة المصطلحات والإختصار ات العالمية القياسية في الهندسة.
    - دراسه أساسيات الترجمة الهندسية •
    - كتابة وترجمة التقارير الفنية المتعلقة بالهندسة .

استراتيجيات تدريس المقرر

- Lecture \_
- Exercises and drills

استراتيجيات (طرق) التقييم

- Exercises and drills 10% -
- Mid-term test 20%
- Final examination 70%

#### **References:**

- Thrush, Laurie Blass and 1- Emily Austin Robert Baldwin, "Interactions Access (Listening/Speaking)", McGraw-Hill Contemporary, 2002.
- 2- Judith Tanka, Paul Most, and Lida R. Baker, "Interactions1 (Listening/Speaking)", McGraw-Hill Contemporary, 2004.
- 3- William R. Smalzer, "English Language Grammar", Conversational English