COURSE TITLE : INDUSTRIAL MANAGEMENT & SAFETY
COURSE CODE : 5001
COURSE CATEGORY : C
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Principles of management Human resources management Wages and incentives	13
2	Quality planning and Development Material and sales management	13
3	Project management techniques and quantitative techniques	13
4	Industrial safety , entrepreneurship	13
TOTAL		**52**

COURSE OUTCOME

SL.NO.	STUDENT WILL BE ABLE TO
1	Understand the principles of management practices
2	Appreciate the significance of human resources management
3	Understand the principles of wage payment system and incentives
4	Appreciate the significance of quality planning and development
5	Understand the functions of material and sales management
6	Appreciate the role of project management techniques
7	Apply the principles of quantitative techniques in managenent
8	Understand the features of industrial safety
9	Appreciate the qualities of an entrepreneur

SPECIFIC OUTCOME

MODULE I

1.1.0 Understand the principles of management practices.
- 1.1.1 Explain the meaning of Management.
- 1.1.2 Explain the development of management theory of F.W.Taylor and Henry Foyal.
- 1.1.3 State and explain the functions of management .
- 1.1.4 State the forms of business organization.
- 1.1.5 Explain different types of ownership .
- 1.1.6 Explain different types of organizational structure .

1.2.0 Appreciate the significance of human resources management
- 1.2.1 Outline the importance of HRM.
- 1.2.2 State and explain the functions of HRM .
- 1.2.3 Explain the process of man power planning.
- 1.2.4 Explain Job analysis, job evaluation, merit rating, performance appraisal .
- 1.2.5 Describe the steps in selection of workers.
- 1.2.6 Explain the objectives of training.

1.2.7 State and explain the methods of training.
- 1.2.8 Define labour turn over.

1.3.0 Understand the principles of wage payment system and incentives
- 1.3.1 Define different types of wages.
- 1.3.2 Define incentives.
- 1.3.2 Identify financial, non-financial and semi financial incentives.

List different types of financial incentive plans.

MODULE II

2.1.0 Appreciate the significance of quality planning and development**.**
- 2.1.1 List the dimensions (characteristics) of quality.
- 2.1.2 List the objectives of quality planning.
- 2.1.3 Describe Three prong approach to quality planning.
- 2.1.4 List the developments in quality planning.
- 2.1.5 Explain the concept and role of ISO standards.
- 2.1.6 List the elements of ISO 9000 series.
- 2.1.7 List the steps for ISO 9000 installation.
- 2.1.8 List the objectives of quality audit.
- 2.1.9 Describe the concept of Total Quality Management (TQM).
- 2.1.10 Discuss the link between ISO and TQM.
- 2.1.11 List the ten “manthras’’ of TQM.
- 2.1.12 Explain mission, vision and quality policy.

2.2.0 Understand the functions of material and sales management.

2.2.1 List the objectives of purchase department.

2.2.2 State the buying techniques.
2.2.3 Describe purchase procedure.
2.2.4 Define inventory.
2.2.5 Classify the inventory.
2.2.6 Explain inventory models such as EOQ and ABC.
2.2.7 List the objectives of stores management.
2.2.8 Explain the functions of store keeping.
2.2.9 Describe the store keeping records.
2.2.10 Explain the concept of store layout.
2.2.11 Describe the centralised and de-centralised store.
2.2.12 Outline the importance of sales department.
2.2.13 List the functions of sales department.
2.2.14 Explain the process of sales forecasting.

MODULE III

3.1.0 Appreciate the role of project management techniques
3.1.1 Outline the network technique .
3.1.2 List different applications of CPM and PERT
3.1.3 Outline scope of PERT and CPM
3.1.4 Define the terms used in CPM .
3.1.5 Compute the project duration, slack and critical path by using AOA method only.
3.1.6 Distinguish between CPM and PERT.
3.1.7 Define the terms used in PERT .
3.1.8 Explain the terms pessimistic, optimistic and most likely time.
3.1.9 Calculate the expected time for each activity.
3.1.10 Compute the project duration ,slack and mark the critical path.

3.2.0 Apply the principles of quantitative techniques in management.
3.2.1 List different quantitative techniques.
3.2.2 Formulation of Linear Programming Problem (LPP).
3.2.3 Graphical solution of given LPP on maximisation and minimisation.
3.2.4 Explain the scope of transportation problem.
3.2.5 Compute the initial feasible solution of transportation problem by using Least cost method
3.2.6 Explain game theory.
3.2.7 Compute the saddle point, optimum strategy of the game, two - person - zero sum using max- min and min-max principle.

MODULE IV

4.1.0 Understand the features of industrial safety
4.1.1 Explain the importance and need for safety measures in industries
4.1.2 Define the meaning of the terms - factory, accident, frequency rate, severity rate, incidence rate, performance index, accident proneness, unsafe acts, unsafe conditions, job safety analysis, plant safety inspections, industrial safety policy.
4.1.3 Identify the various accident factors, mechanical factors, environmental factors, and personal factors.

4.1.4 Discuss the 4 E's of accident prevention technique.
4.1.5 Discuss the role of safety council and safety officer.
4.1.6 Discuss emergency preparedness and response.
4.1.7 Discuss the precautions to be observed in preventing accident while working in hazardous environment.

4.2.0 Appreciate the qualities of an entrepreneur
4.2.1 Describe the profile of an entrepreneur
4.2.2 List the functions of an entrepreneur
4.2.3 Identify the risk taking qualities of an entrepreneur
4.2.4 Explain the concept of student entrepreneur.
4.2.5 List the different factors contributing to the failure of entrepreneurial ventures
4.2.6 Identify industrial support needed programs existing in India, Kerala
4.2.7 State the concept of DSIR,TBI, MSME.etc.
4.2.8 State the steps involved in starting small-scale industry
4.2.9 Describe the procedure for the registration of SSI
4.2.10 Identify the net work of financial assistances given to an entrepreneur
4.2.11 Identify the different constituents of feasibility study
4.2.12 Prepare the feasibility report / project report

CONTENT DETAILS

MODULE I

1. Principles of management

Introduction - meaning of management - development of management theory: - Taylor's scientific management,- Modern approaches-compare F.W. Taylor and Henry Fayol's contributions
Functions of management- Different types of ownership: - Sole proprietorship, partnership, private Ltd company, public Ltd company, co-operative society-transnational organizations (brief description only)
Organizational structure: - Definition of organization-components of organizational structure- different types of organizational structure-line, functional, line & staff organization (brief description)

2. Human Resource Management (HRM)

Concept of HR Management - functions of HRM - requirements of manpower planning - factors affecting the manpower planning - job evaluation - steps required for job evaluation - methods for job evaluation - merit rating - objectives and methods - performance appraisal - training - importance of training - methods of training - advantages of training (brief description only) , labour turn over.

3. The principles of a good wage payment system

Importance of good wage plan-types of wages - nominal, real, living, fair, and minimum wages - requirement of a good wage payment system - Incentives - definitions, types of incentive plan for dire

MODULE II

1. Quality Planning and its developments

Definitions of quality- dimensions of quality- ISO 9000 & Installation -Concept and role of ISO 9000, elements of ISO 9000, steps for installation of ISO 9000 - preparatory step, implementation step, registration and certification step-Quality Audit - objectives
list the objectives of quality planning -three prong approach to quality planning- Documentation-Quality management system.
TQM -Concept, ten mantras of TQM, the link between ISO 9000 and TQM -mission, vision and quality policy.

2. Materials and sales management.

objectives of purchase department.-State the buying techniques.-Describe purchase procedure.
classification -spot quotation -floating the limited enquiry -tenders -single and open -earnest money -security deposit
Inventory management -definition and -inventory models -EOQ and ABC.
Stores management -introduction -store keeping functions -duties of store keeper -store layout -centralised and decentralised store -store records -indent forms -bincard -store ledger. Sales -importance -functions of sales department -sales forecasting

MODULE III

1. Project Management Techniques .

Introduction to Network analysis - application of CPM and PERT -scope of CPM and PERT -commonly used terms in CPM: - Operation, pre-operation, post operation, concurrent operation, earliest finish time (EFT), latest finish time (LFT), critical activities, critical path, event, slack or float, dummy activity -procedure for CPM -simple problems on CPM (by AOA method only).
PERT - comparison between CPM and PERT -procedure for PERT - calculation of expected time -commonly used terms in PERT, event, activity, successor event, predecessor event, Earliest expected time, Latest allowable time, slack - simple problems in PERT.

2. Quantitative techniques in management.

Introduction -methods -Linear programming: - Formulation of LPP -solution of given LPP using graphical method -transportation problem -meaning -initial feasible solution of transportation

MODULE IV

1. Industrial safety.

Importance of safety in work place -increasing trends in industrial accidents -terminology -factory -accident -incident -severity rate -- frequency rate -incidence rate -safety performance index -accident proneness -unsafe acts
list the causes of accidents: - Mechanical, Environmental, personnel factors -accident prevention techniques - 4 E'S of accident prevention technique .
organizing safety -role of management -safety officers -government norms -factories act of 1948 -factories rule 1960 -emergency preparedness and response -precautions to be observed in hazardous situations like toxic ,,flammable ,,electrical shock and material handling.

2. Concept of entrepreneurship- profile of an entrepreneur- functions-risk taking qualities-concept of student entrepreneur.- factors contributing to the failure of entrepreneurial ventures- industrial support needed programs existing in India, Kerala-concept of DSIR, TBI, MSME. etc.- steps involved in starting small-scale industry- registration of SSI-agencies for financial assistances - feasibility study - Preparation of feasibility report and project report.

TEXT BOOKS

1. O P Khanna-Industrial Engineering and management- Dhanpat Rai and sons, New Delhi
2. N D Vohra -Quantitative techniques in management- TMH, New Delhi

REFERENCE BOOKS

1. LS Srinath -PERT and CPM principles and applications -Eeast West Press Pvt Ltd. New Delhi
2. Dr.Deepak Kumar Battachariya-Industrial Management- Vikas Publishing
3. S K Hajra Choudhury, Nir jhar Roy, A K Hajra Choudhury -Production Management- Media Promoters and publishers pvt Ltd, Mumbai
4. L M Deshmukh -Industrial safety management - TMH New Delhi
5. Dr. A K Singh – Entrepreneurship Development and Management –Laxmi Publications

COURSE TITLE : INDUSTRIAL TRAINING/ INDUSTRIAL VISIT / COLLABORATIVE WORK /SPOKEN TUTORIAL
COURSE CODE : 5009
COURSE CATEGORY : P
DAYS / SEMESTER : 14
CREDITS : 2

General Outcome:

GO	On completion of the study of this course the students will be able:
1	To provide an industrial exposure in tune with the curriculum.
2	To familiarize industrial standards, safety aspects, organizational structure.
3	To improve employability of students.
4	To provide training on industrial relevant topics.

Guidelines:

The students need to undergo any of the four options mentioned in the course title for successful award of credit for the program, subject to the evaluation criteria mentioned below.

Industrial Training:

The students need to undergo 10 days full time industrial training on Government, Quasi Government or Public limited industries. Students of Diploma in Biomedical Engineering can opt for Super/multi specialty hospitals in addition to the above mentioned industries. On successful completion of the training students need to submit certificate of completion mentioning days of their attendance to the Head of the Department. It is required to submit bonafide report of the training at the end of the course and shall be evaluated internally.

Evaluation criteria:

1. Attendance (based on feedback from the industry) : 30%
2. Involvement (based on feedback from the industry) : 30%
3. Viva (as part of internal evaluation at the institute) : 20%
4. Bonafide record : 20%

Industrial Visit:

The concept of industrial visit is to encourage students to interact with nearby industries. The students need to be assigned with specific task that need interaction with the industry. For example, students of Diploma in Chemical Engineering in batches of five can be sent to the nearby industry to collect details regarding effluent treatment. Industrial visit to Small, medium or large scale industries accompanied by faculty members can also be encouraged. In such case one faculty from each branch can be assigned as advisor for the visit. The advisor can identify appropriate industry and co-ordinate the visit. At least four

industries should to be visited for successful completion of the course. The visit can be spanned conveniently within the semester. Evaluation is based on the report submitted by the accompanied faculty along with the evaluation criteria mentioned below. It is required to submit bonafide report of the visit at the end of the course and shall be evaluated internally.

Evaluation criteria:

1. Attendance ((evaluated by the advisor) : 30%
2. Involvement (evaluated by the advisor) : 30%
3. Viva (as part of internal evaluation at the institute) : 20%
4. Bonafide record : 20%

Collaborative Work:

Academic departments can collaborate with industries of repute by way of taking up consultancy, testing or assembling work. One faculty can be assigned as coordinator. The students need to consult or visit the collaborative industry as part of the course. It is required to submit bonafide report at the end of the collaborative work and shall be evaluated internally. It is to be ensured that the collaborating industry is selected based on their repute in the segment. Collaborative works are not allowed with academic or industrial training providers.

Evaluation criteria:

1. Attendance (evaluated by the advisor) : 30%
2. Involvement (evaluated by the advisor) : 30%
3. Viva (as part of internal evaluation at the institute) : 20%
4. Bonafide record : 20%

Spoken Tutorial

Students can optionally go for spoken tutorial provided Ministry of Human Resource Development, Govt. of India for successful completion of the course. Students can go for at least one course provided as part of spoken tutorial. The students need to submit completion certificate with mention of their grade.

Evaluation criteria:
Evaluation shall be made based on certification of the programme.

COURSE TITLE : EMBEDDED SYSTEMS
COURSE CODE : 5041
COURSE CATEGORY : A
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	AVR microcontroller architecture	12
2	Assembly language programming	14
3	AVR programming using embedded C	14
4	Embedded systems	12
TOTAL		**52**

Course General Outcome:

MODULE	GO	ON COMPLETION OF THE STUDY OF THIS COURSE THE STUDENTS WILL BE ABLE:
1	1	To understand AVR architecture
2	2	To understand basics of AVR programming
3	3	To understand AVR programming using C
	4	To understand AVR timers and interrupts
4	5	To understand the architecture of embedded systems and embedded OS
	6	To know about advanced development boards

GO - General Outcome

On the completion of the study the student will be able:

MODULE I AVR MICROCONTROLLER ARCHITECTURE

1.1.0 To understand AVR architecture

1.1.1 To describe about AVR family
1.1.2 To list the features of AVR family
1.1.3 To compare various members of the AVR family
1.1.4 To compare the AVR with microcontroller offered by other manufactures
1.1.5 To explain the block diagram of AVR ATmega32 microcontroller
1.1.6 To explain the General purpose registers of ATmega32 microcontroller
1.1.7 To explain the data memory of ATmega32 microcontroller
1.1.8 To explain I/O memory (SFRs)
1.1.9 To describe internal data SRAM of ATmega 32 microcontroller
1.1.10 To compare SRAM and EEPROM in ATmega32 chips

1.1.11 To illustrate ATmega32 status register
1.1.12 To explain different addressing modes of ATmega 32 microcontroller

MODULE II ASSEMBLY LANGUAGE PROGRAMMING

2.1.0 To understand the basics of AVR programming

2.1.1 To explain the structure of assembly language program
2.1.2 To describe AVR microcontroller data formats and assembler directives
2.1.3 To list the steps to create an AVR assembly language program
2.1.4 To explain the data transfer, arithmetic and logic instructions
2.1.5 To explain the rotate and shift instructions
2.1.6 To explain the branch instructions and looping
2.1.7 To explain the call instructions and stack
2.1.8 To describe AVR time delay and instruction pipeline
2.1.9 To explain delay calculation for the AVR
2.1.10 To describe I/O port programming in AVR
2.1.11 To write simple assembly language programs
2.1.12 To explain macros
2.1.13 To compare macros and subroutines

MODULE III AVR PROGRAMMING USING EMBEDDED C

3.1.0 To understand AVR Programming in C

3.1.1 To describe data types and time delays in C
3.1.2 To describe I/O programming in C
3.1.3 To explain logic operations in C
3.1.4 To describe data conversion programs in C
3.1.5 To explain data serialization in C
3.1.6 To describe memory allocation in C

3.2.0 To understand AVR timers and interrupts

3.2.1 To explain programming timers 0, 1, and 2
3.2.2 To describe AVR interrupts
3.2.3 To explain the programming of timer interrupts
3.2.4 To explain programming external hardware interrupts
3.2.5 To state interrupt priority in the AVR microcontroller
3.2.6 To explain about serial Communication- I^2C and SPI
3.2.7 To describe ATmega32 connection to RS232

MODULE IV EMBEDDED SYSTEMS

4.1.0 To understand the architecture of embedded systems and embedded OS

- 4.1.1 To define an embedded system
- 4.1.2 To explain the concept of embedded systems
- 4.1.3 To list the characteristic features of an embedded system
- 4.1.4 To explain the architecture of an embedded system
- 4.1.5 To list the application areas of embedded system
- 4.1.6 To explain the specialities of embedded system
- 4.1.7 To list the types of embedded operating system
- 4.1.8 To describe various activities of an embedded OS such as task, task scheduling, context switching, mutual exclusions and inter task communications
- 4.1.9 To describe about memory management and timer services
- 4.1.10 To explain the general architecture of an embedded operating system
- 4.1.11 To state the role of kernal in embedded OS
- 4.1.12 To list the different categories of embedded OS and give examples for each

4.2.0 To know about advanced development boards

- 4.2.1 To describe the concept of arduino development board
- 4.2.2 To describe the concept of raspberry pie development board

CONTENTS

MODULE III AVR PROGRAMMING USING EMBEDDED C

Data types and time delays in C - I/O programming - logic operations - data conversion programs - data serialization - memory allocation - programming of timers 0 - timer 1 - timer2- AVR interrupts - programming of timer interrupts - programming external hardware interrupts - interrupt priority in AVR microcontroller - serial communication- I^2C and SPI - connection to RS232

MODULE IV EMBEDDED SYSTEMS

Embedded system - concept - characteristic features - architecture - application areas - specialities - embedded operating system - types - activities of an embedded OS like task, task scheduling, context switching, mutual exclusions and inter task communications - memory management and timer services - general architecture of OS - kernal - categories of embedded OS - examples - concept of arduino and raspberry pie development boards

TEXT BOOK

1. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi -The AVR Microcontroller and Embedded Systems using assembly and C - - Pearson Education.
2. Dr. K V K Prasad- Embedded / Real Time Systems Concept, Design and Programming The ultimate reference - (Dreamtech).

REFERENCE

1. Atmel AVR32 data sheet doc no 2053.pdf www.atmel.com

COURSE TITLE : INDUSTRIAL ELECTRONICS & PLC
COURSE CODE : 5042
COURSE CATEGORY : A
PERIODS PER WEEK : 4
PERIODS PER SEMESTER : 52/5
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Power Semiconductor Devices & Thyrister Family	13
2	Converters	13
3	Motor Drives, Industrial Heating, Welding And UPS	13
4	PLC & Programming	13
	TOTAL	**52**

Course General Outcome :

Module	GO	On completion of the study of this course the students will be able:
1	1	To Understand Various Types of Power Semiconductor Devices
	2	To Comprehend Thyrister Family
2	3	To Comprehend the Operation and Applications of Different Types Of Converters
3	4	To Understand various Motor Speed Control Methods Using Thyristers.
	5	To Understand The Principles and Applications of Industrial Heating, Dielectric Heating And Welding.
	6	To Understand the Principle Of UPS.
4	7	To Understand the Basics of PLC.
	8	To Understand PLC Programming.

On the completion of the study the student will be able:

MODULE I POWER SEMICONDUCTOR DEVICES AND THYRISTOR FAMILY.

1.1.0 To understand various types of power semiconductor devices.

1.1.1 To explain the characteristics, working principles of power MOSFETs.
1.1.2 To list the applications of power MOSFETs.
1.1.3 To explain the characteristics, working principles of power IGBTs.
1.1.4 To list the applications of IGBTs.

1.2.0 To comprehend thyristor family.

1.2.1 To explain the structure, characteristics and working principle of SCR.
1.2.2 To explain twoTransistor analogy of SCR.
1.2.3 To explain the turn on/triggering methods of SCR.
1.2.4 To explain the gate triggering methods using 'R' triggering, RC & UJT triggering.
1.2.5 To explain various commutation techniques of SCR.
1.2.6 To explain forced commutation circuits (class A to F).
1.2.7 To describe the structure, working principle and V-I characteristics of DIAC.
1.2.8 To describe the structure, working principle and V-I characteristics of TRIAC.

MODULE II CONVERTERS

2.1.0 To comprehend the operation and applications of different types of converters.

2.1.1 To Explain the Operation of Single Phase Half Wave, Full Wave Midpoint and Bridge Converters (Half and Fully Controlled) With R and RL Loads.
2.1.2 To Describe the Working of Thyristor AC Power Control Using SCR & Triac.
2.1.3 To Explain the Principle of Basic Inverter Circuit.
2.1.4 To Describe Series and Parallel Inverter Circuits With Waveforms.
2.1.5 To Explain Single Phase Dual Converters With Waveforms.
2.1.6 To Explain the Principles and Applications Of Low To High and High To Low Frequencies Cyclo Converters.
2.1.7 To explain the principles and applications of step up,step down and Jone's choppers.

MODULE III MOTOR DRIVES, INDUSTRIAL HEATING, WELDING AND UPS.

3.1.0 To understand various motor speed control methods using thyristors.

3.1.1 To compare AC and DC drives.
3.1.2 To explain the speed control of series & shunt DC drives.
3.1.3 To explain various methods of speed control of induction motors.
3.1.4 To describe stator voltage control, rotor on off control and variable voltage variable frequency control of induction motor.

3.2.0 To understand the principles and applications of industrial heating, dielectric heating and welding.

3.2.1 To explain Industrial Heating methods.
3.2.2 To explain the principle, merits and applications of Induction Heating.
3.2.3 To state the principle and applications of Dielectric Heating.
3.2.4 To explain the types of resistance welding schemes.
3.2.5 To explain timers used in resistance welding system.

3.3.0 To understand the principles of UPS.

3.3.1 To explain the principle of UPS.
3.3.2 To list the type of UPS.
3.3.3 To describe on-line UPS.
3.3.4 To describe off-line UPS.

MODULE IV PLC AND PROGRAMMING

4.1.0 To understand the basics of PLC.

4.1.1 To explain basic principles and architecture of PLC.
4.1.2 To list the advantages of PLC.
4.1.3 To list the applications of PLC.

4.2.0 To understand PLC programming.

4.2.1 To explain ladder logic and ladder diagram.
4.2.2 To explain different instruction sets used in ladder diagram.
4.2.3 To write ladder programs.
4.2.4 To explain real time applications of PLC.

CONTENT DETAILS

MODULE I Power semiconductor devices and thyristor family.

Power MOSFET - power IGBT- characteristics - working principles - applications - SCR – structure - characteristics - working principle - two transistor analogy - turn on/triggering methods - gate triggering methods - 'R' triggering - RC triggering - UJT triggering - commutation techniques - forced commutation circuits (class A to F) - DIAC - TRIAC- structure - working principle - VI characteristics.

MODULE II Converters

Single phase converters - half wave - full wave midpoint and bridge woking principle – R, RL loads - thyristor AC power control using SCR and triac - working principle - basic inverter circuit - working principle, series and parallel inverter circuits - working principle -waveforms, single phase dual converters - working principle - waveforms, low to high and high to low frequencies cyclo converters, step up, step down and Jone's choppers - principle – applications.

MODULE III Motor drives, industrial heating, welding and UPS

AC and DC drives- comparison, series and shunt DC drives - speed control - methods of speed control of induction motors - stator voltage control- rotor on off control - variable voltage variable frequency control, industrial heating methods - principle- merits - applications, dielectric heating - principle - applications, resistance welding schemes - types - timers, on-line and off-line UPS – operation.

MODULE IV PLC and programming

PLC - basic principles -architecture - advantages - different units, ladder logic- ladder diagram - instruction sets -Bit instructions - timer/counter instructions - compare instructions - move instructions - math instructions - program control instructions - ladder programs - real time applications of PLC.

Text Books

1. Industrial Electronics and Control - S K Bhattacharya, S Chatterjee.
2. Programmable logic controllers - Frank D Petruzella.

Reference

1. Industrial Electronics and Control - Biswanath Paul - PHI
2. Thyristors principles and applications - Ramamoorthy
3. Power Electronic systems Theory and Design - Jai P Agrawal
4. Modern Power Electronics and AC Drives - Bimal K Bose
5. Power Electronics (Principles and Applications) - Joseph Vithayathil
6. Introduction to Programmable Logic Controllers - Gary Dunning - 3rd Edition - Delmar

COURSE TITLE : CONTROL SYSTEMS
COURSE CODE : 5043
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52/5
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Introduction To Control System.	13
2	Systems and Transfer Functions.	13
3	Time Response Analysis.	13
4	Stability Analysis.	13
	TOTAL	**52**

Course General Outcome:

Module	GO	On completion of the study of this course the students will be able:
1	1	To understand the basics of control system.
	2	To understand Laplace and inverse Laplace transform.
2	3	To know systems and transfer function.
	4	To understand methods of obtaining transfer function
3	5	To understand time response analysis.
	6	To understand stability of a system and Routh stability criterion.
4	7	To understand bode plot and root locus techniques for stability analysis.

GO - General Outcome

On the completion of the study the student will be able:

MODULE I INTRODUCTION TO CONTROL SYSTEM

1.1.0 To understand the basics of control system.

1.1.1 To understand physical model of control system.
1.2.1 To analyze mathematical model of control system.
1.1.2 To explain linear time invariant and linear time variant system.
1.1.3 To know open loop and closed loop control systems.

1.2.0 To understand Laplace and inverse Laplace transforms.

1.2.1 To discuss Laplace transforms.
1.2.2 To find the Laplace transform of $e^{at,}$ e^{-at}, t, sin at and cos at.
1.2.2 To find the Laplace transform of test inputs such as step, ramp, parabolic, impuls inputs.
1.2.3 To state Laplace transform theorems - differentiation theorem and integration theorem.
1.2.4 To find Inverse Laplace transforms using partial fraction method to solve simple problems.

MODULE II SYSTEMS AND TRANSFER FUNCTIONS

2.1.0 To know systems and transfer function.

2.1.1 To define transfer function.
2.1.2 To find the order of transfer function.
2.1.3 To write transfer function of linear system.
2.1.4 To derive of general transfer function of Mechanical Translational system and rotational system.
2.1.5 To derive the transfer function of Electrical circuits – R, L and C (series & parallel).
2.1.6 To describe force/torque - voltage and force/torque - current analogy.

2.2.0 To understand methods of obtaining transfer function.

2.2.1 To explain Block diagram reduction rules.
2.2.2 To find the overall transfer function of control systems by block diagram.
2.2.3 Reduction rules (single input- single reduced output systems).
2.2.4 To define the parameters of signal flow graph.
2.2.5 To write Mason's gain formula.
2.2.6 To draw SFG from block diagram.
2.2.7 To obtain overall transmittance of control system by signal flow graph.

MODULE III TIME RESPONSE ANALYSIS

3.1.0 To understand time response analysis.

3.1.1 To explain the time response of first order system.
3.1.2 To find the response of first order systems such as step, ramp, and impulse inputs.
3.1.3 To define the type of a system.
3.1.4 To define static error coefficients such as static position, velocity & acceleration error coefficient.
3.1.5 To derive steady state error in terms of Kp, Kv & Ka for Type 0, Type 1, Type 2 Systems.

3.2.0 To understand Routh Hurwitz criterion.

3.2.1 To state absolute stability, relative stability and marginal stability.
3.2.2 To explain Routh hurwitz criterion.
3.2.3 To solve simple problems using Routh Hurwitz criterion.

MODULE IV STABILITY ANALYSIS

4.1.0 To understand bode plot and root locus techniques of stability analysis.

4.1.1 To draw Bode plot for simple transfer functions. K, Ks, K/s, 1+Ts, Ts, 1/1+Ts, 1/1Ts.
4.1.2 To explain gain cross over frequency, phase cross over frequency, gain margin and phase margin.
4.1.3 To describe the Procedure to construct Root locus.
4.1.4 To construct Root Locus for transfer functions (Single poles only).

CONTENT

MODULE I Introduction to control system

Basics of control system - physical model - mathematical model of control system - linear time invariant and linear time variant system - open loop and closed loop control systems - Laplace transforms - Laplace transform of $e^{at,}$ e^{-at}, t, sin at and cos at - Laplace transform of step, ramp, parabolic, impulse inputs - Laplace transform theorems - differentiation theorem and integration theorem - Inverse Laplace transforms - partial fraction method to solve simple problems.

MODULE II Systems and Transfer Functions

Transfer function - definition and order - transfer function of linear system - general transfer function of Mechanical Translational system and rotational system - transfer function of Electrical circuits – R, L and C (series & parallel) - force/torque - voltage and force/torque - current analogy - block diagram reduction – rules - overall transfer function of control systems using block diagram reduction rules - signal flow graph - parameters - Mason's gain formula - procedure to draw SFG from block diagram - overall transmittance of control system by signal flow graph.

MODULE III Time Response analysis

Time response analysis - time response of first order system - response of first order system for step, ramp, and impulse inputs - type of a system - static error coefficients - static position, velocity & acceleration error coefficient - steady state error in terms of Kp, Kv & Ka for Type 0, Type 1, Type 2

Systems - Routh Hurwitz criterion - absolute stability, relative stability and marginal stability – simple problems using Routh hurwitz criterion

MODULE IV Stability analysis

Bode plot – stability analysis of simple transfer functions. K, Ks , K/s,1+Ts,1-Ts,1/1+Ts,1/1-Ts - gain cross over frequency, phase cross over frequency, gain margin, phase margin - Root locus - Procedure to construct - Root Locus for single pole transfer functions.

TEXT BOOK

1. Control systems Engg -I.J.Nagarath, N. Gopal (New Age International Publisher).
2. Control Systems- R.S. Manke (Khanna Publisher).

REFERENCE

1. Modern Control Engineering - Katsuhiko Ogata – PHI.
2. Control Systems Engineering - R.Anandanatarajan.P.Ramesh Babu (Scitech Publisher).

COURSE TITLE : MEDICAL ELECTRONICS
COURSE CODE : 5044
COURSE CATEGORY : E
PERIODS / WEEK : 4
PERIODS / SEMESTER :52/5
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Basics of Anatomy and Bio-Potentials	13
2	Analytical Instruments and Laser	13
3	Therapeutic Instruments	13
4	Imaging System, Bio-Telemetry and Patient Safety	13
	Total	**52**

Course General outcome :

Module	GO	On completion of the study of this course the students will be able :
1	1	To know the basics of bio-electric potentials and electrodes used for measurement.
	2	To understand bio-electric potential recorders.
2	3	To understand the different types of analytical instruments.
	4	To understand the application of lasers in biomedical field.
3	5	To understand the different types of therapeutic instruments.
4	6	To understand the various imaging systems.
	7	To understand the need of bio-telemetry and patient safety.

GO - General Outcome

On the completion of the study the student will be able :

MODULE - I - BASICS OF ANATOMY AND BIO-POTENTIALS

1.1.0 To know the basics of bio-electric potentials and electrodes used for measurement.

1.1.1 To describe the anatomy of human body - mention various physiological systems.

1.1.2 To describe resting and action potentials with waveforms.
1.1.3 To describe the different types of electrodes used.

1.2.0 To understand bio-electric potential recorders.

1.2.1 To explain electrical activity of heart with diagram.
1.2.2 To explain the origin and significance of ECG waveform.
1.2.3 To explain the block diagram of ECG recorder.
1.2.4 To explain the electrical activity of brain.
1.2.5 To explain the block diagram of EEG machine.
1.2.6 To explain the bio-electrical potentials associated with muscle activity.
1.2.7 To explain the setup for EMG measurement using block diagram.

MODULE - II - ANALYTICAL INSTRUMENTS AND LASER.

2.1.0 To understand the different types of analytical instruments.

2.1.1 To explain blood cells and their classification.
2.1.2 To explain the different methods of blood cell counting.
2.1.3 To explain blood pressure and its classes - Arterial BP and Ventricular BP.
2.1.4 To describe Sphygmomanometer - Direct and Indirect methods for the measurement of BP.
2.1.5 To explain blood gas analyzer.

2.2.0 To understand the application of lasers in biomedical field.

2.2.1 To state the Principle of Laser.
2.2.2 To explain the Properties of Laser.
2.2.3 To explain the Nd-Yag Laser, Argon Laser.
2.2.4 To list the application of Laser in Medical Field.

MODULE - III - THERAPEUTIC INSTRUMENTS.

3.1.0 To understand the different types of therapeutic instruments.

3.1.1 To state the need of Pacemakers.
3.1.2 To classify and compare different types of Pacemakers.
3.1.3 To explain the block diagram of a Ventricular Synchronous Demand Pacemaker.
3.1.4 To state the need of Defibrillators.
3.1.5 To compare AC Defibrillators and DC Defibrillators.
3.1.6 To explain the functions of a Dialysis Machine.
3.1.7 To list different types of Hemo-Dialysis Machine.
3.1.8 To state the working principle of a Portable Hemo-Dialysis Machine with a diagram.
3.1.9 To state the use of respirators.

3.1.10 To explain the classification of Ventilators according to Pressure Cycling And Volume Cycling.
3.1.11 To explain the different types of Diathermy Equipments.
3.1.12 To explain the methods of applying electrodes in shortwave diathermy treatment with diagram.
3.1.13 To list the advantages and disadvantages of Shortwave Diathermy Treatment.
3.1.14 To explain the Schematic Diagram of Microwave Diathermy Unit.

MODULE - IV - IMAGING SYSTEM, BIO-TELEMETRY AND PATIENT SAFETY.

4.1.0 To understand the various imaging systems.

4.1.1 To explain the operation of an x-ray machine with a block diagram.
4.1.2 To explain the working principle of CT scanner.
4.1.3 To explain the working principle of an ultrasonic imaging system.
4.1.4 To explain the working principle of nuclear magnetic resonance imaging system.

4.2.0 To understand the need of bio-telemetry and patient safety.

4.2.1 To state the need of bio-telemetry.
4.2.2 To explain the bio telemetry system with block diagram.
4.2.3 To state the application of bio-telemetry system with example.
4.2.4 To list the effect of electricity, electromagnetic radiation & magnetism in the human body.
4.2.5 To state the precautions to be taken while handling bio-medical instruments.
4.2.6 To list the precautions to be taken while handling x-ray machines.
4.2.7 To list the electrical safety considerations with respect to machine operators and patients – explanation of macro shock and micro shock.
4.2.8 To explain the importance of grounding.

CONTENT DETAILS

Module - I

Anatomy of human body - various physiological systems - sources of bio-electric potentials - resting and action potentials - waveforms - types of electrodes used for measurement. Electrical activity of heart with diagram - origin and significance of ECG wave form - block diagram of ECG recorder. Electrical activity of brain - block diagram of EEG machine. Bio-electrical potentials associated with muscle activity - setup for EMG measurement using block diagram.

Module - II

Blood cells and their classification - different methods of blood cell counting. Blood pressure and its classes - arterial BP and ventricular BP - sphygmomanometer - direct and indirect methods for the measurement of BP - Blood gas analyzers.
Principle of laser action - properties of Laser - Nd-Yag Laser, Argon Laser - application of laser in medical field.

Module - III

Pace maker - need of pacemakers – pacing modes - different types of pacemakers – internal - external - ventricular synchronous demand pacemaker - block diagram.
Defibrillator - need of defibrillators - compare ac defibrillators and dc defibrillators.
Dialysis machine - functions - different types of hemo-dialysis machine - working principle of a portable hemo-dialysis machine with a diagram. Use of respirators - classification of ventilators - pressure cycling and volume cycling. Diathermy - different types of diathermy equipments - methods of applying electrodes in shortwave diathermy treatment with diagram - advantages and disadvantages of shortwave diathermy treatment - schematic diagram of microwave diathermy unit.

Module - IV

Imaging systems – operation of an x-ray machine with a block diagram - working principle of CT scanner, ultrasonic imaging system, nuclear magnetic resonance imaging system. Bio-telemetry - need of bio-telemetry - bio telemetry system - block diagram - application of bio-telemetry system with example. Effect of electricity- electromagnetic radiation & magnetism in the human body - precautions for handling bio-medical instruments - precautions for handling x-ray machines - electrical safety considerations - machine operators and patients - macro shock and micro shock - importance of grounding.

TEXT

1. Handbook of Biomedical Instrumentation - R S Khandpur - Tata McGraw Hill Publishing Company Limited.
2. Biomedical Instrumentation and Measurements - Leslie Cromwell, Fred J Weibell and Erich A Pfeiffer - PHI Learning Private Limited.
3. Biomedical Electrical and Instrumentation - Omkar M Pasndey and Rakesh Kumar - S K Kataria and Sons.

COURSE TITLE : OPTICAL FIBRE COMMUNICATION
COURSE CODE : 5045
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52/5
CREDITS : 4

TIME SCHEDULE

Module	Topics	Periods
1	Fundamentals of optics and optical fibers	13
2	Optical sources and detectors	13
3	Basic optical fiber communication system	13
4	Transmission characteristics of optical fibers	13
Total		**52**

Course general outcome :

Module	GO	On completion of the study of this course the students will be able :
1	1	To know the fundamentals of optics
	2	To understand optical fibers
2	3	To understand optical sources
	4	To understand optical detectors
3	5	To understand optical amplifiers
	6	To understand optical transmission and reception
4	7	To understand transmission losses and measurement
	8	To understand the elements of optical fiber communication system

GO - General Outcome

On the completion of the study the student will be able :

MODULE I FUNDAMENTALS OF OPTICS AND OPTICAL FIBERS

1.1.0 To know the fundamentals of optics

1.1.1 To state absorption, scattering and dispersion
1.1.2 To describe the principle of light transmission in a fiber, total Internal reflection, numerical aperture, acceptance angle

1.2.0 To understand optical fibers

1.2.1 To describe the ray types - meridional, skew and axial rays
1.2.2 To describe elements of physical optics

1.2.3 To explain the optical fiber modes and configurations
1.2.4 To explain various optical fiber types – based on transmission mode and on refractive index profile
1.2.5 To describe different types of fiber materials - glass, plastic optical fiber
1.2.6 To explain the advantages of optic fiber

MODULE II VARIOUS OPTICAL SOURCES AND DETECTORS

2.1.0 To understand optical sources

2.1.1 To state optical process in semiconductors - energy band, direct and indirect band gap
2.1.2 To explain the structure of surface emitting and edge emitting LEDs
2.1.3 To explain the modulation of LED
2.1.4 To explain the theory of Laser action such as absorption and emission of radiation, population inversion, stimulated emission
2.1.5 To explain the Laser diode structure and radiation pattern

2.2.0 To understand optical detectors

2.2.1 To explain the principle of photo-detection
2.2.2 To explain the structure and working principle of PIN photodiode
2.2.3 To explain the structure and working principle of avalanche photodiode
2.2.4 To compare various photodiodes

MODULE III BASIC OPTICAL FIBER COMMUNICATION SYSTEM

3.1.0 To understand optical amplifiers

3.1.1 To explain the basic optical communication system block diagram
3.1.2 To explain the basic concept of optical amplifiers
3.1.3 To explain the various types of optical amplifiers - SOA, Raman, EDFA

3.2.0 To understand optical transmission and reception

3.2.1 To explain the block diagram of optical transmitter
3.2.2 To explain the block diagram of optical receivers
3.2.3 To explain the block diagram of optical transceivers
3.2.4 To explain the basic idea of wavelength division multiplexing (WDM)

MODULE IV TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS

4.1.0 To understand transmission losses and measurement

4.1.1 To explain absorption losses, linear and nonlinear scattering losses, fiber bend losses, intra and inter mode dispersion losses
4.1.2 To explain the methods of measurement of attenuation losses

4.2.0 To understand the elements of optical fiber communication system

4.2.1 To describe fiber connector and splicer, different types of fiber couplers such as three and four port couplers, star couplers

4.2.2 To explain the optical fiber directional coupler - principle and applications

4.2.3 To describe optical isolators and circulators

4.2.4 To describe beam splitters and optical modulators

CONTENT DETAILS

Module I Fundamentals of optics and optical fibers

Fundamentals of optics - principle of light transmission in a fiber - total internal reflection - numerical aperture - acceptance angle - absorption, scattering and dispersion - optical fibers - the ray types - meridional, skew and axial rays - elements of physical optics - optical fiber modes and configurations - various optical fiber types - based on transmission mode and on refractive index profile - different types of fiber materials - glass, plastic - optical fiber - advantages

Module II Various optical sources and detectors

Optical process in semiconductors - energy band, direct and indirect band gap - LED structure - surface emitting and edge emitting LEDs - modulation of LED - theory of laser action - absorption and emission of radiation, population inversion, stimulated emission - laser diode structure and radiation pattern - optical detectors - principle of photo-detection - PIN photodiode - avalanche photodiode - compare various photodiodes

Module III Basic optical fiber communication system

Optical communication system - block diagram - basic concept of optical amplifiers - types of optical amplifiers - SOA - Raman - EDFA - optical transmission and reception - optical transmitter - optical receivers - optical transceivers block diagrams - wavelength division multiplexing (WDM)

Module IV Transmission characteristics of optical fibers

Transmission losses - absorption losses, linear and non linear scattering losses, fiber bend losses, intra and inter mode dispersion losses - methods of measurement of attenuation losses.
Elements of optical fiber communication system - fiber connector and splicer, different types of fiber

couplers - three and four port couplers - star couplers - optical fiber directional coupler - principle and applications - optical isolators and circulators - beam splitters and optical modulators

Text Books

1. Fibre Optic Communication - Systems and Components - Vivekanand Mishra
2. Sunita P Ugale - Wiley India
3. Optical Fibre Communication - Gerd Keiser - Fourth edition
4. Optical Fibre Communication - John M Senior
5. Introduction to Fibre Optics - Ajay Ghatak and K Thyagarajan

COURSE TITLE : PCB DESIGN & SPICE LAB
COURSE CODE : 5047
COURSE CATEGORY : A
PERIODS/WEEK : 5
PERIODS/ SEMESTER : 65/5
CREDITS : 3

LIST OF EXPERIMENTS

After completing the course student will be able :

1. To prepare the PCB

   (a) Drawing the circuit diagram of analog and digital circuit functions
   (b) Layout and artwork procedure
   (c) Translating circuit schematic into layout
   (d) Taping art work for single sided board
   (e) Printing and etching
   (f) Drilling the board, surface preparation
   (g) Mounting/fixing procedure of components on PCB

2. To perform soldering and de-soldering

   Specification and selection of Soldering tools - soldering flux and solder - simple soldering with tag boards and prepare PCB - precaution in soldering with PCB's and IC's base - principle of wave soldering

3. To perform soldering and de-soldering of SMD
4. To perform PCB design and Layout preparation using available Simulation Soft ware
5. To use SPICE
   - Component model and sources
   - Units & values
   - types of analysis, operating point transient, AC & DC
   - Simulation of circuits (transient, AC & DC)

   (a) Characteristics of diode, BJT

   (b) Centre tapped Full wave Rectifier circuit

   (c) Single stage amplifier

   (d) RC phase shift oscillator

   (e) Astable multivibrator using transistor

   (f) Astable multivibrator using 555

   (g) Regulated power supply

   (h) Schmitt Trigger using 741

   (j) Sequential & combinational digital circuits

COURSE TITLE : INDUSTRIAL ELECTRONICS & PLC LAB
COURSE CODE : 5048
COURSE CATEGORY : A
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 2

LIST OF EXPERIMENTS

On completion of the course, the student will be able:

1.0 To understand the construction and testing of power electronics devices.

1.1 To plot the VI characteristics of SCR.

1.2 To set up Single Phase control using resistance triggering circuit and
(i) plot the waveform across the load and SCR
(ii) find the maximum firing angle

1.3 To set up Single-phase control using RC trigger circuit. Plot the waveform across the resistor load and SCR.

1.4 To setup a UJT triggering circuit and Plot the waveforms.

1.5 To setup single phase control rectifier using SCR and load (resistive) and find the minimum and maximum values of firing angle.

1.6 To setup illumination control using DIAC and TRIAC.

1.7 To set up DC motor speed control using SCR.

1.8 To construct a time delay relay circuit using UJT and SCR.

1.9 To set up an emergency lamp circuit using SCR.

1.10 To set up a chopper and plot the waveform.

1.11 To set up an inverter circuit using BJT and plot the waveform.

1.12 To set up a Battery Charger circuit.

2.0 To understand the concept of PLC programming.

2.1 To study various instructions in PLC programming.

2.2 To implement logic gates using PLC.

2.3 To implement stair case light using PLC.

2.4 To implement water level controller using PLC.

2.5 To implement traffic light controller using PLC.

2.6 To implement conveyor controller using PLC.

2.7 To implement lift controller using PLC.

2.8 To implement square wave generator using PLC.

2.9 To implement logic to count pulses from a source and check for the pre determined value using PLC.

COURSE TITLE : EMBEDDED SYSTEMS LAB
COURSE CODE : 5049
COURSE CATEGORY : A
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 2

LIST OF EXPERIMENTS

On completion of the course, the student will be able:

1.0 To Familiarization of kit (AtMega32)

2.0 To implement assembly language Programs using kit

- 2.1 Time Delay
- 2.2 Code Conversion
- 2.3 Serial Communication
- 2.4 Timer programming

3.0 To simulate Interface Programs in embedded C using AVR Studio

- 3.1 LED Interface (output)
- 3.2 Switch Interface (input)
- 3.3 4x 4 Matrix Keyboard interface
- 3.4 Relay interface
- 3.5 Seven segment LED display interface
- 3.6 Character based LCD interface
- 3.7 DC motor interface
- 3.8 Stepper motor interface
- 3.9 ADC Interfacing
- 3.10 DAC Interfacing
- 3.11 Temperature sensor

COURSE TITLE : PROJECT WORK AND SEMINAR
COURSE CODE : 6009
COURSE CATEGORY : A
DAYS / SEMESTER : 90
CREDITS : 0

PART I - SEMINAR

The student should be able:
1. To have an exposure to an innovative area of Technology/Information.
2. To develop presentation skills.
3. To develop creative interaction among listeners.
4. To learn to appreciate your peers and give positive feedback.

Topic Selection:
1. Select topics related to Industry/Technology/allied area, but not part of the curriculum.
2. Repetition of topics not permitted.

Presentation:
Presentation shall be for at least 15 minutes. Presentation is to be made with audio visual aids.

Report:

A rough report of the seminar shall be submitted at least 3 working days before presentation. The fair report shall be submitted within one week after the presentation.

The report shall include:
1. Abstract
2. Actual content
3. Reference

PART II – PROJECT WORK

1. To develop design of a multi storeyed building.
2. To implement structural planning. And site planning
3. To enhance team spirit and creative talents for achieving a goal.

Selection of Project:
1. Select programme related project which has relevance to today's industry, preferably with a social relevance.
2. Suggested type of Projects :
    a. Providing technical service to industry
    b. Entrepreneurship development
3. Project should be feasible at Diploma level and economically viable
4. Only projects which can be developed by the Diploma students need be selected. Support of external agencies not permitted

Guidelines for Project Work:

1. Suitable batches may be formed with 3 – 5 students per batch
2. The programme of the project work should be monitored at least once a week and progress may be documented
3. Involvement of each student should be ensured

Format for the preparation of Project work :

1. Cover Page as per format
2. Acknowledgement
3. Certificate of the Project Guide
4. Synopsys of the Project
5. Main Report
    - Objective & Scope of the Project
    - Theoretical Background
    - Definition of Problem
    - Methodology adopted, System Implementation & Details
    -Hardware/Software/Machinery/Equipment/used