

COLLEGE OF ENGINEERING ROORKEE
SYLLABUS FOR
VALUE ADDED PROGRAM (VAP)



DEPARTMENT OF ELECTRICAL ENGINEERING

Approved by:

HOD

Dean Academics

Table of Contents

S No	Semester	Course Code	Name of the Course	Page Number
1.	I	VAP/EN/ODD SEM/I	BASICS OF HARDWARE AND COMPUTER NETWORKING	3
2.	II	VAP/EN/EVEN SEM/II	ENGLISH LANGUAGE SKILLS	4
3.	III	VAP/EN/ODD SEM/III	PLC & SCADA	5
4.	IV	VAP/EN/EVEN SEM/IV	APPLICATION OF NUMERICAL TECHNIQUES IN ELECTRICAL ENGINEERING SYSTEM	8
5.	V	VAP/EN/ODD SEM/V	POWER SYSTEM TECHNIQUES USING MATLAB	9
6.	VI	VAP/EN/EVEN SEM/VI	INDUSTRIAL AUTOMATION	10
7.	VII	VAP/EN/ODD SEM/VII	ENGINEERING OPTIMIZATION MODELS WITH GAMS	12
8.	VIII	VAP/EN/ EVEN SEM/VIII	ADVANCED INDUSTRIAL AUTOMATION	13

ODD SEMESTER	1st SEM
BASICS OF HARDWARE AND COMPUTER NETWORKING	

S No	Heading	Sub Heading	Hours
1.	Experimental and hands on training	Identifying Computer Hardware Devices	2
2.		Identifying Computer Assembly	2
3.		Identifying external ports and interfacing	2
4.		PC Identifying Problems & Troubleshooting	2
5.		Operating System Installation	2
6.		Printer – Installation / Troubleshooting	2
7.		Introduction to LAN	2
8.		Introduction to LAPTOPS	2
9.		Hands on Training on PC Trainer KIT	2
10.		Hands on Training on LAN Trainer KIT	2
11.		Hands on Training on UPS Trainer KIT	2
12.		Hands on Training on Monitor Trainer KIT	2
13.		Preventive maintenance of a PC	2
14.		Understanding CMOS	2
15.		Working with Backups and Archival utilities	2
Total Contact Hours			30 Hours

S. NO.	Name of Projects/Experiments
1.	Identifying Computer Hardware Devices
2.	Identifying Computer Assembly
3.	Identifying external ports and interfacing
4.	PC Identifying Problems & Troubleshooting
5.	Operating System Installation
6.	Printer – Installation / Troubleshooting
7.	Introduction to LAN
8.	Introduction to LAPTOPS
9.	Hands on Training on PC Trainer KIT
10.	Hands on Training on LAN Trainer KIT
11.	Hands on Training on UPS Trainer KIT
12.	Hands on Training on Monitor Trainer KIT
13.	Preventive maintenance of a PC
14.	Understanding CMOS
15.	Working with Backups and Archival utilities

ODD SEMESTER	2nd SEM
ENGLISH LANGUAGE SKILLS	

Module	Content	Duration
1.	SPEAKING SKILLS Art of Public Speaking, Situational Dialogues Based on Everyday Situations, Formal Presentations.	6
2.	WRITING SKILLS Pre requisites of professional writing, Functional Grammar, Vocabulary Building, Principles of Effective Technical writing.	6
3.	READING SKILLS Reading with comprehension, Enhancing the speed of reading (RPM), Preparing for competitive exams, Elaborated reading with Literature: Three Short Stories –Writing Reviews	5
4.	LISTENING SKILLS How to be a good listener, Listening for note-taking, Listening Comprehension-Quiz	5
5.	SOFT SKILLS Job Application and Resume Writing, Corporate Inter Personal Soft Skills, Professional Ethics, Group Discussion, Interview skills and Time Management	8
Total Contact Hours		30

S. NO.	Name of Projects/Experiments
1.	Speaking skills
2.	Writing skills
3.	Reading skills
4.	Listening skills
5.	Soft skills

ODD SEMESTER	3rd SEM
PLC & SCADA	

Module	Content	Duration
1.	PROGRAMMABLE LOGIC CONTROLLER (PLC) Introduction to PLC hardware, Architectural Evolution of PLC, Role of PLC in automation, Introduction to the field devices attached to PLC, PLC Fundamentals - (Block diagram of PLC's), Detail information about PLC components, Power supply, CPU, I/O modules, Communication bus, Various ranges available in PLCs, Types of Inputs & outputs, Source Sink Concept in PLC, Concept of flags, Scan cycle execution	10
2.	INTRODUCTION TO PLC PROGRAMMING SOFTWARE Addressing concepts, Introduction to bit, byte & word concept, Programming instructions arithmetic and logical, Load /and /or/out / and Read / Write, Compare / Add / Sub /And /Or – Blocks, Leading edge / trailing edge instructions, MOVE block application, Timer Blocks programming, Counter Block programming, Advanced instructions, File handling, Comment functions, Master control /set /reset function, Upload, download, Monitoring of programs, Forcing I/P & O/P, Monitoring / Modifying data table values, Standard procedure to be followed in wiring / writing ladder etc, Hands on experience on writing programs, Case studies for conveyer, motors control, timer & counter applications etc., Troubleshooting and fault diagnostics of PLC, Documenting the project, Program assignments for real time applications	10
3.	ELECTRICAL AND ELECTRONIC BASICS Basic Electricity, Electrical Terms and Definition, Capacitors, Conductors and Inductors, Ohm's Law, Series and Parallel connection, AC and DC Principles, Reading Electrical diagrams, Cables and Wiring, Types of Cables and wiring, Termination and jointing of cables, Working with Site Plans and Symbols, L. V. Switchgear, Push Buttons, Limit switches, Contactors, Bi metal Relays, Fuses, MCB, ELCB, Basic Electronics	10
Total Contact Hours		30

S. NO.	Name of Projects/Experiments
1.	Programmable logic controller (PLC)
2.	Introduction to PLC programming software
3.	Electrical and electronic basics

ODD SEMESTER	4th SEM
APPLICATION OF NUMERICAL TECHNIQUES IN ELECTRICAL ENGINEERING SYSTEM	

Module	Content	Duration
1.	TRANSIENT ANALYSIS OF ELECTRICAL CIRCUITS Response of Various electrical Networks under steady state and Transient Condition (Differential Equation Approach)	8
2	LAPLACE TRANSFORM & APPLICATION OF LAPLACE TRANSFORM IN CIRCUIT ANALYSIS Response of various AC electrical circuits with independent and dependent sources.	6
3.	ANALYSIS OF COUPLED CIRCUITS IN ELECTRICAL ENGINEERING Analysis of magnetically coupled circuits and coupling elements, designing of iron or air core transformers.	8
4.	ELECTRICAL ENGINEERING SIMULATION USING MATLAB Simulation of AC network, Simulation of DC network, Simulation of 1-phase & 3-phase transformers.	8
Total Contact Hours		30

S. NO.	Name of Projects/Experiments
1.	Transient analysis of electrical circuits
2.	Laplace transform & application of laplace transform in circuit analysis
3.	Analysis of coupled circuits in electrical engineering
4.	Electrical engineering simulation using matlab

ODD SEMESTER	5th SEM
POWER SYSTEM TECHNIQUES USING MATLAB	

MODULE	CONTENT	SUB-CONTENT	TIME DURATION
1	Power System Technologies	<ul style="list-style-type: none"> • Simulation of Electric Circuits • Designing of transfer function in MATLAB • SIM Power System Toolbox • Load flow solution using Newton Rapson Method 	6
2	Application of Power Electronics using MATLAB	<ul style="list-style-type: none"> • Symbols and Characteristics of various power electronic devices • Voltage source converters • Modulator Multi Level Converter • Total Harmonic Distortion • Zero Hold Logic 	8
3	Designing of Switch Yard	<ul style="list-style-type: none"> • Types of Sub Stations • Drawing, planning and layout • Earthing protection • Equipment associated with sub-station installation etc. 	8
4	Protection Schemes using Adaptive Control Schematics	<ul style="list-style-type: none"> • Introduction about automatic control systems • Block Diagrams • Stability from MATLAB • Protection of equipment and line against traveling waves • Designing of Control Algorithm for DSTATCOM for power quality improvement 	8
Total Contact Hours			30

S. NO.	Name of Projects/Experiments
1.	Power System Technologies
2.	Application of Power Electronics using MATLAB
3.	Designing of Switch Yard
4.	Protection Schemes using Adaptive Control Schematics

ODD SEMESTER	6th SEM
INDUSTRIAL AUTOMATION	

Module	Content	Duration
1.	INTRODUCTION TO PNEUMATICS Pneumatics, Important basic terms Characteristics of Industrial Pneumatics, advantages and limitations, Comparisons of Pneumatics over other technology like Hydraulics, Electrical/ Electronic and Mechanical drives (Systems Comparison), Applications.	6
2	GRAPHICAL SYMBOLS AND PNEUMATIC CIRCUITS Basic elements, commonly used symbols, Circuit symbols. Compressed Air Preparation. Compressor Unit, Drying of Compressed Air, Distribution of Compressed air, Filter, Pressure control valve, lubricator, air dryer etc.	6
3.	DIRECTION CONTROL VALVE Design Principle, Symbols, Operations, 3/2 Directional control valve, Manual operated, 5/2 Directional control valve, pneumatically operated, 5/3 Directional control valve, electrically operated.	6
4.	PRESSURE VALVES Pressure regulating valve, Pressure relief valve, Pressure sequence valve.	2
5.	FLOW CONTROL VALVES Throttle valve, Throttle check valve	2
6.	PNEUMATIC CYLINDERS Introduction, Cylinder types, Single acting cylinder, Double acting cylinder	2
7.	INTRODUCTION TO ELECTRO-PNEUMATICS Electro – mechanical Relays, Symbols of electrical components like switch, contacts, solenoid, relay, LED etc, NO and NC contacts, magnetic proximity switch working principle, Electrical signal storage, Electrical ladder diagram, Logic flow diagram, Solenoid working principle, Solenoid operated valves, Advantages of solenoid operated valves over manual valves	6
Total Contact Hours		30

S. NO.	Name of Projects/Experiments
1.	Introduction to pneumatics
2.	Graphical symbols and pneumatic circuits
3.	Direction control valve
4.	Pressure valves
5.	Flow control valves
6.	Pneumatic cylinders
7.	Introduction to electro-pneumatics

ODD SEMESTER	7th SEM
ENGINEERING OPTIMIZATION MODELS WITH GAMS	

Module	Content	Sub-Content	Time Duration
1.	Mathematical Modelling	<ul style="list-style-type: none"> • Electrical System • Optimization • Interfacing with GAMS 	3
2.	Software Simulation for Electrical Networks	<ul style="list-style-type: none"> • Mathematical modelling of simple series RL network • Mathematical modelling of simple series RLC network • Mathematical modelling of simple complex RLC network • Transient stability analysis using Equal area criteria • Controlling of TCR (Thyristor Controlled Reactor) • Simulation of single phase full wave bridge inverter • Study of the voltage and current relationship in a series R-L-C circuit using Sim power system 	15
3.	General Overview of GAMS	<ul style="list-style-type: none"> • Model types • Available Solvers • Structure of the GAMS model 	10
4.	GAMS programming	Power System Modeling	2
Total Contact Hours			30

S. NO.	Name of Projects/Experiments
1.	Mathematical Modelling
2.	Software Simulation for Electrical Networks
3.	General Overview of GAMS
4.	GAMS programming

ODD SEMESTER	8th SEM
ADVANCED INDUSTRIAL AUTOMATION	

Module	Content	Duration
1.	BASIC PNEUMATICS Introduction to Pneumatic Technology, Difference between Hydraulics & Pneumatics Control., Advantage & Disadvantages of Pneumatics Technology, Application of Pneumatics Technology in Automation, Types of Directional control valves & their Implementation, Theories & Hands on practices on Shuttle valve, Twin pressure valve, Time delay valve, Theories & Experiments on Flow control valve, Practices of Pneumatic circuits in Simulation Software.	4
2	ADVANCE PNEUMATICS Theory & practice of some Special valve operation, Sequential control, Time dependent control, Displacement dependent control, Troubleshooting and maintenance of pneumatic system, Reflex nozzle & Pneumatic amplifier, Pneumatic calculation and implementation, Selection of components for specific work	5
3.	BASIC ELECTRO-PNEUMATICS Introduction to Electro-Pneumatics, Details of Reed Switch & Sensor (Inductive, Capacitive, Optical Sensor), Practices with 3/2 solenoid valve, 5/2 Solenoid valve & 5/3 Solenoid valve.	2
4.	ADVANCE ELECTRO-PNEUMATICS PLC interfacing with Pneumatics system, Application of various sensors in pneumatic actuators, Design of project based on Pneumatic drives	2
5.	BASIC HYDRAULICS Applications of Hydraulic Technology in industrial Automation, Advantages & Disadvantages of Hydraulic System, Theories & Hands on practices of Various Directional & Pressure control Valves, Theories & Hands on practices of Flow control Valves, Various Actuators, Detailed discussion on Hydraulics Symbols Simulation Software.	2
6.	BASIC ELECTRO-HYDRAULICS Introduction to Electro-Hydraulics, Design of Electro-Hydraulics circuit with Hardware & software, Practices with 4/2 solenoid valve, 4/3 Solenoid valve.	4
7.	ADVANCED ELECTRO-HYDRAULICS Different sensor interfacing with Electro-hydraulics, PLC interfacing with different directional control valve, Displacement dependent, Time dependent, Sequential control of Electro-hydraulic system	5
8.	BASIC PLC Introduction to Programmable Logic Controller, History of PLC, PLC Architecture, Hardware details of PLC, Software details of Indra works Engineering, PLC Languages with Ladder Logic Details, Assignments on NO & NC, Application of SET, RESET Coil with SR, RS, Global variable declaration, Application of Timer & Counter in PLC.	6
Total Contact Hours		30

S. NO.	Name of Projects/Experiments
1.	Basic pneumatics
2.	Advance pneumatics
3.	Basic electro-pneumatics
4.	Advance electro-pneumatics
5.	Basic hydraulics
6.	Basic electro-hydraulics
7.	Advanced electro-hydraulics
8.	Basic PLC