STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

DISCIPLINE: MECHATRONICS ENGINEERING						**SEMESTER: 4TH**						
SL NO	**SUBJECT CODE**	**SUBJECT**	**PERIODS**			**EVALUATION SCHEME**						
			L	**T**	**P**	**INTERNAL EXAM**			**END SEM EXAM**	**TERM WORK**	**PRACTICAL EXAM**	**TOTAL MARKS**
						TA	**CT**	**TOTAL**				
THEORY												
1.	MCT 401	MECHANICAL ENGG.SC—II	4	-	-	10	20	30	70			100
2.	MCT 402	APPLIED MECHANICS	4	-	-	10	20	30	70			100
3.	CST 421	COMPUTER PROGG& NETWORKING	4	-	-	10	20	30	70			100
4.	ELT 421	MEASUREMENT SYSTEM	4	-	-	10	20	30	70			100
5.	MCT 403	MECHATRONICS SYSTEM &ADVANCED MANUFACTURING	4	-	-	10	20	30	70			100
PRACTICAL/TERM WORK												
5.	ETP 421	ELECTRONICS LAB –II	-	-	5					25	25	50
6.	CSP 421	COMPUTER PROG. LAB	-	-	6					25	50	75
7.	MCP 401	AUTO CAD	-	-	4					25	25	50
8.	ETP 422	DIGITAL ETC LAB	-	-	4					25	50	75
GRAND TOTAL			**20**		**19**	**50**	**100**	**150**	**350**	**100**	**150**	**750**

Total contact hours per week: 39
Abbreviations:L-lecture,T-tutorial, P-practical, TA- Teacher’s Assessment, CT- class test
Minimum pass mark in each theory subject is 35% and in practical subject is 50%

MECHANICAL ENGG.SC—II

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	MCT 401	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

COURSE OBJECTIVES :

- Trainees will be able to understand the mechanical concepts used in various machine.
- To understand various manufacturing methods to used in a company.
- To understand the concepts of heat treatment.
- To understand power transmission elements.
- Will able to select right type of bearings and its lubrication.
- To understand an overview on steam turbines and IC engines.

MAJOR TOPICS

1. MANUFACTURING METHODS.
2. SUPER FINISHING OPERATION.
3. HEAT TREATMENT.
4. PROCESS PLANNING.
5. BEARING MATERIALS AND ANTIFRICTION BEARINGS.
6. LUBRICANTS.
7. AN OVERVIEW ON STEAM TURBINE, IC ENGINES, REFRIGERATION.
8. JIGS AND FIXTURES.
9. INFORMATION ON NON CONVENATIONAL MACHINING.
10. CLUTCHES AND COUPLINGS.

Sl.No.Topics Periods

UNIT-1

1.0 MANUFACTURING METHODS 12

1.1 Introduction to various methods of manufacturing like forming 4
Machining, joining methods (fabrication).

1.2 Forming process-An over view on casting,forging,rolling,drawing 2
Powder material technology etc.

1.3 Joining methods—Temporary joints like screws,bolts,Rivets-- 6
Types of riveted joints,Soldering,brazing,Arc and Gas welding,
Types of welding like Spot welding, seam welding butt welding etc.
Welding like TIG, MIG andcontinuous welding process.

2.0 SUPER FINISHING OPERATIONS 2

2.1 An over view ofvarious super finishing operations like honing
lapping, its process advantages and disadvantages.

3.0 HEAT TREATMENT 5

3.1 Principle of heat treatment, phase transformation in steel during 2
heating.

3.2 Heat treatment process—Annealing, normalizing hardening Tempering case hardening surface hardening, vacuum hardening and induction hardening.	2
3.2 Defects in Hardening.	1

UNIT-2

4.0 PROCESS PLANNING	**7**
4.1 Definition and Objective	1
4.2 Materials for the screw, nut, bolt, washer and shaft	3
4.3 Manufacturing Process of screw, nut, bolt, washer and shaft.	3
5.0 BEARING MATERIALS AND ANTIFRICTION BEARINGS	**6**
5.1 Introduction of bearings, characteristics ,types, composition of Common bearing materials like white metal (Babbitt), bronze, brass, aluminum alloys, cadmium, alloys etc, bimetal and tri Metal bearings.	2
5.2 Types of antifricationbearings,designation of each type,ball bearings,roller bearings and needle bearings,preloading of angular contact bearings.	4
6.0 LUBRICATION	**3**
6.1 Characteristics of lubrication,types of lubrication	1
6.2 Methods of lubrication—self lubrication,manualfeed,auto feed and aerosollubrication,auto lubrication systems--time and motionbased.	2

UNIT-3

7.0 ANOVERVIEW ONSTEAMTURBINS,IC ENGINES, REFRIGERATION	**12**
7.1 Working principles of boilers and turbines, types of IC engines Construction, classification—two stroke and four stroke petrol and diesel engines, thermal efficiency and mechanical efficiency.	4
7.2 Rankinecycle,autocycle,diesel cycle&carnot cycle.	2
7.3 Properties of water and steam. Use of steam table and mollier chart.	3
7.4 Refrigeration concepts, functionsand types. Vapor compression and Vapor absorption, refrigerants and principles of air conditioning.	3
8.0 JIGS AND FIXTURES	**10**
8.1 Introduction to jigs and Fixtures and advantages	1
8.2 Planes of movement degrees of freedom	2
8.3 Methods of location, different types of clamps and clamping devices, drill bushes and supports.	2
8.4 Types of jigs and fixtures.	2
8.5 Types of locators and location methods	2
8.6 Jigs and Fixtures design—elements factors to be considered With examples.	2
9.0 INFORMATION ON NON CONVENTIONAL MACHINING	**3**
9.1 Chemical etching, ultrasonic machining, electro chemical machining.	1

9.2 Electrical discharge machining, wire cut EDM 1

9.3 Plasma arc machining, laser beam machining, water jet 1

Machining and abrasive machining.

Learning Resources:[Text Books]			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1.	W.A.J.Chapman	Workshop Technology (Part1 & Part2)	
2.	HazraChoudhury	Workshop Technology (Part1 & Part2)	
3.	H.Gerling	All about Machine Tools	
4.	Wright Baker	Modern Workshop Practice	
5.	P.m.Johnston	Machine Technology Vol.1.2.3	
6.	Ganesan	I.C.Engine	
7.	Rao	Manufacturing Technology Vol-I & II	

APPLIED MECHANICS

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	MCT 402	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

Sl.No	Major Topics	Time allotted
		Total periods : 60
1.	Forces and Moment of Inertia	13
2.	Strength of Material	17
3.	Simple Machines	06
4.	Basic Kinematics	09
5.	Transmission of Power and Motion	09
6.	Gear Driver	06

SUBJECT CONTENT :

1.0 Forces :

1.1 Moment of a force. Beams and types of beams and their applications.

1.2 To draw , SPD and BMD (analytical method)

1.3 Introduction to moment of intertie.

1.4 Determination of moment of inertia of different sections analytically.

2.0 Strength of Material :

2.1 Types and importance of stress, determination and explanation of Young's modulus of elasticity (simple problems on these).

2.2 Strut and columns – Definition, classification of columns, strength of columns, Euler's column Theory, Problems.

2.3 Thick and Thin Cylinders – Stress in thick and thin cylinders subjected to fluid pressures.

2.4 Bending Stress – Pure bending, types of load acting on beams, principle of bending action, bending moment.

2.5 Torsion of shaft – Definition, effect of torsion, twisting moment, torsion of shafts power transmitted, strength of shaft and torsion rigidity.

2.6 Torsion of springs – Introduction, types of springs, close coiled springs subjected to loads.

3.0 Simple Machines :

3.1 Definitions – Mechanical advantages, velocity ratio and efficiency and relationship between the three.

3.2 Effort in friction, simple screw jack and efficiency of the screw jack, worm and worm wheel.

4.0 Basic Kinematics :

4.1 Introduction to theory of machines, machine structure and kinematics.

4.2 Difference between machine and mechanism – Kinematics jack, types of kinematics jack, kinematics chain.

4.3 Four jack chain, application of quadric cycle.

5.0 Transmission of Power and Motion :

5.1 Belt drive – velocity ratio, effect of belt thickness, and effect of belt slip on velocity ratio. Slip and creep in belts.

5.2 Length and width of belt – open and cross belt driver.
5.3 Use of killers and jockey pulleys, fast and loose pulley, stepped pulley crowning of pulleys.
5.4 Vee belt advantages, rope driver – types of power transmitted by rope drive and chain drivers – classification based on hoisting chain, conveyor chain and power transmitted by chains.

6.0 Gear Driver :

6.1 Law of gearing.
6.2 Properties of involute profile toothed gears. Types of gear trains – simple, compound, reverted and unicyclic gear trains.

Learning Resources:[Text Books]			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1.	I.B. Prasad	Applied Mechanics and Graphics statics	
2.	R.S. Khurmi	Applied Mechanics and Graphics statics	
3.	Roy Chowdhury	Engineering Materials	
4.	R.S. Khurmi	Theory of Machines	
5.	R.S. Khurmi	Machine Design	
6.	Rattan	Theory of Machines	
7.	Timmorhant& Young	Strength of Material	

COMPUTER PROGG& NETWORKING

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	CST 421	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

General Objective:

1 Analyze problem and arrange them logically using C++ Language.
2 To study about computer networking.
3 To study about oracle.

Sl.No	Major Topics	Time allotted
		Topic periods :60
1	C++ Language programming	20
2	Computer networking	30
3	Oracle	10

SUBJECT CONTENT:--

C++ LANGUAGE PROGRAMMING

1.0 Introduction

1.1 Overview of C++ structures
1.2 Specifying aclass
1.3 Defining member function
1.4 C++ programming on class
1.5 Making an outside function inline
1.6 Nesting of member functions
1.7 Private member functions
1.8 Arrays within a class.
1.9 Memory allocation for objects
1.10 Static data members.
1.11 Arrays of objects.
1.12 Objects as function arguments.
1.13 Friend functions retuning objects.

2.0 Constructors and Destructors

2.1 Introduction to constructors.
2.2 Parameterized constructors.
2.3 Multiple constructors in a class.
2.4 Dynamic constructors.
2.5 Constructing two dimensional arrays.
2.6 Destructors.

3.0 Overloading.

3.1 Define operator overloading.
3.2 Overloading unary operators.
3.3 Overloading binary operators.

3.4 Using friend functions.
3.5 Manipulation of strings using operators.
3.6 Rulers for overloading operators.
3.7 Type conversions.
3.8 Function overloading.

4.0 Inheritance.

4.1 Defining derived classes.
4.2 Single inheritance.
4.3 Multiple inheritances.
4.4 Hierarchical inheritance.
4.5 Hybrid inheritance.
4.6 Virtual base class.
4.7 Abstract class.
4.8 Construction in derived classes.
4.9 Nesting of classes.

COMPUTER NETWORK

5.0. Basic of Data Communication.

5.1 Introduction to Data Transfer.
5.2 Asynchronous &Synchronous Transmission.

6.0. Reliable Data Transmission.

6. 1. Data Transfer rate,Channel capacity.
6. 2. Packet Switching.
6. 3. Different methodsof ErrorDetection,
6. 4. ErrorRecovery of Error Correction,
6. 5. Flow Control.

7.0. Connections and Interfacing.

7. 1. Introduction to serial and parallel connection.
7. 2. Half Duplex, Full Duplex, parallel connection.
7. 3. Analog and digital transmission.
7. 4. Multiplexing.
7. 5. Concepts of Multiplexing.
7. 6. Interconnection.
7. 7. Use of Repeaters,Bridges,Routers, Gateways Services,Network,Benefits.
7. 8. Networkdisadvantages.

8.0 Network structures

8. 1. Topologies, BUS, RING, STAR
8. 2. Structured Wiring Systems Media, Twisted

9.0 Standards.

9. 1. Introduction to OSI reference model, seven.
9. 2. Layer Model, Physical Layer, Session Layer, Presentation.
9. 3. Layer, Application Layer.
9. 4. Advantages of laying & existing standards.
9. 5. Protocol Suite: TCP/IP.

10.0 ORACLE.

10 . 1. Introduction to Database management system.
10 . 2. Data,information,Database,DBMS, relations,tuples,attributes,oracle engine,

10 . 3. SQL (Structured Query Language), SQL statement (DCL, DDL, DML), Data type (Character, Number, Date, Varchar2)
10 . 4. Retrieving and storing data.
10 . 5. Use queries to solve problems.

Learning Resources:[Text Books]			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1.	Balaguruswamy	C++	
2.		C++ Programming	Schaum Series
3.	W.Stallings	Net working and Data communication	PHI
4.	A.S Tanenbum	Computer Network	PHI
5.	BipinDashi.	An introduction to Data base	

MEASUREMENT SYSTEM

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	ELT 421	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

General Objective:

1 To get an overview of various industrial instrumentation and its utility.
2 To understand various sensors/transducers
3 To understand different electronics measuring instruments.
4 To understand ultrasonic/optical measurement and usages.

Sl.No	Major Topics	Time allotted
		Total periods
1	Introduction	05
2	Electronics instrumentation	04
3	Level measurement	10
4	Temperature measurement	10
5	Pressure measurement	04
6	Displacement and Acceleration measurement	09
7	Force, weight and flow measurement	10
8	Vibration and ultrasonic measurement	08

SUBJECT CONTENT:

1. **INTRODUCTION**
   - **a.** Definition of measurement system
   - **b.** Measurement system and it's constituent elements.
   - **c.** Sensors and transducers/.
   - **d.** Performance Terminology.
   - **e.** Static and Dynamic characteristics.

2. **ELECTRONIC INSTRUMENTATION**.
   - a. V-F Converts.
   - b. F-v Converter.

3. **LEVEL MEASUREMENT**
   - a. D.P type level measurement.
   - b. Displacer type measurement.
   - c. Float type measurement.
   - d. Ultrasonic type measurement.

4. **TEMPERATURE MEASUREMENT**
    a. Introduction to Temperature Measurement.
    b. Thermo couples, principle, Types, selection, standard table of thermocouples And signal condition circuits.
    c. RTD, principle, Types, Selection of RTD,s and conditioning circuits.
    d. Thermistor and Bimetallic Strip.
    e. Measurement of temperature using Diodes.
    f. IC temperature Transducer using LM35 and AD590.
    g. pyrometer (optical and Infrared).
5. **PRESSURE MEASUREMENT**
    a. Introduction to pressure measurement
    b. Pressure Standards
    c. Conventional pressure sensors
    d. Electrical and Electronic pressure transducers.
    e. Introduction to Calibration and Calibration of pressure Gauge.
    f. P/I & I/P converter.
    g. Pressure transmitter,watermanometer,mercury manometer.
6. **DISPLACEMENT AND ACCELERATION MEASUREMENT**
    a. Introduction to displacement measurement.
    b. Potentiometer sensor capacitive sensor,Types,Construction,operation and Errors.
    c. LVDT,Principle,Operation and Application
    d. Inductive proximity Switch.
    e. Digital Encoder: Contact.Magnetic and Optical Fncoder.
    f. Rotational Displacement/Angular position: Using optical and Signal
    g. Conditioning circuits.
    h. Introduction, characteristics and types of Accelerometer.
7. **FROCE WEIGHT AND FLOW MEASUREMENT**
    a. Introduction to force weight and flow measurement.
    b. Strain gauge and its function.
    c. Load Cell, principle and operation of load cell.
    d. Weight measurement by static, dynamic and in motion method .
    e. Orifice, venture flow nozzle, pitot tube.
    f. Flow measurement by D.P type, turbine flow type, magnetic flow type, ultrasonic type.
8. **VIBRATION AND ULTRASONIC MEASUREMENT**
    a. Introduction, characteristics.
    b. Vibration measurement by Eddy current method, PIezo sensor
    c. Basic Ultrasonic Transmission Link, piezoelectric, ultrasonic, transmitter and receiver, principle and example.

Learning Resources:[Text Books]			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1.	Bolton,Pearson	Mechatronics	Education Asia
2.	JP Bentlley	Principle of measurement	
3.	Addition Wesley	Systems 2000	
4.	J.Michael Jacob	Industrial Control Electronics	

5.	R.K .Jain	Mechanical and Industrial Measurement	Khanna Publication
6.	Bhasker	Instrumentation and Control System	Anuradha Agencies
7.	Kali	Electronic Instrumentation	
8.	Rangan	Instrumentation Devices & System	

MECHATRONICS SYSTEM &ADVANCED MANUFACTURING

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	MCT 403	Semester	4th
Total Period:	60	Examination	3 hrs
Theory periods:	4 P/W	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

General Objective:

1. To understand the Mechatronics concept.
2. To understand the mechatronics approach.
3. To understand the actuation system.
4. To know the assembly technique.
5. To know about the data presentation techniques.
6. To understand the motion control & rotational drives.
7. To study about advanced manufacturing.

SL.No	Major Topics	Time Allotted
01	Introduction to Mechatronics	05
02	Mechatronics elements	12
03	Assembly technique	08
04	Data presentation system	05
05	Actuation syatem	15
06	Motion control & Rotational drives	08
07	Cellular manufacturing	01
08	Flexible manufacturing system	06
	Total period	60

Subject Content;

1.0 Introduction to mechatronics

1.1 What is mechatronics, system, measurement system.

1.2 Controlsystem,microprocessor based controllers.

1.3 Mechatronics in manufacturing the products.

1.4 Conventionalvs mechatronics.

2.0 Mechatronics elements

2.1 Introduction, machine structure
2.2 Guide ways-- classification**,** friction, antifriction guide ways & other guide ways.
2.3 Drive system—Servo principle, servo motors, drive optimization, Drive Protection, selection criteria for drives, power supply for CNC, electric Panel cooling.
2.4 Mechanical transmission system

2.5 Mechanism to convert rotary motion to the linear motion.
2.6 Torque transmitting elements.
2.7 Spindle bearing, antifriction bearing hydrostatic bearing and hydrodynamic bearing.
2.8 Direct and indirect measuring system.
2.9 Tool monitoring & changing system.

3.0 Assembly Technique.

3.1 Introduction,guideways-Lm guideways,tychoways,rolling elements, Aerostatic & Hydrostatic guideways—the assembly precautions.
3.2 Ball screw & nut—assembly technique alignment, fitting and displacement.
3.3 Feedback elements—Preffered linear scale assembly, incremental encoder, Assembly care of mounting of proximity switch.
3.4 Spindle bearings—general assembly precauctions,misalignment, noise and vibrations.

4.0 Data presentation system.

4.1 Loading and data presentation elements.
4.2 Magnetic recordings & data acquisition system.
4.3 Displays.
4.4 Data acquisition systems.

5.0 Actuation system.

5.1.5.1.1 Pneumatic & Hydraulic system.
5.1.2 Cylinders.
5.1.3 Process control valves.
5.1.4 Examples of fluid control system rotary actuators.
5.2 5.2.1 Mechanical systems—Types of motion—freedom and constraints Loading—QRM
5.2.2 Cams—gear trains-Ratchet & pawl.
5.2.3 Bearings—plain journal bearing—Ball & roller bearing—selection of bearing.
5.2.4 Mechanical aspects of motor selection—moment of inertia Torque.
5.3 5.3.1 Electrical systems—mechanical switches—solid state switches.
5.3.2 Control of D.C motors—stepper motor control.

6.0 Motion control & rotational drives.

6.1 Linear systems—pneumatics rams rod & rod less type.
6.2 Electrical actuators
6.3 Solenoid & other forms of electrical actuators.
6.4 Pneumatic motors, continuous and limited rotations.
6.5 Hydraulic motors, continuous and limited rotations.

7.0 Cellular manufacturing.

7.1 Introduction, types & benefits.
7.2 Cell layout & design
7.3 Application.

8.0 Flexible manufacturing system.

8.1 FMS—Introduction, benefits, meaning, major elements and their role.
8.2 FMS—Layout concept, system, tool handling system material handling Principle & system.

Reference Books:

1 System design – DevdasShetty& Richard A.Kolk PWS Publication—3rd Reprint 2004: ISBN:981-240-067-2

2 Mechatronics -- Electronics control systems in Mechanical Engineering W.Bolton—2nd Edition Pearson Educational

Ltd.ISBN81 - 7808-339—6.

3 Mechatronics HMT (TMH)

4 Mechatronics -- Prof. C.R.Venkataramana,Sapna book house,First Edition, 2nd reprint October,2002.

5 Mechatronics -- Electronics in product & process—D.A.Bradley,D. Dawson,N.C. Burd and A.J.Loader Nelson Thomes Ltd.
First Indian Reprint 2004 ISBN 0.

2 Introduction to mechatronics & measuring system.—Alciatore (TMH).

3 Machine Design—Hall

4 Mechatronics Principles, concept & Applications—Mahalik (TMH).

Pneumatic system principle & maintenance - Majumdar

ELECTRONICS LAB –II

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	ETP 421	Semester	4th
Total Period:	75	Examination	4hrs
Lab. periods:	5P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

Sl. No.	Topics	Periods
1.	DC analysis of a Differential Amplifiers	06
2.	Familiarization of IC 741 & Verification of its Parameters	06
3.	Op. Amp. Applications – Voltage Follower, Summing Amplifier	05
4.	Design and Verification of Inverting Amplifier Circuit	05
5.	Design and Verification of Non-Inverting Amplifier Circuit	05
6.	Op. Amp. As Instrumentation Amplifier – Verification of gain and CMRR.	06
7.	Op Amp as Integrator and Differentiator	05
8.	Op Amp as Integrator and Differentiator	05
9.	Op Amp as Schmitt Trigger.	05
10.	Op Amp as Filter Circuits and Study of Frequency Response (LPF, HPF, BPF)	06
11.	Op Amp as RC phase shift Oscillator.	06
12.	MonostableMultivibrators using IC 555.	05
13.	AstableMultivibrators using IC 555.	05
14.	Familiariazation of Fixed Regulators – 7805, 7905	02
15.	Familiariazation of Variable Regulators – 1M, 371	03

COMPUTER PROG. LAB

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	CSP 421	Semester	4th
Total Period:	90	Examination	4hrs
Lab. periods:	6P/W	Term Work	25
Maximum marks:	75	End Semester Examination:	50

Sl.No	Major Topics	Tim allotted
		Total periods :120
1	C++ Language Programming	50
2	Computer Networking	30
3	Database(Oracle)	10

SUBJECT CONTENT:--

PROGRAMMING ON C++ LANGUAGE

1 Write a program to swap two numbers in C++
2 Write a program by having the class name marks with data member's m1, m2, m3, total, average and calculate total and average of the given numbers.
3 Write a program to input age, name using the array size of 5
4 Write a program to input age, name and salary using scope resolution operator.
5 Write a program to overload operators such as ++,>=etc.
6 Write a program using unary operators (+,-).
7 Write a program to prove single inheritance and multiple inheritances.
8 Create a base class called XXX and derived two classes i.e. YYY from xxx and ZZZ from XXX.
9 Create a class called counter which counts and increment and decrement with different arguments.
10 Write overloaded functions to convert a string to an int and to convert to a float.

Computer Network

1 Understand the various networking devices.
2 Analyzing the different cable and their connection.
3 Analyzing the connection at no. of nods in a network.
4 Network setting and sharing between numbers of nods.
5 Installation

DATABASE

1 Use of SQL syntax: insertion, deletion, joins,updation.
2 Program on different SQL statements.
3 Use of where clause.
4 Use queries for solving problem.

AUTO CAD

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	MCP 401	Semester	4th
Total Period:	60	Examination	4hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	50	End Semester Examination:	25

GENERAL OBJECTIVE :

1. The trainees should be exposed to solid modeling, assembly, Drafting, 3-D wire frame geometry and surfacing using PRO-ENGINEERING Willfire-3 Software.

Sl. No.	Major Topics	Time Allotted Total Periods : 60
1.	Introduction to CAD	04
2.	Constraining Geometry and Dimensional	06
3.	Construction Tools	02
4.	Construction Features	06
5.	Local Operation	02
6.	Datum	02
7.	Advanced Modeling Technique	10
8.	Duplication Features	04
9.	Master Surfacing Creating Surfaces	06
10.	Manipulation of Surfaces	06
11.	Assembly	06
12.	Drafting	06

SUBJECT CONTENT :

1. Introduction to CAD.

2. **Constraining Geometry –** Types of geometry constrains, using geometry constrains, Dimensional constraints – Creating Dimension, Modifying Dimensions.

3. **Construction Tools –** Fillet, Offset, Trim / Extend, Mirror.

4. **Construction Features –** Extrude, Revolve.

5. **Local operation –** Filler / Shell / Draft / Chamfer / Hole

6. **Datum –** Datum Planes / Datum Axis.

7. **Advanced Modeling Techniques –** Sweep / Blend / Slept Blunt / Variable Section Sweep.

8. **Duplication Features –** Copy / Pattern.

9. **Master Surfacing – Creating Surfaces –** Extrusion / Revolve / Sweep / Boundary blend, style / extend / offset surface. Manipulation of Surfaces – Stitch surfaces / Extend surfaces / Bridge / Fillet / Offset surfaces / Mid surfaces.

10. **Assembly** – Constrains / Patters / Creating components within assembly / Cloning assembling / Substituting components.

11. **Drafting** – Detailing.

DIGITAL ETC LAB

Name of the Course: Diploma in MECHATRONICS ENIGINEERING			
Course code:	ETP 422	Semester	4th
Total Period:	60	Examination	4hrs
Lab. periods:	4 P/W	Term Work	25
Maximum marks:	75	End Semester Examination:	50

General Objective:

1 To design the circuits.
2 To understanding their working.
3 To verify their truth tables or outputs.

Sl. No	Major Topics	Time allotted
		Total periods
1	Familiarization of digital trainer kit	02
2	Familiarization of Logic gate ICs	02
3	Verification of Boolean Rules	04
4	Implementing and verifying Karnauhg's Map	04
5	Implementing Combinational circuits.	02
6	Half Adder and full Adder circuits.	04
7	Comparators, Decoders, Encoders, MUX and DeMUX.	06
8	Latches and Flip Flops	04
9	Timer IC 555 and Mono stable ICs74121,74123	02
10	Multi vibrator circuits	02
11	Counters using logic gates	06
12	Counters using ICs	08
13	Registers using Flip Flops	06
14	Registers using ICs	04
15	DAC 0808	02
16	ADC 0808	02

SUBJECT CONTENT :

1. Familiarization of Digital Trainer Kit.

2. Familiarization of Logic gate IC's.

2.1 NAND gate (IC 7402).

2.2 NOR gate (IC 7402)

2.3 INVERTER or NOR get (IC 7404)

2.4 AND gate (IC 7408)

2.5 OR gate (IC 7432)

2.6 Ex – OR gate (IC 7486).

3.0 Implementing and verifying Boolean Rules.

4.0 Implementing and verifying Karnaugh's Map.

5.0 Implementing Combinational circuits.

5.1 Realizing Universal property of NAND gate.

5.2 Realizing Universal property of NOR gate.

6.0 Construct and realize Half Adder and Full Adder circuit using minimum no. of gates.

7.0 Familiarization of comparator (97485), Decorder (74138), Encoder (74147), MUX (74151) and DeMUX (74138).

8.0 Familiarization of Latches and Flip Flops (SR Latch, D Latch, JK Flip-Flop).

8.1 IC 7474 (Dual D-Flip Flop).

8.2 IC 7474 (Dual J.K. Flip Flop).

8.3 IC 74373.

8.4 IC 74374.

9.0 Familiarization of Timer ICs IC 555 & IC 74121, IC 74123.

10.0 Construction of multi-vibrator circuits (Monostable and Astable).

11.0 Design and construction of Counters (Asynchronous & Synchronous Mod 16 & BCD, Presettable).

12.0 Familiarization of Counter ICs (7490, 7493, 74163, 74193).

13.0 Design and construction of Register circuits (SISO, SIPO, PIPO, PISO, RING & JOHNSON Counter).

14.0 Familiarization of Register ICs (74164, 74165, 74194).

15.0 Familiarization of DAC 0808.

16.0 Familiarization of ADC 0808.

17.0 Verify the characteristics of Logic Families fan-in, fan-out, V_{IL} max, V_{IH} min, V_{OL} min, V_{OL} min, V_{OH} max.