GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Fundamental of Mechanical Engineering (Code: 3300015)

Diploma Programmes in which this course is offered	Semester in which offered
Electrical Engineering, Plastic Engineering	**First Semester**
Ceramic Engineering, Metallurgy Engineering, Mining Engineering, Transportation Engineering	**Second Semester**

1. RATIONALE:

In the era of technology integration, it has become unavoidable to possess the basic knowledge of various engineering disciplines. The advancement in technology is the best on multi technology integration and hence in performance too. The motive of this subject is to enhance the knowledge & skill level in the inter disciplinary area to strengthen the present practices.

This course is specially designed with a view to impart basic knowledge of other conventional disciplines (other than own discipline).

This course mainly encompasses the major and general areas of mechanical engineering which are being used by common man to large industrial sectors. A technician has to know many times the implications and knowledge of other disciplines so as to conclude the solution of his/her own branch tasks.

2. LIST OF COMPETENCIES:

i. **To perform the simple tasks related to mechanical engineering so as to reduce the dependency on mechanical engineers and to achieve the reliability and quality of own branch's tasks**.

3. TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	**150**
3	0	2	5	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit;
ESE - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS:

Unit	Major Learning Outcomes	Sub-topics
Unit –1 **INTRODUCTION**	1.1 Identify mechanical related basic components and their uses.	1.1 Introduction of mechanical engineering. 1.2 Use of mechanical engineering : a. In day to day life. b. Interdisciplinary use. 1.3 Items in general use- identification criteria, major types, specifications and uses : such as bolts, nuts, washers, bearings, bushes, belts, springs, levers, couplings, brakes, screws, rivets, keys, o' rings, oil seals, gears, pulleys, shafts, axles, etc. 1.4 Pipes and pipe fittings- Types , specifications and uses of pipes and pipe fittings. 1.5 Hand and power tools: a. Types, specifications and uses of spanners (such as fix, ring, box, pipe, allen, adjustable, etc.). b. Types, specifications and uses of hand tools (such as pliers, screw drivers, saws, hammers, chisels, cutters, planes, etc.). c. Types, specifications and uses of power tools(drill, chipper, etc.)
Unit –2 **POWER TRANSMISSION & SAFETY**	2.1 Identify the type of power transmissions being used. 2.2 Follow general safety norms.	2.1 Power transmission: a. Importance. b. Modes (belt drives, rope drives, chain drives and gear trains). c. Types of belts. d. Gear train-concept, transmission ratio. e. Applications. 2.2 Types and applications of couplings in power transmission. 2.3 Causes and remedies of general accidents in power transmission. 2.4 Safety norms to be followed for preventing accidents and damage in power transmission. 2.5 Safety norms to be followed in mechanical based industries / shop floors.
Unit – 3 **PROCESSES ON MATERIAL**	3.1 Understand common metal joining and machining methods.	3.1 Welding. a. Types. b. Working setup of arc and gas welding, accessories and consumables. c. Types of work carried out by welding. d. Precautions and safety during arc and gas welding.

Unit	Major Learning Outcomes	Sub-topics
		3.2 Brazing and Soldering. a. General set up. b. Applications. 3.3 Gas cutting. a. Working setup, accessories and consumables. b. Types of work carried out. c. Precautions and safety during gas cutting. 3.4 Foundry. a. Concept. b. Process of getting cast material. c. Applications. 3.5 Other metal forming and cutting operations- bending, shearing-concept and applications. 3.6 Basic machine tools. a. Working principle of hacksaw, lathe, drill and milling machines. b. Types of operations / jobs which can be performed on machine tools listed above.
UNIT –4 **STEAM GENERATION AND PRIME MOVERS**	4.1 Explain working of boilers and prime movers.	4.1 Steam. a. Generation process. b. Properties. 4.2 Boilers. a. Classification. b. Working. c. Accessories and mountings-types and applications. d. Applications. e. Regulations and safety requirements. f. Common troubles and remedies. 4.3 Prime movers. a. Meaning. b. Classification. c. Working. d. Steam turbine-working. e. Gas turbine-types and applications. f. Common troubles and remedies.
Unit –5 **INTERNAL COMBUSTION ENGINES**	5.1 Explain working of internal combustion engines.	5.1 Internal combustion engines. a. Meaning. b. Classification. 5.2 Working of petrol engine, diesel engine and gas engine. 5.3 Performance parameters. 5.4 Main parts and functions. 5.5 Applications. 5.6 Common troubles and remedies.

Unit	Major Learning Outcomes	Sub-topics
Unit– 6 **HYDRAULIC AND PNEUMATIC DEVICES**	6.1 Identify the applications of fluid concepts. 6.2 Use pumps and other hydraulic – pneumatic equipments and machineries.	6.1 Concept of theory of fluid flow. 6.2 General properties of fluids. 6.3 Pump. a. Working principle. b. Types. c. Working of centrifugal and reciprocating pumps. d. Performance parameters. e. Main parts of pumps and their functions. f. Common troubles and remedies. 6.4 Water turbines-working principle, types and applications. 6.5 Common troubles and remedies of water turbine. 6.6 Air compressor. a. Working principle. b. Types. c. Performance parameters. d. Applications. 6.7 Other hydraulic/pneumatic/ hydro-pneumatic equipments. a. Principle of working-hydraulic lift, hydraulic pump, hydraulic power pack, hydraulic jack. b. Applications of above.
Unit – 7 **MATERIAL HANDLING**	7.1 Select proper material handling equipment. 7.2 Identify common reasons for common troubles.	7.1 Need of material handling. 7.2 Types , principle of working and applications of material handling equipments. a. Hoisting equipments. b. Conveying equipments. c. Surface & overhead equipments. d. Earth moving machineries. e. Construction machineries. 7.3 Criteria for selection of material handling equipments. 7.4 Factors affecting selection of material handling equipments. 7.5 Selection of suitable material handling equipment for the given situation. 7.6 Common troubles and remedies.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Introduction	4	5	0	2	07
2.	Power transmission & safety	8	7	7	0	14
3.	Processes on material	8	7	3	4	14
4.	Steam generation and prime movers	4	3	4	0	07
5.	Internal combustion engines	6	3	4	2	09
6	Hydraulic and pneumatic devices	6	3	3	3	09
7	Material handling	6	7	0	3	10
	Total	**42**	**35**	**21**	**14**	**70**

Legends:
R = Remembrance; U = Understanding; A = Application and above levels.

NOTES:

a: If mid sem test is part of continuous evaluation, unit numbers 1, 2 and 3 are to be considered.

b: Ask the questions from each topic as per marks weightage. Optional questions must be asked from the same topic. That is weightage of compulsory attendance part of questions will be equal to marks allotted to each topic.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

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Ex. No.	Unit No.	Practical Exercises/Experiment	Hours
1	1	Demonstrate use of various mechanical items, spanners, hand tools and power tools. Student will prepare the report which will include sketches of each item demonstrated with specifications and applications.	02
2	2	a: Demonstrate various power transmission methods. Also demonstrate items used in power transmission with material of construction and specifications of each item. Student will prepare the report on working principles, set up sketch, working parameters, specifications of items and safety norms followed. b: Student will calculate velocity ratios for belt drives and number of teeth for gear train based on given data.	04
3	3	Demonstrate working of welding transformers, welding process, gas welding process , gas cutting process, brazing and soldering process. Student will prepare the report on working principles, set up sketch, working parameters, consumables used with specifications and safety norms	02

		followed.	
4	3	Prepare simple weld joint job.	02
5	3	a: Demonstrate various machining methods on hacksaw, lathe, drill and milling machines. b: Also prepare simple turning job.	04
6	4	Study boiler, boiler mountings and boiler accessories.	02
7	5	Perform and study the effect of variation of load on fuel-consumption of an I.C. engines (On petrol engine). Also locate the faults in a given petrol engine and suggest remedial measures.	02
8	5	Perform and study the effect of variation of load on fuel-consumption of an I.C. engines (On diesel engine). Also locate the faults in a given diesel engine and suggest remedial measures.	02
9	6	Demonstrate a water-turbine.	02
10	6	Perform test on Air compressor.	02
11	6	Perform test on centrifugal pump. Also find fault and remedies for centrifugal pump.	02
12	7	Study various types of materials handling equipments.	02
		Total	28

NOTES:

1. It is compulsory to prepare log book of exercises. It is also required to get each excersise recorded in logbook, checked and duly dated signed by laboratory assistant/instructor and teacher.
2. Student activities are compulsory and are also required to be performed and noted in logbook.
3. For 20 marks practical ESE, students are to be assessed for competencies achieved.

7. STUDENT ACTIVITIES:

S. No.	Details of activity.
1	Student will visit the respective discipline industry / site (electrical, printing, as applicable) and will prepare the list of mechanical engineering related equipments/machineries used by that industry / site.
2	Student will observe the fuel supply system of any bike and will also observe the working of engine. Student will also identify the type and specification of engine used for bike.
3	Prepare the list of mechanical items surrounding to you.

8. SUGGESTED LEARNING RESOURCES:

A. List of Books.

S.No.	Title of Books	Author	Publication
1	Theory of Machines	R.S.Khurmi and J.K.Gupta	S.Chand
2	Heat engine	Shah & Pandya	Charotar Publishing House
3	Hydraulic machines	Jagdish lal	Metropolitan Book Company
4	Elements of Workshop	Hazara chaudhary	Asia Publishing House

S.No.	Title of Books	Author	Publication
	Technology (Vol. 1,2)		
5	Hydraulics	R.C.Patel	Acharya Book Depot
6	Pumps operation and maintenance	Tyler and Hicks	Tata McGraw-Hill
7	Material Handling equipments	M.Rundenko	Mir Publishers

B. List of Major Equipment/ Instrument.

a: Various mechanical items, spanners, hand tools and power tools..
b: Various power transmission devices.
c: Welding transformers, welding accessories and consumables.
d: Gas welding set up with all accessories and consumables.
e: Brazing and soldering setup with all accessories and consumables.
f: Gas cutting process set up with all accessories and consumables.
g: Workshop based machine tools-Hacksaw, Lathe, Drill and Milling.
h: Boiler/ Working model of boiler.
i: Petrol engine test rig.
j: Diesel engine test rig.
k: Air compressor test rig.
l: Water turbine / working model of water turbines.
m: Centrifugal pump test rig.
n: Models / working models of various material handling devices.

C. List of Software/Learning Websites: ---

a: http://www.youtube.com/watch?v=1cFu2bkZ7Vw&feature=related (ic engine)
b: http://www.youtube.com/watch?v=pCg1Ih_oVSA (pump)
c: http://www.youtube.com/watch?v=V3aPHmZ97yM&feature=related (pump)
d: http://www.youtube.com/watch?v=FENCiA-EfaA&feature=related (impeller)
e: http://www.youtube.com/watch?v=TBdUcGYo7XA (gas turbine)
f: http://www.youtube.com/watch?v=HzQPNpP55xQ (turbines)
g: http://www.youtube.com/watch?v=e_CcrgKLyzc (coal power plant)
h: http://www.youtube.com/watch?v=8GSUgwombdE&feature=related (boiler)
i: http://www.youtube.com/watch?v=A3ormYVZMXE (hy.lift)
j: http://www.youtube.com/watch?v=FP05rYRI9JU&feature=related (hy.pump)
k: http://homepages.cae.wisc.edu
l: http://www.youtube.com/watch?v=E6_jw841vKE&feature=related (air compressor)
m: http://www.youtube.com/watch?v=twM-GLUYQ-o&feature=related (belt drive)
n: http://www.youtube.com/watch?feature=endscreen&v=gjUwJ1CJVq4&NR=1 (belt drive)
o: http://www.youtube.com/watch?v=XunM7yUC06M&feature=related (gear drive)

p: http://www.youtube.com/watch?v=ftdgB93QOD8&feature=related (gear box)

q: http://en.wikipedia.org/wiki/Boiler

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Shri. M.K.Shukla**, Lecturer in Mechanical Engineering, Sir B.P.I., Bhavnagar.
- **Shri. A.M.Talsaniya**, Lecturer in Mechanical Engineering, Sir B.P.I., Bhavnagar.
- **Shri. R.B.Variya**, Lecturer in Mechanical Engineering, B and B institute of Technology, Vallabhvidyanagar.
- **Shri. N.C.Pandya**, Lecturer in Mechanical Engineering, Government Polytechnic, Himmatnagar

Co-ordinator and Faculty Member from NITTTR Bhopal

- **Dr. K.K. Jain**, Professor & Head, Dept. of Mechanical Engg, NITTTR, Bhopal
- **Dr. Joshua Earnest**, Professor & Head, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal