GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic Mechanical Engineering (Code: 3320602)

Diploma Programmes in which this course is offered	Semester in which offered
Civil Engineering, Environment Engineering,	**Second Semester**

1. RATIONALE:

In the era of technology integration, it has become unavoidable to possess the basic knowledge of various engineering disciplines. 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.

This course is specially designed with a view to impart basic knowledge of mechanical engineering which will be useful in professional career of civil engineering students.

2. LIST OF COMPETENCIES:

Apply the general know-how of mechanical engineering in dissolving the civil engineering's integrated 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**	
0	1	2	3	0	0	20	30	**50**

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

4. DETAILED COURSE CONTENTS:

Unit	Major Learning Outcomes	Sub-topics
UNIT –1 **INTRODUCTION**	1a. Identify mechanical related basic components and their uses.	1.1 Introduction of mechanical engineering. 1.2 Use of mechanical engineering : i: In day to day life. ii: 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: i: Types, specifications and uses of spanners (such as fix, ring, box, pipe, allen, adjustable, etc.). ii: Types, specifications and uses of hand tools (such as pliers, screw drivers, saws, hammers, chisels, cutters, planes, etc.). iii: Types, specifications and uses of power tools(drill, chipper, etc.
UNIT –2 **POWER TRANSMISSION & SAFETY**	2a. Describe the type of power transmission being used in electrical engineering 2b.Describe the different types of couplings used in electrical equipment 2c. Follow general safety norms applicable to mechanical engineering equipment	2.1 Power transmission: i. Importance. ii. Modes (belt drives, rope drives, chain drives and gear trains). iii. Types of belts. iv. Gear train-concept, transmission ratio. v. 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	Major Learning Outcomes	Sub-topics
UNIT – 3 **WELDING AND GAS CUTTING**	3a.Explain different welding and gas cutting operations. 3b.Make simple jobs by using arc and gas welding.	3.1Welding. i. Types. ii. Working setup of arc and gas welding, accessories and consumables. iii. Types of work carried out by welding. iv. Precautions and safety during arc and gas welding. 3.2Gas cutting. i. Working setup, accessories and consumables. ii. Types of work carried out. iii. Precautions and safety during gas cutting.
UNIT –4 **INTERNAL COMBUSTION ENGINES (I.C.ENGINES)**	4a.Explain working of internal combustion engines. 4b. Identify faults in a given IC engine and suggest remedies by using trouble-shooting charts	4.1 Internal combustion engines. i. Meaning. ii. Classification. 4.2 Working of petrol engine, diesel engine and gas engine. 4.3 Performance parameters. 4.4 Main parts and functions. 4.5 Applications. 4.6 Common troubles and remedies.
UNIT– 5 **HYDRAULIC AND PNEUMATIC DEVICES**	5a.Explain different fluid properties 5b.Describe construction, working and applications of centrifugal and reciprocating pumps 5c.Explain working and applications of water turbines and air compressor 5d. Describe working and applications of other pneumatic/ hydro-pneumatic equipment	5.1 Concept of theory of fluid flow. 5.2 General properties of fluids. 5.3 Pump. i. Working principle. ii. Types. iii. Working of centrifugal and reciprocating pumps. iv. Performance parameters. v. Main parts of pumps and their functions. vi. Common troubles and remedies. 5.4 Water turbines-working principle, types and applications. 5.5 Common troubles and remedies of water turbine. 5.6Air compressor. i. Working principle. ii. Types. iii. Performance parameters.

Unit	Major Learning Outcomes	Sub-topics
		iv. Applications. 5.7 Other hydraulic/pneumatic/ hydro-pneumatic equipments. i. Principle of working-hydraulic lift, hydraulic pump, hydraulic power pack, hydraulic jack. ii. Applications of above.
UNIT – 6 **MATERIAL HANDLING**	6a. Select proper material handling equipment for a given situation 6b. Identify common troubles/problems in material handling equipments and list possible remedial measures.	6.1 Need of material handling. 6.2 Types , principle of working and applications of material handling equipments. i. Hoisting equipments. ii. Conveying equipments. iii. Surface & overhead equipments. iv. Earth moving machineries. v. Construction machineries. 6.3 Criteria for selection of material handling equipments. 6.4 Factors affecting selection of material handling equipments. 6.5 Selection of suitable material handling equipment for the given situation. 6.6 Common troubles and remedies.

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

Unit No.	Unit Title	TUTORIAL HOURS	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Introduction	2	NOT APPLICABLE			
2.	Power Transmission & Safety	3				
3.	Welding and gas cutting	3				
4.	I.C. Engines	2				
5.	Hydraulic and pneumatic devices	3				
6.	Material handling	1				

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

6. SUGGESTED LIST OF EXERCISES:

This is the list of minimum exercises to be performed.

Ex. No.	UNIT No	Exercise	Tutorial Hours	Practice Hours
1	1	a: Demonstrate various mechanical items, hand tools and power tools listed in Unit 1. Also explain/state specifications/ designations (as per BIS) and uses. b: Student will identify use of each item demonstrated and will prepare the report with sketch of each item along with specifications/ designations(as per BIS) and uses.	02	04
2	2	a: Demonstrate various power transmission methods including points stated in Unit 2. Also demonstrate and explain concept and calculation of velocity/ transmission ratio for belt drives and gear trains. b: Student will prepare the report including sketches of power transmission systems demonstrated with labeling of each part, their specifications and functions. c: Student will calculate the velocity ratio, diameters/number of tooth based on data given. This has to be included in report also.	03	06
3	3	a: Demonstrate arc and gas welding including points stated at unit number 3. b: Show and explain welding transformer settings for welding. c: Show and explain pressure settings for gas cuttings. d: Demonstrate use of welding and gas cutting consumables, accessories and safety items. e: Brief students about safety norms to be followed for welding and gas cutting. f: Student will prepare the report including : i. Sketches for welding and gas cutting setups. ii. Specifications, uses and sketches for welding accessories, consumables and safety items. g: Student will prepare one job using welding and one job using gas cutting.	03	06
4	4	a: Identify parts and demonstrate strokes of petrol , diesel and gas engines. b: Show and explain classification of IC engine. c: Determine the effect of variation of load on fuel-consumption of an I.C. engine. Also locate the faults in a given I.C.engine and suggest remedial measures. d: Student will prepare the report including : a. Sketches for various parts of petrol, diesel and gas engines and will explain the functions of each.	02	04

		b. Explain working of petrol, diesel and gas engines. c. Workout various parameters like break power, indicated power, fuel consumption, etc..		
5	5	a: Explain concept of theory of fluid flow. b: Demonstrate properties of fluids. c: Classify, show various parts and explain their functions, also demonstrate working of: a. Various pumps. b. Various turbines. c. Various air compressors. d. Other hydraulic/pneumatic/ hydro-pneumatic equipments. d: Perform test on centrifugal pump. Also find fault and remedies for centrifugal pump. Work out important performance parameters. e: Demonstrate working of Air compressor. f: Student will prepare the report including : a. Sketches for various parts of pumps, turbines, air compressors and other hydraulic/pneumatic devices and will explain the functions of each. b. Explain working of various pumps, turbines, air compressors and other hydraulic and pneumatic devices. c. Workouts.	03	06
6	6	a: Explain concept / demonstrate working of various material handling equipments / devices listed in Unit number 6. Also explain / demonstrate working of main parts of each equipment / device. b: Student will prepare the report including : a. Sketches for various parts of various material handling equipments / devices . b. Explain working of various material handling equipments / devices.	01	02

NOTES:

1. It is compulsory to prepare log book of exercises. It is also required to get each exercise 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. Term work report includes log book and term work reports. Term work report must not include any photocopy/ies, printed manual/pages, lithos, etc. It must be hand written / hand drawn by student only.

4. For 20 marks practical ESE, students are to be assessed for competencies achieved. Students may be asked to:
    a. Presentation on given topic.
    b. Identify and specify given items.
    c. Answer short questions which are leading to test competencies developed.
    d. Explain working with neat sketch and state applications of various equipments/devices/instruments/etc. from the syllabus.
    e. Start and operate given equipments/devices/instruments/etc. from the syllabus.

7. SUGGESTED LIST OF STUDENT ACTIVITIES:

S. No.	Details of activity.
1	Student will visit the civil site and will prepare the list of mechanical engineering related equipments/machineries used at that site. Student will also observe and study concrete mixing process.
2	Student will observe the working of crane and will prepare the specifications of it.
3	Prepare the list of mechanical items surrounding to you.
4	Collect catalogue of various pumps and compare them. Also find suitable pump for specified head.
5	Collect catalogue of earth moving equipments and study their working.

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	Hydraulic machines	Jagdish lal	Metropolitan Book Company
3	Elements of Workshop Technology (Vol. 1,2)	Hazara chaudhary	Asia Publishing House
4	Hydraulics	R.C.Patel	Acharya Book Depot
5	Pumps operation and maintenance	Tyler and Hicks	Tata McGraw-Hill
6	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: Gas cutting process set up with all accessories and consumables.
f: Petrol engine test rig.

g: Diesel engine test rig.
h: Air compressor test rig.
i: Water turbine / working model of water turbines.
j: Centrifugal pump test rig.
k: 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=A3ormYVZMXE (hy.lift)
h: http://www.youtube.com/watch?v=FP05rYRI9JU&feature=related (hy.pump)
i: http://homepages.cae.wisc.edu
j: http://www.youtube.com/watch?v=E6_jw841vKE&feature=related (air compressor)
k: http://www.youtube.com/watch?v=twM-GLUYQ-o&feature=related (belt drive)
l: http://www.youtube.com/watch?feature=endscreen&v=gjUwJ1CJVq4&NR=1 (belt drive)
m: http://www.youtube.com/watch?v=XunM7yUC06M&feature=related (gear drive)
n: http://www.youtube.com/watch?v=ftdgB93QOD8&feature=related (gear box)

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

1. M.K.Shukla, Lecturer in Mechanical Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.