



CAPITAL SCHOOL OF ENGINEERING

PLOT NO. 1288, MAHATAPALLA, BAJAPUR, KHURDA, PIN-752060

Session: 2023-2024

Course Name: DIPLOMA
Theory/Practical: Theory
Section : A
Semester : 5

Branch Name: MECHANICAL
Subject Name: TH 2 : Design of Machine elements
Teacher Name: SURYANARAYAN MOHARANA

Credit " External Evaluation(Marked) '80' Internal Evaluation(Marked) "

Text Books:

Sl.No	Text Books
1	PANDYA AND SHAH MACHINE DESIGN CHAROTAR PP
2	R.S.KHURMI & J.K.GOPTA A TEXT BOOK OF MACHINE DESIGN S.CHAND
3	P.C.SHARMA & D.K AGRAWAL A TEXT BOOK OF MACHINE DESIGN S.K.KATARIY A

Reference books:

Sl.No	Reference books
1	V.B.BHANDARI DESIGN OF MACHINE ELEMENTS TMH
2	S.MD.JALAUDEEN DESIGN DATA BOOK ANURADHA PUBLICATION

Course Outcomes:

Sl.No	Course Outcomes
1	Understanding the behaviours of material and their uses.
2	Understanding the design of various fastening elements and their industrial uses.
3	Understanding the different failures of design elements.
4	Understanding the change of design to accomplish the different field of applications.
5	Design shafts, keys, couplings required for power transmission.
6	Design closed coil helical spring

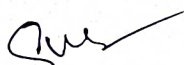
SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
1	1	1	Introduction to Machine Design and Classify it.	Cos 1	
2	2	1	Different mechanical engineering materials used in design with their uses and their mechanical and physical properties.	Cos 1	
3	3	1	Different mechanical engineering materials used in design with their uses and their mechanical and physical properties.	Cos 1	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
4	4	1	Different mechanical engineering materials used in design with their uses and their mechanical and physical properties.	Cos 1	
5	5	1	Define working stress, yield stress, ultimate stress & factor of safety and stress-strain curve for M.S & C.I.	Cos 2	
6	6	1	Define working stress, yield stress, ultimate stress & factor of safety and stress-strain curve for M.S & C.I.	Cos 1	
7	7	1	Modes of Failure (By elastic deflection, general yielding & fracture)	Cos 1	
8	8	1	Modes of Failure (By elastic deflection, general yielding & fracture)	Cos 1	
9	9	1	State the factors governing the design of machine elements.	Cos 1	
10	10	1	State the factors governing the design of machine elements.	Cos 1	
11	11	1	Describe design procedure.	Cos 1	
12	12	1	Describe design procedure.	Cos 2	
13	13	2	Joints and their classification.	Cos 3	
14	14	2	State types of welded joints .	Cos 2	
15	15	2	State advantages of welded joints over other joints.	Cos 2	
16	16	2	Design of welded joints for eccentric loads.	Cos 2	
17	17	2	Design of welded	Cos 3	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			joints for eccentric loads.		
18	18	2	State types of riveted joints and types of rivets.	Cos 3	
19	19	2	Describe failure of riveted joints.	Cos 3	
20	20	2	Determine strength & efficiency of riveted joints.	Cos 3	
21	21	2	Design riveted joints for pressure vessel.	Cos 3	
22	22	2	Design riveted joints for pressure vessel.	Cos 3	
23	23	2	Solve numerical on Welded Joint and Riveted Joints.	Cos 3	
24	24	2	Solve numerical on Welded Joint and Riveted Joints.	Cos 3	
25	25	3	State function of shafts.	Cos 4	
26	26	3	State materials for shafts.	Cos 4	
27	27	3	Design solid & hollow shafts to transmit a given power at given rpm based on a) Strength: (i) Shear stress, (ii) Combined bendin	Cos 4	
28	28	3	Design solid & hollow shafts to transmit a given power at given rpm based on a) Strength: (i) Shear stress, (ii) Combined bendin	Cos 4	
29	29	3	State standard size of shaft as per I.S.	Cos 4	
30	30	3	State function of keys, types of keys & material of keys.	Cos 4	
31	31	3	Describe failure of key, effect of key way.	Cos 4	
32	32	3	Design rectangular sunk key considering	Cos 4	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			its failure against shear & crushing.		
33	33	3	Design rectangular sunk key by using empirical relation for given diameter of shaft.	Cos 4	
34	34	3	State specification of parallel key, gib-head key, taper key as per I.S.	Cos 4	
35	35	3	Solve numerical on Design of Shaft and keys.	Cos 4	
36	36	3	Solve numerical on Design of Shaft and keys.	Cos 4	
37	37	4	Design of Shaft Coupling Design of Shaft Coupling	Cos 5	
38	38	4	Design of Shaft Coupling	Cos 5	
39	39	4	Requirements of a good shaft coupling	Cos 5	
40	40	4	Requirements of a good shaft coupling	Cos 5	
41	41	4	Types of Coupling.	Cos 5	
42	42	4	Types of Coupling.	Cos 5	
43	43	4	Design of Sleeve or Muff-Coupling.	Cos 5	
44	44	4	Design of Sleeve or Muff-Coupling.	Cos 5	
45	45	4	Design of Clamp or Compression Coupling.	Cos 5	
46	46	4	Design of Clamp or Compression Coupling.	Cos 5	
47	47	4	Solve simple numerical on above.	Cos 5	
48	48	4	Solve simple numerical on above.	Cos 5	
49	49	5	Materials used for helical spring.	Cos 6	
50	59	5	Standard size spring wire. (SWG).	Cos 6	
51	51	5	Terms used in	Cos 6	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			compression spring		
52	52	5	Terms used in compression spring	Cos 6	
53	53	5	Stress in helical spring of a circular wire	Cos 6	
54	54	5	Stress in helical spring of a circular wire	Cos 6	
55	55	5	Deflection of helical spring of circular wire	Cos 6	
56	56	5	Deflection of helical spring of circular wire	Cos 6	
57	57	5	Surge in spring	Cos 6	
58	58	5	Surge in spring	Cos 6	
59	59	5	Solve numerical on design of closed coil helical compression spring	Cos 6	
60	60	5	Solve numerical on design of closed coil helical compression spring	Cos 6	


Subject Teacher


HOD

Principal



CAPITAL SCHOOL OF ENGINEERING

PLOT NO. 1288, MAHATAPALLA, BAJAPUR, KHURDA, PIN-752060

Session: 2023-2024

Course Name: DIPLOMA
Theory/Practical: Theory

Branch Name: MECHANICAL
Subject Name: TH 3 : Hydraulic Machines & Industrial Fluid
Power

Section : A
Semester : 5

Teacher Name: RAJALAXMI DAS

Credit " External Evaluation(Marked) '80' Internal Evaluation(Marked) '20'

Text Books:

Sl.No	Text Books
1	HYDRAULIC MACHINES by DR.JAGDISH LAL
2	HYDRAULIC &PNEUMATIC CONTROL by K SHANMUGA, SUNDARAM

Reference books:

Sl.No	Reference books
1	HYDRAULIC &PNEUMATIC CONTROL by MAJUMDAR

Course Outcomes:

Sl.No	Course Outcomes
1	Distinguish the working principle of pumps and turbines
2	Explain the working of centrifugal pumps and gear pumps.
3	Compare pneumatic system with hydraulic system.
4	Draw pneumatic circuits for industrial application.
5	State the properties of hydraulic system.
6	Develop hydraulic circuit for machine tool operation.

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
1	1	1	HYDRAULIC TURBINES.	Cos 1	
2	2	1	Definition and classification of hydraulic turbines	Cos 1	
3	3	1	Construction and of impulse turbine.	Cos 1	
4	4	1	working principle of impulse turbine.	Cos 1	
5	5	1	Velocity diagram of moving blades, impulse turbine	Cos 1	
6	6	1	Velocity diagram of moving blades, work done and derivation of various efficiencies of	Cos 1	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			impulse turbine		
7	7	1	Velocity diagram of moving blades, work done and derivation of various efficiencies of Francis turbine.	Cos 1	
8	8	1	Velocity diagram of moving blades, work done and derivation of various efficiencies of Francis turbine.	Cos 1	
9	9	1	Velocity diagram of moving blades, work done and derivation of various efficiencies of Kaplan turbine	Cos 1	
10	10	1	Velocity diagram of moving blades, work done and derivation of various efficiencies of Kaplan turbine	Cos 1	
11	11	1	Numerical on above	Cos --Select--	
12	12	1	Numerical on above	Cos --Select--	
13	13	1	Distinguish between impulse turbine and reaction turbine.	Cos 1	
14	14	1	Distinguish between impulse turbine and reaction turbine.	Cos 1	
15	15	2	CENTRIFUGAL PUMPS	Cos 2	
16	16	2	Construction of centrifugal pumps	Cos 2	
17	17	2	working principle of centrifugal pumps	Cos 2	
18	18	2	work done and derivation of various efficiencies of centrifugal pumps.	Cos 2	
19	19	2	work done and derivation of various efficiencies of centrifugal pumps.	Cos 2	
20	20	2	Numerical on above	Cos --Select--	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
21	22	3	RECIPROCATING PUMPS	Cos 3	
22	23	3	Describe construction & working of single acting reciprocating pump.	Cos 3	
23	24	3	Describe construction & working of double acting reciprocating pump.	Cos 3	
24	25	3	Derive the formula for power required to drive the pump (Single acting & double acting)	Cos 3	
25	25	3	Define slip.	Cos 3	
26	26	3	State positive & negative slip & establish relation between slip & coefficient of discharge.	Cos 3	
27	27	3	Solve numerical on above	Cos 3	
28	28	4	PNEUMATIC CONTROL SYSTEM	Cos 4	
29	29	4	Elements –filter-regulator-lubrication unit	Cos 4	
30	30	4	Pressure control valves	Cos 4	
31	31	4	Pressure relief valves	Cos 4	
32	32	4	Pressure regulation valves	Cos 4	
33	33	4	4. 3/2DCV,5/2 DCV,5/3DCV	Cos 4	
34	34	4	Flow control valves	Cos 4	
35	35	4	Throttle valves	Cos 4	
36	36	4	ISO Symbols of pneumatic components	Cos 4	
37	37	4	Direct control of single acting cylinder	Cos 4	
38	38	4	Operation of double acting cylinder	Cos 4	
39	39	4	Operation of double acting cylinder with	Cos 4	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			metering in and metering out control		
40	40	5	HYDRAULIC CONTROL SYSTEM	Cos 5	
41	41	5	Hydraulic system, its merit and demerits	Cos 5	
42	42	5	Hydraulic accumulators	Cos 5	
43	43	5	Pressure relief valves	Cos 5	
44	44	5	Pressure regulation valves	Cos 5	
45	45	5	Direction control valves 5. 3/2DCV,5/2 DCV,5/3DCV	Cos 5	
46	46	5	3/2DCV,5/2 DCV,5/3DCV	Cos 5	
47	47	5	Flow control valves	Cos 5	
48	48	5	Throttle valves	Cos 5	
49	49	5	Fluid power pumps	Cos 6	
50	50	5	External and internal gear pumps	Cos 6	
51	51	5	Vane pump	Cos 6	
52	52	5	Radial piston pumps	Cos 6	
53	53	5	ISO Symbols for hydraulic components.	Cos 6	
54	54	5	Actuators	Cos 6	
55	55	5	Hydraulic circuits	Cos 6	
56	56	5	Direct control of single acting cylinder	Cos 6	
57	57	5	Operation of double acting cylinder	Cos 6	
58	58	5	Operation of double acting cylinder with metering in and metering out control	Cos 6	
59	59	5	Comparison of hydraulic and pneumatic system	Cos 6	
60	60	5	Revision class	Cos --Select--	


Subject Teacher


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Session: 2023-2024

Course Name: DIPLOMA
Theory/Practical: Theory
Section : A
Semester : 5

Branch Name: MECHANICAL
Subject Name: TH 4 : Mechatronics
Teacher Name: RAKESH KU SAHU

Credit " External Evaluation(Marked) '80' Internal Evaluation(Marked) '20'

Text Books:

Sl.No	Text Books
1	W. Bolton, Mechatronics, Pearson Education India
2	R.K Rajput, Text book of Mechatronics, S. Chand

Reference books:

Sl.No	Reference books
1	R. RADHAKRISHNA, S, SUBRAMANIAN, CAD/CAM/CIM, NEW AGE INTERNATIONAL PVT.LTD
2	MIKELL GROVER, CAD/CAM

Course Outcomes:

Sl.No	Course Outcomes
1	To study the definition and elements of mechatronics system.
2	To learn how to apply the principle of mechatronics for the development of productive systems.
3	To learn the CNC technology and applications of mechatronics in manufacturing automation.
4	Define different type of system and Sensors and solve the simple problems.
5	Explain the concept of Mechanical actuation, Electrical actuation and solve the simple problems.
6	Find out the various types of System Models & Input /Output parts and solve the problems.

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
1	1	1	INTRODUCTION Definition of Mechatronics, Advantages & disadvantages of Mechatronics MECHATRONICS:	Cos 1	
2	2	1	Application of Mechatronics	Cos 1	
3	3	1	Scope of Mechatronics in Industrial Sector	Cos 1	
4	4	1	Components of a Mechatronics System	Cos 1	
5	5	1	Importance of mechatronics in	Cos 1	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			automation		
6	6	2	SENSORS AND TRANSDUCERS	Cos 2	
7	7	2	Defination of Transducers	Cos 2	
8	8	2	Classification of Transducers	Cos 2	
9	9	2	Electromechanical Transducers	Cos 2	
10	10	2	Transducers Actuating Mechanisms	Cos 2	
11	11	2	Transducers Actuating Mechanisms	Cos 2	
12	12	2	Displacement & Positions Sensors	Cos 2	
13	13	2	Velocity, motion, force and pressure sensors.	Cos 2	
14	14	2	Velocity, motion, force and pressure sensors.	Cos 2	
15	15	2	Temperature and light sensors.	Cos 2	
16	16	3	ACTUATORS- MECHANICAL, ELECTRICAL: Mechanical Actuators	Cos 3	
17	17	3	Machine, Kinematic Link, Kinematic Pair, Mechanism, Slider crank Mechanism	Cos 3	
18	18	3	Gear Drive, Spur gear, Bevel gear, Helical gear, worm gear	Cos 3	
19	19	3	Belt & Belt drive	Cos 3	
20	20	3	Bearings	Cos 3	
21	21	3	Electrical Actuator: Switches and relay, Solenoid	Cos 3	
22	22	3	D.C Motors	Cos 3	
23	23	3	A.C Motors	Cos 3	
24	24	3	Stepper Motors, Specification and control of stepper motors	Cos 3	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
25	25	3	Servo Motors D.C & A.C	Cos 3	
26	26	4	PROGRAMMABLE LOGIC CONTROLLE RS(PLC)	Cos 4	
27	27	4	Introduction	Cos 4	
28	28	4	Advantages of PLC	Cos 4	
29	29	4	Selection and uses of PLC	Cos 4	
30	30	4	Architecture basic internal structures	Cos 4	
31	31	4	Architecture basic internal structures	Cos 4	
32	32	4	Architecture basic internal structures	Cos 4	
33	33	4	Input/output Processing and Programming	Cos 4	
34	34	4	Input/output Processing and Programming	Cos 4	
35	35	4	Input/output Processing and Programming	Cos 4	
36	36	4	Mnemonics	Cos 4	
37	37	4	Mnemonics	Cos 4	
38	38	4	Master and Jump Controllers	Cos 4	
39	39	4	Master and Jump Controllers	Cos 4	
40	40	4	Master and Jump Controllers	Cos 4	
41	41	5	Introduction to Numerical Control of machines and CAD/CAM	Cos 5	
42	42	5	NC machines	Cos 5	
43	43	5	CNC machines	Cos 5	
44	44	5	CAD/CAM	Cos 5	
45	45	5	Software and hardware for CAD/CAM	Cos 5	
46	46	5	Functioning of CAD/CAM system	Cos 5	
47	47	5	Features and characteristics of	Cos 5	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			CAD/CAM system, Application areas for CAD/CAM		
48	48	5	elements of CNC machines, Introduction	Cos 5	
49	49	5	Machine Structure	Cos 5	
50	50	5	Guideways/Slide way	Cos 5	
51	51	5	Introduction and Types of Guideways, Factors of design of guideways	Cos 5	
52	52	5	Drives	Cos 5	
53	53	5	Spindle drives	Cos 5	
54	54	5	Feed drive	Cos 5	
55	55	5	Feed drive	Cos 5	
56	56	6	ROBOTICS	Cos 6	
57	57	6	Definition, Function and laws of robotics	Cos 6	
58	58	6	Types of industrial robots	Cos 6	
59	59	6	Robotic systems	Cos 6	
60	60	6	Advantages and Disadvantages of robots	Cos 6	


Subject Teacher


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Session: 2023-2024

Course Name: DIPLOMA
Theory/Practical: Theory
Section : A
Semester : 5

Branch Name: MECHANICAL
Subject Name: TH 5 : Refrigeration and air conditioning
Teacher Name: SARADENDU BHUJABALA

Credit " External Evaluation(Marked) '80' Internal Evaluation(Marked) '20'

Text Books:

Sl.No	Text Books
1	C.P ARRORA REFRIGERATION AND AIR CONDITIONING TMH
2	R.S.KHURMI &J.K.GOPTA REFRIGERATION AND AIR CONDITIONING S.CHAND

Reference books:

Sl.No	Reference books
1	P.L BALLANY REFRIGERATION AND AIR CONDITIONING KHANNA PUBLISHER
2	DOMKUNDRA AND ARORA REFRIGERATION AND AIR CONDITIONING DHANPAT RAY AND SONS

Course Outcomes:

Sl.No	Course Outcomes
1	Explain the working of open & closed air system of air refrigeration system
2	Describe the working and construction of compressor, Condenser, evaporator, expansion valve used for air conditioning and refri
3	Explain Vapor Compression refrigeration system.
4	Explain Vapor Absorption refrigeration system.
5	Compare different refrigerants properties.
6	Describe equipment for air conditioning.

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
1	1	1	AIR REFRIGERATION CYCLE	Cos 1	
2	2	1	Definition of refrigeration and unit of refrigeration	Cos 1	
3	3	1	Definition of COP, Refrigerating effect (R.E)	Cos 1	
4	4	1	Principle of working of open and closed air system of refrigeration	Cos 1	
5	5	1	Calculation of COP of Bell-Coleman cycle	Cos 1	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
			and numerical on it.		
6	6	2	SIMPLE VAPOUR COMPRESSION REFRIGERATION SYSTEM	Cos 2	
7	7	2	schematic diagram of simple vapors compression refrigeration system'	Cos 2	
8	8	2	Types	Cos 2	
9	9	2	Cycle with dry saturated vapors after compression.	Cos 2	
10	10	2	Cycle with wet vapors after compression	Cos 2	
11	11	2	Cycle with superheated vapors after compression	Cos 2	
12	12	2	Cycle with superheated vapors before compression	Cos 2	
13	13	2	Cycle with sub cooling of refrigerant	Cos 2	
14	14	2	Representation of above cycle on temperature entropy and pressure enthalpy diagram	Cos 2	
15	15	2	Numerical on above (determination of COP, mass flow)	Cos 3	
16	16	3	VAPOUR ABSORPTION REFRIGERATION SYSTEM	Cos 3	
17	17	3	Simple vapor absorption refrigeration system	Cos 3	
18	18	3	Practical vapor absorption refrigeration system	Cos 3	
19	19	3	COP of an ideal vapor absorption refrigeration system	Cos 3	
20	20	3	COP of an ideal vapor absorption refrigeration system	Cos 3	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
21	21	3	Numerical on COP	Cos 3	
22	22	3	Numerical on COP	Cos 3	
23	23	4	REFRIGERANT COMPRESSORS: Principle of working and constructional details of reciprocating and rotary compressors.	Cos 4	
24	24	4	Centrifugal compressor only theory: Important terms.	Cos 4	
25	25	4	Hermetically and semi hermetically sealed compressor.	Cos 4	
26	26	4	CONDENSERS: Principle of working and constructional details of air cooled and water cooled condenser	Cos 4	
27	27	4	Heat rejection ratio.	Cos 4	
28	28	4	Cooling tower and spray pond	Cos --Select--	
29	29	4	EVAPORATORS: Principle of working and constructional details of an evaporator	Cos 4	
30	30	4	Types of evaporator, Bare tube coil evaporator, finned evaporator, shell and tube evaporator	Cos 4	
31	31	5	EXPANSION VALVES, Capillary tube	Cos 4	
32	32	5	Automatic expansion valve, Thermostatic expansion valve	Cos 4	
33	33	5	REFRIGERANTS, Classification of refrigerants	Cos 4	
34	34	5	Desirable properties of an ideal refrigerant.,	Cos 4	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Coa	Reference Material Links
			Designation of refrigerant.		
35	35	5	Thermodynamic Properties of Refrigerants.	Coa 4	
36	36	5	Chemical properties of refrigerants., commonly used refrigerants, R-11, R-12, R-22, R-134a, R-717	Cos 4	
37	37	5	Substitute for CFC	Cos 4	
38	38	5	Applications of refrigeration, cold storage	Cos 4	
39	39	5	dairy refrigeration, ice plant	Cos 4	
40	40	5	water cool/frost free refrigerator,	Cos 4	
41	41	6	Psychrometric forms, Adiabatic saturation of air by evaporation of water	Cos 5	
42	42	6	Psychrometric chart and uses.	Cos 5	
43	43	6	Psychrometric chart and uses.	Cos 5	
44	44	6	Sensible heating and Cooling, Cooling and Dehumidification	Cos 5	
45	45	6	Heating and Humidification	Cos 5	
46	46	6	Adiabatic cooling with humidification	Cos 5	
47	47	6	Total heating of a cooling process	Cos 5	
48	48	6	SHF, BPF, Adiabatic mixing	Cos 5	
49	49	6	Problems on above	Cos 5	
50	50	6	Effective temperature and Comfort chart	Cos 5	
51	51	7	Factors affecting comfort air conditioning	Cos 6	
52	52	7	Factors affecting comfort air conditioning	Cos 6	

SL No.	Lecture No.	Module/Unit No.	Topic To Be Taught	Cos	Reference Material Links
53	53	7	Equipment used in an air-conditioning	Cos 6	
54	54	7	Equipment used in an air-conditioning	Cos 6	
55	55	7	Classification of air-conditioning system	Cos 6	
56	56	7	Winter Air Conditioning System	Cos 6	
57	57	7	Winter Air Conditioning System	Cos 6	
58	58	7	Summer air-conditioning system	Cos 6	
59	59	7	Summer air-conditioning system	Cos 6	
60	60	7	Numerical on above	Cos 6	


Subject Teacher


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