Mashreq University

Faculty of Technology and Community Development

A Proposed Program for:

Technical Diploma in Mechatronics Engineering

مقترح برنامج :

الدبلوم التقني في هندسة الميكاترونكس

لجنة الإعداد:

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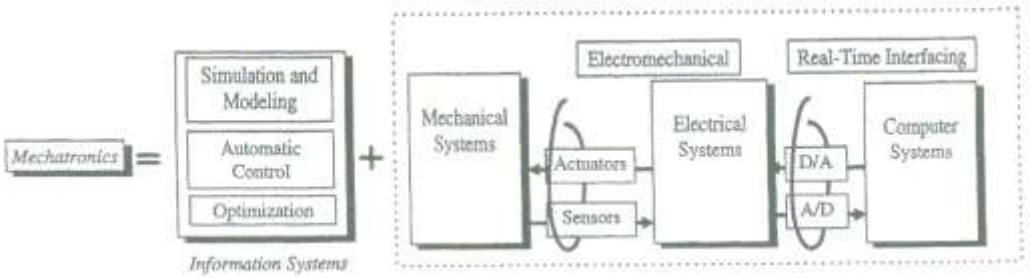
1 Introduction

Mashreq University (MU) is currently offering B.SC degree in Mechatronics engineering. The objective was to construct the contents in the light of new developments in the field and the needs of the local industry. Keeping in view the above scenario, the present curriculum has been designed for students to acquire the essential knowledge & skills in the broader context of a synergic approach in the fields of Mechatronics & Automations depicted below as well as present and future applications.



Mechatronics Applications

- Smart consumer products: home security, camera, microwave oven, toaster, dish washer, laundry washer-dryer, climate control units, etc.
- Medical: implant-devices, assisted surgery, haptic, etc.
- Defense: unmanned air, ground, and underwater vehicles, smart munitions, jet engines, etc.
- Manufacturing: robotics, machines, processes, etc.
- Automotive: climate control, antilock brake, active suspension, cruise control, air bags, engine management, safety, etc.
- Network-centric, distributed systems: distributed robotics, tele-robotics, intelligent highways, etc.

The curriculum is thus addresses the following learning objectives:

1. Understand the principles of applied sciences, basic electrical circuitry and operation of electrical and electronic devices.
2. Understanding the concepts of engineering drawings and developing technical drawing using conventional & new drafting & drawing methods (CAD etc.)
3. Comprehend the relationships between components of the automated system(s) such as the sensors, transducers, actuators, drives etc., and the

systems themselves Developing the basic understanding of microcontrollers and its programming and practice programming on different software(s)

4. Understand the manufacturing environment and technology, the applications of instruments/tools commonly applied the industry for diagnostics, R&D and measurement purposes
5. Understand PLCs and its programming for automating an industrial unit
6. Developing ability to know about the working/operation and development of industrial robots and other automation systems

2 Training Objectives

2.1 General Objectives

1. This curriculum aims at providing the knowledge, skills, abilities, attitudes and experiences to students, enabling them to serve as technicians/supervisors in the field of Mechatronics.
2. It has been designed in a way which promotes competency based understanding and knowledge in order to gain confidence for working in a technology-savvy world as they develop interest in scientific & technical aspects of this technology. They shall also recognize the efficacy of applied sciences with reference to their applicability in other disciplines
3. In addition to above, the other general objectives which the curriculum shall meet are stated below:
    - Developing aptitudes relevant to technology such as accuracy and precision, objectivity, integrity, enquiry, initiative and insight.
    - Promoting general awareness about study and practice of science / technology as co-operative, complementary and cumulative activities that are subject to social, economic, technological, ethical and cultural influences and limitations. Both the beneficial and detrimental aspects of scientific and technological applications at the individual and at the community levels shall be highlighted.
    - Promoting the presentation of information and ideas appropriate for different audiences and purposes by using latest ICT tools.

- Simulating genuine interest in, and care for, the local & global environment, energy conservation and clean energy measures.
- Encouraging learners to take and sustain interest in the course of study so that they are well-prepared for suitable employment and/or for further studies beyond current level.

2.2 Specific Objectives

This 3-year diploma level curriculum on "Mechatronics" is developed to prepare skilled manpower for employment in the automation industries along with automated sectors of the industry. The course covers almost all the important aspects which relates to the production & operation of reliable and efficient automated systems. The curriculum is intended to serve as a base for class room and laboratory instructions as well as an essential reference for use by the institutions offering this course of studies. It is intended to serve the following two purposes:

a) To provide students with a sound understanding of the basic concepts, types, applications of mechatronics & industrial automation;
b) To help students develop proficiency in handling mechatronics equipment and systems and making rational choices regarding situations they are likely to encounter in their professional practices.

3 Curriculum Outstanding

Qualification Title	3-YearDiploma of Associate Engineer in Mechatronics Technology
Qualification Stream	Technical
Duration of Course	3-Years
Time Allocation	Theory 40% : Practical 60%
Instructional Medium	English / Arabic

4 Admission requirements

Admission of the students for the program is according to the Ministry Admission Regulation.

5 Academic Evaluation

Candidates enrolled in the program are evaluated according to the University Academic Regulations of Undergraduate Studies for the Year (2003 modified in 2013).

6 Degree Awarded

The University senate awards the candidate a "**Diploma in Mechatronics Engineering"** after passing all courses and scoring a CGPA of 2.00 or more and successfully completing the requirements of the Program.

7 Codes

COM **حسب**	1	2	4
Code of Subject	Year	Semester	number of Subject in Semester

Code	Assign to
Com حسب	**Computers Science**
MAT ريض	**Mathematics**
PHYفيز	**Physics**
CHE كيم	**Chemistry**
ARB عرب	**Arabic Language**
SUSدرس	**Sudanese Studies**
ISMثاس	**Islamic Culture**
GENهعم	**General Engineering**
ELE كهر	**Electrical and Electronics**
MEXمكس	**Mechatronics**
MECميك	**Mechanical**

Humanities (13%)		
No.	**Subject**	**Credit Hours**
1	*Arabic Language -1*	*2(2,0,0)*
2	*English Language -1*	*2(2,0,0)*
3	*Islamic Culture*	*2(2,0,0)*
4	*Sudanese Studies*	*2(2,0,0)*
5	*Arabic Language -2*	*2(2,0,0)*
6	*English Language -2*	*2(2,0,0)*
7	Safety & Security	*2(2,0,0)*
Total		*14(14,0,0)*

Basic pure Sciences (23%)		
No.	**Subject**	**Credit Hours**
1.	*Mathematics-I*	*3(2,2,0)*
2.	*Mathematics-II*	*3(2,2,0)*
3.	*Mathematics-III*	*3(2,2,0)*
4.	*Probability and Statistics*	*3(2,0,0)*
5.	*Physics*	*3(2,0,3)*
6.	*Chemistry*	*3(2,0,3)*
7.	*Introduction to Computer Science*	*2(1,0,3)*
8.	*Programming Language*	*2(1,0,3)*
9.	*Mechanics Engineering*	*3(2,2,0)*
Total		*25(16,10,12)*

Basic Engineering Science (29%)		
No.	**Subject**	**Credit Hours**
.1	*Engineering Drawing-I*	*2(1,0,3)*
.2	*Engineering Drawing-II*	*2(1,0,3)*
.3	*Material Technology*	*2(2,0,0)*
.4	*Introduction to Electrical and Electronics Engineering*	*3(2,0,3)*
.5	*Workshop practice-I*	*1(0,0,5)*
.6	*Workshop practice-II*	*1(0,0,5)*
.7	*Thermodynamics and Heat Transfer*	*3(2,2,0)*
.8	*Industrial Management*	*2(2,0,0)*
.9	*Electrical Circuits*	*2(2,0,0)*
.10	*Electronics' Devices and Circuits*	*3(2,0,3)*
.11	*Motors and generators*	*3(2,0,3)*
.12	*Instrumentation and Measurements*	*2(1,0,3)*
.13	*Machine Elements*	*3(2,1,2)*
.14	*Manufacturing Technology*	*3(2,0,3)*
Total		*32(21,3,33)*

Specialization (Application) Sciences **(35 %)**		
No.	**Subject**	**Credit Hours**
.1	*Introduction to Mechatronics*	*2(2,0,0,)*
.2	*CNC Technology*	*3(2,0,3)*
.3	*Compute -Aided design*	*2(1,0,3)*
.4	*Industrial Robotics*	*3(2,0,3)*
.5	*Industrial Hydraulic Circuits*	*3(2,0,3)*
.6	*Digital logic Circuits Design*	*3(2,0,3)*
.7	*Mechatronics System and Automation Technology*	*3(2,0,3)*
.8	*Microprocessors and Assembly Language*	*3(2,0,3)*
.9	*PLC and Applications*	*3(2,0,3)*
.10	*Sensor and Actuators*	*3(2,0,3)*
.11	*Automotive Mechatronics System*	*3(2,0,3)*
.12	*Filed Training*	*3(1,2,5)*
.13	*Graduation Project*	*4(0,4,6)*
Total		*38(22,6,41)*

The **Credit Hours** according to Sudanese Engineering Council:

Categories	**Credit Hours**			**Total Hours**	**Credit Hours**	**Percentage**	**Engineering Council %**
	Lect.	**Tut.**	**Pract.**				
Humanities	14	0	0	14	14	13	10-15%
Basic pure Sciences	16	10	12	36	25	23	20-30%
Basic Engineering Science	21	3	33	55	32	29	25-35%
Specialization (Application) Sciences	22	6	41	64	38	35	25-35%
Total	73	19	89	178	109	100	

- The **Lectures** Percentage: **41.0%**
- The **Practical** and **Tutorial** Percentage: **59.0%**

8 Scheme of Studies

1st Year:

First Semester:

Code	Subject	Credit Hours	Lecture	Pract.	Tut.
COM111 حسب 111	Introduction To Computer Science مقدمة علوم الحاسوب	2	1	3	0
MAT112 ريض112	Mathematics I رياضيات -1	3	2	0	2
PHY 113 فيز113	Physics فيزياء	3	2	3	0
ARB114 عرب114	Arabic Language I لغة عربية 1	2	2	0	0
ISM 115 ثاس 115	Islamic Culture ثقافة اسلامية	2	2	0	0
GEN116 هعم 116	Engineering Drawing I رسم هندسي1	2	1	3	0
ELE117 كهر117	Introduction of Electrical and Electronics Engineering أساسيات الهندسة الكهربائية والالكترونية	3	2	3	0
GEN118 هعم118	Work Shop Practice I أعمال ورشI	1	0	5	0
Total Hours		**18**	**12**	**17**	**2**

18 **Credit hours**

Second Semester:

Code	Subject	Credit Hours	Lecture	Pract.	Tut.
ENG121 نجل121	English Language I لغة إنجليزية 1	2	2	0	0
MAT122 ريض122	Mathematics II رياضيات2	3	2	0	2
MEX123 مكس 123	Introduction to Mechatronics مقدمة الميكاترونيكس	2	2	0	0
ARB 124 عرب124	Arabic Language II لغة عربية II	2	2	0	0
CHE125 كيم125	Chemistry كيمياء	3	2	3	0
GEN126 هعم126	Engineering Drawing II رسم هندسي 2	2	1	3	0
ELE127 كهر127	Electrical Circuits الدوائر الكهربائية	2	2	0	0
GEN128 هعم128	Workshop Practice II أعمال ورش II	1	0	5	0
Total Hours		**17**	**13**	**11**	**2**

17 **Credit hours**

2nd Year:

Third Semester:

Code	Subject	Credit Hours	Lecture	Pract.	Tut.
ENG211 نجل211	English Language II لغة إنجليزية 2	2	2	0	0
MAT212 ريض212	Mathematics III رياضيات3	3	2	0	2
MEC213 ميك213	Mechanics Engineering ميكانيكا الهندسة	3	2	0	2
COM214 حسب214	Programming Language لغة برمجة	2	1	3	0
ELE215 كهر215	Electronic Devices & Circuits الأجهزة الالكترونية والدوائر	3	2	3	0
GEN216 معم216	Material Technology تكنولوجيا المواد	2	2	0	0
MEX217 مكس217	Motors and Generators الموتورات والمولدات	3	2	3	0
SUS218 درس218	Sudanese Studies دراسات سودانية	2	2	0	0
Total Hours		**20**	**15**	**09**	**04**

20 Credit hours

Fourth Semester:

Code	Subject	Credit Hours	Lecture	Pract.	Tut.
MAT221 ريض221	Probability and Statistics الاحصاء والاحتمالات	3	2	0	2
MEX222 مكس222	Sensors and Actuators المتحسسات والمحركات	3	2	3	0
MEC223 ميك223	Machine Elements عناصر اللالة	3	2	1	2
ELE224 كهر224	Instrumentations and Measurement القياسات والاجهزة	2	1	3	0
MEX225 مكس225	Digital Logic Circuits Design تصميم الدوائر الرقمية	3	2	3	0
MEC226 ميك226	Manufacturing Technology تكنولوجيا التصنيع	3	2	3	0
MEC227 ميك227	Thermodynamic and Heat Transfer انتقال حرارة وديناميكية حرارية	3	2	0	2
Total Hours		**20**	**13**	**13**	**06**

20 Credit hours

3rd Year:

Fifth Semester:

Code	Subject	Credit Hours	Lecture	Pract.	Tut.
MEX311 مكس311	Industrial Hydraulic Circuits الدوائر الهيدروليكية الصناعية	3	2	3	0
MEX312 مكس312	Computer-Aided manufacturing التصنيع بمساعدة الحاسوب	2	1	3	0
MEX313 مكس313	Industrial Robotics الروبوتات الصناعية	3	2	3	0
MEX314 مكس314	Microprocessor And Microcontroller Applications تطبيقات المعالج الدقيق والمتحكمات	3	2	3	0
GEN315 هعم315	Industrial Management إدارة صناعية	2	2	0	0
MEX316 مكس316	Automotive Mechatronics System انظمة الميكاترونكس الالكترونية	3	2	3	0
MEX317 مكس317	Computer Numerical Control Technology تكنولوجيا التحكم الرقمي	3	2	3	0
Total Hours		**19**	**13**	**18**	**0**

19 Credit hours

Sixth Semester:

Code	Subject	Credit Hours	Lecture	Pract.	Tut.
MEX321 مكس321	Mechatronics Systems and Automation Technology أنظمة الميكاترونيكس وتكنولوجيا الأتمتة	3	2	3	0
MEX322 مكس322	PLC and Applications تطبيقات حاكمات المنطق المبرمجة	3	2	3	0
GEN323 هعم323	Safety & Security الامن والسلامة	2	2	0	0
MEX324 مكس324	Field Training التدريب الحقلي	3	1	5	0
MEX325 مكس325	Final Project مشروع التخرج	4	0	12	0
Total Hours		**15**	**07**	**23**	**0**

15 Credit hours

109 Total Credit Hours

9 Courses Description

COM111: Introduction to Computer Science 2(1,0,3)

Course Title	**Introduction to Computer Science** مقدمة علوم الحاسوب
Level /Semester	1/1
Credit Hours	2
Pre-requisite(s)	Non.
Objective(s)	To provide the students with skills and knowledge necessary for using computers in their future courses. Emphasis will be given to applications and independent work. Also the course helps students to pass ICDL exams.
Course Contents	Computer history. Computer system's terminology. Definitions of software and hardware. Computer main units. Computer peripherals. Digital and analog computers. Data representation in digital computer. Types of operating systems. GUI and DOS prompt commands. Overview of programming languages. Packages, word processing and spread sheets. Solving problems by computers using programming language. Main internal external commands. Examples and practice.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	1. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Glenn Brookshear, computer Science an overview, 11ed ISBN:0132569035 2. Peter Norton's, "Introduction to Computers", McGraw-Hill/Irwin; 6th edition, 2004

MAT112: Mathamtics-1: 3(2,2,0)

Course Title	Mathamtics-1 رياضيات 1
Level /Semester	1/1
Credit Hours	3
Pre-requisite(s)	None.
Objective(s)	After the completion of this course, the student should be able to: 2. Understand limits, and continuous functions 3. Plot the graphs of the elementary function. 4. Find Derivatives. 5. Integrate by part and substitution. 6. Apply improper integrals.
Course Contents	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.
Teaching Method	30 hours for lectures. 30 hours for tutorial. 10 office hours for revision.
Evaluation	7. Class Assignments, Mid-Term Test and Final exam
Reference(s)	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

PHY113: Physics 3(2,0,3)

Course Title	**Physics**
Level /Semester	1/1
Credit Hours	3
Pre-requisite(s)	**None.**
Objective(s)	• At the end of this course the student willBuild a good base for further topics in light, electricity theorems and topics.
Course Contents	Transformation of scalars and vectors under Rotation transformation, Forces in Nature, Newton's laws and its completeness in describing particle motion, Form invariance of Newton's second law, Solving Newton's equations of motion in polar coordinates, Problems including constraints and friction, Extension to cylindrical and spherical coordinates. Mechanical and electrical simple harmonic oscillators, Complex number notation and phasor representation of simple harmonic motion Reflection and refraction of light lens systems. Light and electromagnetic waves. Electric charge and current. Electric and magnetic fields. Capacitance, inductance and resistance. Maxwell's equations. Electromagnetic oscillation and wave.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	8. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. **"Physics for Scientists and Engineers",** 9th Edition , by Raymond A. Serway, 2013 2. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning 3. G. Main, "Vibrations and waves in physics', 3rd Edn, Cambridge University Press, 2018. 4. Ajoy Ghatak, " Optics", McGraw Hill Education, 2012

ARB 114: Arabic Language I: 2(2,0,0)

Course Title	Arabic Language I لغة عربية 1
Level /Semester	1/1
Credit Hours	2
Pre-requisite(s)	لايوجد
Objective(s)	ان يتعرف المتعلم مسائل في اللغة وآدابها لتوظيفها في استعمالاته اللّغوية ، وتدريبه على بعض قواعد النحو الأساسية، وبعض قواعد الضبط الإملائي وتنمية مهارات الطلاب اللغوية من خلال (الاستماع،والكلام،والقراءة،والكتابة).
Course Contents	المسائل النحوية: 1. مراجعة لبعض القواعد النحوية التالية: ▪ الإعراب والبناء (الأسماء، والأفعال، والحروف) . ▪ الجملة الاسمية (المبتدأ والخبر، والأفعال الناسخة، والحروف الناسخة) . ▪ الجملة الفعلية (الفاعل ونائبه، وبناء الفعل للمجهول،والأفعال اللازمة والمتعدية، والمفاعيل) . ▪ العدد وأحكـامه (صياغته، وإعرابه) . 2. المعاجم العربية (التعريف، والأهمية، والأنواع، وطريقة الاستخدام) .
Teaching Method	المحاضرة (الكتروني)
Evaluation	بحث 10% اختبار فصلي 10% اختبار نهائي80% (الكتروني)
Reference(s)	1 - النحو الجامعي، محمـــد 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.

ISM 115: Islamic Culture: 2(2,0,0)

Course Title	**Islamic Culture** **ثقافة الاسلامية**
Level /Semester	1/2
Credit Hours	2
Pre-requisite(s)	
Objective(s)	ان يتعرف المتعلم على العقيدة السليمه ضد انحرافات وشبهات المذاهب الفكرية والاجتماعية المعاصرة للقيام بواجبه الديني في بناء ذاته وأسرته ووطنه المشاركة في النهضة المعاصرة للأمة في مختلف مجالات الحياة.
Course Contents	**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
Teaching Method	المحاضرة (الكتروني)
Evaluation	بحث 10% اختبار فصلي 10% اختبار نهائي80% (الكتروني)
Reference(s)	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.

GEN116: Engineering Drawing I : 2(1,0,3)

Course Title	**Engineering Drawing I**
Level /Semester	1/2
Credit Hours	2
Pre-requisite(s)	**Non.**
Objective(s)	1. To provide the student with the experience of geometrical construction and sketching. 2. To provide the student with the principles of orthographic projection, sectional views, auxiliary views, and writing dimensions
Course Contents	**Introduction:** - I. S. specification for preparation of drawings. - Use of drawing instruments and materials. Basic Tools-classification and brief description. - Special Tools: Mini-drafter. Drafting Machine. - Scales, Recommended, reduced and enlarged scale. - Lines, Types of lines, Selection of line thickness. - Selection of Pencils. - Drawing sheets, different sheet sizes and standard layouts. Title block as per I.S. specification. - Care and maintenance of drawing material. **Lettering, Numbering and Dimensioning:** - Importance of lettering. Different types of lettering as per I. S. code. Capital and small letters of vertical and slanting type as per I. S. code. - Numerical figures of vertical and slanting type as per I. S. code. Single stroke and double stroke, advantages. - Necessity of dimensioning. Principles and method of dimensioning and dimensioning practice as per I.S.I. code. - Making of Centre Line, Section Line, Dimensioning Lines, etc. - Drawing of plain and diagonal scales and dimensioning practice. **Conic Section:** - Concept of Drawing and concept of conic section and its simple properties. - Concept of ellipse and its construction by various methods. Drawing of tangent and normal on ellipse. - Concept of parabola and its construction by various methods. Drawing of tangent and normal to parabola. - Concept of hyperbola and its construction by various methods. Drawing of tangent and normal to hyperbola. - Concept of spirals; construction of Logarithmic & Archemerian spirals. To draw tangent and normal to the curves.

	Orthographic Projections: - Principles of orthographic projection. Concept of horizontal, vertical and auxiliary planes. 1st angle and 3rd angle projection. - Projection of points on horizontal, vertical and auxiliary planes and its implication. - Projection of lines on different planes, Length of line and its true inclination with different planes and its traces. - Concept of orthographic projection of planes. **Section Views and Auxiliary Views:** - Concept of sectioning and drawing section lines, Need for drawing sectional views. - Section of simple geometrical solids-cases involving different types of cutting planes. - Conventional representation of materials as per I.S. Code.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	9. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Thomas, E.E., Charls, J.V., and Robert J.F., Engineering Drawing and Graphic Technology, 14th edition, McGraw-Hill, 1993. 2. Colin H., Simmons and Dennis E. Maguire, Manual of Engineering Drawing, 2nd edition, 2004, Elsevier Newnes, Linacre House, Jordan Hill, Oxford OX2 8DP, 200 Wheel Road, Burlington MA 01803.

ELE 117: Introduction of Electrical and Electronics Engineering: 3(2,0,3)

Course Title	Introduction of Electrical and Electronics Engineering
Level /Semester	1/1
Credit Hours	3
Pre-requisite(s)	**None.**
Objective(s)	On completion of this course, students should be able to: • Explain the relations between charge, current, voltage, energy, power and the properties of ideal circuit elements, including resistors and voltage and current sources, and show understanding of how these differ from real elements. • Perform simple power calculations and find the maximum power available from a source. • Describe the behavior of ideal energy storage elements (inductor, capacitor).
Course Contents	10. Units, atom, charge, Coulomb law. 11. Current .voltage, power, Ohm's law, resistance measuring, resistance connection; series, parallel, delta, star. Kirchhoff's laws. Coils; Magnetic Circuits, Magnetic Fields, flux, flux density, magnetization curve, hysteresis loop, eddy current. 12. Capacitor: Capacitance connection, electric field, charging and discharging, energy. 13. Introduction to Electronics, Diodes and transistors.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	14. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Fundamentals Of Electrical Engineering, By Giorgio Rizzoni, 2009

GEN118: Work shop Practice I: 1(0,0,5)

Course Title	**Work shop Practice I:**
Level /Semester	1/2
Credit Hours	1
Pre-requisite(s)	**None.**
Objective(s)	To familiarize with: 1. The basics of tools and equipment are used in fitting, carpentry, sheet metal, welding and smithy. 2. The production of simple models in the above trades.
Course Contents	**Workshop Safety:** Demonstration of safety concepts and practices in workshop. **Measurement Section:** Measurement practices using surface table, dial indicator, height gauge, bevel protector, Micrometer, caliper (different types). **FITTING** Tools &Equipment's – Practice in Filing and Drilling. Making Vee Joints, Square, dovetail joints, Key Making. **CARPENTARY** Tools and equipment's- Planning practice. Making Half Lap, dovetail, Mortise & Tenon joints, a mini model of a single door window frame. **SHEET METAL** Tools and equipment's - Fabrication of a small cabinet, Rectangular Hopper, etc. **WELDING** Tools and equipment's - Arc welding of butt joint, Lap Joint, Tee Fillet. Demonstration of Gas welding, TIG &MIG. **SMITHY** Tools and equipment's –Making simple parts like hexagonal headed bolt, chisel.
Teaching Method	The student divided into a group, and each one assigns work in the workshop according to the above contents.
Evaluation	A: Excellent job, B+: V. good Job, B: Good, C: Pass, F: Fail
Reference(s)	1. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, practice and work book", Suma Publications, 2005. 2. Kannaiah, P. & Narayanan, K.C. Manual on Workshop Practice, Scitech Publications, Chennai, 1999. 3. Venkata chalapathy, V.S. First year Engineering Workshop Practice, Ramalinga Publications, Madurai,1999.

ENG121: English Language I: 2(2,0,0)

Course Title	English Language I
Level /Semester	1/1
Credit Hours	2
Pre-requisite(s)	None.
Objective(s)	This course aims to enable students to realize the basic skills of language. 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.
Course Contents	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.
Teaching Method	- Lecture - Exercises and drills
Evaluation	- Exercises and drills 10% - Mid-term test 20% - Final examination 70% (Electronic)
Reference(s)	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.

MAT122: Mathematics-II: 3(2,0,2)

Course Title	Mathematics-II
Level /Semester	1/1
Credit Hours	3
Pre-requisite(s)	Mathematics I
Objective(s)	The objectives of this course as follow: 15. Study integration technique 16. Understanding partial derivative 17. Using vector caraculs
Course Contents	**Linear Algebra** Algebra of matrices; Inverse and rank of a matrix; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigen values and eigenvectors. **Analytic Geometry** General conics and centers of general conics, Degenerate conics and axes, asymptotes, Axes, asymptotes, focus and directrix, Tangents and normal, Parabola, Ellipse, Hyperbola, Pole and polar, orthoptic loci. The length along a curve if it were straightened out. **Convergent Series**: A series for which partial sums become arbitrarily close to some fixed number. **Exponential Growth**: The increase in a quantity according to an exponential function. **Harmonic Series**: The sum of the reciprocals of the positive integers. The series diverges. A Taylor series expansion of a function around zero. **Power Series**: A sum of powers of a variable. A power series is essentially an infinite polynomial. **Radius of Convergence**: Half the width of the interval inside which a power series converges absolutely. **Surface of Revolution**: A surface generated by rotating a two-dimensional curve about an axis. **Taylor Series**: The power series of a function around a given point. **Introduction to complex variables.**
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	18. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	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

MEX123: Introduction to Mechatronics: 2(2,0,0,)

Course Title	Introduction to Mechatronics
Level /Semester	**1/2**
Credit Hours	**2**
Pre-requisite(s)	**Non.**
Objective(s)	19. To familiarize the students with the basic concepts of mechatronics engineering. 20. To familiarize the students with the concept of Mechatronics systems, Electronics for Mechanical engineering, Mechanical system For Electronics Engineering and CNC
Course Contents	What is Mechatronics? • Basic Definitions • Key Elements of Mechatronics • Scope of Mechatronics • Historical Perspective • The Development of the Automobile as a Mechatronic System What is Mechatronics? And What's Next? Basic Concepts in Mechatronics : • Historical Development and Definition of Mechatronic Systems. • Functions of Mechatronic Systems • Division of Functions Between Mechanics and Electronics • Ways of Integration: • Integration of Components (Hardware) • Integration of Information Processing (Software) Electronics for Mechanical engineering: Mechanical system For Electronics Engineering. Introduction to Modern CNC Machine and Manufacturing Systems.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	21. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. William Bolton, Mechatronics, Electronic control systems in mechanical and Electrical Engineering, sixth edition

ARB 124: Arabic Language: 2(2,0,0)

Course Title	Arabic Language II لغة عربية 2
Level /Semester	1/2
Credit Hours	2
Pre-requisite(s)	**لغة عربية 1**
Objective(s)	ان يطبق المتعلم مهارات اللغة العربية في شؤون حياته
Course Contents	أولاً: التحريـر العـربي: – ضوابط عـامة حول التحريـر والكتـابة العربيـة . – كتابة التلخيص (التعريف، والأهمية، والخطوات، والمبادئ، والتطبيق) . – كتابة التقـرير (التعريف، والأهمية، والأنواع " الإداري، والطبي، والهندسي "، والتطبيق). – كتابة الرسـالة (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.
Teaching Method	المحاضرة (الكتروني)
Evaluation	بحث 10% اختبار فصلي 10% اختبار نهائي80% (الكتروني)
Reference(s)	1 - محمد عيد ،النحو المصفى، مكتبة الشباب، مصر، 2000 م. 2 - عبد العليم إبراهيم، الإملاء و الترقيم في الكتابة العربية، مكتبة غريب، القاهرة، 1995م.

CHE125: Chemistry: 3(2,0,3)

Course Title	Chemistry
Level /Semester	1/2
Credit Hours	3
Pre-requisite(s)	**None.**
Objective(s)	1. Understand the significance and role of chemistry in the development of modern technology. 2. Become acquainted with the basic principles of chemistry as applied in the study of relevant Technology. 3. Know the scientific methods for production, properties and use of materials of industrial & .technological significance. 4. Gains skill for the efficient conduct of practical's in a Chemistry lab.
Course Contents	INTRODUCTION AND FUNDAMENTAL CONCEPTS: Orientation with reference to this technology, Terms used & units of measurements in the study of chemistry, Chemical Reactions & their types ATOMIC STRUCTURE: Sub-atomic particles: Architecture of atoms of elements, Atomic No. & Atomic Weight , The periodic classification of elements periodic law, General characteristics of a period and group CHEMICAL BOND: Nature of chemical Bond, Electrovalent bond with examples, Covalent Bond (Polar and Non-polar, sigma & Pi Bonds with examples, Co-ordinate Bond with examples WATER: Chemical nature and properties, Impurities , Hardness of water (types, causes & removal) , Scales of measuring hardness (Degrees Clark , Boiler feed water, scales & treatment , Sea-water desalination, sewage treatment ACIDS, BASES AND SALTS: Definitions with examples, Properties, their strength, basicity & Acidity, Salts and their classification with examples, pH-value and scale OXIDATION & REDUCTION: The process, definition& examples, Oxidizing and reducing agents , Oxides and their classifications NUCLEAR CHEMISTRY: Introduction , Radioactivity (alpha, beta and gamma rays) ,Half life process, Nuclear reaction & transformation of elements
Teaching Method	- Lecture - Exercises and drills
Evaluation	- Exercises and drills 10% - Mid-term test 20% Final examination 70%
Reference(s)	1. C. N. Banwell, and E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Ed., Tata McGraw-Hill. 2. F. A. Cotton, and G. Wilkinson, *Advanced Inorganic Chemistry*, 3rd Ed., Wiley Eastern Ltd., New Delhi, 1972, reprint in 1988. 3. D. J. Shriver, P. W. Atkins, and C. H. Langford, *Inorganic Chemistry*, 2nd Ed., ELBS ,1994. 4. S. H. Pine, *Organic Chemistry*, McGraw-Hill, 5th Ed., 1987

GEN 126: Engineering Drawing II: 2(1,0,3)

Course Title	Engineering Drawing II
Level /Semester	2/1
Credit Hours	2
Pre-requisite(s)	**Engineering Drawing I**
Objective(s)	1. To provide the student with the experience of geometrical construction and sketching. 2. To provide the student with the principles of orthographic projection, sectional views, auxiliary views, and writing dimensions
Course Contents	**Isometric, Pictorial and Oblique Drawing:** - Introduction to pictorial drawing. Brief description of different types of pictorial drawing viz Isometric, oblique and perspective and their applications. - Concept of Isometric views. Isomeric Projection and Isometric Scale. - Isometric Projection of simple solids, frustum of solids, truncated solids and sets of simple solids. - Concept of oblique and perspective views. - Simple drawing of oblique views. **Development of Surfaces:** Development of surfaces of Cylinders, Prisms, Pyramids, cones and their frustum and truncated objects. **Intersection of solids: Line method,** Cutting-plane method, Intersection of two prisms. **Assembly Drawing**: Machine components. Detail and assembly drawing. Lay out and manufacturing drawing. Pipes and electric print structural elements. **Introduction to Computer Aided Drawing**
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	22. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Thomas, E.E., Charls, J.V., and Robert J.F., Engineering Drawing and Graphic Technology, 14th edition, McGraw-Hill, 1993. 2. Colin H., Simmons and Dennis E. Maguire, Manual of Engineering Drawing, 2nd edition, 2004, Elsevier Newnes, Linacre House, Jordan Hill, Oxford OX2 8DP, 200 Wheel Road, Burlington MA 01803.

ELE 127: Electrical Circuits: 2(2,0,0)

Course Title	Electrical Circuits
Level /Semester	1/2
Credit Hours	3
Pre-requisite(s)	Introduction to Electrical and Electronics Engineering
Objective(s)	• Ability to apply basic laws to resistive circuits. • Ability to perform mesh and nodal analysis. • Ability to apply circuit theorems • Ability to analyze first-order circuits
Course Contents	Basic circuit laws, Ohm's Law, Nodes, Branches and Loops, Kirchoff's Laws, Voltage and Current Dividers, 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. Transient response in DC Circuit.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	23. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Fundamentals Of Electrical Engineering, By Giorgio Rizzoni, 2009

GEN 128 Workshop Practice-II: 1(0,0,5)

Course Title	Workshop Practice-II
Level /Semester	2/2
Credit Hours	-
Pre-requisite(s)	Electrical Circuits
Objective(s)	To familiarize with: - The advance tools and equipment are used in electrical and electronics engineering discipline.
Course Contents	1. Workshop Safety: Demonstration of safety concepts and practices in workshop. 2. Electrical measurement: Measurement of Resistance, Measurement of Inductance and Capacitance, Measurement of Power, Energy, Power factor and Frequency. Errors, adjustments and calibration of single and three phase energy meters. 3. Electrical machines: DC and AC motors and generators, and AC transformers. Electromagnetic circuits .Machine control
Teaching Method	The student divided into a group, and each one assigns work in the workshop according to the above contents.
Evaluation	A: Excellent job, B+: V. good Job, B: Good, C: Pass, F: Fail
Reference(s)	-

ENG 211: English Language II: 2(2,0,0)

Course Title	English Language II
Level /Semester	1/2
Credit Hours	2
Pre-requisite(s)	English Language-I
Objective(s)	This course aims to enable students to realize the basic skills of language. 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.
Course Contents	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.
Teaching Method	- Lecture - Exercises and drills
Evaluation	- Exercises and drills 10% - Mid-term test 20% - Final examination 70% (Electronic)
Reference(s)	1. C-E- Eckersley, J-M-Eckersley,(1985), comprehensive English 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.

MAT 212: Mathematics-III: 3(2,2,0)

Course Title	Mathematics-III
Level /Semester	1/1
Credit Hours	3
Pre-requisite(s)	Mathematics I, Mathematics II
Objective(s)	• To study of differential equations as a wide field in pure, applied mathematics, and engineering. • To study the properties of solutions of a given differential equation. • To show that differential equations are used to model the behavior of complex systems.
Course Contents	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 of the operators. Frobenius method. Partial differential equations: Wave equations. Particular solutions with boundary and initial conditions.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	4. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Advanced Engineering Mathematical, by alan Jeffrey, 1 edition (June 27, 2001) 2. Engineering Mathematical, by K.A. Stroud , 2007 3. Differential equation with BU, Dennis G.Zill, 7th edd.

MEC213: Mechanics Engineering: 3(2,2,0)

Course Title	Mechanics Engineering
Level /Semester	1/2
Credit Hours	3
Pre-requisite(s)	**Non.**
Objective(s)	To develop the capacity to predict the effects of force while carrying out the creative design function of engineering. Concepts of properties of forces, moments,
Course Contents	**UNIT I:** Two Dimensional Force Systems: Basic concepts, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Reaction; Static indeterminacy. Structures: Difference between trusses, frames and beams, analysis of structures; 2D truss; Method of joints; Method of section. Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction. Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies. Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems **UNIT II:** Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity. Kinetics of Rigid Body: Introduction, Mass and Acceleration, Force, Newton's laws of motion, equations of motion. Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere about their Axis of Symmetry Work and Energy, Impulse and Momentum.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Meriam Kraige Engineering Mechanics Statics 7th Edition book 2. R.C. Hibbeler, Engineering Mechanics - Statics, 12th Edition

COM 214: Programming Language: 2(1,0,3)

Course Title	Programming Language
Level /Semester	2/1
Credit Hours	2
Pre-requisite(s)	**Introduction to Computer Science**
Objective(s)	Because programming languages are at the core of writing software, students should have a thorough understanding of how languages are designed, implemented, and manipulated.
Course Contents	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 Array, Array I/O. Multidimensional Arrays, Arrays and Functions, Applications and Review. Strings and Pointers. Applications and Review.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Object oriented programming using C++, Robett Lafore **,2001** 2. H.H. Tan and T.B. D'Orazio, "C Programming for Engineering & Computer Science", McGraw-Hill Science/Engineering/Math; 1st edition (September 17, 1998) 3. B.W. Kernighan and D.M. Ritchie, "The C Programming Language", 2nd edition, Prentice-Hall, 1988. 4. P.J. Plauger, "The Standard C Library", Prentice-Hall, 1992. 5. A.I. Holub, "The C Companion", Prentice-Hall, 1987.

ELE 215: Electronics Devices and Circuits: 3(2,0,3)

Course Title	Electronics Devices and Circuits
Level /Semester	2/1
Credit Hours	3
Pre-requisite(s)	Physics
Objective(s)	• This course is designed to help the student to learn about origin of electronics starting from the atomic level in solid state theory, components, circuits, and the use of electronics.
Course Contents	Solid state principal, atomic theory. Charge and conduction. Covalent bonding. Diodes: types of diodes, Zener diode, tunnel diode, light emitting diode (LED), operation curve, breakdown and other characteristics. Diodes applications, LED indicators, half and full wave rectifiers. Transistor: types of transistors, bipolar junction transistor, PNP and NPN transistors, field effect transistors (FET), metal oxide transistors (MOS), operation and regions. Q-point and characteristics, saturation, cut off regions. Comparison between bipolar and field effect transistors in power consumption, speed and cost.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Electronic devices edition 9 , Floyd 2. Microelectronic Circuits by Sedra Smith,5th edition

GEN 216: Material Technology: 2(2,0,0)

Course Title	**Material Technology**
Level /Semester	2/1
Credit Hours	2
Pre-requisite(s)	**None**
Objective(s)	The aims of the course is to give fundamental knowledge about type of materials, their usage, properties and characteristics, which are important in engineering design. It is also aimed to give a theoretical background about the analysis of behavior of engineering materials by emphasizing important relationships between internal structure and properties.
Course Contents	Structural Principles of Condensed Phases. Atomic Structure and Interatomic Bonding. The Structure of Crystalline. Imperfections in Solids. Diffusion. Mechanical Properties of Metals. Phase Diagrams Dislocations and Strengthening Mechanisms. Failure. Metal Alloys Phase Transformations in Metals: Development of Microstructure and Alteration of Mechanical Properties. Thermal Processing of Metal Alloys Structures and Properties of Ceramics. Applications and Processing of Ceramics. Polymer Structures. Characteristics, Applications, and Processing of Polymers. Electrical Properties. Corrosion and Degradation of Materials. Composites. Thermal Properties. Magnetic Properties. Optical Properties.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Material for Engineering, by dohn martin , 2003 2. William D. Callister, Jr. Materials Science and Engineering: An Introduction, 5th , John Wiley and Sons, 2000. 3. Larry D. Horath, Fundamentals of Material Science, 3rd Ed., Prentice Hall, 2006

MEX 217: Motors and Generators: 3(2,0,3)

Course Title	Motors and Generators
Level /Semester	1/2
Credit Hours	3
Pre-requisite(s)	Electrical Circuits
Objective(s)	• To understand the working principle of a motor and generator • To learn about the types of motors & generators • To know about the different repair techniques for motors & generators
Course Contents	**INTRODUCTION** Definition of Motor, Definition of Generator Types of Motors, Types of Generators Aspects of motor and generator selection, Torque, Moments of inertia, Electric Flux, Magnetic Flu, Law of Conservation of Energy. **DC MOTORS:** Operating Principles, Permanent Magnet DC Motor, DC Motor with field coils, Series wound motor, Shunt wound motor, Compound motor, Brushless Permanent Magnet DC Motor, Control of DC Motors, Advantages and Drawbacks of DC motors. **AC MOTORS:** Operating Principles, Single Phase Squirrel Cage Induction Motor, Three Phase Induction Motor, Synchronous Motors, Advantages and Drawbacks of AC motors **STEPPER MOTORS:** Operating Principles, Stepper Motor Specifications, Variable Reluctance Stepper, Permanent Magnet Stepper, Hybrid Stepper, Stepper Motor Control **SERVO MOTORS:** Operating Principle, Servo vs Stepper motor, What is inside a Servo?, Types of Servo Motors, Applications of Servo Motors, Servo Motor Control **GENERATORS:** How does a Generator work?, Components of a Generator:, Engine, Alternator, Fuel System, Voltage Regulator, Cooling and Exhaust Systems, Lubrication System, Battery Charger, Control Panel, Main Assembly / Frame, Using generator to power industrial applications. **TYPES OF GENERATORS:** Induction Motor, Dynamo, MHD Generator
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Electric Motors & Generators (Fundamental Series): Jack Rudman, Passbook, (2010) 2. Motors, Generators, Transformers and Energy: Pericles Emanuel (1985)

SUS 218: Sudanese Studies: 2(2,0,0)

Course Title	Sudanese studies الدراسات السودانية
Level /Semester	2/1
Credit Hours	2
Pre-requisite(s)	لايوجد
Objective(s)	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.
Course Contents	البلاد وسكانها وعصورها التاريخية وتشمل الجغرافية الطبيعية والبشرية والحضارات السودانية (النوبة – المسيحية – الإسلام) العلاقات الدولية – المهدية والقومية السودانية – السودان والحكم الثنائي – الحركة الوطنية والاستقلال. الآداب والفنون – جمعيات القراءة والمناقشة – المجلات – أشهر الأدباء والفنانين – الفنون التشكيلية – الثقافة الشعبية السودانية والفلكلور السوداني (الأغاني – الأمثال الشعبية – الأحاجي). التعليم الأهلي (فلسفته – مؤسساته – بنيانه). يستعان ببعض الشخصيات لمناقشة القضايا مع زيارة المعالم الوطنية والمتاحف، كتابة بحوث ومقالات قصيرة بواسطة الطلاب.
Teaching Method	المحاضرة(الكتروني)
Evaluation	بحث 10% اختبار فصلي 10% اختبار نهائي80% (الكتروني)
Reference(s)	1 - بروفيسور محمد عمر بشير ، دراسات سودانية معاصرة، 2 - معتصم محمد الحاج ،دراسات سودانية معاصرة ، 3 - زينب الزبير الطيب، الدراسات السودانية ،جامعة الخرطوم ،2010م 4 - أماني الطويل : مستقبل السودان : واقع التجزئة وفرص الحرب –المركز العربي للأبحاث ودراسة السياسات2011م

MAT 221: Probability and statistics: 3(2,0,0)

Course Title	Probability and Statistics
Level /Semester	2/1
Credit Hours	3
Pre-requisite(s)	**Mathematics II**
Objective(s)	To acquaint the student with the concept of probability & statistics and their applications.
Course Contents	Statistic concepts in modern society. Frequency distribution, the normal distribution, elements of statistical inference. Estimation and hypothesis testing. Contingency tables. Linear regression and correlation. Simple analysis of variance. Fundamentals of the basic theory of probability. Sample spaces, events, basic axioms and theorems of probability, finite sample spaces with equally likely probabilities. Random variables and their distribution functions. Principles of set theory and a set of axioms for probability are used to derive some probability density and/or distribution functions.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Walpole, Myers, Myers & Ye, Probability & Statistics for Engineers and Scientists; Pearson; 9th edition, 2011. 2. Engineering mathematical by K.A stword 2007

MEX 222: Sensors and Actuators: 3(2,0,3)

Course Title	Sensors and Actuators
Level /Semester	1/2
Credit Hours	3
Pre-requisite(s)	Non.
Objective(s)	• Attain a Practical and Working Knowledge of Different Types of Sensors • To Attain a Practical and Working Knowledge of Different Types of Actuators Esp. Electrical Actuators • To Identify and Select Sensors & Actuators as Per the Given Parameters
Course Contents	**The Process of Measurement:** Define Measurement, Fundamental Methods of Measurement, The SI System. **SENSORS AND TRANSDUCERS:** Definition of sensors and transducers, Performance terminologies, Static and Dynamic Characteristics. **DISPLACEMENT, POSITION AND PROXIMITY SENSORS:** Potentiometer Sensor, Strain-gauge Element, Capacitive Element, Variable Inductance Transducers, Differential Transformer, Proximity Switches, Hall effect Sensors **VELOCITY AND MOTION SENSORS:** Optical Encoder, Tacho-generator, Pyroelectric Sensors, Accelerometer, Vibro-meters. **FORCE:** Strain-gauge Load Cells, Piezoelectric Load Cells, Ballistic weighing **FLUID PRESSURE:** Bourdon Tube Gauges, Flat Metal Diaphragms, Corrugated Diaphragms, Semiconductor Diaphragms. Additional Transducers: Strain Gauges and Flat diaphragms, Inductive Transducers, Capacitive Transducers, Piezoelectric Transducers (PVDF) **LIQUID FLOW:** Flow Measurement Methods, Flowmeters, Orifice Plate, Venturi meters, Turbine Meter, Variable Area Meter, Ultrasonic Flowmeter, Velocity Probes,, Doppler Shift Method for Velocity Measurement, Flow Visualization Techniques. **TEMPARATURE:** Bimetallic Strips, Resistance Temperature Detectors (RTDs), Thermistors, Thermocouples, Pryrometers. **ELECTRICAL ACTUATION SYSTEM:** Relays, Solenoids, DC Motors, Control of Brush-type DC motors, Control of Brushless permanent magnet DC motors AC Motor: Characteristics of Single-Phase Squirrel Cage Induction Motor, Characteristics of Three-Phase Induction Motor, Stepper Motor, Construction: Types, Control of Stepper Motor
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	**1.** W. Bolton, *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering*, Pearson **2.** Sensors and Actuators: Control System Instrumentation: Clarence W. de Silva (2007) **3.** Sensors: An Introductory Course: Kourosh Kalantar-Zadeh (2013) Industrial Automated Systems: Instrumentation and Motion Control: TerryL.M. Bartelt (2010) **4.** Actuators: Basics and Applications Hartmut Janocha (2010) **5.** Introduction to Mechatronics: W. Bolton

MEC 223: Machine Elements: 3(2,1,2)

Course Title	Machine Elements
Level /Semester	**2/4**
Credit Hours	**3**
Pre-requisite(s)	**Non.**
Objective(s)	• To understand the basic components of a mechanism/ machine • To learn about different types of mechanisms and their applications • To understand the phenomenon of vibrations control during operation of machines
Course Contents	1. KINEMATICS FUNDAMENTALS & MECHANISM 2. JOINTS 3. BELTS AND CHAIN DRIVES 4. SPRINGS 5. CLUTCHES & BRAKES 6. GEARS 7. CAM FOLLOWER MECHANISM
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	5. Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Robert Norton, Machine Design: An Integrated Approach 2. R.S. Khurmij& K. Gupta, Machine Design 3. Henry T. Brown: Mechanical Movements: Mechanisms and Devices: Dover Science Books(2005) 4. N. Chironis : Mechanisms, Linkages and Mechanical Controls, (1965)

ELE224: Instrumentations and Measurements: 2(1,0,3)

Course Title	Instrumentations and Measurements:
Level /Semester	2/4
Credit Hours	3
Pre-requisite(s)	Electrical Circuits, Electronic Devices & Circuits
Objective(s)	• This course aims to provide the student with the SI, the modern metric system of measurement. • Also to study different measuring instruments, their use and operation.
Course Contents	Measurement concept. SI units. Errors in measurement Measurement of electrical quantities. Types and applications. Galvanometers. Moving iron and coil instruments. Bridges, Digital instruments. CRT theory and operation.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	**1.** Measurement and Instrumentation: Theory and Application: Alan S Morris and Reza Langari, 2011 **2.** Instrumentation for Engineering Measurements: James W. Dally, William F. Riley andKenneth G. McConnell, 1993 **3.** Measurement and Instrumentation in Engineering: Principles and Basic LaboratoryExperiments: Francis S. Tse and Ivan E. Morse, 1989

ELE225: Digital Logic Circuits Design: 3(2,0,3)

Course Title	**Digital Logic Circuits Design**
Level /Semester	2/4
Credit Hours	3
Pre-requisite(s)	Electronic Devices and Circuits
Objective(s)	• To study and Design of combinational and Sequential Logic circuits. • To link these designs with applicable electronic circuits
Course Contents	Basic notions: Characteristics of digital systems, basic gates AND, OR, NOT, XOR symbols, 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. Memory, PAL, Sequential and combinational circuit's comparison. Multi-vibrators circuit operation. RS Flip Flop, T FF, D FF, and JK Flip Flop. Serial and parallel Shift Register. Counters, a Synch and Synch Counters, Decade counters, different Mod Counters.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	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

MEC226: Manufacturing Processes: 3(2,0,3)

Course Title	**Manufacturing Processes**
Level /Semester	**2/4**
Credit Hours	**3**
Pre-requisite(s)	**Material Science and Strength of Material**
Objective(s)	1. Familiarize students with major manufacturing processes 2. Correlate the material type with the possible fabrication processes. 3. Describe the operations and tools for major manufacturing processes. 4. Highlight the process design parameters to eliminate defective products. 5. Introduce quality assurance principles and techniques.
Course Contents	This course is a quantitative and qualitative study for the main manufacturing processes. It will illustrate how a design is turned into a product. It will offer a detailed understanding of manufacturing processes used in industry such as casting, molding, forming, cutting, and welding and will relate the design requirements of a part to the possible manufacturing processes. The course also includes quality assurance of manufactured parts by inspection and testing. It will also discuss how the material properties of a product control the spectrum of manufacturing processes that can be utilized and will highlight major design guidelines for each manufacturing process to be successful. UNIT I CASTING: Casting types, procedure to make sand mould, types of core making, molding tools, machine molding, special molding processes – CO2 molding; shell molding, investment molding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects. UNIT II WELDING: Classification of welding processes. Principles of Oxy-acetylene gas welding. A.C metal arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, defects in welding, soldering and brazing. UNIT III MACHINING: General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. UNIT IV FORMING AND SHAPING OF PLASTICS: Types of plastics - Characteristics of the forming and shaping processes – Molding of Thermoplastics – Working principles and typical applications of - Injection molding — Blow molding – Rotational molding – Film blowing – Extrusion - Thermoforming – Processing of Thermosets – Working principles and typical applications UNIT V METAL FORMING AND POWDER METALLURGY: Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy. UNIT VI ADVANCED MACHINING PROCESSES: General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, and Electron beam machining and Laser beam machining.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Manufacturing Engineering and Technology, Kalpakjian and Schmid, Prentice Hall, New Jersey, 2013. 2. Fundamentals of Modern Manufacturing, Mikell P. Groover, John Wiley & Sons, Inc, New Jersey, 2010. 3. Materials and Processes in Manufacturing, DeGarmo, Black, and Kohser, John Wiley & Sons, Inc, New York, 2011.

MEC 227: Thermodynamics and Heat Transfer: 3(2,2,0)

Course Title	Thermodynamics and Heat Transfer
Level /Semester	**2/4**
Credit Hours	**3**
Pre-requisite(s)	**Physics**
Objective(s)	1. Study of basic concepts and laws of thermodynamics. 2. Study of modes of heat transfer and governing laws. 3. Study and analysis of Boilers, turbines and heat exchangers
Course Contents	**Course Description** **Principles of fluid mechanics** Basic fluid properties, Hydrostatics, Buoyancy, Stability, fluid equations **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** General differential equation for conduction heat transfer. Conduction in a flat wall. Conduction in a cylindric wall.Thermal resistance. Overall heat transfer coefficient. **Convection** Free and forced convection mechanism. Interior and exterior convection. Convection over flat surfaces. Convection over cylinders. Convections in pipe flow. Empirical correlations. **Radiation** Electromagnetic spectrum and radiation physics. Kirchoff's law. Black-body radiation. Grey and real bodies. Radiation functions.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	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 6. R. K. Rajput, Textbook of Fluid Mechanics, S. Chand Limited, 2008

MEX 311: Industrial Hydraulic Circuits: 3(2,0,3)

Course Title	Industrial Hydraulic Circuits
Level /Semester	**3/1**
Credit Hours	**3**
Pre-requisite(s)	**Fluid Mechanics**
Objective(s)	1. The fundamentals of fluid power 2. Principles & characteristics of the fluid power components 3. Circuit building and interpretation 4. Logic controls and trouble shooting
Course Contents	**Course Description** **HYDRAULIC SYSTEMS:** Introduction to fluid power system, Hydraulic fluids- functions, types, properties, selection and application. Construction, operation, characteristics and graphical symbols of hydraulic components – pumps, actuators/motors, valves, switches, filters, seals, fiitings and other accessories. **PNEUMATIC SYSTEMS:** Introduction, comparison with hydraulic systems and electrical systems. Construction, operation, characteristics & symbols of pneumatic components. Air treatment – principles and components. Sensors – types, characteristics and applications. Introduction to fluidics and MPL. **HYDRAULIC / PNEUMATIC CIRCUITS:** Reciprocating circuits, pressure dependant circuits, speed control circuits, pilot operated circuits, simple sequencing circuits, synchronizing circuits, circuits using accumulator, time delay circuits, logic circuits,cascading circuits, feedback control circuits. **DESIGN OF FLUID POWER SYSTEMS:** Speed, force and time calculations, Calculation of pressure and pressure drop across components, size of actuators, pumps, reservoirs and accumulators. Calculations on Heat generation in fluid.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	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

MEX312 Computer Aided Manufacturing: 2(1,0,3)

Course Title	Computer Aided Manufacturing
Level /Semester	**3/1**
Credit Hours	**2**
Pre-requisite(s)	**Computer Numerical Control Technology:**
Objective(s)	1. To build concrete foundation for their core branch as a thinker, inter disciplinary thoughts 2. To educate students by covering different aspects of computer Aided Manufacturing. 3. To create strong skills of writing CNC programs, PLC programs. 4. To educate students to understand different advances in manufacturing system like: GT, CAPP and FMS 5. To educate students by covering robotics and different material handling system required in manufacturing shop floor. 6. To educate students by covering different Integrated production management system.
Course Contents	**Computer Aided Manufacturing**: CAM Concepts, Objectives & scope, Nature & Type of manufacturing system, Evolution, Benefits of CAM, Role of management in CAM, Concepts of Computer Integrated Manufacturing, Impact of CIM on personnel, Role of manufacturing engineers, CIM Wheel to understand basic functions. **NC/CNC Machine Tools:** NC and CNC Technology: Types, Classification, Specification and components, Construction Details, Controllers, Sensors and Actuators, CNC hardware: Re circulating ball screw, anti friction slides, step/servo motors. Axis designation, NC/CNC tooling. Fundamentals of Part programming, Types of format, Part Programming for drilling, lathe and milling machine operations, subroutines, do loops, canned Cycles, parametric sub routines. **Programmable Logic Controllers**: Relay Device components, Programmable controller architecture, programming a programmable controller. **Flexible Manufacturing System:** Introduction & Component of FMS, Needs of FMS, general FMS consideration, Objectives, Types of flexibility and FMS, FMS lay out and advantages. Automated material handling system: Types and Application, Automated Storage and Retrieval System, Automated Guided Vehicles, Cellular manufacturing, Tool Management, Tool supply system, Tool Monitoring System, Flexible Fixturing, Flexible Assembly Systems. **Robot Technology: Introduction**: Robot Anatomy, Laws of Robot, Human System and Robotics, Coordinate system, Specifications of Robot. Power sources, actuators and Transducers, Robotic Sensors, Grippers, Robot Safety, Robot Programming and Robot Applications, Economic Considerations of Robotics system, Robot Kinematics and Dynamics, Robot Arm Dynamics. Concepts of Computer Vision and Machine Intelligence.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Computer Aided Manufacturing by Tien Chien Chang, Pearson Education 2. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Groover, Pearson Education 3. Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited. 4. Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India. 5. CAD/CAM, Principles and Applications –P N Rao, McGraw Hill, 2010 6. CAD/CAM, Introduction, -Ibrahim Zeid, Tata McGraw Hill, 2007

MEX313: Industrial Robotics: 3(2,0,3)

Course Title	Industrial Robotics
Level /Semester	**3/1**
Credit Hours	**3**
Pre-requisite(s)	**Non.**
Objective(s)	- To understand the basic concepts of robotics - To understand the application of robots in industry - To identify the operating principles and configurations of industrial robots
Course Contents	Definition: Robot, Introduction to robotics, History of Robots; Three Laws of Robotics, Advantages of Robots, ARCHITECTURE OF ROBOTIC SYSTEMS, Mechanical Structure Kinematics model, Dynamics model Actuators: Electrical, Hydraulic, Pneumatic, Artificial Muscle , Computation and controllers , Sensors , Communications , User interface , Power conversion unit INDUSTRIAL ROBOT CLASSIFICATION Degrees of Freedom & Types of Joint , Robot workspace , Mechanical Configurationsm, Cartesiam, Gantry,Cylindrical , Spherical Jointed ,SCARA , Advantages and Disadvantages MOTION CONTROL: Axis Limit , Point to Point , Contouring , Line Tracking INDUSTRIAL APPLICATIONS OF ROBOTS: Application of Robots in Industry , Welding, Assembly , Material handling ,Loading and unloading , CIM Hostile and remote environments Robot Utilization and Justification , Labour Resistance , Economic Justification
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Robots and Manufacturing Automation:, .C.RayAsfahl, John Wiley & Sons Inc., USA 2. Analytical Robotics and Mechatronics: Wolfram Stadler, McGraw-Hill, Intl. Edition. 3. Introduction to Robotics, Analysis, Systems, Applications: S. B. Niku (Prentice Hall) (2001) 4. Industrial Robotics Technology:M.P. Groover 5. Mechatronic Design Automation: Emerging Research and Recent Advances (Mechanical Engineering Theory and Applications: Zhun Fan (2010) 6. Mechatronics 2013: Recent Technological and Scientific Advances: TomásBrezina and RyszardJablonski (2013)

MEX 314: Microprocessor and Microcontroller Application: 3(2,0,3)

Course Title	Microprocessor and Microcontroller Application
Level /Semester	3/1
Pre-requisite(s)	Digital Logic Circuits Design;, Programming language
Objective(s)	This course aims to introduce the organization of a microprocessor system and the assembly language for programming the microprocessor. Students will learn the programming techniques, design techniques of memory system and input/output system for a simple microprocessor system.
Course Contents	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. Introduction to Control: Introduction, control system, Open loop, Closed loop Mathematical Modeling representation, Differential equations (t-domain). Laplace transforms (s-domain). Transfer function, block diagram. 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).
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Computer architecture and Organization,William Stalling. 2. Microprocessor Fundamentals by K.John 3. Analog and Digital Circuits for Electronic Control System Applications. By: Jerry Luecke. 4. Interfacing PIC Microcontrollers Embedded Design by Interactive Simulation. By : Martin Bates. 5. “NISE”, “Control Systems Engineering”, John wiley, 6th Edition, 2011.

GEN 315: Industrial Management: 2(2,0,0)

Course Title	Industrial Management
Level /Semester	3/1
Pre-requisite(s)	None.
Objective(s)	1. Principles of organizational management 2. Behavior of human at organizations with modern management concepts.
Course Contents	**UNITI:** HISTORICAL: Definition of Management–Science or Art–Management and Administration– Development of Management Thought–Contribution of Taylor and Fayol– Functions of Management– Types of Business Organization. **UNIT II:** Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision- making. **UNIT III:** Nature and Purpose–Formal and informal organization–Organization Chart–Structure and Process– Departmentation by difference strategies–Line and Staff authority–Benefits and Limitations–De-Centralization and Delegation of Authority–Staffing–Selection Process - Techniques – HRD – Managerial Effectiveness. **UNIT IV:**Scope–HumanFactors–CreativityandInnovation–HarmonizingObjectives–Leadership – TypesofLeadershipMotivation–Hierarchyofneeds–Motivationtheories–Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication. **UNIT V:**System and process of Controlling– Requirements for effective control–The Budget as Control Technique–Information Technology in Controlling– Use of computers in handling the information–Productivity–Problems and Management– Control of Overall Performance –Direct and Preventive Control– Reporting– The Global Environment– Globalization and Liberalization– International Management and Global theory of Management.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Murphy W.R. and Mc Kay. G., Energy Management Butterworths, London. 2. Chandran. J.S., Organizational Beheviours, Vikas Publishing House Pvt. Ltd., New Delhi, 1994. 3. Ernest Dale, Management Theory and Practice, International Student edition, McGraw Hill blushing 4. Industrial engineering and management by O.P Khanna

MEX 316: Automotive Mechatronics Systems: 3(2,0,3)

Course Title	Automotive Mechatronics Systems
Level /Semester	**3/1**
Credit Hours	**3**
Pre-requisite(s)	**Thermodynamics and heat transfer** **Sensor and Actuator**
Objective(s)	1. Fundamentals of automotive electronics 2. Sensors and actuators for various engine applications 3. Electronic fuel injection and ignition systems 4. Automobile control system
Course Contents	**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.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. William B. Riddens, Understanding Automotive Electronics, 5th Edition, Butterworth, Heinemann Woburn, 1998. 2. Tom Weather Jr and Cland C. 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.

MEX 317: Computer Numerical Control (CNC) Technology: 3(2,0,3)

Course Title	Computer Numerical Control (CNC) Technology
Level /Semester	2/4
Credit Hours	3
Pre-requisite(s)	Non.
Objective(s)	1. To understand the importance of NC and CNC technology in manufacturing industry 2. To understand the application of CAD/CAM systems in generating Part Programmes, in particular for complex models. 3. To understand and apply the use of various transducers, encoders and feedback devices. 4. Identify and select proper NC tooling's.
Course Contents	**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 friction and other types of guide ways, elements used to convert the rotary motion to a linear motion – Screw and 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, servo principle, 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 radius and tool nose radius compensation, do loops, subroutines, canned cycles, mirror image, parametric programming, machining cycles, programming for machining centre and turning centre for well known controllers such as Fanuc, Heidenhain, Sinumerik etc., generation of CNC codes from CAM packages. **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.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	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

MEX 321: Mechatronics Systems and Automation Technology: 3(2,0,3)

Course Title	Mechatronics Systems and Automation Technology
Level /Semester	**3/1**
Credit Hours	**3**
Pre-requisite(s)	**Non.**
Objective(s)	1. To acquaints students with the emerging fields in mechatronics & industrial automation 2. To apprise students of the core importance of mechatronics and automation in emerging fields 3. To enable students to understand importance of interdisciplinary studies
Course Contents	1. MICRO ELECTRO-MECHANICAL SYSTEMS Definition, Advantages, Fabrication, Economy of MEMs manufacturing. 2. ARTIFICIAL INTELLIGENCE Definition and overview, Features of a Intelligent system and different tests/approaches, Agents and abstraction ande Searching and states 3. IMAGE PROCESSING Overview, Introduction to images, points, pixels and functions, Histogram analysis and mapping and Filtering 4. NANOTECHNOLOGY The basics, History, Nano-scale electronics, Magnetism on nano-scale, Nano-scale materials and photonics 5. MEDICINE Mechatronics applications in medicine: MRIs , Neurosurgery , Urological surgery and orthopedics , High intensity focused ultrasound , Blood sampling
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Mechatronics Design Automation: Emerging Research and Recent Advances (Mechanical Engineering Theory and Applications: Zhun Fan (2010) 2. Mechatronics 2013: Recent Technological and Scientific Advances: Tomás Brezina and Ryszard Jablonski (2013)

MEX 322: PLC and Applications: 3(2,0,3)

Course Title	PLC and Applications
Level /Semester	**3/1**
Credit Hours	**3**
Pre-requisite(s)	Non.
Objective(s)	1. Understand the basic of data conversion and data acquisition 2. Understand the fundamental of PLC.
Course Contents	• Electromagnetic Control Circuit(ECC) elements and basic applications • Principles of PLC and system component • Interfacing input/output devices and operation • CPU Configuration • Memory concepts, addressing, and data types. • Industrial sensors and actuators, • PLC general Programming languages. • Programming techniques for various types of PLC. • Basic industrial process problems, installation and safety, • Monitoring program execution and diagnostic.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. Petrezeulla, Programmable Controllers, McGraw Hill , 1989. 2. Hughes .T, Programmable Logic Controllers, ISA Press, 1989. 3. G.B.Clayton, Data Converters The Mac Millian Press Ltd., 1982. 4. Curtis D. Johnson Process Control Instrumentation Tech 8TH Edition Prentice Hall June 2005.

GEN 323: Safety and Security: 2(2,0,0)

Course Title	Safety and Security
Level /Semester	3/2
Credit Hours	2
Pre-requisite(s)	**None.**
Objective(s)	The aims of the course are to cover the safety of installation of electrical/electronic accessories and conforming to standards & regulations for safety of the installation.
Course Contents	Electrical and Electronics Installations: This module covers the installation of electrical/electronic accessories, fixtures and fittings using specified tools, equipment and material, according to electrical layout plans, conforming with standards & regulations for safety of the installation, while ensuring safety of self, others and property. Security and communication systems Installation: This module covers the competencies required to install and test industrial security and communication systems, using specified tools, test instruments and material, conforming to manufacturer's specifications, standards and regulation, while ensuring safety of self, others and property. Faults in electrical/electronic installations: This unit covers the competencies required to inspect and test industrial electrical/electronic installations after completion of the installations. Locate faults systematically according to regulations/ standards, using specified test instruments & repair. Carryout periodic test and maintain reports for safe and optimum performance of the electrical installation, while ensuring safety of self, others and property. Estimation for Installations: This module covers the competencies required to prepare estimates for industrial wiring and communication & safety equipment wiring in accordance with the layout plan/wiring diagrams etc., ensuring cost effectiveness, conforming to standards and regulations.
Teaching Method	30 hours for lectures. 45 hours for Lab. 10 office hours for revision.
Evaluation	Class Assignments, Mid-Term Test and Final exam.
Reference(s)	1. The Handbook for School Safety and Security: Best Practices and Procedures 1st Edition by byLawrence Fennelly , Marianna Perry, 2014

MEX 325: Final Project: 4(0,4,6)

Course Title	Final Project
Level /Semester	3/1
Credit Hours	3
Pre-requisite(s)	All courses.
Objective(s)	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 Contents	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:** - **Mechatronics Engineering**
Teaching Method	Weekly meeting with supervisor
Evaluation	Supervisor :40 mark and committee: 60
Reference(s)	The students should select recent references depend on the project area