Jordan University of Science and Technology

Faculty of Engineering

Department of

Mechanical Engineering

Study Plan of Bachelor Degree in Mechanical Engineering

2016

Important Contacts

Jordan University of Science and Technology

P.O. Box: 3030 Irbid 22110 Jordan

Tel: (962)-2-7201000

Fax: (962)-2-7095141

E-mail: prsdy@just.edu.jo

Faculty of Engineering

Tel: (962)-2-7201000 Ext. 22525

Fax: (962)-2-7201074

E-mail: eng@just.edu.jo

Department of Mechanical Engineering

Tel: (962)-2-7201000 Ext: 22640

Fax: (962)-2-7201074

E-mail: me@just.edu.jo

Deanship of Students affairs

Tel: (962)-2-7201000 Ext: 22543

Fax: (962)-2-7201043

E-mail: studentaffairs@just.edu.jo

Admission and registration unit

Tel: (962)-2-7201000 Ext: 27174

Fax: (962)-2-7095145

E-mail: register@just.edu.jo

International Students Office

Tel: (962)-2-7201000 Ext: 23040

Fax: (962)-2-7201025

E-mail: iso@just.edu.jo

Vision:

To be a recognized as a national and regional pioneer program in mechanical engineering education, research, and community engagement.

Mission:

To graduate competent mechanical engineers who fulfill market needs and are equipped with sound mechanical engineering knowledge and research and fundamental skills capable of working in diverse environments and able to contribute to the national sustainable development plans.

Objectives:

1. To equip students with the technical knowledge necessary to work effectively as mechanical engineers in an industrial environment.
2. To provide students with adequate experience to design systems as individuals and within teams.
3. To qualify engineers who respect the ethics of their profession.
4. To equip students with good communication skills.
5. To prepare students for life-long learning and continuing education.
6. To achieve international reputation in distinct research areas including but not limited to: renewable energy, turbo-machines, intelligent systems, robotics, control, MEMS (microfluidics & Bio-MEMS), Nano technology and fracture mechanics.

Learning Outcomes:

By the time of graduation, our graduates should be able to demonstrate the ability to:

a - Apply knowledge of mathematics, science, and engineering in practice.

b - Design and conduct experiments as well as analyze and interpret data.

c - Design systems, components, or processes to meet the desired needs.

d - Function within multidisciplinary teams.

e - Identify, formulate, and solve engineering problems.

f - Understand professional and ethical responsibilities of mechanical engineers.

g - Communicate effectively.

h - Obtain broad knowledge to understand the implications of engineering solutions within global and societal contexts.

i - Recognition of the need for, and possess the ability to engage in, lifelong learning.

j - Possess knowledge of contemporary issues.

k - Use the techniques, skills, and modern engineering tools necessary for engineering practice.

l - Adhere to safety rules and regulations.

Objectives - outcomes mapping table

		Objectives					
		1	2	3	4	5	6
outcomes	a	×					
	b	×					
	c	×					
	d		×				
	e	×					
	f			×			
	g				×		
	h	×					
	i					×	
	j					×	×
	k					×	
	l	×					

ME Undergraduate Curriculum

Course Coding (Numbering)

A two letters (or three letters, if necessary) and three 3-numbers code is given to each course offered by the dept. as shown below:

Department			Level/Year	Field	Sequence
A	B	C	X	Y	Z

The Department codes (A, B, C) are selected as follows:

Code	Department
AE	Architectural Engineering
CE	Civil Engineering
ME	**Mechanical Engineering**
EE	Electrical Engineering

Code	Department
IE	Industrial Engineering
ChE	Chemical Engineering
BME	Biomedical Engineering
NE	Nuclear Engineering

Therefore, courses in Mechanical Engineering will have numbers of the form **ME** XYZ, where the coding of X, Y and Z is described as follows:

A- The middle digit (Y) denotes the course subject area as follows:

Number	Field
0	General/Miscellaneous
1	General Mechanics (Dynamics & Strength of Materials)
2	Thermodynamics & Microcontrollers/Processors
3	Mechanical Design & Mechatronics System Design
4	Fluid Mechanics & Industrial Automation
5	Heat Transfer & Energy
6	Vibration & Control
7	Engineering Measurements, Data Acquisition & Signal Processing& Managements
8	HVAC, Refrigeration & Intelligent Systems
9	Projects, Special Topics & Training

B- The leftmost digit (X) denotes the level of the course according to student's study plan as follows:

Number	Level of Course
1	First year
2	Second year
3	Third year
4	Fourth year
5	Fifth year.

C- The rightmost digit (Z) denotes the course sequence in its subject area (Odd numbers represent first semester and even numbers represent second semester courses.

Example:

ME 511			
ME	5	1	1
Department	5th year level	General Mechanics field	1st semester sequence / offering

Framework for ME B.Sc. Degree (160 Semester Credits)

The Bachelor of Science (B.Sc.) degree in ME in the Faculty of Engineering at JUST is awarded in accordance with the **Statute stated in the JUST regulations** for B.Sc. awarding issued by the Deans' council based on the 1987 law for awarding scientific degrees and certifications at JUST and after the successful completion of 160 credit hours (C.H). The 160 C.H are distributed as shown in Tables (1).

Table 1: Distribution of credit hours

Classification	Credit Hours		
	Compulsory	Elective	Total
University Requirements	16	9	25
College Requirements	31	-	31
Department Requirements	85	19	104
Total =	**132**	**28**	**160**

Degree Requirements

University Requirements (25 Credit Hours)

Students are required to study a total of 25 credit hours (16 compulsory and 9 electives), as follows:

a- Compulsory: (16 Credit Hours)

Table 2: University compulsory courses (16 credit hours).

Course No.	Course Title	Cr. Hr.	Lecture	Lab.	Pre-requisite or Co-requisite
Arb 101	Arabic Language	3	3	0	
HSS 110	Social Responsibility	3	2	1	
HSS 119	Entrepreneurship And Innovation	2	2	0	
Eng 112 (1)	English Language II	3	3	0	Eng 111
HSS 129	General Skills	2	3	0	
MS 100 (2)	Military Science	3	3	0	
	Total	**16**			

Notice: All the non Arabic Speaking foreign students in the University are required to study one course in Arabic language as shown in Table (3):

Table 3: Courses for non Arabic Speaking Students

Course Code & No.	Course Name	Credit Hrs
Arb 101A [3]	Fundamentals of Arabic Language (for non Arabic speaking students as a substitute for the course Arb101 Arabic Language)	3

(1) Pre-requisite: Eng 111 or passing the English Language Placement Test with a grade > 80%. Students who have a TOEFL score of > 500 are exempted from both ENG 099 and Eng. 111.

(2) This course is required from Jordanian students only; graded on Pass/Fail basis. Students graduating from Royal Military faculty and military candidate's school and equivalent institutes are exempted from taking this course. Non-Jordanian Arabic speaking students are required to take a substitute for this course from the elective courses and in this case the grade of this course is included in their grade point average (GPA).

(3) The director of the Admission and Registration Department is permitted to determine the students from non-Jordanian/non-Arabic speaking who are eligible to take ARB 101A.

a- University Elective: (9 Credit Hours)

A total of 9 credit hours should be selected from the list of elective courses listed in the table (4).

Table 4: University elective courses.

Course No.	Course title	Credit hours	Theoretical	Lab
ADS 100	Oral and Dental Health (for non-Dentistry and non Dentistry Sciences students)	3	3	0
AP 200	Farm Animal Products And Production (For Non Agriculture And Veterinary Students)	3	3	0
ARB 200	Appreciation of Literary Texts	3	3	0
CHEM 191	Introduction to the Nanotechnology	3	3	0
ES 103	Environment Protection (for non Environnent Sciences surdents)	3	3	0
HSS 105	Basic French Language	3	3	0
HSS 106	Basic German Language	3	3	0
HSS 115	Islam and Recent Problems	3	3	0
HSS 116	Economic system in Islam	3	3	0
HSS 121	Principles of Sociology	3	3	0

Course No.	Course title	Credit hours	Theoretical	Lab
HSS 126	Principles of Psychology	3	3	0
HSS 127	Educational Technology	3	3	0
HSS 128	National Education	3	3	0
HSS 131	Islamic Civilization	3	3	0
HSS 132	The History of the City of Jerusalem	3	3	0
HSS 133	Civilization and Recent Cultures	3	3	0
HSS 135	Islamic culture	3	3	0
HSS 137	Human rights	3	3	0
HSS 141	Introduction to Economics (for non CIS students)	3	3	0
HSS 142	Library and Information Research	3	3	0
HSS 151	Introduction to Management Sciences (for non CIS students)	3	3	0
HSS 161	Contemporary Problems	3	3	0
HSS 166	Man and Science	3	3	0

Course No.	Course title	Credit hours	Theoretical	Lab
HSS 211	Sociology in English	3	3	0
HSS 212	Arab Society	3	3	0
HSS 213	Individual and Society	3	3	0
HSS 216	International Global Issues	3	3	0
HSS 221	Introduction to Psychology in English	3	3	0
HSS 222	Creativity and Problems Solving	3	3	0
HSS 224	Leader ship and Communication Skills	3	3	0
HSS 231	History of Science in Islam	3	3	0
HSS 250	The History of music in English	3	3	0
HSS 429	The Science of Children behavior	3	3	0
ME 102	Introduction to renewable energy	3	3	0
ME 211	Fundamentals of Automobile Engineering (for non ME students)	3	3	0
NF 177	Food Preservation (in English)	3	3	0
NR 200	Natural Resources and man	3	3	0
NUR 100	Health Promotion (for non Medicine, non Nursing, and non Midwifery students)	3	3	0

Course No.	Course title	Credit hours	Theoretical	Lab
PH 104	Community Health and Nutrition (for non Medicine, non Nursing, and non Midwifery students)	3	3	0
PH 200	First Aid (for non Medicine, non Nursing, and non Midwifery and paramedic students)	3	3	0
PHAR 104	Drugs and Medicinal Plants in Jordan	3	3	0
PP 200	Home Gardens (for non Agriculture students)	3	3	0
PP 201	Bee Keeping (for non Agriculture students)	3	3	0
PP 202	Natural plants of Jordan (For Non agriculture Students)	3	3	0
PT 100	wellness and Life Style (for non physical therapy students)	3	3	0
VM 211	Animal Health (for non Veterinary Medicine and non Agriculture students)	3	3	0
VM 212	Pet Animal Care (for non VM and Agriculture students)	3	3	0
VM 213	Animal Behaviour and Welfare	3	3	0

B. Faculty Requirements: (31 credit hours) distributed as follows:

I. Courses from the Faculty of Engineering (2 C.H):

a) Courses form the Mechanical Engineering Department (2 C.H):

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite
ME 100	Engineering Workshops	1	0	3	---
ME 200	Engineering Drawing A	1	0	3	CIS 100
Total		2	0	6	

II. Courses from the Faculty of Science and Arts (26 C.H)

a) Mathematics Courses (12 C.H):

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite
MATH 101	Calculus 1	3	3	0	---
MATH 102	Calculus 2	3	3	0	MATH 101
MATH 201	Intermediate Analysis	3	3	0	MATH 102
MATH 203	Ordinary Differential Equations	3	3	0	MATH 102
Total		12	12	0	

b) Physics Courses (7 C.H):

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite
PHYS 101	General Physics 1	3	3	0	---
PHYS 102	General Physics 2	3	3	0	PHYS 101
PHYS 107	General Physics Lab	1	0	3	PHYS 102 (or Co.)
Total		7	6	3	

a) Chemistry Courses (7 C.H):

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite
CHEM 101	General Chemistry 1	3	3	0	---
CHEM102	General Chemistry 2	3	3	0	CHEM 101
CHEM107	General Chemistry Lab	1	0	3	CHEM 102 (or Co.)
Total		7	6	3	

III. Courses from the Faculty of Computer and Information Technology (3 C.H)

Course No.	Course title	Credit hours	Theoretical	Lab	Prerequisite/Co-request
CS114	Programming For Engineers	3	3	0	CIS 100
Total		3	3	0	

Department Requirements: (104 Credit Hours)

The compulsory course requirements include a total of 104 credit hours as follows:

A- Department compulsory courses (85 credit hours) listed in Table 6

Table 6: (Department compulsory courses)

Course No.	Course Title	Cr. hr.	Lecture	Lab.	Pre-requisite or Co-requisite
ME 103	Engineering Workshop theoretical	1	1	0	Co. ME 100
ME 100	Engineering Workshop	1	0	3	
ME 201	Engineering Drawing B	1	0	3	Pre CIS 100, Co. ME 200
ME 202	Mechanical Drawing	2	0	6	ME 201 , ME 200
ME 211	Statics	3	3	0	Phys 101

ME 212	Dynamics	3	3	0	ME 211 (Pass)
ME 214	Strength of Materials	3	3	0	ME 211 (Pass)
EE 303	Fundamentals of Electrical Engineering (none EE students)	3	3	0	Phys 102, Math 102
EE 304	Electric Drives	3	3	0	EE 303
ME 304	Engineering Economics and management	3	3	0	Math 201
ME 305	Applied Mathematics for Engineers	3	3	0	Math 201, Math 203
ME 306	Numerical Methods for Engineers	3	3	0	CS114, ME 305
EE 306	Electrical Engineering Lab.	1	0	3	EE 304
ME 311	Mechanics of Machinery	3	3	0	ME 212 (Pass)
ME 312	Mechanics of Materials Lab	1	0	3	ME 214, IE 361
ME 320	Fundamentals of Electronics and Digital Logic	3	3	0	EE 303
ME 321	Thermodynamics (1)	3	3	0	Phys 101, Math 203, CHEM 102
ME 322	Thermodynamics (2)	3	3	0	ME 321 (Pass)
ME 332	Machine Design I	3	3	0	ME 214 (Pass), ME 202
ME 343	Fluid Mechanics	3	3	0	ME212 , ME 321
IE 363	Engineering Materials	3	3	0	ME 103 ME 214
IE 366	Manufacturing Processes I	3	3	0	IE 363
ME 425	Microcontroller Applications	**3**	**3**	**0**	ME 320, CS114
ME 433	Machine Design II	3	3	0	ME 332 (Pass)

ME 445	Thermo fluids Lab.	1	0	3	Pre ME 343, Co. ME 451 , Pre ME 322
ME 451	Heat Transfer	3	3	0	ME 305, ME 343,ME 322
ME 462	Automatic Control	3	3	0	Co. ME 463
ME 463	Mechanical Vibrations	3	3	0	ME 305, ME 212
ME 464	Control systems Lab.	1	0	3	ME 425
IE 469	**Manufacturing Process Lab**	1	0	3	IE 366
ME 471	Instrumentation	3	3	0	ME 343, EE 303
ME 472	Instrumentation and Dynamic Systems Lab.	1	0	3	ME 471, ME 463
ME 490	Engineering Training	3	-	-	Completion of117C.H.
ME 591	Graduation Project I	1	-	-	Completion of 114C.H.
ME 592	Graduation Project II	3	-	-	ME 591
ME 593	Projects in Mechanical Design	2	1	3	ME 433

- Eight weeks of practical engineering training in an institution working in the field of mechanical engineering and accredited by the Deanship of the Faculty of Engineering upon the recommendation of the department.

B- Technical Electives(**Minimum 19 credit hours**) can be selected from the courses listed from Table 7

Table 7: (Department Technical Electives)

Course No.	Course Title	Cr. hr.	Lecture	Lab.	Pre-requisite
ME 532	Design of Thermal Systems	3	3	0	ME 306, ME 451
ME 527	Automotive System	3	3	0	ME 322
ME 528	Thermal Power Plants	3	3	0	ME 322
ME 529	Thermal Power Lab.	1	0	3	ME 445
ME 581	Heating Ventilation and Air Conditioning	3	3	0	ME 451
ME 533	Mechatronics Systems Design	3	3	0	ME 425, ME 462
ME 542	Industrial Automation	3	3	0	ME 425, ME 462
ME 543	Mechatronics Lab.	1	0	3	Pre/Co. ME 542
ME 547	Robotics	3	3	0	ME 462
ME 564	Digital Control	3	3	0	ME 463

ME 535	Design of Renewable Energy Systems	3	3	0	ME 306, ME 451
ME 536	Renewable Energy Lab	1	0	3	ME 535
ME 553	Solar Concentrated Energy System	3	3	0	ME 451
ME 555	Wind Energy	3	3	0	ME 320
ME 557	Photovoltaic s Cells System	3	3	0	ME 462
ME501	Water Desalination ME 532	3	3	0	ME 451
ME 502	Vision Technology for Mechatronics	3	3	0	ME 425
ME 505	Finite Elements Analysis	3	3	0	ME 306
ME 514	Mechanics of Materials II	3	3	0	ME 214
ME 515	Modeling, Simulation and Analysis of Physical Systems	3	3	0	ME 462
ME 520	Introduction to Micro-Electro-Mechanical-Systems	3	3	0	ME 462
ME 524	Fuel and Combustion	3	3	0	ME 322
ME 526	Real Time Systems	3	3	0	ME 425, ME 462
ME 540	Gas dynamics	3	3	0	ME 343
ME 541	Fluid Power Control	3	3	0	ME 343, ME 462
ME 544	Turbomachinery	3	3	0	ME 322
ME 548	Autotronics	3	3	0	ME 462, ME 471
ME 549	Introduction to Intelligent Systems	3	3	0	ME 462

ME551	Energy and Environment	3	3	0	5th year standing
ME 552	Bio Fuel	3	3	0	ME 322
ME 554	Renewable Energy	3	3	0	5th year standing
ME 556	Industrial Heat Exchangers	3	3	0	ME 451
ME 558	Sustainable Energy Conversion	3	3	0	ME 343
ME 559	Economics of Renewable Energy System	3	3	0	5th year standing
ME 562	Acoustics	3	3	0	ME 463
ME 574	Maintenance Engineering	3	3	0	IE 364
ME 575	Safety Engineering	3	3	0	IE 364
ME 577	Engineering Project Managements	3	3	0	ME 304
ME 582	Refrigeration	3	3	0	ME 322
ME 594A	Special Topics in Mechanical Engineering	3	3	0	Department approval
ME 594B	Special Topics in Mechanical Engineering	3	3	0	Department approval
ME 594C	Special Topics in Mechanical Engineering	3	3	0	Department approval

Study Plan for the B.Sc. Degree in Mechanical Engineering

First Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
HSS 110	Social Responsibility	3	-
Math 101	Calculus 1	3	-
Phys 101	General Physics 1	3	-
Chem 101	General Chemistry I	3	-
ME 103	Engineering workshops theoretical	1	CO ME 100-
ME 100	Engineering Workshops	1	-
Eng 112	English Language 2	3	Eng 111
Total		**17**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
Arb 101	Arabic Language	3	-
Phys 102	General Physics 2	3	Phys 101
Chem 102	General Chemistry2	3	Chem 101
Math 102	Calculus 2	3	Math 101
HSS 119	Entrepreneurship And Innovation	2	
Chem 107	General Chemistry Lab	1	Pre/ Co. Chem 102
HSS 129	General Skills	2	
Total		**17**	

Second Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
MS 100	Military Science	3	
Phys 107	General Physics Lab	1	Pre/Co. Phys. 102
CS 114	Programming for Engineers	3	CIS 100
Math 201	Intermediate Analysis	3	Math 102
ME 211	Statics	3	Phys 101
ME 200	Engineering Drawing A	1	CIS 100
ME 201	Engineering Drawing B	1	Pre/CIS 100, Co. ME200
Total		**15**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 202	Mechanical Drawing	2	ME 201, ME 200
Math 203	Ordinary Differential Equations I	3	Math 102
ME 212	Dynamics	3	ME 211
ME 214	Strength of Materials	3	ME211
ME304	Engineering Economics and mgt	3	Math 201
	University Elective (1)	3	
Total		**17**	

Third Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 305	Applied Math for Engineers	3	Math 201, Math 203
EE 303	Fundamentals of Electrical Engineering	3	Phys 102
ME 321	Thermodynamics I	3	Phys 101, Math 203
ME 332	Machine Design 1	3	ME 202, ME 214
IE 363	Engineering Materials	3	ME 103, ME 214
ME 312	Mechanics of Materials Lab	1	ME 214, IE 361
Total		**16**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 311	Mechanics of Machinery	3	ME 212
ME 320	Fundamentals of Electronics and Digital Logic	3	EE303
ME 322	Thermodynamics 2	3	ME 321
ME 343	Fluid Mechanics	3	ME 212, ME 321
IE 366	Manufacturing Processes I	3	IE 363
ME 306	Numerical Methods for Engineers	3	CS 114 , ME 305
Total		**18**	

Fourth Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 433	Machine Design 2	3	ME 332
EE 304	Electric Drives	3	EE303
ME 471	Instrumentation	3	ME 343, EE 303
ME 425	Microcontroller Application	3	ME 320, CS 114
IE 469	Manufacturing Process Lab	1	IE 366
	University Elective (2)	3	
Total		**16**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
EE 306	Electrical Engineering Lab.	1	EE 304
ME 451	Heat Transfer	3	ME 343, ME 305, ME 322
ME 462	Automatic Control	3	ME 463
ME 464	Control system lab	1	ME 425
ME 445	Thermo-fluid Lab	1	Pre ME 343, Pre ME 322, Co. ME451
ME 463	Mechanical Vibration	3	ME 212 ME 305
	Track Elective (1)	3	
Total		**15**	

Summer Session

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 492	Engineering Training	3	**Completion of 117 credit hours**
Total		**3**	

Fifth Year

First Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 472	Instrumentation and Dynamic Systems Lab.	1	ME 471, ME 463
ME 591	Graduation Project I	1	Completion of 120 credit hours
ME 593	Projects in Mechanical Design	2	ME 433
	University Elective (3)	3	
	Technical Elective (2)	3	
	Technical Elective (3)	3	
Total		**13**	

Second Semester

Course Number	Course Name	Credit Hours	Pre-Requisite
ME 592	Graduation Project II	3	ME 591
	Technical Elective (4)	3	
	Technical Elective (5)	3	
	Technical Elective (6)	3	
	Track Elective LAB	1	
Total		**13**	

Mechanical Engineering Department Course Description

ME 101: Engineering Workshops (2CH)

Development of basic skills in fields of hand filing, turning, welding, piping and plumbing, carpentry, sand casting, glass works, sheet metal fabrication, and household electric circuits. Theories related to metal machining, measurements, metal forming, sand casting, and welding.

Pre: none

ME 101: Engineering Workshop Lab.

ME 201: Engineering Drawing B (1CH)

Drawing Instruments and their use, graphical geometry, lettering, orthographic and isometric drawing and sketching, sectional views.Introduction to descriptive geometry.Surface intersections and developments.Computer graphics.

Pre: CIS 100 CO ME 200

ME 202: Mechanical Drawing (2CH)

Auxiliary views.Temporary fasteners and springs; their construction and standards.Power screws and welded symbols. Dimensioning, tolerance, limits and fits using ISO system. Detail and working drawings.Assembly drawings.

Pre: ME 201 , ME 200

ME 211: Statics (3CH)

Force vectors and resultant. Free-body diagram of forces and equilibrium of particles and rigid bodies.Moment of a force about a point and about an axis.Equilibrium of rigid body.Analysis of trusses and frames. Shear forces diagrams and bending moment diagrams. Center of area and moment of inertia of an area.

Pre: Phys 101

ME 212: Dynamics (3CH)

Dynamics of particles, two- and three-dimensional dynamics of rigid bodies, moment of inertia, work and energy, impulse and momentum for rigid bodies.

Pre: ME 211

ME 214:Strength of Materials (3CH)

Concepts of stress and strain.Stresses and displacements of axially loaded members.The state of stress and strain; Normal, bending, shear, and torsion stresses.Mechanical properties of materials, combined stresses, composite sections. Deflections: integration Method, Moment area method, Buckling of columns.

Pre: ME 211.

ME 215: Engineering Mechanics (for none ME students) (3CH)

Statics of particles, rigid bodies.Equilibrium of rigid bodies.Distributed forces.Moment of inertia. Rigid bodies kinematics. Rigid bodies kinetics. Newton's second law.Work and energy for rigid bodies.Impulse and momentum for rigid bodies, oscillations.

Pre: Phys 101

ME: 216 Modern Programming Tools (3CH)

Programming and software tools for engineer, variables and basic data types, control structures and loops, functions, arrays, structures, classes and objects, constructors and destructors, inheritance, pointers and references to objects, streams and files. Weekly laboratory experiments will provide hands-onexperience in topics covered in this course.

Pre: CIS 100

EE 304: Electric Drives (3CH)

Introduction to electric drives; DC drives; AC drives: induction motors, synchronous motors, reluctance and stepping motors; servomotor drives

Pre: EE 303.

ME 304: Engineering Economies and mgt (3CH)

Time value of money, interest formulas, judging attractiveness of proposed investment using different methods, depreciation, inflation, sensitivity analysis, increment cost and sunk cost. Retirement and replacement.

Pre: Math 201

ME 305: Applied Mathematics for Engineers (3CH)

Laplace transformation, complex variables and complex integration.Applications to solutions of ordinary differential equations. Fourier series, half range expansion. Solutions of partial differential equations using separation of variables and Laplace transformation techniques, probability, permutations and combinations.

Pre : Math 201, Math 203

ME 306: NumericalMethods for Engineers(3CH)

Errors in computations.Roots of equation.System of linear algebraic equations including eigenvalues problems.Interpolations and curve fitting.Numerical integration and differentiation.Ordinary differential equations including boundary and initial value problems.Introduction to numerical solution of partial differential equation.

Pre: CS 114 , ME 305

ME 311: Mechanics of Machinery (3CH)

Kinematic analysis of mechanisms.Velocity and acceleration polygons. Static and inertia force analysis of machinery. Dynamic analysis of cams, gear and gear trains. Balancing of machines.

Pre: ME 212

ME 312: Mechanics of Materials Lab. (1CH)

Strength of material experiments including: hardness, Tensile, compression, impact. Torsion. Creep. Buckling and fatigue tests.Experiments on thin pressure vessels, non-destructive testing, heat treatment, and casting.

Pre: ME 214, IE361

ME 320 : Fundametals of Electronics and Digital Logic

Provide electronic and digetal Systems Fundamentals for mechatronics systems ; Diodes, transistors, operational amplifires and A/D and D/A convesion introductron to digital logic systems including ; combinational and sequential logic and slip-flops with application.

Pre : EE 303

ME 321: Thermodynamics I (3CH)

Properties and behavior of a pure substance, work and heat, first law and second law analysis of closed and open systems.

Pre: Phys 101, chem102. , math 203

ME 322: Thermodynamics 2(3CH)

Availability and Irreversibility.Vapor and air-standard power and refrigeration cycles.Thermodynamic relations.Ideal and real mixtures and solutions.Chemical reactions, phase and chemical equilibrium.

Pre: ME 321

ME 332: Machine Design I(3CH)

Introduction to design process. Design considerations. Tolerances, fits and surface finish. Stress analysis and deflection of mechanical elements. Energy methods.Design of screws.Failure of machine elements.Fatigue.

Pre: ME 214, ME 202

ME 343: Fluid Mechanics (3CH)

Fluid and their properties.Fluid Statics.Kinematics of fluid flow.Conservation equations and their applications.Euler's equation applications, Bernoulli's equation applications, Dimensional analysis and similarity. Pipe flows, Calculations of head losses.

Pre: ME 212 , ME 321

ME 425: Microcontrollers applications (3CH)

Introduction to Microcontroller based systems; architecture, basic assembly language programming, stacks, interrupts, communication. A/D conversion and timer subsystems with applications.

Pre: CS114 , ME 320

ME 433: Machine Design II (3CH)

Fasteners and connections.Welded joints, mechanical springs, spur gears, shafts, belts, chains and rolling bearings.Lubrication and journal bearings.

Pre: ME 332

ME 445:Thermo-fluid Lab. (1CH)

Experiments on thermo-fluid systems including: pipe flows, flow meters, hydrostatic forces, pump performance, jet forces, thermal conductivity, heat transfer coefficients, heat exchanger performance, air-conditioning processes, refrigeration cycles, boiling and condensation, and steam devices.

Pre/.: ME 343, ME 451 , pre ME 322

ME 451: Heat Transfer (3CH)

Modes of heat transfer, Steady heat conduction, Thermal resistance method, Transient heat conduction, Convection and Radiation heat transfer, Heat balance method, Heat transfer correlations, Heat exchangers.
Pre: ME 343, ME 305 , ME 322

ME 462: Automatic Control (3CH)

System modeling. Transfer functions, block diagrams and signal flow graph. Time domain analysis, transient response, steady-state error, stability and sensitivity.Routh's stability criterion. Root locus. Frequency domain analysis, Bode plots. Control system design by compensation.

Co: ME 463

ME 463: Mechanical Vibrations (3CH)

Properties of oscillatory motion.Derivation of governing differential equations.Free and damped vibrations. Harmonically excited motion, rotating and reciprocating unbalance, support motion. Vibration measurements.Vibration isolation.Transient vibrations.Free and forced vibrations in multi-degrees-of-freedom systems.Vibration absorbers.Continuous systems.

Pre: ME 305, ME 212

ME 464: Control Systems Lab.
Fundamental concepts of electronics and digital logic circuit, and microcontroller programming interfacing and applications on classical control concepts.

ME 425

ME:471 Instrumentation (3CH)

Analysis of experimental data.Statistics; mean and variance, Basic electronic measurement and sensing devices, Displacement, area, force , torque , pressure, strain, fluid flow, temperature, and thermal and transport properties measurements.

ME 472: Instrumentation and Dynamic Systems Lab. (1CH)

System response and performance.Dynamic and vibration measurements of systems.Strain and temperature measurements.Operational amplifiers.Data acquisition.

Pre: ME 471, ME463

ME 492: Engineering Training (3CH)

Eight weeks of practical training in an institution (university, company, …etc) that is accredited by the mechanical engineering department and faculty of engineering at JUST for training purposes in the field of mechanical engineering.

Pre: Completion of 117 credit hours

ME 501: Water Desalination (3CH)

Water analysis and treatment.Analysis and design of different types of desalination processes. Distillation processes: multi-stage, multi-effect distillation, and vapor compression. Membrane processes: electro-dialysis and reverse osmosis. Desalination by freezing.

Pre: ME 451

ME 502:Vision Technology for Mechatronics (3CH)

Provide the student with introduction to machine vision: vision systems, image analysis, processing, application and integration for mechatronics systems.
Pre: ME 425

ME 505: Finite Elements Analysis (3CH)

Basic concepts of the finite element method.Spring, bar, beam and triangular elements. Plane stress and plane strain models. Axisymmetric elements.3D stress analysis. Applications to heat transfer, fluid mechanics, vibrations and thermal stresses.

Pre: EE 305

ME 514:Mechanics of Materials II (3CH)

Introduction to plastic behavior of materials.Bending of curved beams.Flat plates.Buckling of eccentric loaded columns. Shear center. Unsymmetrical bending.Energy methods.Beams on elastic foundations.Dynamic loading.

Pre: ME 214

ME 515: Modeling, Simulation and Analysis of Physical Systems (3CH)

Definition and classification of dynamic systems and components.State-variables and input-output models.Modeling of system components: electrical, mechanical, fluid, and thermal.Modeling of multi-domain systems.Nonlinear systems and linear representations of nonlinear components.Simulation techniques.Analysis and solution techniques for linear systems. Transfer functions and block diagrams. MATLAB based case studies.

Pre: ME 462

ME 520: Introduction to Micro-Electro-Mechanical-Systems (MEMS) (**3CH**)
Overview of MEMS and Microsystems; history and industry perspective. Scaling laws in iniaturization.Working principles of Microsystems; micro-sensorsandmicro-actuators. Microsystems design, modeling and fabrication processes. Case studies on several classes of devices including Bio-MEMS, microfluidics, RF MEMS, micro-robotics

Pre: ME 462

ME 524: Fuel and Combustion(3CH)

Fuel properties and handling.Combustion thermodynamics.Chemical equilibrium.Introduction to chemical kinetics.Combustion in internal combustion engines.

Pre: ME 322

ME 526: Real Time Systems(3CH)

sample rate selection, pre-filtering, quantization effects and computational delay; scheduling theory and priority assignment to control processes, timing of control loops, effects of missed deadlines; time based characteristics of sensors and devices, embedded processors, processor/device interface, real time operating systems, real time programming of mechatronics systems.

Pre: ME 425, ME 462

ME 527: Automotive Systems (3CH)
Engine cycles, gas-exchange processes, fuel metering, ignition, combustion and emissions, turbo-charging and overall performance. Electrics and electronics, control and instrumentation, sensors and actuators. Electronic engine and vehicle control.
Pre: ME 322

ME 528: Thermal Power Plants (3CH)

Actual Rankine cycles: Boilers and furnaces, Steam turbines, and condensers. Actual Brayton cycles: compressors, combustors, and turbines. Cogeneration and combined systems. Power plant economics.
Pre: ME 322

ME 529: Thermal Power LAB (1CH)

Experiments and related analysis for internal combustion engines, gas turbines, steam power plants, cooling tower, air compressor analysis, fuel tests and continuous combustion systems.

Pre: ME 445

ME 532: Design of Thermal Systems (3CH)

Modeling of thermal systems.Basic optimization techniques such as Langrange multipliers, dynamic programming, research methods and calculus of variation.Case studies.

Pre: EE 306, ME451

ME 533: Mechatronics Systems Design (3CH)

Integrates the knowledge gained in previous courses; covers theory and real design steps of mechatronics systems integration including: sensors, input/output interfacing circuits, microcontroller programming and actuators, through emphases on case study group projects.

Pre : ME 425 , ME 462

ME 535: Design of Renewable Energy System(3CH)

Scientific and technological fundamentals of renewable energy sources: passive and active solar systems (high, medium and low temperature thermal solar collectors; photovoltaic systems); wind energy; biomass and bio-energy; waste management; hydrogen production, hydroelectric power; geothermal. Practical aspects of renewable energy systems; design development, exploitation and monitoring. Introduction to social, legal and market challenges of RE systems. Prospective of RE technologies, factors affecting the deployment of RE systems.

Pre: ME 306 , ME 451

ME 536: Renewable Energy Lab (1CH)

Hands-on laboratory experiments in the area of sustainable energy. The fundamental principles required will be provided prior to laboratory experimentation. Topics covered include but are not limited to, solar-thermal energy and photovoltaics, energy storage in batteries and ultra-capacitors, wind energy, ethanol production from corn and sugar and bio-diesel extraction from algae, A field-trip is also included as a part of this course.

Pre: ME 535

ME 539: Mechatronics Lab (1CH)

Introduce the students to the concept of low cost automation using pneumatic, electro-pneumatic, electro-hydraulic and PLCs integration and control.

Co: ME 533

ME 540: Gas Dynamics (3CH)

Wave propagation, Isentropic flow, Normal shock waves, Steady and 2-D supersonic flows, oblique shock waves and expansion waves, Flow in ducts with friction and heat transfer.
Pre: ME 343

ME 541: Fluid Power Control (3CH)

Fundamentals of fluid power (hydraulic and pneumatic) and its components.Pipes, compressors, pumps, motors and control. In addition, complex components, such as servo actuators and electro-hydraulic servo valves will be discussed functions and terminology. Basic circuit design, symbols, and schematic diagrams.

Pre: ME 462, ME 343

ME 542: Automation Industrial 3 ch

Design and analysis of mechatronics and automation systems.Selection and integration of actuators, sensors, hardware, and software. Programming and software design for mechatronics systems Design of logic control systems, Pneumatic and hydraulic systems, Ladder Programming, PLC's integration and programming.Case studies including automation systems, Introduction to CNC machines and programming, introducation to industrial robots.

Pre: ME 425, ME 462

ME 544: Turbo machinery (3CH)

Types of turbo machinery, energy transfer between fluid and rotor. Axial machines and centrifugal machines.Pumps, compressors, and turbines.Gas-turbine power plant and applications.

Pre: ME 322,

ME 547: Robotics (3CH)

Overview of the field of robotics and their applications; Types, locomotion, kinematics, dynamics, planning, control and design of manipulators and mobile (wheeled) robots; Robotics perception (sensors) and actuators; Multi-robotics systems.

Pre: ME 462

ME 548: Autotropic (3CH)

Fundamentals of engine and vehicle systems, Review of Electrics and Electronics, control and instrumentation, sensors and actuators, electronic engine control, vehicle motion control.

Pre: ME 462, ME 471

ME 549: Introduction to Intelligent Systems (3CH)

Classical logic and Fuzzy logic, fuzzy sets and fuzzy systems, fuzzy operations and inference, fuzzy control and applications, Introduction to Neural networks and Adaptive Neuro Fuzzy Inference System.

Pre: ME

ME 551: Energy and Environment(3CH)

Theory and practice of environment and sustainable development at urban, national and international levels. Environmental degradation by deforestation, loss of biodiversity, air pollution, global warming, soil erosion, decreasing quality and quantity of water, poor sanitation services and poor urban conditions; CO_2 emissions and global warming, interactions among society. Development and environment: implications for sustainable development. Technical, economic, ethical and philosophical aspects of sustainable development.

Pre : 5 th year standing

ME 552: Bio Fuel (3CH)

Types of Biofuels; ethanol, biodiesel, biogas, … etc. Their feedstocks, production processes, differences, advantages, and challenges. Fundamentals of thermochemical and biochemical conversions of biomass to biofuel/bioenergy. Economic trend, environmental, ethical, social, and technical innovation and technological issues associated with the use and management of biofuels.

Pre: 322

ME553: Solar Concentrated Energy System (3 CH)

Introduction to the solar energy, Solar radiation; Review of the basics of thermodynamics and heat transfer, Power plant Technologies; Types of CSP systems including CSP parabolic trough systems, CSP dish technology, CSP Fresnel technology and Solar tower; Heat storage systems; Hybridisation; Secondary use of CSP systems; Operation and maintenance of CSP systems; Power quality control and grid integration; CSP plant project planning: economical, social and environmental considerations and site assessment.

Pre: 451

ME 554 Renewable Energy (3CH)

Renewable energy sources including, solar, wind, biomass, hydroelectric and geothermal.Electric power solar, wind and future energy alternatives.

Pre: 5th year standing

ME 555 Wind Energy System(3CH)

The characteristics of sunlight.Semiconductor and P-N junctions.The behavior of solar cells.Cell properties and design.PV cell interconnection and module fabrication.Stand-alone photovoltaic system components.Designing stand-alone photovoltaic systems.Specific purpose photovoltaic applications. Remote area supply systems. Grid-connected photovoltaic systems.Photovoltaic water pumping system components.PV water pumping system design.

Pre: ME 320

ME 556: Industrial Heat Exchangers (3CH)

Forced convection heat transfer in internal flows. Free convection heat transfer,Heat exchangers. Radiation heat exchangeTypes of Heat Exchangers: Shell-and-Tube and Gasketed-plate heat exchangers. Exchanger selection.Heat transfer and pressure losses.Fouling.Heat transfer augmentation.Thermal design.Applications.Material and cost.

Pre: ME 451

ME 557 Photovoltaic cells System (3CH)

Basic characteristics of wind, site characterization, Statistical methods of wind analysis, wind resources assessment, fundamental principles of wind energy utilization, aerodynamics, mechanical and electrical design aspects. Wind machine technologies and wind turbines performance analysis. Wind power integration into the power systems, environmental impact of wind power utilization.

Pre: ME 462

ME 558: SustainableEnergy Conversion (3CH)

Forms of energy.Fossil fuels including, petroleum, coal, oil shale and tar sand, natural gas and hydrogen power.Principles of nuclear power.Renewable energy sources including, solar, wind, biomass, hydroelectric and geothermal.Conversion of thermal energy into electrical power including thermoelectric convertersand fuel cells, thermoelectric systems, electric generators and alternators.Environment and sustainable development at urban, national and international levels. Development and environment: implications for sustainable development. Technical, economic, ethical and philosophical aspects of sustainable development.

Pre: ME 343

ME 559: Economies of Renewable Energy Systems(3CH)

Technical, cost, and environmental fundamentals of emerging renewable sources of energy, including solar, wind, biomass, oceanic, geothermal, hydropower and fuel cell (hydrogen). Renewable energy sources commercialization and measurement. Economic and technical performance indicators of renewable energy and energy efficiency systems; levelized cost of electricity and payback periods.

Pre: 5th year standing

ME 562 : Acoustics (3CH)

One dimensional acoustic waves. Sound radiation and sources. Plane and spherical waves propagation. Duct acoustics. Wave transmission and reflection from solids.Noise control.

Pre: ME 463

ME 564 Digital Control (3CH)

Introduction continuous and discrete –time signals, difference equations, z-transform; sampled-data systems, sample and hold, discrete models including state-space; discrete equivalents of continuous-time systems; stability analysis; controllability and observability of sampled-data systems; design specifications; controller design using transform techniques, design using state-space methods.

Pre: ME 463

ME 574:Maintenance Engineering(3CH)

All types of maintenance management including preventive, corrective and predictive maintenance. Planning and controlling of maintenance material and spare parts. Component and systems reliability failure rate.

Pre: 5th year standing

ME 575: Safety Engineering(3CH)

Planning for safety.Government regulations.Hazard causes and prevention.Equipment safe guarding .Safety programs.Management of emergencies.

Pre: 5th year standing

ME 577:Engineering Project Managements(3CH)

Economic analysis of engineering projects.Interest rate factors.Methods of evaluation.Depreciation.Introduction to management theories and techniques.Project definition, characteristics, and phases.Network representation of projects.CPM and Pert techniques.

Pre: 5th year standing

ME 581: Heating, Ventilation, and Air Conditioning (3CH)

Air-conditioning processes; psychrometric and humid air calculations.Air quality and comfort conditions, Heating- and cooling-load calculations.Air handling units and air distribution systems.

Pre: ME 451

ME 582: Refrigeration (3CH)

The vapor compression cycle. Alternative cycles: The absorption cycle, multiple effect cycles, ejector cycles, expansion cycles, electric and magnetic cycles. Refrigerants: the properties, refrigerant mixtures. Refrigeration system components.

Pre: 5th year standing

ME 591: Graduation Project I (1CH)

Provides students the opportunity to individually explore a mechanical engineering problem or issue within their field of study and apply their education to solving the problem for the benefit of the local community and society as a whole. Students produce a short report that documents the application of previous learning, experience and knowledge to the problem at hand, and evaluates the results.

Pre: Completion of 114 credit hours

ME 592: Graduation Project II (3CH)

Students perform the experimental and practical phases associated with solving the mechanical engineering problem addressed in Graduation Capstone Project I. Students produce a full technical report that documents the research, design, results, analysis, and recommendations of the study, followed by a final presentation and defense.

Pre: ME 591

ME 593: Projects in Mechanical Design (2CH)

Introduction to computer aided engineering environment. Solid modeling.Introduction to Finite Element Methods.Optimum design.Computer applications in mechanical design.

Pre: ME 433

ME 594A: Special Topics in Mechanical Engineering (3CH)

Pre Department approval

ME 594B: Special Topics in Mechanical Engineering (2CH)

Pre Department approval

ME 594C: Special Topics in Mechanical Engineering (1CH)

Pre Department approval