



Course Specifications

| | |
|----------------------|--|
| Course Title: | System Dynamics |
| Course Code: | ME 343 |
| Program: | Mechanical Engineering (UG) |
| Department: | Mechanical & Industrial Engineering |
| College: | College of Engineering |
| Institution: | Majmaah University |

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A. Course Identification

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|--|
| 1. Credit hours:02 |
| 2. Course type |
| a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> |
| b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/> |
| 3. Level/year at which this course is offered: 07 |
| 4. Pre-requisites for this course (if any): ME 242 |
| 5. Co-requisites for this course (if any): None |

6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1 | Traditional classroom | 45 | 80 |
| 2 | Blended | 05 | 10 |
| 3 | E-learning | 05 | 10 |
| 4 | Correspondence | 0 | 0 |
| 5 | Other | 0 | 0 |

7. Actual Learning Hours (based on academic semester)

| No | Activity | Learning Hours |
|------------------------------|---------------------------------|----------------|
| Contact Hours | | |
| 1 | Lecture | 30 |
| 2 | Laboratory/Studio | 0 |
| 3 | Tutorial | 15 |
| 4 | Others (specify) | 0 |
| | Total | 45 |
| Other Learning Hours* | | |
| 1 | Study | 30 |
| 2 | Assignments | 10 |
| 3 | Library | 10 |
| 4 | Projects/Research Essays/Theses | 05 |
| 5 | Others (specify) | -- |
| | Total | 55 |

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

| |
|--|
| 1. Course Description Analytical and computer techniques for kinematic and dynamic analysis of linkages. Virtual links. Method of kinematic coefficients. Inversion. Geared linkages. Mechanisms with actuators. System response to dynamic inputs |
|--|

2. Course Main Objective

1. Students would be able to apply techniques for kinematics analyses of linkages
2. Ability to understand various applications and inversions for motion dynamics.
3. Analyses of linkage under dynamic inputs
4. Understand various actuators and working.

3. Course Learning Outcomes

| CLOs | | Aligned PLOs |
|------|---|--------------|
| 1 | Knowledge: | |
| 1.1 | Define degree of freedom and describe kinematic and dynamic analysis of linkages | a |
| 1.2 | Demonstrate use and analyze static and dynamic forces through diagrams | a |
| 1.3 | Mathematically reproduce system response to dynamic inputs | k |
| 2 | Skills : | |
| 2.1 | Differentiate basic mechanisms and systems | j |
| 2.2 | Explain and apply the concepts in solving problems. | i |
| 2.3 | Design of mechanisms and find dimensions of various links | c |
| 3 | Competence: | |
| 3.1 | Demonstrate and share with classmates and teachers, help of internet for solving problems | k |
| 3.2 | Work with teams to appraise the issues | k |

C. Course Content

| No | List of Topics | Contact Hours |
|--------------|--|---------------|
| 1 | Analytical and computer techniques for kinematic and dynamic analysis of linkages. | 09 |
| 2 | Inversions | 03 |
| 3 | Virtual links. Method of kinematic coefficients. | 06 |
| 4 | Geared linkages | 09 |
| 5 | System response to dynamic inputs | 09 |
| 6 | Mechanisms with actuators | 09 |
| Total | | 45 |

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------|--|---|---------------------|
| 1.0 | Knowledge | | |
| 1.1 | Define degree of freedom and describe kinematic and dynamic analysis of linkages | Showing different mechanisms and practice to analyze mobility of mechanisms | Mid Terms |
| 1.2 | Demonstrate use and analyze static and dynamic forces through diagrams | Analyzing forces through drawing diagrams and | Mid Term/Final Exam |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------------|---|--|---|
| | | mathematical derivations, practice to solve problems | |
| ... | Mathematically reproduce system response to dynamic inputs | Problem solving hands on practice to solve problems of various forces in links | Mid Term/Quiz/Final Exam |
| 2.0 | Skills | | |
| 2.1 | Differentiate basic mechanisms and systems | Explaining how to draw a mechanisms and to find mathematically dimensions of various links | Home works |
| 2.2 | Explain and apply the concepts in solving problems. | Asking and revising formulae, equations used and how can they apply the knowledge for a specific type of problem and mending the mistakes with explanation | Review through Assignments, Term Exams and Final Exam |
| ... | Design of mechanisms and find dimensions of various links | Apply appropriate mathematical rules to find dimensions to design and draw mechanism diagrams | Review through assignments, Term Exams and Final Exam |
| 3.0 | Competence | | |
| 3.1 | Demonstrate and share with classmates and teachers, help of internet for solving problems | Making the teaching learning two way communication. Getting students involved to solve problems and asking students did they understand the concept clearly. | Assignments, Term Exams and Final Exam |
| 3.2 | Work with teams to appraise the issues | Assignments without direct input, but let them calculate inputs from source data | Assignments, Term Exams and Final Exam |
| ... | | | |

2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|----------------------|----------|--------------------------------------|
| 1 | Quiz 1 | 03 | 05 |
| 2 | Assignment/Homework | 05 | 05 |
| 3 | Mid Term 1 | 07 | 20 |
| 4 | Quiz 2 | 10 | 05 |
| 5 | Mid Term2 | 11 | 20 |
| 6 | Assignment/Home work | 12 | 05 |
| 7 | Final Exam | 15 | 40 |
| | | | 100 |

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Lecture hours as given in Time Tables : Wednesday 8-8:50 AM , 9-9:50 AM,
Tutorial Wednesday 12-Noon -12:50 PM
(Class Rooms E 1 and E 3)

Office hours : :Every day from 10 AM -11 AM
(Office location 044-02-17)

F. Learning Resources and Facilities

1. Learning Resources

| | |
|---------------------------------------|---|
| Required Textbooks | William J. Palm III, System Dynamics, McGraw-Hill, 2005 |
| Essential References Materials | Kolovsky, M.Z., Evgrafov, A.N., Semenov, Y.A., Slousch, A.V., Advanced Theory of Mechanisms and Machines, Springer, 2000 |
| Electronic Materials | --- |
| Other Learning Materials | Course related material is provided in Black Board |

2. Facilities Required

| Item | Resources |
|--|-------------------------|
| Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) | Class Rooms |
| Technology Resources (AV, data show, Smart Board, software, etc.) | Smart board is provided |
| Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | ----- |

G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---------------------------|------------|-----------------------------|
| Effectiveness of Teaching | Students | Indirect Assessment |
| CLOs achievement | Faculty | Direct/Indirect Assessments |
| Learning Resources | Students | Indirect Assessment |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|--------------------------------|-------------------|---------------------------|
| Course Contents | Students | Indirect Assessment |

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

| | |
|----------------------------|---------------------|
| Council / Committee | Department Council |
| Reference No. | 1/34/9767 |
| Date | 25/02/1432 H |