CIUJ:UM3212 Machine Dynamics 1

SUT:HES2310 Machine Dynamics 1

Credit Points: 12.5

Contact Hours: 60 Hours

Duration: 1 Semester

Campus: CIUJ

Prerequisites:UG0112,UG0122

Corequisites: Nil

Teaching Method

* Lectures (36 hrs),
Tutorials (24 hrs),

Assessment: Examination (75%), Tests (25%)

Aims & Objectives

During the course, we aim:
Special understanding of the physical world that is available only to engineers
* To develop the ability to analyse and solve problems involving particles and rigid bodies in plane motion

Content

Dynamics of a particle (25%)
* A review of rectilinear motion
* Plane curvilinear motion
* Use of rectangular, polar and normal-tangential coordinates in plane motion
* Use of Newton's second law in plane motion
* lane motion using work and energy, impulse and momentum

Rigid body Dynamics (50%)
* Relative velocity, instant centres, relative acceleration
* Dynamic analysis of simple mechanisms
* Rigid body translation: fixed axis rotation
* Rigid body plane motions: force, mass, acceleration
* Rigid body plane motion using work and energy principle
* Rigid body plane motion using impulse and momentum principle

Kinematics of mechanisms (25%)
* Degrees of freedom, types of motion, links, joints and kinematic chains
* Linkage transformation, intermittent motion, inversion, the Grashof condition, linkages of more than four bars, practical considerations
* Quick return mechanisms

Reading Materials

Textbooks
Meriam, JL & Kraige, LG, Engineering Mechanics, Dynamics, 5th edn, Wiley, 2003.
Norton, RL, Kinematics and Dynamics of Planar Machinery, Prentice-Hall.

References
Bedford, A & Fowler, W, Dynamics, Addison-Wesley.
Beer, FP & Johnston, ER, Vector Mechanics for Engineers: Dynamics, McGraw-Hill.

CIUJ:UM3211CAD Modeling

SUT:HES2146 Computer Aided Engineering

Credit Points: 12.5

Contact Hours: 60 Hours

Duration: 1 Semester

Campus: CIUJ

Prerequisites: UM3111

Corequisites: Nil

Teaching Method

This subject will be delivered in a computer laboratory. Online tutorials or student handbooks will be used to instruct students how to use the software studied. Theoretical content and practical instruction will also be delivered in the computer laboratory. A trained staff with software knowledge will be available in the laboratory to assist students during their learning. Suitable online tutorials will be used to enhance learning.

Assessment

Assignments, Class Participation, Computer Software Tests, CAD (50%), Computer Application (50%)

Aims & Objectives

During the course we aim:
* To develop the ability to prepare computer models of parts, assemblies and mechanisms using a CAD system.
* To develop abilities in the use of computer software in solving engineering problems and documenting the result.
At the completion of this subject, students should be able to:
* Produce engineering drawings according Engineering standards
* Create mathematical models using standard software eg. excel, mathematics
* Implement computer aided solutions on simple engineering problems
* Prepare written / graphical reports on simple engineering problems

Content

CAD (50%)
* Introduction to CAD, the screen, menus, toolbars, commands, drawing elements, editing, filing, printing.
* Creation of 3D parametric models of parts using solid modelling
* Assembly of parts with constraints
* Mechanism modelling and kinematic modelling
* Introduction to surface modelling

* Preparation of engineering drawings to industry standard
Computer Application (50%)
* Computer software applications eg excel, mathematica, word, powerpoint
* Specialised computer software applications eg spacegas, terramodel

Reading Materials

This part of the subject has no assigned textbook. All material to be covered will be delivered by online and printed tutorials. However, students are encouraged to explore the Internet for relevant information regarding applications of this part of the subject. An area such as computer applications in engineering is mandatory in today's industry and students should take every opportunity to further their knowledge through journals, publications, exhibitions and other suitable sources of information.

CIUJ: UM 3213 Manufacturing Processes

SUT: HES2280 Manufacturing Technology 1

Credit Points: 12.5

Contact Hours: 60 Hours

Duration: 1 Semester

Campus: CIUJ

Prerequisites: Nil

Corequisites: Nil

Teaching Method

* Laboratory (6 hrs). 3 practical laboratories on: i) Taylor's tool life experiment; ii) CNC – milling experiment: iii) Metrology

Assessment

Assignments (20%), Examination (60%), Laboratory Reports (20%)

Aims & Objectives

During the course, we aim:
* To provide a general understanding of the range of modern production techniques in the manufacturing industry
* To provide a variety of practical laboratory experiences to reinforce the theory
* To introduce the basic principles of design of metal and plastics components and tooling in manufacturing industries
* To introduce the concept of quality and measurements and their importance in manufacturing industry

Content

Manufacturing processes (12%): Casting and forming of metals, powder metallurgy, polymer products, material removal processes, guidelines for component and tooling design, manufacturing technologies, environmental impacts and measures developed for cleaner production.

Material removal processes (20%): Chip formation, comparison of machining processes, calculations in machining, tool wear mechanisms, tool life, economics.

Polymers in manufacturing (12%): Forming and moulding techniques, extrusion and injection moulding: effect of process parameters.

Manufacturing automation (16%): Numerical control, fundamentals of CNC programming, role of robotics in increasing efficiencies.

Quality and measurements (12%): Metrology: standards of accuracy, linear, thread, gear, angular measurements, measurement of surface roughness, roundness, flatness. Concepts of quality, quality control and quality assurance, quality control tools.

Design of components (12%): Sand casting, die casting, plastic moulding, die forging: precision, sheet metal forming, welding.

Design of tools for forming processes (16%): Forging, deep drawing, shearing, extrusion, selection of cutting tools, die sets design for metal forming and plastic moulding dies.

Reading Materials

Textbook

Kalpakjian, S & Schmid, SR, Manufacturing Engineering and Technology, 4th edn, Prentice Halls Inc., 2001.

References

Crawford, RJ, Plastic Engineering, 3rd edn, Maxwell Macmillan, 1997.
Groover, MP, Fundamentals of Modern Manufacturing Methods: Materials, Processes and Systems, Prentice Hall Inc, 1996.
Kalpakjian, S, Manufacturing Processes for Engineering Materials, Addison Wesley, 1995.
El-Wakil, SD, Processes and Design for Manufacturing, 2nd edn, PWS Publishing Company, 1998.