**TEMPLATE FOR COURSE SPECIFICATION**

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| HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW |

 **COURSE SPECIFICATION**

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|  Attendance at lectures is recommended. Provided lectures are based on Mechanical engineering design textbook which is basic material for study and preparation to final exam. The lectures refers to the specific pages in the textbook that are related to the discussed topics and are accompanied by information on the current state of knowledge. |

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| College of Engineering  University of Baghdad | ***1. Teaching Institution*** |
| Mechanical Engineering Department (MED) | ***2. University Department/Centre*** |
|  ME401-Fourth year | ***3. Course title/code & Description*** |
| Mechanical Engineering ( ME ) | ***4. Programme(s) to which it Contributes*** |
| Annual | ***5. Modes of Attendance offered*** |
| 2017-2018 | ***6. Semester/Year*** |
| 150 Hours | ***7. Number of hours tuition (total)*** |
| 20-10-2017 | ***8. Date of production/revision of this specification***  |
| ***9. Aims of the Course*** |
| The aims of this course are to provide the student, with an enough knowledge of the design procedure of machine elements. As well as, this course will give the student the required skills for modeling the engineering problems dealing with machine elements design. |

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| **10·Learning Outcomes,** **Teaching ,Learning and Assessment Method** |
|  At the end of this course, students will be able to formulate and analyze stresses and strains in machine elements and structures in 3-D subjected to various loads. To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, de sign and/or select commonly used machine components. 1. Knowledge and Understanding

A1.At the end of this course, students will be able to apply multidimensional static failure criteria in the analysis and design of mechanical components.A2.At the end of this course, students will be able to apply multidimensional fatigue failure criteria in the analysis and design of mechanical components.A3.At the end of this course, students will be able to analyze and design structural joints.- Acquaintance with the terminology, and types of permanent and detachable joints.- Ability to design and analyze permanent joints (riveted, welded, etc.) under concentric and eccentric loading conditions.- Ability to design and analyze detachable joints (bolts, keys, pins, etc.) under various loading conditions.- Ability to design and analyze power screws.A4.At the end of this course, students will be able to analyze and design, power transmission shafts carrying various elements with geometrical features.A5.At the end of this course, students will be able to analyze and design Gears, Breaks and Clutches.A6.At the end of this course, students will be able to analyze and design mechanical springs.- Acquaintance with spring terminology and different types of springs.- Ability to design and analyze coil springs (compression, tension, torsion) under various loads.A7.At the end of this course, students will be acquainted with standards, safety, reliability, importance of dimensional parameters and manufacturing aspects in mechanical design.Knowledge of standards for machine elements.- Understanding of safety and reliability concepts in the design of machine elements.- Ability to minimize the characteristic dimension of a machine element.- An understanding of the influence of manufacturing processes in the design of machine elements.A8.At the end of this course, students will be able to improve their technical report writing skills.- Ability to justify a design project in a formal report.- Ability to perform and present design calculations in a neat and organized manner.- Ability to present the outcomes of the design in the form of engineering drawings. A9.At the end of this course, students will be able make appropriate use of available computer aided design software.B. Subject-specific skillsB1**. apply a rule** & reflective practiceB2. **construct the model** B3. solve problemsC. Thinking Skills C1.d**efine the cases**  C2.classify **the** materials C3.create a new ideasD. General and Transferable Skills (other skills relevant to employability and personal development)  D1.communication D2 decision D3.intiative |
|  ***11.*** ***Teaching and Learning Methods*** |
| 1. **Attendance requirements:**

It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximize their chance of meeting the objectives of the course and to be informed of course-related activities and administration.1. **Requirements for student to be awarded a passing grade in the course:**

To be assured of receiving a passing grade in a course a student must obtain at least 50% of the total weighted marks for the course.1. **Method used to combine assessment results to attain final grade:**

The final grades for students will be assigned on the basis of the weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course(30% short examination+10% Lab.+60%Final Examination).1. **Examination period when Deferred/Supplementary examinations will be held:**

Any Deferred or Supplementary examinations will be held after two months the end of the semester as second attempt. |
|  ***12. Assessment Methods***

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| Term Tests | Laboratory | Quizzes | Project | Final Exam |
| As(20%) | 10% | As(10%) | - | As(60%) |

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| ***13. Grading Policy***

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| **Activity** | **Hours** |
| Examinations | 10 |
| Lectures | 95 |
| Tutorials | 15 |
| Lab. | 30 |

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| ***14. Course Structure*** |
| Assessment Method | TeachingMethod | Unit/Module or Topic Title | LOs( Article 10 ) | Hours | Week |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Introduction, Engineering Materials and Their Properties | A,B,C, D | 5 | 1 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Manufacturing Considerations in Machine Design, Interchangeability, Fits, Basis of Limit System, Fundamental Deviation for Shafts Calculation, Fundamental Deviation for Holes Calculation. Surface Roughness and its Measurement | A,B,C, D | 5 | 2 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Simple Stresses in MachineParts, Torsion and Bending Stresses in Machine Parts | A,B,C, D | 5 | 3 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Failures theories and Variable Stresses in Machine Parts (1), Completely Reversed or Cyclic Stresses. , Fatigue and Endurance Limit, Factor of Safety for Fatigue Loading. Stress Concentration, Notch Sensitivity | A,B,C, D | 5 | 4 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Several applications and worked examples on the types of variable stresses and on its theories. | A,B,C, D | 5 | 5 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Riveted Joints: Methods of Riveting, Lap Joint , Butt Joint , Failures of a Riveted Joint, Strength of a Riveted Joint, Efficiency of a Riveted Joint, Design of Boiler Joints, Riveted Joint for Structural Use, Eccentric Loaded Riveted Joint. | A,B,C, D | 5 | 6 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Riveted Joints: Methods of Riveting, Lap Joint , Butt Joint , Failures of a Riveted Joint, Strength of a Riveted Joint, Efficiency of a Riveted Joint, Design of Boiler Joints, Riveted Joint for Structural Use, Eccentric Loaded Riveted Joint. | A,B,C, D | 5 | 7 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Welded Joints : Types of Welded Joints. ,. Lap Joint. Butt Joint. , Basic Weld Symbols, Strength of Transverse Fillet Welded Joints, Strength of Parallel Fillet Welded Joints, Special Cases of Fillet Welded Joints, Strength of Butt Joints, Stresses for Welded Joints, Stress Concentration Factor for Welded Joints, Axially Loaded Unsymmetrical Welded Sections, Eccentrically Loaded Welded Joints.,. Polar Moment of Inertia and Section Modulus of Welds | A,B,C, D | 5 | 8 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Worked examples on welded and riveted joints | A,B,C, D | 5 | 9 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Shafts Design: Maximum Permissible Working Stresses for Transmission Shafts, Shafts Subjected to Twisting Moment Only, Shafts Subjected to Bending Moment Only. Shafts Subjected to Combined Twisting Moment and Bending Moment. Shafts Subjected to Fluctuating Loads. Shafts Subjected to Axial Load in addition to Combined Torsion and Bending Loads. | A,B,C, D | 5 | 10 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Screwed Joints: Important Terms used in Screw Threads, Designation of Screw Threads, Stressesin Screwed Fastening due to Static Loading, Initial Stresses due to Screwing Up Forces, Stresses due to External Forces, Stress due to Combined Forces, Bolted Joints under Eccentric Loading, Eccentric Load Acting Parallel to the Axis of Bolts, Eccentric Load Acting Perpendicular to the Axis of Bolts. Eccentric Load on a Bracket with Circular Base, Eccentric Load Acting in the Plane Containing the Bolt. | A,B,C, D | 5 | 11 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Pressure Vessels, Classification of Pressure Vessels, Stresses in a Thin Cylindrical Shell due to an Internal Pressure, Thick Cylindrical Shell Subjected to an Internal Pressure, Stresses in Compound Cylindrical Shells, Cylinder Heads and Cover Plates. Pipes and Pipe Joints, Stresses in Pipes, Design of Pipes, Design of Circular Flanged Pipe Joint and others | A,B,C, D | 5 | 12 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | **C**otter and Knuckle Joints: Socket and Spigot Cotter Joint, Design of Socket and Spigot Cotter Joint, Sleeve and Cotter Joint, Design of Sleeve and Cotter Joint and other types, Design of Knuckle Joint, Design of Turn Buckle joint. | A,B,C, D | 5 | 13 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Coupling. Bushed Pin Flexible Coupling. Oldham Coupling. Universal Coupling **Keys and Coupling:** Types of Keys, Strength of a Sunk Key , Shaft Couplings, Design of Flange Coupling, Flexible | A,B,C, D | 5 | 14 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Power Screws: Types of Screw Threads used for Power Screws, Design of Jacks. | A,B,C, D | 5 | 15 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Power Screws: Types of Screw Threads used for Power Screws, Design of Jacks. | A,B,C, D | 5 | 16 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Columns and Struts: Failure of a Column or Strut,Types of End Conditions of Columns, Euler’s Column Theory, Assumptions in Euler’s Column Theory. Euler’s Formula, Slenderness Ratio. | A,B,C, D | 5 | 17 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Flat Belt Drives: . Selection of a Belt Drive, Working Stresses in Belts, Power transmitted by a Belt, Maximum Tension in the Belt, Initial Tension in the Belt. Types of Pulleys for Flat Belts, Design of Cast Iron Pulleys | A,B,C, D | 5 | 18 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | V-Belt and Rope Drives: Types of V-belts and Pulleys, V-flat Drive Design, Rope Drives, Stresses in Wire Ropes. And Procedure for Designing. | A,B,C, D | 5 | 19 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Chain Drives; Classification of Chains, Power Transmitting Chains, Number of Teeth on the Smaller or Driving Sprocket or Pinion. Maximum Speed for Chains, Principal Dimensions of Tooth Profile, Design Procedure for Chain Drive. | A,B,C, D | 5 | 20 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Springs: Types of Springs, Stresses in Helical Springs of Circular Wire. Deflection of Helical Springs of Circular Wire. ,Eccentric Loading of Springs, Buckling of Compression Springs, Surge in Springs, Energy Stored in Helical Springs of Circular Wire, Stress and Deflection inHelical Springs of Non-circular Wire, Helical Springs Subjected to Fatigue Loading, Springs in Series. | A,B,C, D | 5 | 21 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Sliding Contact Bearings: Classification of Bearings, Design Procedure for Journal Bearings, Design of Bearing Caps and Bolts, | A,B,C, D | 5 | 22 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Rolling Contact Bearings: Types of Rolling Contact Bearings, Life of a Bearing, Basic Dynamic Load Rating of Rolling Contact Bearings, Dynamic Equivalent Load for Rolling Contact Bearings, Dynamic Load Rating for Rolling Contact Bearings under Variable Loads, Reliability of a Bearing, Selection of Radial Ball Bearings. | A,B,C, D | 5 | 23 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Clutches Types of Clutches, Considerations in Designing a Friction Clutch, Design of a Disc or Plate Clutch, Cone Clutch, Cone Clutch, Centrifugal Clutch  | A,B,C, D | 5 | 24 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Brakes : Types of Brakes, Design a Single Block or Shoe, Brake and others types of brake. | A,B,C, D | 5 | 25 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Spur Gears; Classification of Gears, Condition for Constant Velocity Ratio of Gears–Law of Gearing, Forms of Teeth.  | A,B,C, D | 5 | 26 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Spur Gears; Lewis Equation, Permissible Working Stress for Gear Teeth in Lewis Equation, Dynamic Tooth Load, Static Tooth Load, Spur Gear Construction. | A,B,C, D | 5 | 27 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Spur Gears; Design of Shaft for Spur Gears, Design of Arms for Spur Gears. | A,B,C, D | 5 | 28 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Helical Gears: Terms used in Helical Gears, Face Width of Helical Gears,  | A,B,C, D | 5 | 29 |
| 4 (Theo.)+ 1 (Tut.)+1 Lab | Discussion ,explain and examples | Helical Gears: Equivalent Number of Teeth for Helical Gears, Proportions for Helical Gears, Strength of Helical Gears. | A,B,C, D | 5 | 30 |

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| ***15. Infrastructure*** |
| ***Textbook*** 1. A TEXTBOOK OF MACHINE DESIGN, EURASIA PUBLISHING HOUSE (PVT.) LTD. RAM NAGAR, NEW DELHI-110 055, 2005

 R.S. KHURMI, J.K. GUPTA 2.Machine Design, Paul H. Black and O. Eugene Adams, International Student Edition, McGRAW-HILL Book Company, 1985 * ***References***

1- Machine Design, An integrated approach, Robert L. Norton, third edition, Pearson Printice Hall, 2006 2- Mechanical Design, An integrated approach, Ansel C. Ugural, first edition, McGRAW-HILL Book Company, 20043-Mechanical Engineering Design, Shigley J. E., eight edition, McGRAW-HILL Book Company, 2006  | Required reading:· CORE TEXTS· COURSE MATERIALS· OTHER |
| * FEM program(Ansys15)+YouTube site
 | Special requirements (include for example workshops, periodicals, IT software, websites) |
| - guest lectures- internship- field studies | Community-based facilities(include for example, guestLectures , internship , field studies) |
| ***16. Admissions*** |
| Pass third stage | Pre-requisites |
| 45 | Minimum number of students |
| 50 | Maximum number of students |
| ***Instructor:*** 1. **Prof.Dr.Mohammad Q. Abdullah.**
2. **Dr.Thaier J.Ntayeesh.**

Programme coordinator: **Dr.Thaier J.Ntayeesh** | ***17. Course Instructors*** |

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