

<p>Kingdom of Saudi Arabia Ministry of Higher Education Qassim University College of Engineering</p>		<p>المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة</p>
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Robotics

College: Engineering

Department: Mechanical

First: Course Definition

1- Course Code: ME 666

2- Units: 3 credit hrs

3 – Semester

4 -Prerequisite Undergraduate courses in mechanics of machinery and controls

5- Co-requisite

6- Location (if not on main Campus):

Second: Course Objectives

1. To introduce the role of robots in automation, their types and uses.
2. To teach the mathematical representation of robot kinematics.
1. To teach the formulation and solution of the forward- and inverse-kinematic problems of robots.
4. To teach the formulation and solution of manipulator dynamics problems.
5. To introduce the robot control problem and techniques for its solution.

Third: Course Specifications

1- Topics to be covered		
Subject	No of Weeks	Units
Introduction. Automation and Robotics. Robot Classification.	1	3
D-H representation and forward kinematics	3	9
Inverse kinematics	2	6

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Manipulator dynamics	3	9
Robot control	3	9
Task planning	2	6
Miscellaneous topics	1	3

2- Course components (Total hrs in the Semester)

Lecture	Exercise or lab	Other
45	---	--

3- Intended Learning Outcomes of the Course (ILO's)

a. Knowledge

i) Description of the knowledge to be acquired

- The role of robots in automation.
- Classification of robots.
- Mathematical representation of robot kinematics.
- Concept of forward and inverse kinematics.
- Types of control schemes for robots.
- Main robot components.

ii) Teaching strategies to be used to develop that knowledge

- Class lectures
- Internet resources
- Homework

iii) Methods of assessment of knowledge acquired

- Quizzes
- Exams

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

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- Ability to represent a robotic manipulator using D-H representation.
- Ability to carry out forward and inverse kinematic analyses of robotic arm.
- Ability to set up and solve dynamic equations of motion for a robot.
- Ability to describe different control schemes for a robot and to choose the most suitable one.
- Ability to describe main robot components and their relevant characteristics.

ii) Teaching strategies to be used to develop these cognitive skills

- Class lectures and presentations
- Homework problems

iii) Methods of assessment of students' cognitive skills

- Quizzes and homework
- Term projects
- Exams

c. Interpersonal Skills and Responsibility

i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Ability to work in a team
- Ability to meet assigned deadlines

ii) Teaching strategies to be used to develop these skills

- Group discussions and projects
- Class attendance requirements, homework deadlines, and general class discipline

iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility

- Observation of student contribution in group discussions and group projects.
- Record of attendance, homework timeliness and class behavior.

d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

- Ability to communicate the material learned

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- Ability to use computer software to solve robot analysis problems.
- Ability to search for information using the internet

- ii) Teaching strategies to be used to develop these skills**
- Student presentations
 - Home assignments requiring the use of computers and internet.
- iii) Methods of assessment of students numerical and communication skills**
- Exams
 - Performance in homework and presentations

e. Psychomotor (if applicable) & Other Non-cognitive Skills
Not applicable

i) Description of the psychomotor or other skills to be developed and the level of performance required

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ii) Teaching strategies to be used to develop these skills

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iii) Methods of assessment of student's psychomotor skills

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4- Student Assessment Schedule

Serial	Assessment tool (test, group project, examination etc.)	Week due	Weight
1	Homework & Quizzes	Every week	15%
2	Term project	15 th	10%
3	Midterm exam	7 th	25%
4	Final exam	16 th	50%

5- Student Support

- Regular office hours

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- Electronic copies of books and online resources

6- Learning Resources

i) Essential Books (References)

- Mark W. Spong, M. Vidyasagar, Robot Dynamics and Control, Wiley, 1989
- J. J. Craig, Introduction to Robotics Mechanics and Control, Pearson

ii) Course Notes

iii) Recommended Books

- R K Mittal and I J Nagrath, Robotics and Control, McGraw-Hill
- Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer, 2011

iv) Electronic Books & Web Sites:

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v) Periodicals

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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Informal discussion with students
- Student survey at the end of course

ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Student performance on homework and quizzes

iii) Processes for Improvement of Teaching

- Self-assessment by the instructor

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- Feedback from Department Chairman and Vice Dean Academics, as required

iv) Processes for verifying standards of student achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Courses are reviewed by relevant subject committees and the department and college councils.