Faculty of Engineering
Department of Mechatronics Engineering

Undergraduate Programs Curriculum

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Contents

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

$C_1C_2C_3C_4C_5C_6$

C_1C_2 Field of study

C_3 Year of study

C_4 Semester (1 or 2)

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

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

- **نسب مكونات البرنامج:**

النوع	المعيار	المستحق
رياضيات وعلوم بحته	%30 - %25	26%
علوم هندسة أساسية	%35 - %25	30%
علوم تطبيقية وتصميم	%35 - %25	33%
علوم انسانية	%15 - %10	11%
المجموع		**100%**

7 Syllabus Components and Coding

Component		Code
Basic Sciences	Mathematics	EM
	Basic Sciences	PH, CH
	Computer System	CS
Engineering Science	Electrical Eng.	EE
	Mechanical Eng	ME
	General Engineering	GE
Social and Human Sciences	Economics & Admin.	AD
	Studies & Languages	AR, IS, EN
Engineering Design and Applied	Project	PR
	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 حسبان 1	**3**
EM1102	Linear Algebra جبر خطي	**3**
PH1103	Physics I الفيزياء 1	**3**
CH1104	Chemistry كيمياء	**3**
CS1105	Fundamentals of Computer Scienceمبادئ الحاسوب	**3**
EM1201	Calculus II حسبان 2	**3**
PH1202	Physics II2فيزياء	3
CS1203	Programming LanguageI 1لغة برمجه	**2**
EM1204	Analytical Geometryالهندسة التحليلية	**3**
EM2101	Differential Equations معادلات تفاضلية	3
CS 2102	Programming Language II لغة برمجة 2	2
ME2108	Engineering Mechanics-I ميكانيكا الهندسة -1	**3**
EM2201	Mathematical Methods طرق رياضية	3
ME2208	Engineering Mechanics-II ميكانيكا الهندسة -2	**3**
EM3101	Probabilities and Statistics احصاء واحتمالات	3
EM3201	Numerical Methods طرق عددية	3
EM3202	Complex Analysis متغيرات مركبة	3
CS3206	Computer Application تطبيقات الحاسوب	2
	Total	51

8.2 Basic Engineering Science (30%)

Code	Title	Credit Hours
ME1109	Fundamentals of Mechanical Engineering مبادئ الهندسة الميكانيكية	**2**
EE1205	Fundamentals of Electrical Engineeringمبادئ الهندسة الكهربائة	**3**
ECE2104	Digital Circuits Design I1-تصميم الدوائر الرقمية	**3**
ECE2105	Principles of Electronic Devices مبادئ الاجهزة الالكترونية	**2**
EE2106	Electrical Circuits Analysis I1- تحليل الدوائر الكهربائية	**3**
ECE2204	Digital Circuits Design I1 تصميم الدوائر الرقمية2	**3**
ECE2205	Analog Electronic Circuits-I الدوائر التماثلية الالكترونية1	**3**
EE2206	Electrical Circuits Analysis II تحليل الدوائر الكهربائية2	**3**
ME3103	Strength of Materials مقاومة المواد	**3**
ME3104	Engineering Material هندسة المواد	**3**
ECE3105	Analog Electronic Circuits-II الدوائر التماثلية الالكترونية2	**3**
EE3106	Signals and Systems اشارات ونظم	**3**
ME3107	Fluid Mechanics ميكانيكا الموائع	**3**
ECE3203	Measurements and Sensors المقاييس والمتحسسات	**3**
EE4102	Control Systems I1 انظمة التحكم	3
ME4105	Manufacturing Processes عمليات التصنيع	3
ECE4105	Digital Signal Processingمعالجة الاشارة الرقمية	3
EE4106	Power Electronics الكترونيات القدرة	3
EE4202	Control SystemsII2 انظمة التحكم	3
GE 4204	Reliability of Engineering Systemموثوقية النظم الهندسية	2
GE 5101	Research Methodsمناهج البحث	2
	Total	59

8.3 Applied Science and Design (33%)

Code	Title	Credit Hours
MEE1209	Introduction to Mechatronics مقدمة هندسة الميكاترونكس	**2**
ME2202	Thermodynamics and Heat Transferالديناميكا الحرارية وانتقال الحرارة	**3**
GE2207	Engineering Drawing رسم هندسي	3
ECE3102	Microprocessors & Assembly Languageالمعالجات الدقيقة ولغة التجميع	**3**
ME3204	Mechanical Vibrations الاهتزازات الميكانيكية	**3**
ME3205	Machine Theory نظرية الالات	**3**
ME4101	Machine Design تصميم ماكينات	3
MEE4107	Microcontrollersand Applicationsالمتحكمات الدقيقة والتطبيقات	3
MEE4201	Introduction to Robotics مقدمة الروبوتات	**3**
MEE4203	PLC and Applicationsالمتحكمات القابلة للبرمجة والتطبيقات	3
MEE4205	Computer Numerical Control Machines ماكينات التحكم الرقمي بالحاسوب	**3**
MEE4207	Autoronics اوتورنكس	**3**
ME5102	Industrial Hydraulic System أنظمة الهايدروليك الصناعية	3
MEE5103	Mechatronics Systems Designالتصميم لانظمة الميكاترونكس	3
MEE5104	Automationالاتمته	3
PR5105	Final Project I1 مشروع التخرج	3
MEE51xx	Elective Course11كورس اختياري	3
MEE5201	Mechatronics System Modeling and Simulation النمذجة والمحاكاة لانظمة الميكاترونكس	3
MEE5202	Introduction to ANN and FLمقدمة الشبكات العصبية والمنطق الضبابي	3
MEE52xx	Elective Course II2 كورس اختياري	3
MEE5204	CAD / CAMالتصميم والتصنيع باستخدام الحاسوب	3
PR5205	Final Project II مشروع التخرج 2	3
	Total	65

8.4 Social and Human Sciences (11%)

Code	Title	Credit Hours
AR1106	Arabic Language I لغة عربيه1	2
EN1107	English Language I لغة انجليزية 1	2
IS1108	Islamic Studies 1 ثقافة اسلامية 1	2
AR1206	Arabic Language II2 لغة عربية	2
EN1207	English Language II2 لغة انجليزية	2
EN 2103	English Language III لغة انجليزية 3	2
SD2107	Sudanese Studies دراسات سودانية	2
IS1208	Islamic Studies II ثقافة اسلامية 2	2
EN2203	English for Special Purpose (ESP)لغة انجليزية متخصصة	2
AD 4103	Industrial Managementأدارة صناعية	2
AD 4206	Engineering Economic اقتصاد هندسي	2
	Total	22

9 Mechatronics Engineering Degree Structure

1st 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	Linear Algebra جبر خطي	**3**	**2**	**2**	**-**
PH1103	Physics I الفيزياء 1	**3**	**2**	**-**	**3**
CH1104	Chemistry كيمياء	**3**	**2**	**-**	**3**
CS1105	Fundamentals of Computer Scienceمبادئ الحاسوب	**3**	**2**	**-**	**3**
AR1106	Arabic Language I لغة عربيه1	**2**	**2**	**-**	**-**
EN1107	English Language I لغة انجليزية 1	**2**	**2**	**-**	**-**
IS1108	Islamic Studies 1 1 ثقافة اسلامية	**2**	**2**	**-**	**-**
ME1109	Fundamentals of Mechanical Engineering مبادئ الهندسة الميكانيكية	**2**	**2**	**-**	**-**
	Total	**23**	**18**	**4**	**9**

1st Year: Semester 2:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM1201	Calculus II حسبان 2	**3**	**2**	**2**	**-**
PH1202	Physics II 2 فيزياء	3	2	-	**3**
CS1203	Programming Language I لغة برمجه1	**2**	**1**	**-**	**3**
EM1204	Analytical Geometryالهندسة التحليلية	**3**	**2**	**2**	**-**
EE1205	Fundamentals of Electrical Engineering مبادئ الهندسة الكهربائية	**3**	**2**	**-**	**3**
AR1206	Arabic Language II2 لغة عربية	**2**	**2**	**-**	**-**
EN1207	English Language II 2 لغة انجليزية	**2**	**2**	**-**	**-**
IS1208	Islamic Studies II ثقافة اسلامية 2	**2**	**2**	**-**	**-**
MEE1209	Introduction to Mechatronicsمقدمة هندسة الميكاترونكس	**2**	**2**	**-**	**-**
	Total	**22**	**17**	**4**	**9**

1st Year C.H = 45hrs

Basic Training(Practical Duration→ 6 weeks)					
WS1210	Basic Training التدريب الاساسي	**-**	**-**	**-**	**150**

2nd Year: Semester 3:

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

2nd Year: Semester 4:

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

2nd Year C.H = 43 hrs

Advance Training (**Practical Duration→ 6 weeks)**					
WS2209	Advance Training تدريب متقدم	3	-	-	150

3rd Year: Semester 5:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
EM3101	Probabilities and Statistics احصاء واحتمالات	3	2	2	-
ECE3102	Microprocessors & Assembly Language المعالجات الدقيقة ولغة التجميع	3	2	-	3
ME3103	Strength of Materials مقاومة المواد	3	2	2	2
ME3104	Engineering Material هندسة المواد	3	2	2	2
ECE3105	Analog Electronic Circuits-II - الدوائر الالكترونية2	3	2	-	3
EE3106	Signals and Systems اشارات ونظم	3	2	-	3
ME3107	Fluid Mechanics ميكانيكا الموائع	3	2	2	2
	Total	**21**	**14**	**8**	**15**

3rd Year: Semester 6:

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

3rdYear C.H = 38 hrs

Industrial Training (**Practical Duration→ 8 weeks)**					
WS3207	Industrial Training تدريب صناعي	2	-	-	200

4th Year: Semester 7:

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

4th Year: Semester 8:

Code	Title	Credit Hours	Lectures Hr/Week	Tutorial Hr/week	Practical Hr/week
MEE4201	Introduction to Robotics مقدمة الروبوتات	3	2	2	-
EE4202	Control SystemsII2 انظمة التحكم	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 ماكينات التحكم الرقمي بالحاسوب	3	2	-	3
AD 4206	Engineering Economic اقتصاد هندسي	2	2	-	-
MEE4207	Autoronics اوتورنكس	3	2	2	-
	Total	**19**	**14**	**6**	**8**

4th Year C.H = 39 hrs

On Job Training (**Practical Duration→ 4 weeks)**					
WS4208	On Job Training تدريب خارجي	2	-	-	100

5th Year: Semester 9:

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

MEE51xx:

06 Mechatronics Systems Interfacing ربط بيني لانظمة الميكاترونكس
06 Industrial Hydraulic Control 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 Simulationالنمذجة والمحاكاة لأنظمة الميكاترونكس	3	2	-	3
MEE5202	Introduction to ANN and FL مقدمة الشبكات العصبية والمنطق الضبابي	3	2	2	2
MEE52xx	Elective Course II كورس اختياري 2	3	2	-	3
MEE5204	CAD / CAM التصميم والتصنيع باستخدام الحاسوب	3	2	2	2
PR5205	Final Project II مشروع التخرج 2	3	-	-	-
	Total	**15**	**8**	**4**	**10**

MEE52xx:

03 Embedded Systems Design تصميم الانظمة المدمجة
03 Medical Mechatronics System انظمة الميكاترونكس الطبية

5thYear C.H = 31hrs

TotalCreditHours (All Sem.) = 196 hrs

10 Courses Description

1st Year:

Calculus I: 3(2, 2, 0)

Course code	EM1101	Hours			
Course Name	Calculus-I	L	T	P	C
Prerequisites	None	2	2	-	3
Level /semester	1/1				

Objective(s):
- Understand limits, and continuous functions
- Plot the graphs of the elementary function.
- Find Derivatives.
- Integrate by part and substitution.
- Apply improper integrals.

Outcomes
To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

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.

References:
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**	**T**	**P**	**C**
Prerequisites	**None**	**2**	**2**	**-**	**3**
Level /semester	**1/1**				

Objectives:

- To study Vectors and matrices
- Solution of Linear equation
- Using Gauss method for linear systems.

Outcomes

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Course Description

Vectors Introduction, Space Vector.
Matrices, Algebra of matrices, determinants, matrix and inverse of matrix. Crammer rule and Gauss elimination method for solution of linear systems, and solution of linear equations by inverse matrix. Eigen Value and Eigen Vectors.

References

1. Advanced Engineering Mathematical, by alan Jeffrey, 1 edition (June 27, 2001)
2. 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	Hours			
Course Name	Physics-I	L	T	P	C
Prerequisites	None	2	-	3	3
Level /semester	1/1				

Objectives:

- At the end of this course the student will build a good base for further heat and mechanics theorems and topics.
- The course aims to provide the student with the elementary laws of mechanics and heat theorem.
  To ensure the basic laws of mechanics and heat practically.

Outcomes

The purpose of this course is to develop scientific temper and analytical capability through learning physical concepts and their applications in engineering and technology. Comprehension of some basic physical concepts will enable the students to logically solve engineering problems.

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	T	P	C
Prerequisites	None	2	-	2	3
Level /semester	1/1				

Objectives:

-To make the students conversant with basics of polymer chemistry.

-To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.

-To acquaint the student with concepts of important photo-physical and photochemical processes and spectroscopy.

-To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.

-To acquaint the students with the basics of nano materials, their properties and applications.

Outcomes

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Description

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.

References

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	Hours			
Course Name	Fundamental of Computer Science	L	T	P	C
Prerequisites	None	1	-	2	2
Level /semester	1/1				

Objectives:

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.

Outcomes

At the end of this course students will be able to:

i. Understand and distinguish the main historical milestones in the evolution of the computer science.
ii. Understand the impact of computer science in society in the past and in the future.
iii. Understand and describe simple problem-solving strategies and how these can be implemented through computers.
iv. Understand general principle of networking, internet and world wide web

Course Description

Description:-

The course is organized into six modules

History of computing systems, modern computers, introduction to modern computer system. Introduction of how computer work: basic of computer architecture. Introduction to operating system. Introduction to problem solving, algorithm and programming. Introduction to network, internet and World Wide Web. Social aspect of computers and information technology.

References

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

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

Course code	ME1109	Hours			
Course Name	Fundamentals of Mechanical Eng.	L	T	P	C
Prerequisites	None	2	-	-	2
Level /semester	1/1				

Objectives:
Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

Outcomes
After learning the course the students should be able to:
- To understand the fundamentals of mechanical systems.
- To understand and appreciate significance of mechanical engineering in different Fields of engineering.

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

References

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**	**T**	**P**	**C**
Prerequisites	None	**2**	**2**	**-**	**3**
Level /semester	**1/2**				

Objectives:

The objectives of this course as follow:

- Study integration technique
- Understanding partial derivative
- Using vector caraculs

Outcomes

The outcomes of this course as follow:

Course Description

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.

References:

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**	**Hours**			
Course Name	**Physics-II**	**L**	**T**	**P**	**C**
Prerequisites	None	**2**	**-**	**3**	**3**
Level /semester	**1/2**				

Objectives:

- At the end of this course the student will build a good base for further electricity theorems and topics.
- The course aims to provide the student with the elementary laws of electricity and charges theorem.
- To ensure the basic laws of electricity practically.

Outcomes

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.

References

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	**Computer Programming-I**	**L**	**T**	**P**	**C**
Prerequisites	**Fundamental of Computer Science**	**2**	**-**	**3**	**3**
Level /semester	**1/2**				

Objectives:	**Outcomes**
To provide the student with the fundamental concepts of C programming language which is necessary for most other electrical engineering courses.	To provide hands-on training to the students in C – programming language and drafting exercises in Mechanical Engineering

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.

References

1. H.H. Tan and T.B. D'Orazio, "C Programming for Engineering & Computer Science", McGraw-Hill Science/Engineering/Math; 1st edition (September 17, 1998)
2. B.W. Kernighan and D.M. Ritchie, "The C Programming Language", 2nd 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	Hours			
Course Name	Analytical Geometry	L	T	P	C
Prerequisites	1- Calculus-I 2- Linear Algebra	2	2	-	3
Level /semester	1/2				

Objectives:

The course aims at studying the Cartesian coordinates, the withdrawal and rotation of the axes, the study of the conical segments and their relation to the general equation of the second degree in two variables and the conical surfaces and their relation to the general equation of the second class in three variables. The Study of Triple Space. Cylindrical coordinates of spherical coordinates and their relationship to Cartesian coordinates.

Outcomes

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Course Description

Two-dimensional geometry:Transformation of coordinate axes. Pair of straight lines. Circle (parametric form, tangent and normal, pole and polar, orthogonal circle, condition of orthogonality of circles), equation of parabola (its parametric form, tangent and normal). Ellipse (tangent and normal, conjugate diameters), hyperbola and its asymptotes.

General equation of second degree and the conditions for representing a pair of straight lines, parabola, an ellipse and a hyperbola, the equation of tangent, condition of tangency of a line, centre and reduction to standard forms. Polar equations of conics. Three dimensional geometry: Plane, straight lines, in three dimensions, shortest distance.

Sphere, circle in three dimensions. Cone and cylinder (Elementary concept only)

References

1. Calculus with Analytic Geometry , R.A .Silverman , prentice
2. Calculus with analytic Geometry, by E.W SWOkowski 6th ed.

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

Course code	EE1205	Hours			
Course Name	Fundamentals of Electrical Engineering	L	T	P	C
Prerequisites	None	2	-	3	3
Level /semester	1/2				

Objectives:

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).

Outcomes

To familiarize the students with the basics of circuit analysis and the principles of working, characteristics and applications of different Electrical Machines.

Course Description

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 Mechatronics	L	T	P	C
Prerequisites	Non.	2	-	-	2
Level /semester	1/2				

Objective(s)

To familiarize the students with the basic concepts of mechatronics engineering.

Outcomes

To familiarize the students with the concept of Mechatronics systems, Electronics for Mechanical engineering, Mechanical system For Electronics Engineering and CNC

Course Description

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.

References

1. William Bolton, Mechatronics, Electronic control systems in mechanical and Electrical Engineering, sixth edition

Basic Training:0(0,0,3)

Course code	WS1210	Hours			
Course Name	Basic Training	L	T	P	C
Prerequisites	None	-	-	3	0
Level /semester	1/2				

Objectives:

To familiarize with

1. The basics of tools and equipment's used in fitting, carpentry, sheet metal, welding and smithy.
2. The production of simple models in the above trades.

Outcomes

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

Course Description

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 ofa 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.

References

1. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, practice andwork book", Suma Publications, 2005.
2. Kannaiah,P. &Narayanan,K.C. Manual on Workshop Practice, Scitech Publications, Chennai, 1999.
3. Venkatachalapathy, V.S. First year Engineering Workshop Practice, Ramalinga Publications, Madurai,1999.

2nd Year:

Differential Equations: 3(2, 2, 0)

Course code	EM2101	Hours			
Course Name	Differential Equations	L	T	P	C
Prerequisites	Calculus	2	2	0	3
Level /semester	2/3				

Objectives:

At the end of the course, student should be able

1. To apply advanced matrix knowledge to Engineering problems.
2. To improve their ability in solving geometrical applications of differential calculus problems.
3. To equip themselves familiar with the functions of several variables.
4. To familiarize with the applications of differential equations.
5. To expose to the concept of three dimensional analytical geometry.

Outcomes

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Description:-

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.

References

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

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

Course code	SC2102	Hours			
Course Name	**Programming language-II**	**L**	**T**	**P**	**C**
Prerequisites	Programming Language-I	**1**	**0**	**3**	**3**
Level /semester	**2/3**				

Objective(s)

After completing this course, the students should be able to:

1. Appreciate why C++ provides a foundation for further study of programming languages in general.
2. Describe the internal representation of characters, strings, records, and arrays.
3. Use the basic skills of programming using C++ language.
4. Write complete, properly structured, C++ programs.
5. Convert ideas into organized algorithms which can be converted into flow charts that can easily be interpreted into C language.
6. Define and manipulate arrays, characters and strings, formatted input/output and data structures in their C++ programs.

Outcomes

To provide hands-on training to the students in C++ programming language and drafting exercises in Mechanical
Engineering

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	Hours			
Course Name	Digital Circuit Design-I	L	T	P	C
Prerequisites	Electronics Principles	2	-	3	3
Level /semester	2/3				

Objective(s)

- To study the various number systems and implementation of combinational Circuits.
- To study the design of various Synchronous and Asynchronous Circuits.

Outcomes

To introduce the concepts for realising functional building blocks in ICs, application of IC and fundamentals of Digital Circuits, combinational circuit.

Course Description

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.

References

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	Hours			
Course Name	Principle of ElectronicsDevices	L	T	P	C
Prerequisites	Non	2	-	-	3
Level /semester	2/3				

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.

Outcomes

The students can be deal with PN junction construction and layers.

Course Description

Solid state principal, atomic theory. Charge and conduction. Covalent bonding. Intrinsic and extrinsic semiconductors. Holes and energy. PN junction. Formation of depletion layer. Bulk resistance. Forward and reverse biasing. The barrier potential. Controlling width of depletion layer.

References

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

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

Course code	**EE2106**	**Hours**			
Course Name	**Electrical Circuits Analysis-I**	**L**	**T**	**P**	**C**
Prerequisites	**ECE1205**	**2**	**-**	**3**	**3**
Level /semester	**2/3**				

Objective(s)	**Outcomes**
1. Ability to apply basic laws to resistive circuits. 2. Ability to perform mesh and nodal analysis. 3. Ability to apply circuit theorems 4. Ability to analyze 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	Hours			
Course Name	Engineering Mechanics -I	L	T	P	C
Prerequisites	ME1109	2	-	3	3
Level /semester	2/3				

Objective(s)

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.

Outcomes

Concepts of properties of forces, moments, couples and resultants are developed.
Analysis of two and three dimensional force systems and subsequently the analysis of two-dimensional equilibrium are also introduced to the students

Course Description

Force System

1. Force and its rectangular and oblique axis components (two and three dimensional systems).
2. Moment and resultant couple (two and three dimensional systems).

Equilibrium

1. Mechanical systems, isolation and equilibrium conditions for two and three dimensional systems.

Structures

1. Plane trusses.
2. Solution of plane trusses with method of joints and method of sections.
3. Frames.

Friction

1. Types of friction.
2. Application of friction.

References

1. R. C. Hibbeler, Engineering Mechanics, Statics, Thirteenth Edition
2. J. L. Meriam, Engineering Mechanics, Statics

Mathematical Methods: 3(2, 2, 0)

Course code	EM2201	Hours			
Course Name	Mathematical Methods	L	T	P	C
Prerequisites	EM1101,EM1201	2	2	-	3
Level /semester	2/4				

Objective(s)	Outcomes
To study transforms used in many engineering topics.	

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	Hours			
Course Name	Thermodynamics and Heat Transfer	L	T	P	C
Prerequisites	Physics	2	2	-	3
Level /semester	2/4				

Objectives:

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

Outcomes

- This course provides the basic knowledge about thermodynamics and its application I.C. Engines, steam and gas
- Turbines and introduction to heat transfer.

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

References

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-II3(2,0,3)

Course code	**ECE2104**	**Hours**			
Course Name	**Digital Circuit Design-II**	**L**	**T**	**P**	**C**
Prerequisites	**Digital Circuit Design-I**	**2**	**-**	**3**	**3**
Level /semester	**2/4**				

Objective(s)

- To study and Design Sequential Logic circuits.
- To link these designs with applicable electronic circuits.

Outcomes

To introduce the concepts for realising functional building blocks in ICs, application of IC and sequential circuit.

Course Description:

Sequential and combinational circuits comparison. Multi-vibrators circuit operation. RS Flip Flop, T FF, D FF, and JK Flip Flop. Serial and parallel Shift Register. Counters, Asynch and Synch Counters, Decade counters, different Mod Counters.

References

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	Hours			
Course Name	Analog Electronic Circuits-I	L	T	P	C
Prerequisites	ECE2105	2	0	0	3
Level /semester	2/4				

Objective(s)

The goal of this course is to introduce electronic circuit analysis and design techniques with special consideration given to the operation and use of bipolar junction transistors including the analysis and design of important circuits that utilize these devices.

Outcomes

Course Description

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.

References

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	Hours			
Course Name	Electrical Circuits Analysis-II	L	T	P	C
Prerequisites	ECE2106	2	0	3	2
Level /semester	2/4				

Objective(s)

Electric circuit II is a second course on electric circuits. It is intended both to enhance the knowledge of students with regard to electric circuits and to develop skills in analysis. Although the focus is electric circuits, the theory and skills learned are useful in other areas as well.

Outcomes

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	Hours			
Course Name	Engineering Drawing	L	T	P	C
Prerequisites	None	2	-	3	3
Level /semester	2/4				

Objectives:

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.

Outcomes

1. To draw and interpret various projections of 1D, 2D and 3D objects.
2. To prepare and interpret the drawings of buildings.

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.

References

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.

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

Course code	ME2208	Hours			
Course Name	Engineering Mechanics-II	L	T	P	C
Prerequisites	ME2107	2	2	0	3
Level /semester	2/4				

Objective(s)

The objective of this course is to develop the capacity to predict the effects of force and motion while carrying out the creative design function of engineering. The concepts of kinematics of particle motion in various coordinate systems as well as relative and constrained motion are given to the students. This helps them in understanding the forces being applied on a system in motion. Students are further exposed to particles kinetics which include the force mass acceleration, work – energy and impulse momentum. These help students in making their concepts stronger about dealing with the bodies in motion.

Outcomes

The students can be able to: solve the different Kinematics problems

Course Description

Kinematics of Particles

1. Rectilinear motion.
2. Plane curvilinear motion.
3. Rectangular coordinates.
4. Normal and tangential coordinates.
5. Polar coordinates

Kinetics of Particles

1. Force, mass, and acceleration.
2. Newton's second law of motion, equations of motion.
3. Rectilinear and curvilinear motion.
4. Work and energy, potential energy.
5. Impulse and momentum, conservation of momentum

Plane Kinematics of Rigid Bodies

1. Angular motion relations, absolute motion.
2. Relative velocity.
3. Instantaneous centre of zero velocity.
4. Relative acceleration..

Plane Kinetics of Rigid Bodies

1. Force, mass, and acceleration, general equation of motion.
2. Translation, fixed axis rotation.
3. Work and energy relationship.
4. Impulse and momentum equation.

References

1. J. L. Meriam, Engineering Mechanics, Dynamic

3rd Year:

Probability and Statistics3(2,2,0)

Course code	EM3101	Hours			
Course Name	Probability and Statistics	L	T	P	C
Prerequisites	Calculus &Liner Algebra	2	2	-	3
Level /semester	3/5				

Objective(s)
To acquaint the student with the concept of probability & statistics and their applications.

Outcomes
This core course is intended to provide a solid general background in probability and statistics that will form the basis of more advanced courses in statistics.

Course Description

Measure of central tendency and measure of dispersion.
Correlation & regression

- ✓ Correlation between two variables (Pearson-spearman), Contingency tables (nominal variable), Simple linear regression, Time series analysis.

Probability theorems

- ✓ 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

- ✓ t-student distribution , f-distribution
- ✓ Simple analysis of variance

References

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

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

Course code	ECE 3202	Hours			
Course Name	Microprocessor and Assembly Language	L	T	P	C
Prerequisites	Introduction to computer science	2	0	3	2
Level /semester	6				

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. Upon completion, students are equipped with fundamental knowledge to program a microprocessor system for specific application.

Outcomes

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.

References

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

Strength of Materials 3(2,2,0)

Course code	ECE 3103	Hours			
Course Name	Strength of Materials	L	T	P	C
Prerequisites	Engineering Mechanics	2	2	-	3
Level /semester	3/5				

Objective(s)

Study of the subject provides the understanding of principal stress, strains, springs, columns, and structures.

Outcomes

At the end of the course, the student will be able to:

- Determine stresses in the member subjected to Torsion
- Understand the concept of direct and bending stresses
- Understand the concept of deflection in beams.

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.

References:

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	Hours			
Course Name	Engineering Material	L	T	P	C
Prerequisites	Physics	2	0	0	2
Level /semester	3/5				

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. It attempts to present ways of modifying and control the material microstructures and especially mechanical properties (toughness, strength, fatigue and creep resistance) by suitable heat treatment operation.

Outcomes

Demonstrating, through written communication skills, information literacy and critical thinking skills within the materials science and engineering field

Course Description

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

Reference

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, 5th , John Wiley and Sons, 2000.
3. William F. Smith, Foundations of Materials Science and Engineering, 3rd Ed., McGraw-Hill, 2004.
4. James F. Shackelford, Introduction to Materials Science for Engineers, 5th Ed., Prentice Hall, 2000.
5. Larry D. Horath, Fundamentals of Material Science, 3rd Ed., Prentice Hall, 2006.

AnalogElectronic Circuits II 3(2,0,3)

Course code	ECE3205	Hours			
Course Name	Analog Electronic Circuits II	L	T	P	C
Prerequisites	ECE2205	2	0	3	3
Level /semester	6				

Objective(s)
To focus on the design of operational amplifiers, filters.

Outcomes

Course Description
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)

Course code	ECE 3106	Hours			
Course Name	Signals and Systems	L	T	P	C
Prerequisites		2	-	2	3
Level /semester	3/5				

Objective(s)
At the end of this course, students should:
1. Understand the basic concepts for continuous-time and discrete-time signals and systems.
2. Understand linear time-invariant systems and their characterization using impulse response.
3. Be able to compute the output of a continuous-time or discrete-time linear time-invariant system using convolution in the integral or sum form.
4. Understand Fourier series for the analysis and representation of periodic continuous-time signals.
5. Understand the representation of signals using a countably infinite orthogonal basis.
6. Understand the actual meaning of the Fourier series and its infinite sum.
7. Be able to develop the continuous-time Fourier transform from the Fourier series and understand related topics such as time scaling, convolution theorem, Parseval's relation, uncertainty principle and Eigen functions of the Fourier operator.
8. Understand the discrete-time Fourier transform and its properties.
9. Understand the Laplace transform and concepts such as the region of convergence.

Outcomes
The students will demonstrate:
1. The knowledge of how to represent signals in the time, frequency, Laplace, andZ domains.
2. The knowledge of how to perform both discrete and continuous convolution.
3. The ability to design, builds, and analyzes linear time invariant systems.
4. The ability to program simple scripts and functions in Mat lab.

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.

References:

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	Hours			
Course Name	Fluid Mechanics	L	T	P	C
Prerequisites	Engineering Mechanics, Calculus	2	2	0	3
Level /semester	5				

Objective(s)

In essence, this course introduces the fundamentals of fluid mechanics for engineers. The emphasis is on the basics of fluid statics and fluid motion, with application in a variety of engineering fields. The basic idea of what fluids are, the study of static fluids, the use of control volumes for fluids in motion, and the uses of length, mass, time and temperature dimensions to greatly simplify the description of fluids are illustrated. With these tools practical aspects of flow through ducts and around objects including effects of compressibility are also covered.

Outcomes

At the end of the course, the student will be able to:

- Apply conservation laws to derive governing equations of fluid flows.
- Compute hydrostatic and hydrodynamic forces.
- Analyze and design simple pipe systems.
- Apply principles of dimensional analysis to design experiments.

Course Description

- Fundamentals: Definition and properties of fluids, intensity of pressure, variation of pressure in a static fluid, Absolute, Gauge, Atmospheric and Vacuum pressure Manometers.
- Fluid statics: Hydro static forces and centre of Pressure on vertical and inclined plane surfaces. Buoyancy, centre of Buoyancy, Meta centre and Meta-centric height. Analytical method for determination of Meta-centric height. Stability of floating and sub-merged bodies.
- Kinematics and Dynamics of fluid flow : Types of fluid flow, continuity equation, one dimensional Euler's equation of motion, and Bernoulli's energy equation.
- Flow of real fluids: Reynolds number, Laminar flow in circular pipes. Hagen poiseuille equation.
- Fluid flow in pipes: Darcy wisback equation. Losses in pipes - Minor and major losses.
- Dimensional analysis and Similitude: Methods of dimensional analysis, similitude.
- Impact of jet: Force exerted by the jet on stationery vanes and moving vanes.
- Hydraulic turbines: Pelton turbine, Francis turbine and Kaplan turbine (Constructional feature, working principle Velocity triangle, governing mechanisms and simple problems).
- Centrifugal pumps:Single-stage and multi-stage pumps - constructional feature, working principle, velocity triangles and simple problems.

REFERENCES:

1. Fluid Mechanics by F.M. White McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2011
2. Fluid Mechanics by V.L. Streeter., E.B.Wylie and K.W. Bedford, McGraw Hill Education (India) Pvt. Ltd, New Delhi2016.
3. Fluid Mechanics by P.N. Modi and S.M.Seth, Standard Book House, Delhi, 2011.
1. Mechanics of Fluids by Potter, M.C D.C Wiggers, B.H Ramdan Cengage, 2012.
2. Fluid Mechanics by J F Douglas, J M Gasiorek, J A Swaffield and L B Jack, Pearson 2015.
3. Fluid Mechanics and Fluid Machines by S. K. Som, Gautam Biswas and S. Chakraborty, McGraw Hill Education (India) Pvt. Ltd, New Delhi 2015.
4. Engineering Fluid Mechanics by K L Kumar, S Chand, Eurasia Publishing House, New Delhi, 2014.
5. Fluid Mechanics by Dr. A. K. Jain Khanna Publishers, twelfth edition 2014.

Numerical Analysis 3(2,2,0)

Course code	EM3201	Hours			
Course Name	Numerical Analysis	L	T	P	C
Prerequisites	Computer Programming	2	2	-	3
Level /semester	3/6				

Objective(s)

- Find acceptable approximate solutions when exact solutions are either impossible or so arduous and time-consuming as to be impractical;
- Devise alternate methods of solution better suited to the capabilities of computers;
- Formulate problems in their fields of research as optimization problems by defining the underlying independent variables, the proper cost function, and the governing constraint functions;
- Understand how to assess and check the feasibility and optimality of a particular solution to a general constrained optimization problem;
- Use the optimality conditions to search for a local or global solution from a starting point;
- Formulate the dual problem of some general optimization types and assess their duality gap using concepts of strong and weak duality;
- Understand the computational details behind the numerical methods discussed in class, when they apply, and what their convergence rates are.

Outcomes

The aim of the course is to present a creation, analyzing, and implementation algorithms for

- Obtaining numerical solutions to problems of calculus;
- Selection of a best element (with regard to some criteria) from some set of available alternatives.

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.

References

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.
2. D. Bertsimas and J. N. Tsitsiklis. Introduction to Linear Optimization. Athena Scientific, Belmont, MA, 1997, ISBN 1886529191.
3. 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	Complex Variables	L	T	P	C
Prerequisites	Calculus I, II	2	2	-	3
Level /semester	3/6				

Objective(s)	Outcomes

Course Description

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.

References

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

Measurement and Sensors 3(2,2,2)

Course code	ECE3203	Hours			
Course Name	**Measurement and Sensors**	L	T	P	C
Prerequisites	ECE2106, ECE2205 and ECE3106	2	2	2	3
Level /semester	3/6				

Objective(s)

1. Understand the science of measurements and sensors.
2. Identify and avoid errors in measurements.
3. Select appropriate sensors for various applications.
4. Understand the science of micro actuators &Macrobiotics

Outcomes

To lay a foundation for the understanding of different measurements required in Engineering, sensors and its application**.**

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.

References

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	Hours			
Course Name	Mechanical Vibrations	L	T	P	C
Prerequisites	Engineering Mechanics, Calculus I, II	2	2	-	3
Level /semester	3/6				

Objective(s)

1. Understand the sources of vibrationand noise in automobiles and make design modifications.
2. Learn to reduce the vibration and noise and improve the life of the components

Outcomes

1. Translate a physical problem in Mechanical vibration to an appropriate mathematical model.
2. Make engineering judgement on the problem of reducing vibration when required and the role of vibration in the design of mechanical equipment.

Course Description

1. Basic Concepts: Classifications, Procedures, Spring, Mass and Damping Elements.
2. Harmonic Motion.
3. Single Degree of Freedom Systems: Free Vibrations
4. Single Degree of Freedom Systems: forced vibration
5. vibration isolation and transmissibility
6. Torsional vibration

References

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	Hours			
Course Name	Machine Theory	L	T	P	C
Prerequisites	Engineering Mechanics, Calculus I, II	2	2	0	2
Level /semester	3/6				

Objective(s)

The objective of the course is to introduce the preliminary concepts of mechanisms and to present methods of analysis for the motion and force transmission in mechanisms. The course provides the foundation for the study of displacements, velocities, accelerations, and static and dynamic forces required for the proper design of mechanical linkages, cams, and geared systems. After this course the students are able to understand the various and independent technical approaches that exist in the field of mechanisms, kinematics, and machine dynamics. Coverage of all analysis and development methods is provided, with balanced use of both analytic and graphic tools. This course also helps the students in designing robots.

Outcomes

To expose the students on fundamentals of various laws governing rigid bodies and its motions. To study vibration characteristics and balancing of mechanical machines.

Course Description

- Different types of Mechanisms, their Characteristics and applications
- Velocity Analysis
- Acceleration analysis
- Static and dynamic balancing
- Cam design
- Governors
- Gear trains
- Belts

Reference

1. Ratan, S.S. Theory of Machines, Tata McGraw Hill Publishing Company Ltd., 1993.
2. Shigley J.E, Theory of Machines and Mechanisms ,McGraw Hill 1998.
3. SingiresuS.Rao, Mechanical Vibrations, Nem Chand and Bros, 1998.
4. Thomas Beven, Theory of Machines, CBS Publishers and Distributors, 3rd edition, 1984.
5. Ghosh .A and Mallick A.K Theory of Mechanisms and machines – Affiliated East – West Pvt. Ltd. New Delhi, 1998.
6. Sing V.P Mechanical Vibrations –Dhanpat Rai and Co., 1998.
7. Rao J.S and Dukkipati R.V Mechanism and Machine Theory, Wiley Eastern Ltd., New Delhi, 1989.
8. John Hannah and Stephens R.C., Mechnics of Machines, Viva Low Prices student Edition, 1999.

Computer Application 2(2,0,3)

Course code	CS3206	Hours			
Course Name	Computer Application	L	T	P	C
Prerequisites	Computer language	2	0	3	2
Level /semester	3/6				

Objective(s)

The objectives of this course is

1. to teach the student basic drawing fundamentals in various mechanical engineering applications, specially in machine elements drawing. Using computerto use MATLAB program in some Engineering Applications

Outcomes

At the end of the course, the student will be able to: Master the usage of Autocad commands for drawing 2D & 3D machine elements drawings required for different mechanical engineering applications. Also the students will be familiar MATLAB program

Course Description

UNIT – I Introduction to Auto-Cad, Sections And Sectional Views, Development Of Surfaces: Introduction to Auto-CAD: Geometrical construction. Sections and sectional views Sectionsof right regular solids-prisms, pyramids, cylinders and cones , auxiliary views, Development of surfaces Development of surfaces of right regular solids prisms, pyramids, cylinders and cones.

UNIT – II Intersection of Solids: Intersection of solids: Intersection of prism vs prism, cylinder vs prism, cylinder vs cylinder and cylinder vs cone.

UNIT – III Isometric Projections: Isometric projections: Principles of isometric projections, isometric scale, isometric views, conventions. Isometric views of lines, planes, simple and compound solids, isometric views of objects having spherical parts.

UNIT – IV Transformation of Projections: Transformation of projections: Conversion of isometric views to orthographic views -conventions for simple objects. Construction of orthographic projections for given isometric projections.

UNIT -V Perspective Projections: Perspective projections: Perspective view of points, lines, plane figures and simple solids, vanishing point method and visual ray method.

UNIT –VI MATLAB program

References:

1. Computer Aided Design Laboratory by M. N. SeshaPraksh& Dr. G. S. Servesh – Laxmi Publications.
2. N. D. Bhatt, “Elementary Engineering Drawing”, Charotar Publishing House, 55th Edition, 2015.
3. K. L. Narayana and P. Kannaiah, “Engineering Drawing”, Scitech Publications, 23rd Edition, 2010.
4. K. C. John, “Engineering Graphics”, Prentice Hall of India, 1st Edition, 2009.
5. Venugopal, “Engineering Drawing and Graphics, New Age, 2nd Edition, 2010.
6. Dhananjay. A. Johle, “Engineering Drawing”, Tata Mc Graw Hill, 1st Edition, 2008.
7. Trymbaka Murthy, “Computer Aided Engineering Drawing”, I.K. International Publishers, 3rd Edition, 2011.
8. A. K. Sarkar A. P. Rastogi, “Engineering graphics with Auto CAD”, Phi Learning, 1st Edition, 2010.
9. Matlab: A Practical Introduction to Programming and Problem Solving, By Stormy Attaway, 2012

4th Year:

Machine Design 3(2,2,0)

Course code	ME4101	Hours			
Course Name	Machine Design	L	T	P	C
Prerequisites	Engineering Mechanics, Calculus I, II	2	2	0	3
Level /semester	4/7				

Objective(s)

The students will:

1. Review concepts of statics and strength of materials used to determine the stress, strain and deflection of onedimensional structure.
2. Learn fundamental approaches to failure prevention for staticand repeated loading.
3. Consider the design of common machine elements such as shafts, fasteners, springs, bearings, and gears.
4. Solve an open-ended design problem involving cost, drawings, and structural analysis.

Outcomes

The students will be able to:

1. Determine the stress, strain and deflection of simple machine elements.
2. Estimate safety factors of simple structures exposed to static and repeated loads.
3. Determine performance requirements in the selection of commercially available machine elements.
4. Solve simple, open-ended design problems.

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.

References

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	Hours			
Course Name	Control System-I	L	T	P	C
Prerequisites	Signal and System	2	2	3	3
Level /semester	4/7				

Objectives

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance

Outcomes

Upon completion of the course, the students should be able to:

1. Derive the transfer function models for mechanical and electrical systems.
2. Determine the time response of first-order and second-order systems
3. Understand reduction of multiple subsystems.
4. Use Routh-Hurwitz Criterion to analyze the stability of a linear system.
5. Calculate steady-state errors for control systems.
6. Sketch the root-locus and design control systems via root locus.
7. Sketch Bode Plots and Nyquist Diagrams.
8. Determine stability, gain margin and phase margin via Bode Plots and NyquistDiggrams.
9. Understand PID control and how to tune a PID controller.
10. Use MATLAB/Simulink to analyze linear control systems.

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.

References

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 Management2(2,0,0):

Course code	MEE4103	Hours			
Course Name	Industrial Management	L	T	P	C
Prerequisites	None.	2	0	3	3
Level /semester	4/7				

Objective(s)	Outcomes
1. Principles of organizational management 2. Behavior of human at organizations with modern management concepts.	To become familiarized about Engineering Management Principles.

Course Description

UNITI: HISTORICAL: Definition of Management–Science or Art–Management and Administration– Development ofManagement 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 PreventiveControl– Reporting– The Global Environment– Globalization and Liberalization– International Management and Global theory of Management.

References:

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

Manufacturing Processes 3(2,3,0)

Course code	ME4104	Hours			
Course Name	Manufacturing Processes	L	T	P	C
Prerequisites	Material Science and Strength of Material	2	3	0	3
Level /semester	4/7				

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.

Outcomes

Account for how rawmaterials for common industrial products are produced. Explain the principles for manufacturing of different materials in bulk (metals, alloys, ceramics, polymers, paper). Understand how the properties of materials influence the choice welding methods of within and between different types of materials. Understand and argue for different methods of forming, depending on material. For a given material judge what is a suitable method for manufacturing, forming and welding, for small and large scale production respectively? Understand the influence of economical, ethical and environmental aspects when choosing a method.

Course Description

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, moulding tools, machine moulding, special moulding processes – CO2 moulding; shell moulding, investment moulding, 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.

References

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.

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

Course code	ECE4105	Hours			
Course Name	Digital Signal processing	L	T	P	C
Prerequisites	Signal s and systems	2	0	3	3
Level /semester	4/7				

Objective(s)

1. Basic concept of signals and systems.
2. How to design and implement the digital IIR and FIR filters.
3. About the architecture of the DSP processor.

Outcomes

The purpose of this course is to introduce students to the basics of Signal and Systems, Digital Signal Processing and introduction to DSP processor. The main objective of this subject is to help students to design The digital filters and Implementation of digital filters using various structures.

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.

References

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 Electronics	L	T	P	C
Prerequisites	Applied Electrical and Electronics Engineering	2	0	3	3
Level /semester	4/7				

Objective(s)

1. To learn the characteristics of different types of Semiconductor Devices
2. To understand the operation of controlled rectifiers.
3. To understand the operation of choppers and invertors

Outcomes

To enable the students gain a fair knowledge on characteristics and applications of power electronic devices

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^o 180^o) modes Y & Δ '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.

References

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 Applications**	**L**	**T**	**P**	**C**
Prerequisites	Microprocessor	**2**	**0**	**3**	**3**
Level /semester	**4/7**				
Objective(s)	**Outcomes**				

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	Hours			
Course Name	**Introduction to Robotics**	L	T	P	C
Prerequisites	ECE3202, ECE4107	2	2	-	3
Level /semester	4/8				

Objective(s)

1. The Robot fundamentals
2. The Robots various components parts and the robotic internal and external sensors.
3. Robot transformation system and its application to a robots Kinematic structure.
4. The Robot programming and applications.

Outcomes

To provide engineering aspects of robots, robot programming and its applications.

Course Description

INTRODUCTION TO ROBOTICS

RIA definition - History of Robotics - Justification - Anatomy - Classification - Applications, Configurations of Manipulator - Cartesian - Cylindrical - Polar - Joint arm, Work Volume, Spatial resolution - Accuracy and Repeatability of Robotics.

COMPONENTS OF ROBOTICS

Linckged and Joints of manipulators, drive systems, feed back devices, Degrees of freedom, end effectors - grippers, wrist configurations, motion - roll - Pitch - Yaw, sensors - sensor areas 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.

References

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	Hours			
Course Name	Control System-II	L	T	P	C
Prerequisites	Control system-I	2	2	2	3
Level /semester	4/8				

Objective(s)

The objective of this course is to apply knowledge of mathematics and engineering to analyze and design a control system to meet desired specifications. Students should learn to analytically determine a control system's functionality and select appropriate tests to demonstrate system's performance and finally design a control system to meet a set of requirements. Develop an understanding of the elements of classical control theory as applied to the control of aircraft and spacecraft. In particular understand: the concept of feedback and its properties; the concept of stability and stability margins; and the different tools that can be used to analyze the previous properties.

Outcomes

After completion of this course the student is able to:

1. Improve the system performance by selecting a suitable controller and/or a compensator for a specific application
2. Apply various time domain and frequency domain techniques to assess the system performance
3. Apply various control strategies to different applications (example: Power systems, electrical drives etc…)
4. Test system Controllability and Observability using state space representation and applications of state space representation to various systems.

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

Reference

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):

Course code	**ECE 4103**	**Hours**			
Course Name	**PLC and Applications**	**L**	**T**	**P**	**C**
Prerequisites	Control System-1	**2**	**2**	**2**	**3**
Level /semester	**4/8**				

Objective(s)

1. Understand the basic of data conversion and data acquisition
2. Understand the fundamental of PLC.

Outcomes

To provide students the fundamentals of PLC and Data acquisition system

Course Description

- 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.

Reference

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.

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

Course code	GE4204	Hours			
Course Name	Reliability Engineering Systems	L	T	P	C
Prerequisites	None	2	-	-	2
Level /semester	4/8				

Objective(s)

1. Meaning of TQM and Theories about TQM
2. Planning and manufacturing for quality its tools and techniques
3. Human involvement to improve quality and the development and transformation due to such involvement.
4. About failure models, component reliability & system reliability
5. About mean down time, maintainability of systems & condition monitoring.

Outcomes

To provide knowledge about Total Quality Management (TQM), TQM tools and techniques applied to Manufacturing and also about reliability and maintainability of different systems.

Course Description

BASIC CONCEPTS: Evolution of total quality Management, Definition of quality, Comparison between traditional approach and TQM, Deming, Crosby, Juran, Taguchi, Ishikawa theories, Quality costs- product quality Vs Service quality Strategic planning- Goal setting, steps involved in Strategic planning, TQM implementation.

TQM PRINCIPLES & BASIC TOOL: Customer Satisfaction – Types of Customers, customer supplier chain, and customer perception of Quality Customer feed back, customer complaints, Customer retention, and Service quality. Employee involvement – Employee motivation, Maslow's Hierarchy of needs, Herzberg theory,, Empowerment & Team work. Basic Tools: Introduction to Seven basic tools –Check sheets, Histograms, Control charts, Pareto diagram, Cause & effect diagram, Stratification, Scatter diagrams.

NEW SEVEN MANAGEMENT TOOLS & ADVANCED TOOLS: ffinity diagram, Relations diagram, Tree diagram, matrix diagram, Matrix data analysis diagram, Process decision program chart, Arrow diagram.

Advanced QC tools: Advanced QC tools like QFD, Root cause analysis, Taguchi method, Mistake proofing (poka-yoke), Failure mode and effects analysis (FMEAs), failure mode and effects criticality analysis (FMECAs) and Fault tree analysis (FTAs) etc. Quality Management Systems.

RELIABILITY

Definition- Probabilistic nature of failures, Mean failure rate, Meantime between failures, hazard rate, hazard models, Weibull model- System reliability improvement- Redundancy- Series- Parallel and Mixed configurations.

MAINTAINABILITY: Introduction, choice of maintenance strategy. Mean time- to Repair (MTTR), Factors contributing to Mean Down Time (MDT), fault diagnosis, and routine testing for unrevealed faults. Factors contributing to Mean Maintenance Time- (MMT) on condition maintenance periodic condition monitoring, continuous condition monitoring, economics of maintenance.

References

1. Joel E. Rose, Total Quality Management, 2nd Edn, Kogan Page Ltd., USA 1993.
2. Srinath, L.S., Reliability Engineering, Affiliated East West Press, New Delhi 1995.

Computer Numerical Control Machines3(2,0,3):

course code	MEE4205	Hours			
Course Name	Computer Numerical Control Machine	L	T	P	C
Prerequisites	ME4101, ECE4107, ECE3203	2	-	3	3
Level /semester	4/8				

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 toolings.

Outcomes

1. Understand the principles of Numerical Control (NC) technology and describe the range of machine tools to which it is applied.
2. Outline the various routs for part programming in NC and CNC.
3. Explain the application of CNC for Machining & Turning Centers.

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 ofcontrol 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.

References

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	T	P	C
Prerequisites	ME4104	2	-	-	2
Level /semester	4/8				

Objective(s)

1. The different engineering economic principles and strategies
2. Principles of organizational management
3. Behavior of human at organizations with modern management concepts.

Outcomes

To become familiarized about Engineering Economics

Course Description

ENGINEERING ECONOMICS: Introduction - Economics – Scope and Definition – Importance of Economics in Engineering - Economic optimization- Demand and Revenue Analysis – Law of Demand - Demand Forecasting –Methods of Demand Forecasting - Demand curves – Factors affecting Demand – Demand Elasticity - Production Analysis - simple problems.

SUPPLY, COST AND OUTPUT: Supply – Supply schedule – Law of Supply – Elasticity of Supply - Cost and Supply Analysis – Types of Costs - Price and output Determination – Price Fixation – Pricing methods - Pricing Policies – Factors governing Pricing Policies – Break-Even analysis – Estimation of Break-Even Point - Usefulness of BEP – Limitations – simple problems.

References

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 code	MEE4202	Hours			
Course Name	Autoronics	L	T	P	C
Prerequisites	Thermodynamics and heat transfer Sensor and Actuator	2	2	-	3
Level /semester	4/8				

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

Outcomes

To provide knowledge about application of electronics in Automobile engineering

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.

Reference

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.

5th Year:

Research Methodology 2(2,0,0):

Course code	GE5101	Hours			
Course Name	Research Methodology	L	T	P	C
Prerequisites	None	2	-	-	2
Level /semester	5/9				

Objective(s)
The course objective is to prepare student for research work, practice and knowledge about research methods, statistical analyses of data within environmental science, a way of thinking and solving problems. Also focus on papers and proposal writing styles.

Outcomes
To enlighten the students with the various optimized techniques

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			
Course Name	Industrial Hydrologic Systems	L	T	P	C
Prerequisites	Fluid Mechanics	2	2	2	3
Level /semester	5/9				

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

Outcomes

To expose the learner to the fundamentals of hydraulic and pneumatic power control and their circuits with industrial applications.

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.

References:

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	Hours			
Course Name	Mechatronics Systems Design	L	T	P	C
Prerequisites	ECE3203, ECE4107, ME4101	2	0	3	3
Level /semester	5/9				

Objective(s)

On completion of the course the students will be able to understand:

1. The mechatronics system design and their structure, mechanism, ergonomic and safety.
2. Theoretical and practical aspects of computer interfacing and real time data acquisition and control.
3. Motion control of driver and motion converter

Outcomes

The students will be able to design systems with the aid of mechanical and electronic components in mechatronics using modern software packages.

Course Description

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.

References

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)

Course code	MEE5104	Hours			
Course Name	Automation	L	T	P	C
Prerequisites	Control System I, Sensor and Actuator	2	-	-	2
Level /semester	5/9				

Objective(s)

To lay foundation on the principles of automating factory operations.

Outcomes

1. Many of the automation fundamentals and control techniques.
2. Material handling technologies
3. Manufacturing systems and
4. Manufacturing support systems

Course Description

PRODUCTION OPERATIONS AND AUTOMATION STRATEGIES: Automation – Definition, levels, need, strategies principles. Types of production, functions in manufacturing, plant layout – types, organization and information processing in manufacturing, Types of flow lines, methods of transport, transfer mechanisms, ASRS system.

GROUP TECHNOLOGY & FLEXIBLE MANUFACTRUING SYSTEMS: Group Technology – Introduction, part families, parts classification and coding system – OPITZ and MI CLASS system. Production flow analysis, cellular manufacturing – advantages, disadvantages and applications. FMS – Introduction, workstations, scope, components, types, benefits, typical FMS layout configuration, function of FMS computer Control System, FMS data files.

COMPUTER CONTROL SYSTEMS & AUTOMATED PROCESS: Computer control systems – Introduction, Architecture, Factory Communication, Local Area Networks – Characteristics, factory networks, open system interconnection model. Network to network interconnections, manufacturing automation protocol, Data Base Management System – Introduction. Computer aided shop floor control. Automated process planning – introduction, structure, information requirement, CAPP, application, programs in CAPP.

COMPUTER CONTROLLED MACHINES & MATERIAL HANDLING SYSTEMS:
NC machines – Part Programming, CNC, DNC, Adaptive Control, Pallets & Fixtures, Machine centers, Automated inspection systems. Material handling systems – Introduction, Conveyors, Industrial Robots, Automated Guided Vehicles.

COMPUTER INTEGRATED MANUFACTURING: CIM – Introduction, definition, scope, benefits, elements, CIM cycle or wheel. Introduction to Jurt-in-Time (JIT), Kanban System, Business Process Re-engineering (BPR), Materials requirement planning (MRP), Manufacturing Resource Planning (MRP II), Enterprise Resource Planning (ERP), Supply Chain Management (SCM).

Reference:

1. MikellGroover .P, Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India Pvt. Ltd., 2001.
2. Viswanathan .N, Navahari .Y "Performance Modeling of Automated Manufacturing Systems", Prentice Hall of India Pvt. Ltd., 1998.
3. Rao .P.N., Computer Aided Manufacturing, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001.
4. Kant Vajpayee .S, Principles of Computer Integrated Manufacturing, Prentice Hall of India Pvt. Ltd., 1995.
5. Radhakrishnan .P, Subramaniyan .S, CAD/CAM/CIM, New Age International Limited, 1994.

Mechatronics System Interface 3(2,0,3)

Course code	MEE51xx	Hours			
Course Name	06 Mechatronics System Interface	L	T	P	C
Prerequisites	Digital Circuits, Analogue electronics, Microprocessor and assembly language Microcontrollers; Digital Signal Processing	2	0	3	3
Level /semester	5/9				

Objective(s)

This course studies knowledge and skills required to interfacing and programming Mechatronic systems with solid state hardware sequencing microchip devices

On completion of this module, students should be able to:

1. Understand interfacing Circuits concept.
2. Understand interface circuits functions and Services.
3. Understand Mechatronic interconnection Techniques.

Outcomes

The students will be able to design systems with the aid of mechanical and electronic components in mechatronics using modern software packages.

Course Description

Mechatronics System concepts , Microchip Interface concepts; Devices, system Support due to the interface process; Microchip connections and communications techniques; needs for interfacing; sensors types and supports; Mechanical actuators types ; signal conditions modules ;interface circuits classification; analogue and digital interface models ; basics standard components for interface system international standard and specification; interface protocols.

References

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.
5. Mechanical System Interfacing by David M. Auslander, Carl J. Kempf

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

Course code	MEE5201	Hours		
Course Name	**Mechatronics System Modeling and Simulation**	**L**	**T**	**P**
Prerequisites	ECE4107	**2**	**0**	**2**
Level /semester	5/10			

Objective(s)

1. Understand and develop mathematical models for different systems
2. Design simulation experiments.
3. Analyze some commonly used systems

Outcomes

To introduce the fundamentals of mathematical modeling of engineering systems and its simulation.

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 Fuzzy Logic**	**L**	**T**	**P**	**C**
Prerequisites	Control System-I	**2**	**2**	**2**	**3**
Level /semester	**5/9**				

Objective(s)

1. Fundamental of expert system, fuzzy logic and neural controllers with their case studies.

Outcomes

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
2. Neural Network Toolbox, Version 4, 2002
3. Handbook Of Neural Network Signal Processing, 2002

Embedded System Design3(2,0,3):

Course code	**MEE52xx**	**Hours**			
Course Name	**04Embedded System Design**	**L**	**T**	**P**	**C**
Prerequisites		**2**	**-**	**3**	**3**
Level /semester	**5/10**				

Objective(s)

The aim of this module is to enable students at a final year level to design and realize an embedded system. In practice the students will work in teams of 3 to 5. On completion of the course the students will have demonstrated:

- Individual and Group ability to decompose a specified task.
- Simulate the partitioned problem
- Identify processes and data flows continued within the application.
- Make technological recommendations for implementing the application.
- Implement the recommendations.
- Test the system

Outcomes

Course Description:

Introduction to embedded systems. Terms definition, features, characteristics, application, design 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	MEE52xx	Hours			
Course Name	04 Medical Mechatronics System	L	T	P	C
Prerequisites	Machine Design and Sensor and Actuator	2	-	2	3
Level /semester	5/10				

Objective(s)

- To teach the significance of biomedical signal and the challenges in picking the signal
- To educate students the different mechanism to measure and monitor different biomedical parameters
- To identify different types of biomedical units such as pathological, diagnostic, therapeutic and prosthetic devices.
- To help students in enhancing their knowledge about different imaging techniques
- Mechanical design of the electrodes, prosthetic devices and the miniature as well as EMI /RFI protected cabinet is a major challenge to be looked into by this course.

Outcomes

- Select proper electrodes and electrolyte for different measurement of parameters
- Explain the principle and working of any biomedical equipment
- Design suitable orthotic and prosthetic devices and applications
- Explain the working of different imaging techniques in Biomedical Engineering
- Demonstrate the significance of safety, telemetry and hospital information system in biomedical Instrumentation

Course Description

Sources of Bioelectric potential, Electrodes and Transducers.

- Understand generation of electrical signal in human cell, Resting and Action potential
- Different types of Electrodes, Electrolytes and their significance, Biosensors Classification of Biomedical Instruments Biopotential Amplifiers and recorders
- The origin of bio-potential, ECG, ENG, EMG, EEG, MEG, ERG etc. The signal conditioners and amplifiers
- Recording systems for the bio-potential listed above and patient monitoring system, Foetal heart rate monitor Measurement and analysis techniques
- Blood flowmeters, Cardiac output measurement, pulmonary function analysers
- Blood gas analysers, oximeters, Blood cell counters, Audiometers
- Therapeutic and Prosthetic Equipments
- Cardiac Pacemakers, Cardiac defibrillators, Hemodialisis machine, Electrosurgical unit, Ventilators, Infant incubator, drug delivery devices,Orthotic and Prosthetic devices Definition, Need and Classification, Normal Human Locomotion .
- Gait Cycle, Biomaterials: Definition, Need and Classification, Biological Testing and Biocompatibility, Upper and Lower limb Prosthetic devices. Upper and Lower limb Orthotic devices, Study of various biomaterials and applications

References

1. Khandpur R. S., Handbook of Biomedical Instrumentation, Tata McGraw Hill, second edition, 2003
2. Carr and Brown, Introduction to biomedical equipment technology, fourth edition, Pearson press, 2003.
3. W.R.Hendee&E.R.Ritenour, Medical Imaging Physics (3rd eds), Mosbey Year-Book, Inc., 1992.
4. Lesslie Cromwell, Fred J. Weibell, rich J. Pfeiffer Biomedical Instrumentation and Measurements, 2nd Edition, PHI
5. John G. Webster, Bioinstrumentation John Wiley and sons, 2004
6. Joseph Bronzino (Editor-in-Chief), Handbook of Biomedical Engineering, CRC Press, 1995.
7. L.A.Geddes and L.E.Baker,.Principles of Applied Bio-Medical Instrumentation. John Wiley & Sons 1975.

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

Course code	MEE5204	Hours			
Course Name	CAD/CAM	L	T	P	C
Prerequisites	Manufacturing and Assembly drawing	2	2	2	3
Level /semester	10				

Objective(s)

1. Understand the role of hardware and software.
2. Understand the graphics display techniques.
3. Understand the role of computers in CAD/CAM and its Integration.

Outcomes

To introduce the concepts and techniques used in CAD and CAM

Course Description

INTRODUCTION: Introduction of CAD/CAM. The design process morphology of design – Product cycle – sequential and Concurrent Engineering – Role of computer in CAD/CAM. Benefits of CAD/CAM.

INTERACTIVE COMPUTER GRAPHICS: Introduction of Hardware and Software – Input and Output devices – Creation of Graphics primitives –Graphical Input techniques – Display transformation in 2D and 3D – viewing transformation – clipping – hidden line elimination – Model storage and data structure – Data structure organization – Engineering Data Manufacturing Systems.

SOLID MODELING AND GRAPHICS SYSTEM: Geometric modeling – wire frame, Surface and Solid models – CSG and B-Rep techniques – Wire frame versus Solid modeling – Introduction the software Configuration of Graphics System, Functions of Graphics Packages, Graphic standards – CAD/CAM Integration – Introduction to Finite Element Analysis.

COMPUTER AIDED MANUFACTURING: Introduction to CNC, DNC Machines and their elements, Manufacturing planning and control – Principles of Computer Integrated Manufacturing – Hierarchical network of computers – Local Area Networks – Process Planning – Computer Aided Process Planning – Retrieval and Generative Approaches.

PRODUCTION PLANNING AND SHOP FLOOR CONTROL

Computer Integrated Production Management System – Master Production Schedule – Material Requirement Planning – Inventory Management – Manufacturing and Design Data Base – Capacity Planning – Shop Floor Control – Functions – Order release – Order scheduling.

References

1. Sadhu Singh. “Computer Aided Design and Manufacturing”, Khanna Publishers, New Delhi, 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):

Course code	PR5105, PR5205	Hours			
Course Name	Final Project-I, II	L	T	P	C
Prerequisites	All courses	2	2	2	3
Level /semester	10				

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 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

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

الهدف العام :-

ان يتعرف المتعلم على مفهوم الثقافة الإسلامية ، مصادرها ، خصائصها. ،عناصر الثقافة الاسلامية وآثارها في الفرد والمجتمع، مفهوم العبادة في الإسلام.

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

ان يطبق المتعلم ثقافته الاسلامية في شؤون حياته

مفردات المقرر (المحتوى – الموضوعات)

- الوحدة الأولى : مقدمات في الثقافة الإسلامية:
  تعريف الثقافة الإسلامية - مصادرها– خصائصها – موقف المسلم من الثقافات الأخرى.
- الوحدة الثانية : العقيدة الإسلامية:
  مفهوم العقيدة 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:
  - حقيقة العبادة في الإسلام – خصائصها – أنواعها – حكم ومقاصد أركان الإسلام الخمسة.
  - الغلو – مفهومه –أنواعه – حكمه – و خطره – المنهج النبوي في معالجة الغلو – مصير الغلاة – نماذج من الغلاة (الخوارج).

توصيف المهام والتكاليف:

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

استراتيجيات تدريس المقرر

المحاضرة

استراتيجيات (طرق) التقييم

بحث 10%

اختبار فصلي 10%

اختبار نهائي80%

المراجع :-

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.

اسم المقرر	رمز المقرر	عدد ساعات الاتصال		
		نظري	تطبيقات	المعتمدة
لغة عربية 1	AR1106	2	-	2

الهدف العام :-

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،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:

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) .

توصيف المهام والتكاليف:

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

استراتيجيات تدريس المقرر

المحاضرة (الكتروني)

استراتيجيات (طرق) التقييم

الكتروني

المراجـع :

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.

		عدد ساعات الاتصال		
اسم المقرر	رمز المقرر	نظري	تطبيقات	المعتمدة
الثقافة الاسلامية 11	IS1208	2	-	2

الهدف العام :-

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.

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:

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

استراتيجيات تدريس المقرر

المحاضرة

استراتيجيات (طرق) التقييم

بحث 10%

اختبار فصلي 10%

اختبار نهائي80%

المراجع :-

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.

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

الهدف العام :-

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،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)

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.

توصيف المهام والتكاليف:

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

استراتيجيات تدريس المقرر

المحاضرة (الكتروني)

استراتيجيات (طرق) التقييم

الكتروني

المراجع :-

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

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

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 علي الآتي:

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.

توصيف المهام والتكاليف

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

استراتيجيات تدريس المقرر

المحاضرة(الكتروني)

استراتيجيات (طرق) التقييم

الكتروني

المراجع :

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

عدد ساعات الاتصال				
اسم المقرر	رمز المقرر	نظري	تطبيقات	المعتمدة
English Language I	EN1107	2	-	2

الهدف 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

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

استراتيجيات تدريس المقرر

- Lecture
- Exercises and drills

استراتيجيات (طرق) التقييم

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

المراجع :-

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	EN1207	English Language II

الهدف 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. 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

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

استراتيجيات تدريس المقرر

- Lecture
- Exercises and drills

استراتيجيات (طرق) التقييم

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

المراجع :-

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.

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

الهدف العام :-

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

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

استراتيجيات تدريس المقرر

- Lecture
- Exercises and drills

استراتيجيات (طرق) التقييم

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

المراجع :-

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.

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

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

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

مفردات المقرر (المحتوى – الموضوعات)

- دراسة المصطلحات الانجليزية الخاصة بالمجالات الهندسية المختلفة.
- دراسة المصطلحات والإختصارات 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:

1- Emily Austin Thrush, Laurie Blass and 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