

BGE005 - INDUSTRIAL ROBOTICS

Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Mechanical Engineering
BGE005 - INDUSTRIAL ROBOTICS
Seventh Semester, 2015-16 (odd Semester)

Course (catalog) description

To understand the various components, operations and applications of different types of power plants .

Compulsory/Elective course : **Non-Major elective for Mech Engg Students**

Credit & contact hours : 3 & 45

Course Coordinator : Mrs.Vijaya

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Mrs.Vijaya	Final Year	JR201		Vijaya.mct@bharathuniv.ac.in	9.00am-9.50 am

Relationship to other courses:

Pre –requisites : Mechatronics

Co –requisites :

Assumed knowledge : **Basic Robot knowledge**

Following courses : **Nil**

Syllabus Contents

UNIT I INTRODUCTION TO ROBOTICS 9

Definition of Robot – Laws of Robotics – Basic concepts – Robot Configuration – Types of Robot drives – Basic Robot motions – Point to Point control – Continuous path control – Accuracy and repeatability.

UNIT II COMPONENTS OF ROBOTICS 9

Control system components–Control system analysis–Actuation and feed back– manipulators – Direct kinematic model and inverse kinematic model – Coordinate transformation – Robot dynamic modeling – Types of Robot and end effectors - Tools as end effectors

UNIT III SENSING AND MACHINE VISION 9

Range sensing – Proximity sensing – touch sensing – force and torque sensing.
Introduction to machine vision – Sensing and digitalizing – Image processing and analysis.

UNIT IV ROBOT PROGRAMMING**9**

Methods online/ offline – Show and teach – Teach pendant – lead and teach – Languages Explicit – task level – capabilities and limitation – Artificial intelligence – Knowledge representation – Search techniques.

UNIT V ROBOT APPLICATIONS**9**

Applications of robots in machining – Welding – Assembly – Material handling – processing – Loading and unloading – CIM inspection – Hostile and remote environments – Non industrial applications.

Total : 45**Computer usage:****Professional component**

General	-	0%
Basic Sciences	-	10%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Non-conventional sources of energy**Test Schedule**

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2 nd week	Session 1 to 14	2 Periods
2	Cycle Test-2	March 2 nd week	Session 15 to 28	2 Periods
3	Model Test	April 3 rd week	Session 1 to 45	3 Hrs
4 1	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

	Correlates to program outcome		
	H	M	L
To understand the various components, operations and applications of different types of power plants .			
Upon completion of this course, the students can able to apply the basic engineering	a		
To learn about knowledge for the design of robotics.	c,i		e,k
Will understand robot kinematics and robot programming.	a	f	
Will understand application of Robots	c	g	e
To learn about force and torque sensing	i		
To learn about application of robot	a		e,l

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session No	Topics to be covered	Problem solving Yes/no	Text/chapter
UNIT-I			
1	Definition of Robot	NO	[T1]/CHAPTER-4,5,6
2	Laws of Robotics	NO	
3	Basic concepts – Robot Configuration	NO	
4	Basic concepts – Robot Configuration	NO	
5	Types of Robot drives	NO	
5	Types of Robot drives	NO	
6	Basic Robot motions	NO	
7	Point to Point control	NO	
8	Continuous path control	YES	

9	Accuracy and repeatability.	NO	[T1]/CHAPTE R-6
UNIT-II			
10	Control system components-	NO	[T1]/CHAPTE R-2
11	Control system analysis–	NO	
12	Control system analysis–	NO	
13	Actuation and feed back– manipulators –	YES	

14	Direct kinematic model and inverse kinematic model –	YES	
15	Coordinate transformation –	NO	
16	Tools as end effectors	NO	
17	Types of Robot and end effectors -	YES	
	Robot dynamic modeling –	YES	
18	UNIT-III NUCLEAR, HYDEL AND GAS TURBINE POWER		
19	Range sensing	NO	[T1]/CHAPTER -9 [R1]/CHAPTER- 11,12,13
20	Proximity sensing	NO	
21	touch sensing	NO	
22	touch sensing	YES	
23	touch sensing	YES	
24	force and torque sensing.	YES	
25	Image processing and analysis	NO	
26	Introduction to machine vision	YES	
27	Sensing and digitalizing	YES	
UNIT-IV			
28	Methods online/ offline	NO	[R1]/CHAPTER-15
29	Show and teach	NO	
30	Teach pendant – lead and teach	NO	
31	Teach pendant – lead and teach	NO	
32	Languages Explicit	NO	

33	task level – capabilities and limitation	NO	
34	Artificial intelligence	NO	
35	Knowledge representation	NO	
36	Search techniques.	NO	

UNIT-5			
37	Applications of robots in machining	NO	[T1]/CHAPT ER-14 [R1]/CHAPT ER-16,18
38	Welding	NO	
39	Assembly	NO	
40	Material handling	NO	
41	processing	YES	
42	Loading and un loading	YES	
43	CIM inspection	YES	
44	Hostile and remote environments	YES	
45	Non industrial applications.	YES	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment / Seminar / Online		
Test / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by : Mrs.Vijaya

Addendum

ABET Outcomes expected of graduates of B.Tech / MECH / program by the time that they graduate:

- a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.
- b) The ability to identify, formulate and solve engineering problems.
- c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) The ability to design and conduct experiments, as well as to analyze and interpret data
- e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- f) The ability to apply reasoning informed by the knowledge of contemporary issues.
- g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- h) The ability to understand professional and ethical responsibility and apply them in engineering practices.
- i) The ability to function on multidisciplinary teams.
- j) The ability to communicate effectively with the engineering community and with society at large.
- k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
- l) The ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION:

Mechanical Engineering graduates are enthusiastic to provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Mechanical Engineering.

PEO2: CORE COMPETENCE:

Mechanical Engineering graduates have competence to enhance the skills and experience in defining problems in the field of Mechanical Engineering and Technology design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM:

Mechanical Engineering graduates made competence to enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

PEO4: PROFICIENCY:

Mechanical Engineering graduates became skilled to afford training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:

Mechanical Engineering graduates are morally merged to apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

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Course Teacher	Signature
Mrs.Vijaya	

Course Coordinator
Mrs.Vijaya

HOD/MECH