Course Description in Mechanical Engineering Department
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>610111</td>
<td>Engineering Fundamentals</td>
<td>3 Cr. Hrs.</td>
<td>The Engineer: What is engineering, the technology team, successful engineer, traits of a creative engineer. Problem solving: Approach, skills, error free, estimation. Numbers: Notation, significant figures. Tables and graphs: Linear equation, power equation, exponential equation. Statistics: Normal distribution, quality control, histograms. Analysis of motion, introduction to thermodynamics, SI system of units, unit conversion, introduction to design. <strong>Prerequisite:</strong> ---</td>
</tr>
<tr>
<td>610215</td>
<td>Electrical Engineering</td>
<td>3 Cr. Hrs.</td>
<td>Definitions and units, Basic concepts (Charge, Current, Voltage, Power, Energy), Circuit elements (Independent and Dependent Voltage, Power, Sources, Resistors, Capacitors, Inductors), KVL and KCL, Mesh and nodal Circuit analysis, Network theorems, Transient analysis of RL, RC, and RLC Circuits, Introduction to AC circuits. <strong>Prerequisite:</strong> Applied Physics (211104) + Mathematics (1) 210101</td>
</tr>
<tr>
<td>610219</td>
<td>Electrical Engineering Lab.</td>
<td>1 Cr. Hr.</td>
<td>Experiments related to the material covered in 610219. <strong>Prerequisite:</strong> Electrical Engineering (610215)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
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<tr>
<td>650304</td>
<td>Engineering Analysis (3)</td>
<td>3</td>
<td>Engineering Analysis (2) (630202)</td>
</tr>
<tr>
<td></td>
<td>Complex functions; integration in the complex plane;</td>
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<td></td>
<td>Taylor and Lagrange expansions. Singularity</td>
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<tr>
<td></td>
<td>and residue theorem; conformal mapping; Gaussian</td>
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<td></td>
<td>elimination. Vector spaces; least square projections;</td>
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<td></td>
<td>Eigen values and eigenvectors.</td>
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<td></td>
<td><strong>Prerequisite:</strong> Engineering Analysis (2) (630202)</td>
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</tr>
<tr>
<td>640306</td>
<td>Engineering Skills (3)</td>
<td>3</td>
<td>English Language Skills (130102)</td>
</tr>
<tr>
<td></td>
<td>Introduction to technical reports, logical structures</td>
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<td>of technical reports, coherence on log reports. Way</td>
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<td></td>
<td>to use teamwork, editing for style and usage, scopes</td>
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<tr>
<td></td>
<td>and aims of engineering ethics. Moral reasoning and</td>
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<td></td>
<td>ethical theories, engineering as social experimentation,</td>
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<td>the engineer responsibility to safety, responsibility</td>
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<td></td>
<td>to employers, rights of engineers.</td>
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<tr>
<td>610320</td>
<td>Electronics</td>
<td>2</td>
<td>Electrical Engineering (610215)</td>
</tr>
<tr>
<td></td>
<td>Semiconductor theory, PN junction, Diode circuits</td>
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<td></td>
<td>and applications, Bipolar junction transistor</td>
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<td></td>
<td>characteristics, DC biasing and small signal analysis,</td>
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<td></td>
<td>Field effect transistor theory and applications.</td>
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<td><strong>Prerequisite:</strong> Electrical Engineering (610215)</td>
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<tr>
<td></td>
<td>Noise in semiconductor, circuits, diode circuits,</td>
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<td></td>
<td>bipolar junction, diode circuits and applications,</td>
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<td></td>
<td>bipolar junction transistor characteristics, DC biasing</td>
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<td></td>
<td>and small signal analysis, Field effect transistor</td>
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<tr>
<td></td>
<td>theory and applications.</td>
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<td><strong>Prerequisite:</strong> Electrical Engineering (610215)</td>
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<td>Course Code</td>
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<tr>
<td>610381</td>
<td>Electrical Machines</td>
<td>(3 Cr. Hrs.)</td>
<td>Transformers, DC Motors and Generators, Three-Phase Induction motors, Single-Phase Induction Motors, Three-Phase Synchronous Generator and Motor, Single-Phase Synchronous Generator and Motor, AC Series Motor, Repulsion Motor.</td>
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<td><strong>Prerequisite: Electrical Engineering (610215)</strong></td>
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<td>المحولات، مولدات ومحركات التيار المستمر، محركات ذات الأطوار الثلاثة ذات الطور الواحد، المحولات أحادية وثلاثية الأطوار مولدات ألات التيار المتّردد، مولدات وآلات الحث، مولدات وآلات متّزامنة، وآلات التيار الثابت.</td>
</tr>
<tr>
<td>610386</td>
<td>Electrical Machines Lab.</td>
<td>(1 Cr. Hr.)</td>
<td>Experiments related to the material covered in 610381.</td>
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<td><strong>Prerequisite: Electrical Machines (610381) + Electrical Engineering Lab610219</strong></td>
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<td>تجارب تتعلق بالمادة المغطاة في مساق آلات كهربائية.</td>
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<td>المتجرب السابق: آلات كهربائية (610219) + مختبر هندسة كهربائية (610381)</td>
</tr>
<tr>
<td>210101</td>
<td>Mathematics</td>
<td>(3 Cr. Hrs.)</td>
<td>General Introduction, Differentiation, Mean value theorem, Integration- the fundamental theorem and applications, Techniques of integration, Sequences, Infinite and power series, Conic section, Polar coordinators, Vector functions, differentiation, Curves, Arc- length, Applications in mechanics.</td>
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<td><strong>Prerequisite: -----</strong></td>
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<td>المجموعات. الخطوط والتوابع. النهايات والاستمرارية. المشتقات. تطبيقات على المشتقات. التكامل. تطبيقات على التكامل. التوابع غير المتناهية. طراقي التكامل.</td>
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<td>المتجرب السابق: -----</td>
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<tr>
<td>210106</td>
<td>Engineering Mathematics (2)</td>
<td>3</td>
<td>Engineering Mathematics (1) (210101)</td>
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<tr>
<td></td>
<td>Functions of several variables, Partial differentiation, Limits and continuity, The Gradient, Directional derivatives, The chain rule, Tangent lines, Tangent planes, The normal Line, Maxim and minin, The Second partial test, LaGrange method, Multiple integrals (double and triple), Line and surface integrals, Theorems of green, Gauss and stokes.</td>
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</tbody>
</table>

**Prerequisite: Engineering Mathematics (1) (210101)**

*الإجراح. التكاملات المتعددة (التينائي والتالانتي). التكامل على الخط وعلى السطح. نظريات جرين وجاوس وستوكس.*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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</thead>
<tbody>
<tr>
<td>630201</td>
<td>Engineering Analysis (1)</td>
<td>3</td>
<td>Engineering Mathematics (2) (210106)</td>
</tr>
</tbody>
</table>

**Prerequisite: Engineering Mathematics (2) (210106)**

*المعادلات التقاضلية والتنزوجة. المعادلات التقاضلية من الدرجة الأولى. حل المعادلات التقاضلية الخطية وغير الخطية. المعادلات التقاضلية من الدرجة الثانية والعليا. نمذجة النظم الميكانيكية و الكهربائية. تحويلات لإبلاس وتطبيقاتها. حل المعادلات التقاضلية باستخدام المتتاليات. حل المعادلات التقاضلية ذات القيمة الابتدائية. المعادلات التقاضلية الجزئية.*

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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</thead>
<tbody>
<tr>
<td>630202</td>
<td>Engineering Analysis (2)</td>
<td>3</td>
<td>Engineering Analysis (1)(630201)+ Programming Language (630203)</td>
</tr>
</tbody>
</table>

**Prerequisite: Engineering Analysis (1)(630201)+ Programming Language (630203)**

*مقدمة (تحليل الأخطاء). حل المعادلات غير الخطية. استخدام Matlab لوضع الخوارزميات العددية. التكامل العددي. حل المعادلات الخطية (المصفوفات والحدودات). فراغ الأشعة والفراغ الجزئي.*

المتطلب السابق: تحليل هندي (1) (630201) + لغة برمجة (630203)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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</thead>
<tbody>
<tr>
<td>630203</td>
<td>Programming Language</td>
<td>3 Cr. Hrs.</td>
<td>Computer Skills for Engineering and Science (2) (710104)</td>
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<tr>
<td></td>
<td><strong>Prerequisite:</strong> Computer Skills for Engineering and Science (2) (710104)</td>
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<tr>
<td>620105</td>
<td>Automobile Essentials</td>
<td>3 Cr. Hrs.</td>
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<td><strong>Prerequisite:</strong> ---</td>
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<tr>
<td>620121</td>
<td>Engineering drawing</td>
<td>3 Cr. Hrs.</td>
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<tr>
<td></td>
<td>Instruments and their use, Graphic geometry, Lettering, Orthographic and isometric drawing and sketching, Sectional views, Introduction to descriptive geometry, Surface intersections and developments, Computer (ACAD).</td>
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<td><strong>Prerequisite:</strong> ---</td>
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<td>Course Code</td>
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<td>Prerequisite(s)</td>
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<tr>
<td>620162</td>
<td>Workshop (1)  (杉Cr. Hr.)</td>
<td></td>
<td>Development of basic skills in fields of hand filing, Turning, Welding, Piping and plumbing, Carpentry, Sand casting, Glass works, Sheet metal fabrication, Metal forming.</td>
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<td><strong>Co:</strong> Engineering Drawing (620121)</td>
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<td>تطور مهارات العمل في البرادة اليدوية، الخراطة، اللحام، الأنابيب والسباكة، التجارة، السك، أعمال الزجاج، تشكيل الصائح، لحام المعادن، القياسات، نظريات تشكيل المعادن.</td>
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<td>المتطلب المتنزّم: رسم هندسي (620121)</td>
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<tr>
<td>620163</td>
<td>Workshop (2)  (杉Cr. Hr.)</td>
<td></td>
<td>Household electric circuits, Florescent lamps circuits, parallel and series circuits, switches and fuses installations, electronic welding, electronic devices maintenance and circuit-boards design.</td>
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<td><strong>Prerequisite:</strong> Workshop (1) (620162)</td>
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<td>الكهرباء البيتيّة، توصيلات الإشارة، صيانة الأجهزة الالكترونية، التوصيل على النواتي والتوازي.</td>
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<td>المتطلب السابق: مشغل هندسي (1) (620162)</td>
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<tr>
<td>620211</td>
<td>Statics</td>
<td>3 Hrs.</td>
<td>Introduction to mechanics of rigid bodies, Basic concepts: force and displacement vectors, Force systems, Equivalent force systems, Static equilibrium, Analysis of simple structures, Friction, Geometric properties: centroids and moments of inertia.</td>
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<td><strong>Prerequisite:</strong> Mathematics (1) (210101)</td>
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<td>مقدمة في ميكانيكا الأجسام الصلبة، مبادئ أساسية في تحليل القوى والمتجهات، أنظمة القوى، أنظمة القوى الموافقة، الانزلاق الاستاتيكي، تحليل تراكيب بسيطة، الاحتكاك، الخواص الهندسية، المركز المتوسط وعزم القصور الذاتي.</td>
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<td>المتطلب السابق: رياضيات (1) (210101)</td>
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<td>Course Code</td>
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<tr>
<td>620212</td>
<td>Dynamics</td>
<td>3 (Cr. Hrs.)</td>
<td>Statics (620211)</td>
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<tr>
<td></td>
<td>Review of dynamics of particles, Two and Three-dimensional dynamics of rigid bodies; Force and acceleration, Work and Energy, Impulse and momentum.</td>
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<tr>
<td>620213</td>
<td>Solid Mechanics</td>
<td>3 (Cr. Hrs.)</td>
<td>Statics (620211)</td>
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<tr>
<td></td>
<td>Introduction to mechanics of deformable bodies; concepts of stress and strain, Classification of material behavior, Stress-strain relations and generalized Hook's Law, Members under axial load, Torsion of circular rods and tubes, Bending and shear stresses in beams, Combined stresses in beams, Stress analysis and Mohr’s circle, Thin wall cylinders, Deflection of beams, Buckling of columns.</td>
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<tr>
<td>620221</td>
<td>Mechanical Drawing</td>
<td>2 Cr. Hrs.</td>
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<td>(ساعة معتمد) رسم ميكانيكي</td>
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<td></td>
<td>Auxiliary views, Temporary fasteners (threaded members, Keys, Feathers, Splines, Rivets, Cotters and springs), Their construction and standard, Power screws and welding symbols, Dimensioning, Tolerances, Limits and fits (ISO system), Detail and working drawing, Assembly drawing.</td>
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<td></td>
<td><strong>Prerequisite: Engineering Drawing (620121)</strong></td>
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<tr>
<td>620321</td>
<td>Theory of Machines</td>
<td>3 Cr. Hrs.</td>
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<td>(3 ساعات معتمدة) نظرية الآلات</td>
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<td></td>
<td>Kinematic analysis of mechanisms, Velocity and acceleration polygons, Static and inertia force analysis of machinery, Dynamic analysis of cams, Gears, Gear trains, Balancing of machines, Governors.</td>
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<td><strong>Prerequisite: Dynamics (620212)</strong></td>
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<tr>
<td>620331</td>
<td>Fluid Mechanics (1)</td>
<td>3 Cr. Hrs.</td>
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<tr>
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<td>(3 ساعات معتمدة) ميكانيكا موائع (1)</td>
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<td></td>
<td>Hydrostatics, Steady and unsteady flow, Continuity equation, Flow of incompressible ideal flow, Potential flow, Bernoulli equation, One dimensional Euler's equation, Energy equation, Impulse-Momentum principles, Dimensional analysis, Introduction to boundary layer, Fluid flow in pipes, Pipe friction.</td>
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<td><strong>Prerequisite: Dynamics (620212)+ Engineering Analysis (1) (630201)</strong></td>
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<td></td>
<td>الهيدروستاتيكي، التدفق المستقر وغير المستقر، معادلة الاستمرارية، التدفق المثالي الغير قابل للانضغاط، التدفق سالكين، معادلة برئولي، معادلة أويلر، اتجاه الدفع، معدلة الطاقة،はずです، التحليل البعدي، متخل</td>
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<td>إلى الطاقة الحدية، التدفق في الأنبوب، الاحتكاك في الأنبوب.</td>
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<td><strong>المتطلب السابق: ديناميكا (620212) + تحليل هندسي (1) (630201)</strong></td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>620331</td>
<td>Fluid Mechanics Lab.</td>
<td>(1 Cr. Hr.)</td>
<td>Experiments related to the material covered in 620331.</td>
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<td>(ساعة معتمدة واحدة)</td>
<td>تجارب تتعلق بالمادة المغطاة في مساق ميكانيكا موانع (1).</td>
</tr>
</tbody>
</table>

**Prerequisite: Fluid Mechanics (1) (620331)**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>620341</td>
<td>Thermodynamics (1)</td>
<td>(3 Cr. Hrs.)</td>
<td>Basic course in engineering thermodynamics, Properties and behavior of pure substance, First law, Second law, Entropy, System and control volume analysis.</td>
</tr>
</tbody>
</table>

**Prerequisite: Mathematics for Engineering Students (2) (210106)**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>620342</td>
<td>Thermodynamics (2)</td>
<td>(3 Cr. Hrs.)</td>
<td>Availability and irreversibility, Vapor and air-standard power and refrigeration cycles, Thermodynamic relations, Ideal and real gases and generalized charts, Non-reacting mixtures and solutions, Chemical reactions and combustion.</td>
</tr>
</tbody>
</table>

**Prerequisite: Thermodynamics (1) (620341)**

المكونات المتوفرة واللاعنباسية، دورات الطاقة المعيارية للبخار ودورات البخار والبرد، علاقات في الديناميكا الحرارية، الغازات المثلية والحقيقة والجدول العامة، المخاليط والمحاليل غير المنقولة، التفاعلات الكيميائية والاختراق.

**المتطلب السابق: ديناميكا حرارية (1) (620341)**
<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
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<tbody>
<tr>
<td>620351</td>
<td>Engineering Measurements</td>
<td>3</td>
<td>Workshop (2) (620163) + Electronics (650215)</td>
</tr>
<tr>
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</tr>
<tr>
<td>620361</td>
<td>Properties of Engineering Materials</td>
<td>3</td>
<td>Solid Mechanics (620213)</td>
</tr>
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</tr>
</tbody>
</table>


Prerequisite: Workshop (2) (620163) + Electronics (650215)

The errors, linear, angular and contour measurements, sine bar rotating table, fits and tolerances. Interchangeability, ISO shaft and hole systems of fits and tolerances. Thread metrology. Gear metrology; surface texture, out of roundness and flatness measurements. Basic electrical measurements and sensing devices DC, AC bridge, and measuring systems, transducers, smart sensors and transmitters. Force, torque and strain measurements, design of load cells.

Prerequisite: Workshop (2) (620163) + Electronics (650215)


Prerequisite: Solid Mechanics (620213)


Experiments related to the material covered in 620361 & 620213.

Prerequisite: Properties of Engineering Materials (620361) + Engineering drawing(620221)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>620401</td>
<td>Statistics and Probability (3 Cr. Hrs.)</td>
<td>(3 ساعات معتمدة)</td>
</tr>
<tr>
<td></td>
<td>Quantitative and graphical descriptive statistics, probability concepts, discrete and continuous random variables and distributions, joint probability distributions, covariance and correlation of random variables, point and interval estimation, sampling distributions, hypothesis testing, introduction to simple linear regression. Practical exercises on the application of statistical methods in engineering.</td>
<td></td>
</tr>
</tbody>
</table>

Prerequisite: Engineering Analysis (2) (630202)

620421 | Machine Design (1) (3 Cr. Hrs.) | تصميم آلات (1) |
|         | Introduction to design process, Design considerations, Tolerances, Fits and surface finish, Selection of materials, Mechanical properties of engineering materials, Stress analysis in machine elements and deflection, failure of machine elements, Fatigue, Power screws and threaded fasteners, Welded joints and riveted joints, Mechanical springs. |

Prerequisite: Solid Mechanics (620213) + Theory of Machines (620321)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>620422</td>
<td>Machine Design (2)</td>
<td>3 (3 Cr. Hrs.)</td>
</tr>
<tr>
<td></td>
<td>Mechanical power transmission components, Couplings, Friction drives (belts and pulleys, clutches and brakes), Chain selection, Wire rope selection, Gear design, Sliding bearings, Rolling bearings, Prime-mover selection, Applied engineering design of project selected by instructor with the emphasis on the design of practical mechanical engineering systems and/or components.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prerequisite: Machine Design (1) (620421)</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>620424</td>
<td>Project</td>
<td>1 (1 Cr. Hr.)</td>
</tr>
<tr>
<td></td>
<td>Practical subjects related to several topics in mechanical engineering.</td>
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</tr>
<tr>
<td></td>
<td>Prerequisite: Machine Design (2) (620422)</td>
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</tbody>
</table>

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>620431</td>
<td>Fluid Mechanics (2)</td>
<td>3 (3 Cr. Hrs.)</td>
</tr>
<tr>
<td></td>
<td>Viscous flow equations of motion, Laminar boundary layer, methods of solution, transition of laminar boundary layers, turbulent flow, Fluid forces on objects in a flow, Applications, Isentropic flow through varying area channels, Normal shock waves, Oblique shock waves, Prandtl-Meyer expansion fan, Supersonic nozzle, Supersonic airfoils, Heat transfer and friction effects.</td>
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<tr>
<td></td>
<td>Prerequisite: Fluid Mechanics (1) (620331)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit Hours</td>
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</tr>
<tr>
<td>620441</td>
<td>Heat Transfer (1)</td>
<td>3 Cr. Hrs.</td>
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</tbody>
</table>

Introduction to modes of heat transfer; one-dimensional steady state conduction; unsteady state conduction, Lumped heat capacity system; introduction to convection, Flow and thermal boundary layers, Laminar and turbulent boundary layers; convection in internal and external flows; empirical relations for forced convection heat transfer; natural convection systems; condensation and boiling; introduction to thermal radiation.

**Prerequisite:** Thermodynamics (1) (620341) + Fluid Mechanics (1) (620331)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>620442</td>
<td>Heat Transfer (2)</td>
<td>3 Cr. Hrs.</td>
</tr>
</tbody>
</table>

Review of basic concepts, Radiation properties and processes, Radiation exchange among surfaces, Two dimensional steady state conduction, analytical, graphical, and numerical solutions, One-dimensional transient conduction, Topics in connective heat transfer, Exact and Approximate problem solutions, Combined entry length solution in pipe flow, Heat transfer in turbulent and high speed flows, liquid metal heat transfer, freezing, melting, heat-pipe heat transfer, multimode heat transfer.

**Prerequisite:** Heat transfer (1) (620441)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>620446</td>
<td>Thermal Lab.</td>
<td>1 Cr. Hrs.</td>
<td>Experiments related to the material covered in 620441.</td>
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<tr>
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<td></td>
<td><strong>Prerequisite: Heat transfer (2)</strong></td>
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<td></td>
<td></td>
<td></td>
<td>تجارب تتعلق بالمادة المذكورة في مساق انتقال حرارة (2+1).</td>
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<td></td>
<td>المتطلب السابق: انتقال حرارة (2) (620444)+ مختبر ميكانيكا موانع 620336</td>
</tr>
<tr>
<td>620449</td>
<td>Refrigeration</td>
<td>3 Cr. Hrs.</td>
<td>Basic definitions and concepts; review of vapor compression and absorption cycles; compressors, condensers, evaporators, expansion devices; refrigerants; cooling towers; components of an absorption cycle.</td>
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<td><strong>Prerequisite: Thermodynamics (2) (620342)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>تعريفات ومفاهيم أساسية، مراجعة لدارات انسداد البخار والامتصاص، الضواغط، المكتفات، المبخرات، صمامات التحتم، غازات التبريد، أجزاء دارة التبريد بالامتصاص.</td>
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<td></td>
<td>المتطلب السابق: ديناميكا حرارية (2) (620342)</td>
</tr>
<tr>
<td>620452</td>
<td>Automatic Control</td>
<td>3 Cr. Hrs.</td>
<td>Linear feedback control theory, Mathematical modeling of physical systems, Transfer functions, Block diagrams, and signal flow graph, Time domain analysis of control systems, Test signals, transient response, time domain specifications, steady state error and stability, Root locus techniques, Time domain design, PID controllers, and phase-lead and phase lag controllers, Introduction to frequency domain analysis, Nyquist criterion, Bode plots and Nichols charts.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td><strong>Prerequisite: Engineering Analysis (3) 650304) + Engineering Vibration (620471)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>صيغة الأنظمة، اشتقاق الدالة المحولة، تحليل رد الفعل العابر، الانزكان، مقياس روث وهورنتر - مسار الجذر، رد الفعل بدالة الديناميكية، رسومات نايكونست وبودي (Nyquist &amp; Bode) هورزنبيرغ (Routh) تصميم ومواصفات الأنظمة، تحليل الانحراف والتحكم مقدمة في التحكم الرقمي ودالة (Z).</td>
</tr>
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<td></td>
<td>المتطلب السابق: تحليل هندسي متقدم (650304) + اهتزازات ميكانيكية (620471)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Credits</td>
<td>Description</td>
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</tr>
<tr>
<td>620356</td>
<td>Sensors and Actuators Lab.</td>
<td>(1 Cr. Hr.)</td>
<td>Experiments related to the material covered in 620351. <strong>Prerequisite: Engineering Measurements (620351) + Properties of Engineering Materials Lab 620366</strong></td>
</tr>
<tr>
<td>620457</td>
<td>Automatic Control Lab.</td>
<td>(1 Cr. Hr.)</td>
<td>Experiments related to the material covered in 620452. <strong>Prerequisite: Automatic Control (620452) + Sensors and Actuators Lab 620351</strong></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Hours</td>
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<tr>
<td>620464</td>
<td>Manufacturing Processes (2)</td>
<td>3 Cr.</td>
<td>3 hrs</td>
</tr>
<tr>
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<td>(عمليات تصنيع (2))</td>
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<tr>
<td></td>
<td><strong>Prerequisite:</strong> Manufacturing Processes (1) (620463)</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>620471</td>
<td>Mechanical Vibrations</td>
<td>3 Cr.</td>
<td>3 hrs</td>
</tr>
<tr>
<td></td>
<td>(اهتزازات ميكانيكية)</td>
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<tr>
<td></td>
<td><strong>Prerequisite:</strong> Dynamics (620212)+Advanced Engineering Analysis (650304)</td>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Hours</th>
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<tbody>
<tr>
<td>620476</td>
<td>Mechanical Vibration Lab.</td>
<td>1 Cr.</td>
<td>1 hrs</td>
</tr>
<tr>
<td></td>
<td>(مختبر اهتزازات ميكانيكية)</td>
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<tr>
<td></td>
<td>(ساعة معتادة واحدة)</td>
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<tr>
<td></td>
<td>Experiments related to the material covered in 620471.</td>
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<tr>
<td></td>
<td><strong>Prerequisite:</strong> Mechanical Vibration (620471)+Sensors and actuators lab.620356</td>
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</tbody>
</table>

تجربة تتعلق بالذات المغطاة في مجال اهتزازات ميكانيكية. (620356) مختبر أجهزة ومجالات
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>620489</td>
<td>Electric Services in Buildings</td>
<td>3 Cr. Hrs.</td>
<td>Electronics (610320) + Electrical Machines (610381)</td>
</tr>
<tr>
<td>620521</td>
<td>Computer-Aided Design</td>
<td>3 Cr. Hrs.</td>
<td>Machine Design (2) (620422)</td>
</tr>
</tbody>
</table>

**Electric Services in Buildings**

Electric lighting services; fire alarm; lighting protection; standby generators; equipment selection and sizing. Selection of speed and timing; architectural, civil, mechanical and electrical requirements. Controls, specifications, safety features, commissioning. Electrical specifications. Electrical supply. Electronic controllers.

**Prerequisite:** Electronics (610320) + Electrical Machines (610381)

**Computer-Aided Design**


**Prerequisite:** Machine Design (2) (620422)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>620525</td>
<td>Mechanical Systems Design</td>
<td>3</td>
<td>Machine Design (2) (620422)</td>
</tr>
<tr>
<td></td>
<td>The creative design process; engineering decision making; innovative conceptual product design using structured thinking techniques; open-ended design problems similar to typical mechanical systems design problems in industry; computer simulation; efficient production methods; cost analysis, social and environmental concerns.</td>
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</tr>
<tr>
<td>620531</td>
<td>Hydraulic Machines</td>
<td>3</td>
<td>Fluid Mechanics (1) (620331)</td>
</tr>
<tr>
<td>620532</td>
<td>Design of Sanitary Systems</td>
<td>3</td>
<td>Fluid Mechanics (1) (620331)</td>
</tr>
<tr>
<td></td>
<td>Basic definitions; plumbing materials; plumbing fixtures, Traps, Clean outs interceptors, and back water valves; indirect waste piping and special wastes; sizing of hot and cold water supply systems; drainage system design; vents and venting; design of storm water drains; fire fighting networks.</td>
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<tr>
<td>Code</td>
<td>Course</td>
<td>Credits</td>
<td>Prerequisite</td>
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<tr>
<td>620533</td>
<td>Power Hydraulics</td>
<td>3</td>
<td>Fluid Mechanics (1) (620331)</td>
</tr>
<tr>
<td></td>
<td>Fluid power principles, Fluids, Components, and how they are combined to produce common industrial and mobile fluid power systems, Emphasis is on fluids for power transmission and control purposes.</td>
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<tr>
<td>620541</td>
<td>Internal Combustion Engines</td>
<td>3</td>
<td>Thermodynamics (2) (620342)</td>
</tr>
<tr>
<td></td>
<td>Review of air standard power cycles; basic types of reciprocating IC engines; SI engines; CI engines; fuels; combustion; performance evaluation of IC engines; cooling and lubrication of engines; internal combustion gas turbine; air pollution.</td>
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<tr>
<td>620543</td>
<td>Air Conditioning (1)</td>
<td>3</td>
<td>Thermodynamics (2) (620342) + Heat transfer (1) (620441)</td>
</tr>
<tr>
<td></td>
<td>Review of relevant thermodynamics and heat transfer topics; psychometric; thermal comfort; air conditioning processes; inside and outside design conditions; heating load calculations, Infiltration; cooling load calculations, Solar gain; heating systems, Design, Layout; hot water, Steam, Hot air systems; baseboard heating.</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit Hours</td>
<td>Description</td>
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</tbody>
</table>
| 620544      | Air Conditioning (2)                             | 3            | Review of psychometrics; analysis of inside and outside design conditions; Basic cooling load analysis; Residential and Non-residential cooling load; Duct and Pipe sizing; Fans; Air-conditioning systems.  
*Prerequisite: Air Conditioning (1) (620543)* |
| 620545      | Design of Thermal Systems                        | 3            | Modeling of thermal equipments; development of design philosophy and governing relations for thermal configurations. Introducing basic optimization techniques such as Lagrange multipliers, dynamic programming, geometric programming, linear programming and calculus of variation. Familiarize students with design procedure for some thermal systems and components commonly encountered by mechanical engineers. Case studies from diverse thermal application areas.  
*Prerequisite: Heat transfer (2) (620442)* |
| 620546      | Internal Combustion Engines Lab.                 | 1            | Experiments related to the material covered in 620541.  
*Prerequisite: Internal Combustion Engines *(620541)+Thermal lab.620446* |

*Note:* The course **Thermal lab.620446** is an additional component for the **Internal Combustion Engines Lab.** course.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Hrs.)</th>
<th>Prerequisites</th>
</tr>
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<tbody>
<tr>
<td>620547</td>
<td>Thermal Power Plants</td>
<td>3</td>
<td>620541</td>
</tr>
<tr>
<td></td>
<td>Energy cycles, Steam generator, Steam condensers, Steam turbines, Power station auxiliaries, Load cures, Power plant station and economics.</td>
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<td></td>
<td><strong>Prerequisite:</strong> Internal Combustion Engines (620541)</td>
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</tr>
<tr>
<td>620562</td>
<td>Quality Control</td>
<td>3</td>
<td>620401</td>
</tr>
<tr>
<td></td>
<td>Concepts and statistical methods employed in the assurance of product conformance to specifications. Controls charts for attributes and variables, process capability analysis. Acceptance sampling plans and military standards.</td>
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<td></td>
<td><strong>Prerequisite:</strong> Statistics and Probability (620401)</td>
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<tr>
<td>620564</td>
<td>Molding Design and Production</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Classification of forming molds; main parameters to be considered in mold design; sheet metal forming molds: blanking deep drawing and bending molds. Materials used in molds, manufacturing of molds and its heat treatment.</td>
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<tr>
<td></td>
<td><strong>Prerequisite:</strong> Manufacturing Processes (2) (620464)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits (Cr. Hrs.)</td>
<td>Prerequisites</td>
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<tr>
<td>620565</td>
<td>Facility Planning</td>
<td>3</td>
<td>Quality Control (620562)</td>
</tr>
<tr>
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<td></td>
<td><strong>Strategic facilities planning; location selection. Product, process and scheduled design. Flow, space and activity relationships. Personnel requirements; material handling. Layout and Computer-aided layout. Warehouses.</strong></td>
</tr>
<tr>
<td>620567</td>
<td>Production Planning and Control</td>
<td>3</td>
<td>Quality Control (620562)</td>
</tr>
<tr>
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<td></td>
<td><strong>Strategic issues in designing production planning and control systems. Supply chain management, forecasting, inventory management. Aggregate planning, master production scheduling, and materials requirements planning.</strong></td>
</tr>
<tr>
<td>620568</td>
<td>Human Factors</td>
<td>3</td>
<td>Engineering Measurements (620351) + Manufacturing Processes (2) (620464)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td><strong>Physical work and physical and physiological capacity and lumination, improving worker efficiency, anthropometry mental work and information input processing and decision making, design of displays and control, study of physical and social environment of the working place.</strong></td>
</tr>
</tbody>
</table>

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The course descriptions are provided in both English and Arabic. The pre-requisites and descriptions are detailed above.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
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</thead>
<tbody>
<tr>
<td>620581</td>
<td>Energy Conversion</td>
<td>3</td>
<td>Thermodynamics (2) (620342)</td>
</tr>
<tr>
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<td>(3 Cr. Hrs.)</td>
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<tr>
<td></td>
<td>Energy classification, Sources and utilization; fossil fuel systems and combustion; pollution control; introduction to renewable energy sources; solar, Wave, Tidal, OTEC; introduction to direct energy conversion systems, Thermoelectric, Photovoltaic, Thermonic converters, Energy conservation and management; energy storage.</td>
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<tr>
<td>620582</td>
<td>Solar Energy</td>
<td>3</td>
<td>Heat transfer (2) (620442)</td>
</tr>
<tr>
<td></td>
<td>(3 Cr. Hrs.)</td>
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<tr>
<td></td>
<td>Fundamentals of solar radiation; methods of solar radiation collection; thermal systems components and analysis; transfer of collected heat; introduction to solar energy applications.</td>
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<tr>
<td>610504</td>
<td>Entrepreneurship</td>
<td>3</td>
<td>Engineering skills (640306)</td>
</tr>
<tr>
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<td>(3 Cr. Hrs.)</td>
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<tr>
<td></td>
<td>Meaning of Economy; benefit; need, commodities; services; production; gross national product; labor; production and labor; production and trade; role of mind; human change; economy and power; means of production; infrastructure; production and capital commodities; consumption; production and society; division of labor; production and time; distribution; marketing; services; production surplus; selling the production; capital; fortune; influence; currency; investment; the project; the investor; economic relations; macro economy; demand; supply; market balance.</td>
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</tbody>
</table>

**Prerequisite: Thermodynamics (2) (620342)**

تصنيف الطاقة ومصادرها واستغلالها، أنظمة الوقود المستحثة والاحتراف، التحكم بالثراث، مقدمة إلى مصادر الطاقة المتجددة بما في ذلك الطاقة الشمسية، الرياح، المواج، البحار والجزر وطاقة حرارة درجات الحرارة في المحيطات، مقدمة إلى الأنظمة المباشرة لتحويل الطاقة، المحولات الكهروحرارية، الكهروضوئية والأيونوحرارية، إدارة وضغط الطاقة، تخزين الطاقة.

**Prerequisite: Heat transfer (2) (620442)**

تحليلات الإشعاعات الشمسية، قياس الإشعاعات الشمسية وتدويرها، اللوائح الشمسية، أداء اللوائح الشمسية، تخزين الطاقة الشمسية، استعمال الطاقة الشمسية لتسخين المياه والتدفئة، مقدمة تطبيقات الطاقة الشمسية.

**Prerequisite: Engineering skills (640306)**

مبادئ أساسية في الإدارة ونظرية التنظيمات الصناعية، القيمة الحالية للزمن، التضخم، التحليل الاقتصادي للبادئ، تحليل استهلاك القيمة وحسابات الضرائب.

المتطلب السابق: مهارات هندسية (640306)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>620585</td>
<td>Building Management Systems</td>
<td>3 Cr. Hrs.</td>
<td>Engineering Measurements (620351) + Air Conditioning (1) (620543)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conducting an energy audit; system specifications; equipment selection; data entry and display. Reporting method; alarm systems, AHU and fire control systems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Prerequisite:</strong> Engineering Measurements (620351) + Air Conditioning (1) (620543)</td>
</tr>
<tr>
<td>620587</td>
<td>Operation research</td>
<td>3 Cr. Hrs.</td>
<td>Engineering Analysis (2) (630202)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mathematical modeling and operation research; linear programming. Simplex algorithm; duality. Transportation and assignment problems; network models.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Prerequisite:</strong> Engineering Analysis (2) (630202)</td>
</tr>
<tr>
<td>620591</td>
<td>Graduation Project (1)</td>
<td>1 Cr. Hr.</td>
<td>Engineering Analysis (2) (630202)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The student should attach himself to one or more faculty members who assign him a project; He analyzes this project and suggests a method to carry out the project in the next stage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Prerequisite:</strong> Engineering Analysis (2) (630202)</td>
</tr>
</tbody>
</table>

المتطلب السابق: قياسات هندسية (620351) + تكييف (1) (620453)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>620599</td>
<td>Graduation Project (2)</td>
<td>2 Cr. Hrs.</td>
<td>Graduation Project (1) (620591)</td>
</tr>
<tr>
<td>620593</td>
<td>Special Topics in Mechanical Engineering</td>
<td>3 Cr. Hrs.</td>
<td>Department Approval</td>
</tr>
<tr>
<td>320304</td>
<td>Reverse Engineering</td>
<td>3 Cr. Hrs.</td>
<td>Engineering Skills 640306</td>
</tr>
</tbody>
</table>

Based on the results obtained from the first stage, the student carries out the project suggested by the department.

**Prerequisite: Graduation Project (1) (620591)**

The student carries out the project suggested based on the results obtained from the first stage. The student submits the project, which is then approved by the department.

**Special Topics in Mechanical Engineering**

Up-to-date subjects in Mechanical Engineering.

**Prerequisite: Department Approval**

The student must have completed the required courses in Mechanical Engineering.

**Reverse Engineering**


**Prerequisite: Engineering Skills 640306**

The student must have completed the required courses in Engineering Skills.

Monday, October 27, 2008