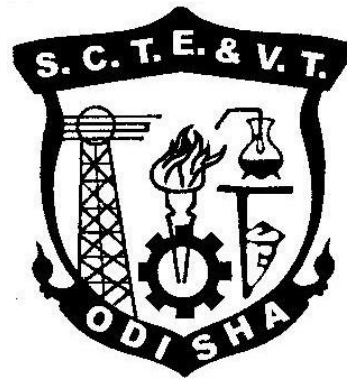# CURRICULLUM OF 3RD SEMESTER

For

DIPLOMA IN
AUTOMATION AND ROBOTICS

(Effective FROM 2024-25 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING,

ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR 3rd Semester (AUTOMATION and ROBOTICS.) (w.e.f 2024-25)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		ANALOG AND DIGITAL ELECTRONICS	4		-	20	80	3	100
Th.2		ELECTRICAL TECHNOLOGY	4		-	20	80	3	100
Th.3		APPLIED MECHANICS	4		-	20	80	3	100
Th.4		COMPUTER PROGRAMMING AND NETWORKING	4		-	20	80	3	100
Th.5		ENVIRONMENTAL STUDIES	4		-	20	80	3	100
		Total	20			**100**	**400**	**-**	**500**
		Practical							
Pr.1		ANALOG AND DIGITAL ELECTRONICS LAB	-	-	6	25	50	3	75
Pr.2		ELECTRICAL TECHNOLOGY LAB	-	-	4	25	50	3	75
Pr.3		COMPUTER PROGRAMMING AND DATABASE LAB	-	-	4	25	50	3	75
Pr.4		COMPUTER NETWORKING LAB			2	25	-	-	25
		STUDENT CENTERED ACTIVITIES (SCA)			3				
		Total	**-**	**-**	**19**	**100**	**150**	**-**	**250**
		Grand Total	**20**	**-**	**19**	**200**	**550**	**-**	**750**

TH-1 ANALOG & DIGITAL ELECTRONICS

Name of the Course: Diploma in Automation and Robotics			
Course code	Th.1	Semester	3rd
Total Period	60	Examination.	3 Hrs.
Theory periods	4 P	Internal Assessment	20
Maximum marks	100	End Semester Examination	80

A. RATIONALE

In automation and robotics, a comprehensive understanding of analog and digital electronics is paramount. Analog electronics is fundamental for real-world data processing, crucial for applications such as sensor interfacing and signal conditioning in robotics. Simultaneously, digital electronics is the backbone of automation systems, enabling precise control and logic operations. The integration of both analog and digital principles is indispensable in designing the electronic circuits that form the basis of automated processes and robotic functionalities. This foundational knowledge not only fosters proficiency in existing technologies but also equips students to drive innovation in the dynamic fields of automation and robotics, ensuring they are well-prepared for the evolving landscape of intelligent machines and automated processes.

B. OBJECTIVE

 After completion of this course the student will be able to:

1. Explain the characteristics and applications of Operational Amplifiers & Differential amplifiers and also analyze the applications of linear and nonlinear Op Amp circuits.
2. Understand the working of various types of filters & oscillators and regulated power supplies.
3. Recognize the different number systems, analyze combinational and sequential circuits
4. Understand, analyze and design various types of Combinational Logic circuits, sequential circuits and timer circuits.
5. Explain the working of A/D and D/A converters& Necessity of A/D and D/A converters.
6. Explain various logic families.

C.CHAPTER WISE DISTRIBUTION OF PERIODS WITH TOTAL PERIODS

SL.NO.	TOPICS	PERIODS
1	OPERATIONAL AMPLIFIERS	12
2	REGULATED POWER SUPPLY, FILTERS & OSCILLATORS	8
3	FUNDAMENTALS OF DIGITAL ELECTRONICS	12
4	COMBINATIONAL LOGIC CIRCUITS	6
5	SEQUENTIAL LOGIC CIRCUITS	11
6	DATA CONVERTERS& TIMERS	8
7	LOGIC FAMILIES	3
	TOTAL PERIOD	**60**

D. DETAILED CONTENTS

1.0 OPERATIONAL AMPLIFIERS

1.1 Introduction to Op-Amp. Block diagram representation of a typical Op-Amp, its equivalent circuits and draw the schematic symbol, Characteristics of Ideal Op-Amp and Applications of Op-Amp.

1.2 Differential Amplifier- explain its configuration & significance.

1.3 Pin Configuration and characteristics of 741 Op Amp

1.4 Op Amp Parameters—Slew Rate, Bias, Offset, Input & Output Impedance, Common Mode Gain, CMRR.

1.5 Open and closed loop operation of Op-Amp— Inverting Amplifier, Non-inverting Amplifier, Voltage series feedback amplifier and voltage shunt feedback amplifier

1.6 Linear and non-linear Op-Amp circuits - Voltage follower, Summing Amplifier, Instrumentation Amplifier, Comparator, Integrator, Differentiator, V/I converter, and I/V converter.

1.7 Waveform Generators-Square, Triangular, Saw tooth

2.0 REGULATED POWER SUPPLIES, FILTERS & OSCILLATORS

2.1 Power supply characteristics, Linear and Switching Regulations.

2.2 Series and Shunt Regulators

2.3 Variable Regulators— LM723 & LM317

2.4 Ideal Responses of filter

2.5 Low pass, High pass, Band Pass, Band Stop and All Pass Filters

2.6 Basics about active filters.

2.7 Oscillators- Block diagram of Sinusoidal Oscillator and Types.

2.8 Principle of operation RC and LC Oscillators (R-C phase shift, Crystal, Colpitt's, Hartley and Wein bridge oscillator)

3.0 FUNDAMENTALS OF DIGITAL ELECTRONICS

3.1 Introduction to Digital System. Difference between Analog and Digital Systems.

3.2 Number System-Binary, Octal, Decimal, Hexadecimal. Conversion from one system to another number system.

3.3 Arithmetic Operation-Addition, Subtraction, Multiplication, Division, 1s & 2s Complements

3.4 Digital Code & its application, distinguish between weighted & non-weighted Code, Binary code, excess-3 code, Gray code, ASCII code.

3.5 Logic gates: AND, OR, NOT, NAND, NOR, Exclusive-OR, Exclusive-NOR - Symbol, Function, expression &truth table.

3.6 Realization of gates using Universal Gates.

3.7 Boolean algebra, Logic Expressions – Rules and Laws of Boolean Algebra, Demorgan's Theorems, Simplifications of Boolean Expressions.

3.8 Represent Logic Expression: SOP & POS forms

3.9 Simplification of Boolean expression using Karnaugh map (3 & 4 Variables),don't care conditions

3.10 Constructing logic circuits for given Boolean expressions

4.0 COMBINATIONAL LOGIC CIRCUITS

4.1 Half adder, Full adder, Half Sub tractor, Full Subtractor

4.2 Multiplexer 4:1, De-multiplexer 1:4, Decoder, Encoder, Digital Comparator (2 Bit)

4.3 BCD to 7-segment decoder

5.0 SEQUENTIAL LOGIC CIRCUITS

5.1 Difference between Latch and Flipflop.

5.2 Level Triggering & Edge Triggering

5.3 FlipFlops – Different Types of Flip Flops (RS, D, T, JK, Master-Slave JK) -Operating Characteristics, Symbol, logic Circuit, truth table and applications.

5.4 Introduction to Counters, Asynchronous & Synchronous Counters, Binary Counter, Ripple counter (Up/Down Counters), Decade Counter, Counter ICs, Counter Applications.

5.5 Introduction to Registers, Types of Registers – SISO SIPO PISO PIPO, Universal Shift Register Applications.

6.0 DATA CONVERTERS& TIMERS

6.1 D/AConverters – Basic concepts, Applications, Types of D/A Converters: Weighted Resistor DAC, R2R Ladder DAC.

6.2 A/D Converters – Basic concepts, Applications, Types of A/D Converters: Counter type, Successive Approximation type.

6.3 555 Timer – Block diagram, pin diagram, modes of operation and applications.

7.0 LOGIC FAMILIES

7.1 Various logic families &categories according to the IC fabrication process.

7.2 Features, circuit operation &various applications of TTL(NAND), CMOS (NAND & NOR).

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT (I.A) CHAPTERS: 1, 2, 3

BOOKS RECOMMENDED

1. A Textbook of Electronic Circuit by **Dr. R.S. Sedha**,-S.Chand Publication
2. Micro Electronic Circuits By **Adel S. Sedra,Kenneth C. Smith,** -Oxford publication,
3. Electronic Devices and Circuit Theory, **Robert L. Boylestad, Louis Nashelsky**, -Pearson Education Modern Digital Electronics by **RP JAIN TMH**
4. Fundamental of Digital Electronics by **Ananda Kumar**-PHI Publication
5. Digital Electronics **by P.RAJA** ,SCITECH Publication
6. Digital Circuits Design by **S.Salivahanan ,S.Arivazhagan** –VIKAS Pub House
7. Digital logic and computer design by **M. Morris Mano**.

TH-2 ELECTRICAL TECHNOLOGY

Name of the Course: **Diploma in Automation and Robotics**			
Course code	Th.2	Semester	3rd
Total Periods	60	Examination.	3 Hrs.
No. of periods per week	4	Internal Assessment	20 Marks
Total marks	100	End Semester Examination	80 Marks

A. RATIONALE

The application of Rotatory and Static Electrical machines find extensive use in modern industries such as radio controlled planes, 3D Printers and precise humanoids. Electrical machine which are used to power robots discussed in this subject. In this Electrical Technology subject, some special purpose motors such as servomotor are used in robotic hand and tracking movement. This subject also deals with the fundamental concepts of single phase and three phase induction motors.

B. OBJECTIVE

After completion of this course the student will be able to:

1 Explain the construction and working of different types of D.C Generator.

2. Understand and analyze the different types of motors, their working principle.

3. Determine the losses and efficiency of single phase transformer.

4. Understand the power stages of induction motor with different types of starters and protection used for induction motors.

5. Recognize different motors used in robotics and automation and their characteristics.

6. Explain the construction and working principle

C.CHAPTER WISE DISTRIBUTION OF PERIODS WITH TOTAL PERIODS

Sl.No.	Topics	No. of Periods
1	DC GENERATOR	6
2	DC MOTOR	12
3	SINGLE PHASE TRANSFORMER	12
4	INDUCTION MOTOR	12
5	SPECIAL PURPOSE MOTORS	10
6	ALTERNATOR	8
	Total Period	**60**

D. DETAILED CONTENTS

1.0 DC GENERATOR

    1.1 DC Generator principle, Construction and Working.
    1.2 EMF Equation of Generator.
    1.3 Classification of Generators depends upon various considerations.

2.0 DC MOTOR

    2.1 Motor Principle, Comparison of Motor and Generator Principle.
    2.2 Back EMF and Voltage equation of a Motor.
    2.3 Torque equation , Armature Torque and Shaft Torque of D.C. Motor.
    2.4 Speed Control of DC Motors.
    2.5 Electric Braking of Motors.
    2.6 T vs Ia characteristics, N vs Ia characteristics of a DC Shunt Motor.
    2.7 T vs Ia characteristics, N vs Ia characteristics of a DC Series Motor.

2.8 T vs Ia characteristics, N vs Ia characteristics of a DC Compound Motor.

3.0 SINGLE PHASE TRANSFORMER

3.1 Definition, Construction& Principle of Operation.
3.2 Application of different types of Transformer (Two winding and Auto).
3.3 EMF Equation and Voltage Transformation Ratio.
3.4 Tests on transformers OC &SC Test.
3.5 Losses and Efficiency of a Transformer.

4.0 INDUCTION MOTOR

4.1 General Principle & Classification of AC motors.
4.2 Construction & types of Single phase and three phase Induction motors
4.3 Relation between slip and Torque.
4.4 Power Stages in Induction Motor.
4.5 Speed Control of an Induction motor.
4.6 Different Types of Starters.
4.7 Different types of motor over load relays, Motor Protection.

5.0 SPECIAL PURPOSE MOTORS

5.1 Construction and working principle of Universal motors and its specialty.
5.2 Construction and working principle of Stepper motors, BLDC motors, PMDC motors
5.3 Construction and working principle of Introduction to Servo Motor, Repulsion Motor.

6.0 ALTERNATOR

6.1 Construction and working principle of an alternator.
6.2. EMF Equation of Alternators.
6.3. Speed and Frequency Relation.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT (I.A) CHAPTERS: 1, 2, 3

BOOKS RECOMMENDED
1. Fundamental of Electrical Engg Volume I & Volume II by **B.L.Theraja**,- S Chand
2. Electrical Machines By **Dr. S.K.Bhattachary**, TMH
3. Electrical Technology By **H.Cotton**, Pitman
4. Principle of Electrical Machine By **V K Mehta & R Mehta,** S Chand
5. General Electrical energy by **Dr. B.R. Gupta**, S Chand

TH-3   APPLIED MECHANICS

Name of the Course: **Diploma in Automation and Robotics**			
Course code	Th-3	Semester	3rd
Total Period	60	Examination.	3 hrs.
Theory periods	4 P /W	Internal Assessment	20
Maximum marks	100	End Semester Examination	80

A. RATIONAL

An applied Mechanics course offers an in depth exploration of the principles and theories that govern the motion of bodies and materials. By understanding these concepts, students will be better equipped to design analyze and optimize various engineering systems.

B. OBJECTIVE

Student will develop ability towards

1. Determination of stress, strain and change in geometrical parameters of cylindrical and spherical shells due to pressure.
2. Drawing bending moment and shear force diagram and locating points in a beam where   the effect is maximum or minimum.
3. Determination of bending stress and torsional shear stress in simple cases
5. Understanding machine system consisting of different link assemblies as components
6. Comprehending working principles related to power transmission systems and predicting the work involved and efficiency.

C. TOPIC WISE DISTRIBUTION OF PERIODS

SL.NO.	TOPICS	PERIODS
1	FORCES	10
2	STRENGTH OF MATERIALS	20
3	BASIC KINEMATICS	05
4	TRANSMISSION OF POWER AND MOTION	20
5	GEAR DRIVE	05
	TOTAL PERIODS	**60**

D. DETAILED CONTENTS
1.0   FORCES
1.1 Moment of a force.
1.2 Beams and types of beams and their applications.
1.3 To draw SFD and BMD (analytical method).
1.4 Introduction to moment of inertia.
1.5 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 BASIC KINEMATICS
3.1 Introduction to theory of machines, machine structure and kinematics.

3.2 Difference between machine and mechanism. Kinematics pair, types of kinematics pair, kinematics chain.

3.3 Four bar chain, application of quadric cycle.

4.0 TRANSMISSION OF POWER AND MOTION
4.1 Concept of Power Transmission

4.2 Types of Drives belt, gear and chain drive

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

4.4 Length and width of belt - open and cross belt driver.

4.5 Use of idlers and jockey pulleys, fast and loose pulley, stepped pulley crowning of pulleys.

4.6 V belt advantages, rope driver - types of power transmitted by rope driver.

4.7 Chain drivers - classification based on hoisting chain, conveyor chain and power transmitted by chains

5.0 GEAR DRIVE
5.1 Law of gearing.

5.2 Properties of involutes profile toothed gears.

5.3 Types of gear trains - simple, compound, reverted and epicyclical gear trains

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT (I.A) CHAPTERS: 1, 2, 3

LEARNING RESOURCES

SL. NO.	NAME OF THE BOOK	AUTHOR NAME	PUBLISHER
1	Applied Mechanics - Dynamics & statics	R.S. Khurmi	S.Chand
2	Strength of materials	S. Ramamrutham	DhanpatRai
3	Theory of Machines	R.S. Khurmi	S.Chand
4	Machine Design	R.S. Khurmi	S.Chand
5	Applied Mechanics - Dynamics & statics	I.B. Prasad	
6	Theory of Machines	Rattan	

TH-4 COMPUTER PROGRAMMING AND NETWORKING

Name of the Course: **Diploma in Automation and Robotics**			
Course code	Th-4	Semester	3rd
Total No. of Periods	60	Duration of Examination	3 hrs.
No. of periods per week	4	Internal Assessment	20 Marks
Total marks	100	End Semester Examination	80 Marks

A. RATIONALE

This subject will help students to have a basic idea of object oriented programming and write effective programs to solve real-world problems. The students will also know about computer networks and different techniques that have to be followed in networks for error-free communication. They will also have an idea about storing, processing, accessing and sharing of large volumes of data.

B. OBJECTIVE

After completion of this course the student will be able to

1. Understand the basic concepts of Object oriented Methodology i.e Overloading, Inheritance
2. Create classes, objects, methods and utilize them correctly in program structure
3. Know about techniques behind error-free and reliable Data Transmission i.e Data Encoding, Error Detection &Correction, Flow Control, Error Control and Multiplexing
4. Construct SQL queries for database creation and interaction using DDL/DQL/DML/DCL commands.

C. TOPIC WISE DISTRIBUTION OF PERIODS

SL.NO.	TOPICS	NO. OF PERIODS
1	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING	10
2	CONSTRUCTORS AND DESTRUCTORS	5
3	OPERATOR OVERLOADING& TYPE CONVERSIONS	6
4	INHERITANCE	9
5	BASICS OF COMPUTER NETWORKS AND PROTOCOLS	6
6	RELIABLE DATA TRANSMISSION	16
7	INTRODUCTION TO DATABASE PROGRAMMING	8
	TOTAL NO OF PERIODS	**60**

D. DETAILED CONTENTS

1. **INTRODUCTION TO OBJECT ORIENTED PROGRAMMING**

    1.1. Basic Concepts of Object Oriented Programming
    1.2. Structure of a C++ program
    1.3. Tokens and Control Structures
    1.4. Functions in C++ (Prototyping , Call by Reference)
    1.5. Specifying a Class and defining member functions
    1.6. Making an outside function inline
    1.7. Nesting of member functions
    1.8. Private member functions
    1.9. Arrays within a class.
    1.10. Memory allocation for objects
    1.11. Static data members and Static Member Functions
    1.12. Arrays of objects.
    1.13. Objects as function arguments.
    1.14. Friend functions and Retuning objects.

2. **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. Destructors.

3. OPERATOR OVERLOADING AND TYPE CONVERSIONS

3.1. Define operator overloading.
3.2. Overloading unary and binary operators.
3.3. Manipulation of strings using operators.
3.4. Rulers for overloading operators.
3.5. Type conversions.
3.6. Function overloading.

4. 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 classes.
4.8. Constructors in derived classes.
4.9. Nesting of classes.

5. BASICS OF COMPUTER NETWORKS AND PROTOCOLS

5.1. Topologies, BUS, RING, STAR
5.2. Transmission media - Guided Transmission, Wireless Transmission
5.3. Introduction to OSI Reference Model: Physical, Session, Presentation, Application
5.4. Protocol Suite: TCP/IP.

6. RELIABLE DATA TRANSMISSION

6.1. Modes of Data Communication: Half Duplex, Full Duplex
6.2 Use of networking devices like Repeaters, Bridges, Routers, Gateway sand their benefits
6.3 Analog and digital transmission.
6.4 Data Transfer rate, Channel capacity.
6.5 Asynchronous & Synchronous Transmission.
6.6. Different methods of Error Detection,
6.7. Error Correction using Hamming codes
6.8. Flow Control
6.9. Multiplexing: FDM & TDM
6.10. Packet Switching Networks
6.11. Introduction to Routing, Routing in Packet switching Networks

7. INTRODUCTION TO DATABASE PROGRAMMING.

7.1. Introduction to Database management system.
7.2. Entity relationship model and Attributes
7.3. Introduction to DDL, DQL, DML, DCL and TCL Commands
    7.3.1 SQL queries to create new table and alter the structure of existing table.
    7.3.2 SQL queries to insert, retrieve, update and delete data
    7.3.2 SQL queries to define access privileges to and control transactions on a database.

COVERAGE OF SYLLABUS UPTO INTERNAL EXAMS (I.A.): CHAPTERS 1,2,3,4

LEARNING RESOURCES

Sl. No	Name of the Author	Title of the Book	Name of the Publisher
1	E Balaguruswamy	OOP with C++	McGraw Hill
2	John Hubbard	Programming with C++	Schaum's Series
3	W.Stallings	Data and Computer communications	Pearson
4	Peter Rob,Carlos Coronel	Database System Concepts	Cengage Learning

Th5. ENVIRONMENTAL STUDIES

(Common to All Branches)

Name of the Course: Diploma in Automation and Robotics			
Course code:		Semester	3rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination	80

A. Rationale:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVES:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. TOPIC WISE DISTRIBUTION OF PERIODS		
SL.NO.	**TOPIC**	**PERIODS**
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution.	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	TOTAL	60

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural resources and associated problems.
- Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
- Mineral Resources: Use and exploitation, environmental effects of extracting

and using mineral resources.

- Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity,.
- Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.
c) Equitable use of resources for sustainable life styles.

Unit 3: Systems

- Concept of an eco system.
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco system:
- Forest ecosystem:
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and optin values.
- Biodiversity at global, national and local level.
- Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

Unit 5: Environmental Pollution.

Definition Causes, effects and control measures of:

a) Air pollution.
b) Water pollution.
c) Soil pollution
d) Marine pollution
e) Noise pollution.
f) Thermal pollution
g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and

industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone and landslides.

Unit 6: Social issues and the Environment

- Form unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems and concern.

- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

Unit 7: Human population and the environment

- Population growth and variation among nations.
- Population explosion- family welfare program.
- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

Syllabus coverage upto I.A

Units 1, 2, 3

Learning Resources:

Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Textbook of Environmental studies	Erach Bharucha	GC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand&Co-Ltd
3.	Textbook of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co

PR-1 ANALOG AND DIGITAL ELECTRONICS LAB

Practical: 6 Periods per week   Term End Exam: 50 Mark
Sessional: 25 Marks   Examination: 3 Hours
Total Periods: 90 Periods   **TOTAL MARKS**: 75 Marks

RATIONALE

This lab will enable students to get practical experience in design, assembly and evaluation/testing of a given electronics circuit by making use of various analog and digital electronic components, ICs, instruments and tools for design and testing of circuits for a problem statement to achieve desired output. They will be able to examine and verify the design of both analog and digital circuits using simulators.

OBJECTIVE:

After completion of this lab course the student will be able to:
1. Know the characteristics of various types of Operational Amplifiers
2. Familiarization of Digital Trainer Kit, & Digital ICs and verify truth tables of Digital gates
3. Implement various gates by using universal properties
4. Implement half adder, Full adder, half sub tractor and Full sub tractor and comparator circuits using logic gates.
5. Study Multiplexer and Demultiplexer.
6. Implement and analyze the operation of Sequential Circuits - Flip Flop, Counters, Registers
7. Construct a Timer Circuit.
8. Study 8 bit D/A and A/D conversion.
8. Learn to work on any simulation software.

LIST OF PRACTICAL: (PERFORM ANY 10 EXPERIMENTS + ANY 04 (USING SOFTWARE) HAVE TO BE COMPLETED) (TOTAL=14 EXPERIMENTS)

1. Study of Operational Amplifier 741 & draw its pin diagram.
2. Construct and study inverting and non-inverting amplifier using OPAMP.
3. Construct and study the Integrator and differentiator using op-amp.
4. Familiarization of Digital Trainer Kit & Digital ICs IE 7400, 7402, 7404, 7408, 7432 & 7486.(draw their pin diagram and features)
5. Verify truth tables of AND, OR, NOT, NOR, NAND, XOR, XNOR gates using ICs.
6. Implement various gates by using universal properties of NAND & NOR gates verify and   truth table tabulate data.
7. Construct& verify operation of Half adder and Full adder using logic gates.
8. Construct & verify operation of Half Sub tractor and Full sub tractor using logic gates.
9. Design & Implement a Single bit/ two bit digital comparator circuit
10. Design Multiplexer (4:1) and De-multiplexer (1:4).
11. Study the operation of flip-flops (i)S-R flip flop (ii) J-K flip flop (iii) D flip flop (iv) T flip flop
12. Construct & test Astable, Monostable & Bistable Multi vibrator using IC 555.
13. Construct & test timer circuit using IC 555 timer
14. Realize a 4-bit asynchronous UP/Down Counter.
15. Realize a 3-bit synchronous UP/Down Counter.
16. Study shift registers -4 bit Registers
17. Verify the operation 8-bit D /A and A/ D conversion.
18. (Any Four from above) using P-spice / or –Wiring X/MULTISIM SOFTWARE, with this Software you can create simple wiring layouts with the most common discreet electronic Components or TINA Design Suite- A very nice and friendly circuit design and simulation Program with 10,000+ built in components. Available in many languages)

REQUIRED SOFTWARE:

1. B2-Spice + Eagle : Simulation & PCB design software.
2. Supper CAD.
3. Electronics work bench: Simulation.
4. CADSTAR/TINA : PCB Design.
5. P Spice/TINA /MULTISIM: Simulation
6. Edwin: Simulation + PCB design.
7. ORCAD
8. Circuit Maker & etc.

Books Recommended
1. Handbook of Experiments in Electronics & Communication Engg **by S P Rao&B.Sasikala**
2. Advanced practical Electronics by **KAR -Books & Allied Pvt**

PR-2 ELECTRICAL TECHNOLOGY LAB

Practical: 4 Periods per week   End Sem Exam: 50 Marks

Total Periods: 60 Periods   Sessional: 25 Marks

Examination: 3 Hours   **TOTAL MARKS: 75 Marks**

RATIONALE

This lab gives understanding of different electrical machines i.e. DC Generator, DC Motor, Transformer, AC Motors, etc. The students will be able to identify different parts and connections of motors which are used in Robotics and Automation and also perform different types of testing of machines.

OBJECTIVES

After completion of this Laboratory Course the students will be able to -

1. Study about construction and features of D.C. Machines and perform terminal testing, insulation testing of DC machines.
2. Implement D.C. motor starters and perform various speed control methods of D.C. machines.
3. Familiarize with different parts of transformer and testing methods.
4. Understand about starting and speed control of A.C. Motors and some special purpose motors.

LIST OF EXPERIMENTS

1. Study of different parts of DC Generator.
2. Open circuit characteristics test on DC Generator.
3. Load Test on DC Generator.
4. Start and run of DC motors with suitable starters.
5. Speed control of DC Motor (Armature control and Flux control method)
6. Transformer Familiarization.
7. Load test on a single phase transformer.
8. Study and run of (Manual) A.C. motor starters.
9. Study and run of (Automatic) A.C. motor starters.
10. Study and run of servo motor, stepper motor.
11. Study and run of BLDC motor, universal motor etc.
12. Start and run of an alternator.

EQUIPMENT LIST

ELECTRICAL TECHNOLOGY LAB

SL NO.	EQUIPMENTS
1	DC SHUNT MOTOR COUPLED WITH A DC SHUNT GENERATOR (MG SET)
2	DC MOTOR (SERIES,SHUNT,COMPOUND)
3	ALTERNATOR SET
4	SINGLE PHASE TRANSFORMER
5	SERVO MOTOR
6	STEPPER MOTOR
7	BLDC MOTOR
8	UNIVERSAL MOTOR
9	THREE PHASE INDUCTION MOTOR
10	DIRECT ONLINE STARTER

11	STAR DELTA STARTER
12	AUTO TRANSFORMER STARTER
13	3 POINT STARTER
14	4 POINT STARTER
15	AMMETER(AC&DC)
16	VOLTMETER(AC&DC)
17	TACHOMETER
18	SINGLE PHASE VARIAC
19	RHEOSTAT (SINGLE PHASE AND THREE PHASE)
20	FIELD REGULATOR
21	WATT METER(L.P.F&U.P.F)
22	LOAD BOX(RESISTIVE,INDUCTIVE,CAPACITIVE)
23	ROTOR RESISTANCE STARTER
24	FREQUENCY METER
25	PHASE SEQUENCE INDICATOR
26	TIMER (ON DELAY& OFF DELAY)
27	CONTACTOR
28	MULTIMETER
29	MEGGER

Pr-3 COMPUTER AND DATABASE PROGRAMMING LAB

Name of the Course: **Diploma in Automation and Robotics**			
Total No. Of Periods	60	Maximum Marks	75
No. Of periods per week	4	Sessional	25 Marks
Duration of Examination	3 hrs	End Semester Examination	50 Marks

A. RATIONALE

This practical subject will help students to have a basic idea of object oriented programming and write effective programs to solve real-world programs. They will also learn how to store, access and process large volumes of data.

B. COURSE OBJECTIVE:

After completion of this course the student will have knowledge about

1. Write a class definition including class, instance, methods.
2. Develop programs using the concepts of Inheritance and Overloading
3. Formulate queries using SQL DDL/DML/DCL commands for database creation and interaction.

C. TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topics	No. Of Periods
1	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING	16
2	PYTHON PROGAMMING LANGUAGE	28
3	DATABASE MANAGEMENT	16
	Total No of Periods	**60**

D. LIST OF PRACTICAL EXERCISES

1. INTRODUCTION TO OBJECT ORIENTED PROGRAMMING

1.1. Write a program in C++ to swap two numbers
1.2. Write a program in C++ to design a class having class members name, marks m1, m2, m3, total, average and calculate total and average of each student using class methods total and average.
1.3. Write a program in C++ to input Name, branch and Roll No. of 5 students into an array
1.4. Write a program in C++to implement Operator Overloading.
1.5. Write a program in C++ to implement multiple inheritance.
1.6. Use method Overloading in C++ to convert a string to an int and then convert that int into float.

2. PYTHON PROGAMMING LANGUAGE

NOTE: Methodology

The Students shall be taught the basic Syntax of Python Language in the initial 6 – 8 classes.

2.1. Create a string containing at least five words and store it in a variable.
    2.1.1. Display the string on screen.
    2.1.2. Convert the string to a list of words using the string split method.
    2.1.3. Sort the list into reverse alphabetical order using some of the list methods & display the sorted, reversed list of words.
2.2. Write a program that determines whether the number is prime.
2.3. Find all numbers which are multiple of 29, but not the multiple of 5, between 2000 and 2500?
2.4. Swap two integer numbers with and without using a temporary variable.
2.5. Find the largest of n numbers, using a user defined function largest().
2.6. Write a function myReverse() which receives a string as an input and returns the reverse of the string.
2.7. Check if a given string is palindrome or not.
2.8. WAP to create a English Dictionary which is able to add, delete, update and display any word along with its meaning

3. DATABASE MANAGEMENT

3.1. Write a query to create column headings EMP#, Employee, Designation ,Department, Reports To, Salary, Comm, Hire date, Location in EMP table and create a query to
    3.1.1. Display unique jobs from the EMP table.
    3.1.2. Display the Name and salary of employees earning more than Rs.15000.
    3.1.3. Display the employee name and department no. for employee no. 007.

3.1.4. Display the details of employees hired between Mar.20.2020 and May 1, 2020 in ascending order of start date

3.1.5. Display the name and title of all employees who don't have a Manager.

3.1.6. Display the name, salary and comm. of all employees who earn comm. In descending order of salary and comm.

3.1.7. Display the name, designation salary for all employees whose Designation is Clerk and their salary is not equal to Rs.25000.

3.1.8. Display a list of unique designations in department SALES.

3.1.9. Display the name, location, department number & department name for all employees.

3.1.10. Display the employee name, department name, and location of all employee who earn a commission.

3.1.11. Display the name, designation, department number and department name for all employees who work in DELHI.

3.1.12. Display the Total number of people with the same Designation

3.1.13. Display the employee name and hire date for all employees in HR department.

3.1.14. Display the employee name and salary of all employees who report to RAHUL .

3.1.15. Display the name, department name and salary of any employee whose salary and commission matches both the salary and commission of any employee located in DELHI

3.2. Create a student database table using create command using Regd. No as Primary Key ,

3.2.1. Insert data of all students of your class.

3.2.2. Delete the information of student having roll No -15 and City- Bhubaneswar.

3.2.3. Rename the Student database table to STUDENT INFORMATION.

E. LEARNING RESOURCES

Sl. No	Name of the Author	Title of the Book	Name of the Publisher
1	Herbert Schildt	C++ : The Complete Reference	McGraw Hill Osborne
2	Herbert Schildt	Java: The Complete Reference	McGraw Hill Osborne
3	Martin Brown	Python : The Complete Reference	McGraw Hill
4	Josephine Bush	Learn SQL Database Programming	O'Reilly

F. Equipment List

Hardware & Tools:
- Desktop PC with i5 or above configuration- 30 Nos.(minimum)
- UPS as per needs

Software
- Windows Server
- C/C++
- Python
- Linux User License
- Oracle 10 g or above (Multiuser with 30 user license or 30 Nos. single user)
- My SQL

PR-4 COMPUTER NETWORKING LAB

Name of the Course**: Diploma in Automation and Robotics**			
Total No. Of Periods	30	Maximum Marks	25
No. Of periods per week	2	Sessional	25 Marks
Duration of Examination	3 hrs	End Semester Examination	-

A. RATIONALE

This practical subject will empower students with knowledge about computer networks and different protocols that have to be followed in networks for error-free communication. They will gain knowledge about addressing, routing and various networking devices

B. COURSE OBJECTIVE:

After completion of this course the student will have knowledge about

1. Know about Addressing, working of IP v4 and v6,
2. Understand Switching and Routing in Networks
3. Know about Networking devices, Cables and Connectors
4. Learn about installation and configuration of NIC, NOS & sharing of hardware resources.

C. TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topics	No. Of Periods
1	INTRODUCTION TO NETWORKS	4
2	DATA TRANSMISSION CONCEPTS	10
3	CONFIGURING AND MANAGING NETWORKS	12
4	NETWORK PROGRAMMING	2
5	CONNECTIVITY TROUBLESHOOTING	2
Total No of Periods		**30**

D. LIST OF PRACTICAL EXERCISES

1. INTRODUCTION TO NETWORKS

1.1. Study of various types of Networks,
1.2. Study of various Network Topologies(Star, Ring, Bus),
1.3. Study of Network Protocols
1.4. Study of Networking Devices
1.5. Study of various Network Cables (UTP, STP, Coaxial, OFC) ,
1.6. Study of Connectors (RJ45,RJ11,SCST,BNC), Cross Cable and Straight cable

2. DATA TRANSMISSION CONCEPTS

2.1. Introduction to IP Address
    2.1.1. Identifying IP Address of a Workstation
    2.1.2. Configuring IP Address of a Workstation
2.2. Study of Switching and Routing
    2.2.1. Switch Configuration
    2.2.2. Router Configuration
    2.2.3. Switch Troubleshooting
    2.2.4. Router Troubleshooting

3. CONFIGURING AND MANAGING NETWORKS

3.1. Installation of NIC on a Workstation
3.2. Installation and Configuring of Network Operating System
3.3. Managing user accounts in Windows and LINUX
3.4. Sharing of Hardware Resources in Network
3.5. Introduction to IPv4 and IPv6.Configuring IPv4 & IPv6 on Wireless Access Point

3.6. Configuring Primary WAN

4. NETWORK PROGRAMMING

5. CONNECTIVITY TROUBLESHOOTING Using NETSTAT, PING & IPCONFIG

E. LEARNING RESOURCES

Sl. No	Name of the Author	Title of the Book	Name of the Publisher
1	Behrouz Forouzan	Data communications & Networking	McGraw Hill

F. Equipment List

Hardware & Tools:

Desktop PC with i5 or above configuration- 30

Nos.(minimum) UPS as per needs

Connectors RJ 45, RJ-11, BNC, SCST Coaxial Cable, UTP, STP, OFC cable Screw Driver

Kit Hub- 3 Nos. Switch 3 Nos. Router – 1No.

Software

Windows

Server/Linux Server

Linux

C/C++