Programme Specifications
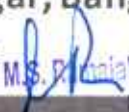

RAMAIAH UNIVERSITY
OF APPLIED SCIENCES

Programme: Bachelor of Vocation (B.Voc.)

in Mechatronics

Faculty of Engineering and Technology

Directorate of Training & Lifelong Learning

M. S. Ramaiah University of Applied Sciences

University House, New BEL Road, MSR Nagar, Bangalore – 560 054
www.msruas.ac.in

1   **Title of The Award**
    - Vocational Diploma in Mechatronics
    - Vocational Advanced Diploma in Mechatronics
    - Bachelor of Vocational Degree in Mechatronics

2   **Modes of Study**
    Full Time & Part Time

3   **Awarding Institution /Body**
    M.S. Ramaiah University of Applied Sciences

4   **Joint Award**
    Not Applicable

5   **Teaching Institution**
    Faculty of Engineering and Technology,
    M.S. Ramaiah University of Applied Sciences

6   **Date of Programme Specifications**
    July 2018

7   **Date of Programme Approval**

8   **Programme Benchmark**
    UGC Guidelines

9   **Rationale for the Programme**

    Mechatronics is a systematic integration of mechanical, electrical and electronic components for systems to handle modern industrial requirements with high precision and accuracy. In recent times, due to the rapid development in the electronics and computer technologies, conventional mechanical systems are being replaced by mechatronic systems and there is an increased demand for cost effective, compact, efficient, accurate and reliable products in industries. Mechatronic systems are integral part of consumer products, home appliances, industrial robots, assembly & automation systems, road vehicles, aircrafts, ships and sub marines, electronic gadgets and military applications. Mechatronic systems encompasses sensors and actuation technology, signal conditioning, data acquisition, and processing, control system development,

instrumentation, PLC and embedded ICs for automation and robot development

This program is mainly aimed to develop competency in modelling & design of Mechatronic systems using sensors, signal conditioning & signal processing circuitry, embedded micro controller IC s and PLCs. They are also used to build controllers for robots and industrial automation along with testing, evaluation and diagnosis of mechatronic system. This program also imparts Knowledge in the field of project management, organizational behavior and other managerial aspects.

At present, Mechatronics is one of the emerging multi-disciplinary domain, gaining popularity with increased demand in industries for the development of efficient industrial products. However very few institutions offering job oriented courses for young aspirants in the similar domain. MSRUAS offers vocational program to candidates with ITI, Diploma and PUC background on Mechatronics. Students can choose the duration of the courses according to their need for 1 year, 2 years and 3 years based on the level of knowledge and experience required. Since most of the product development industries are running in a collaborative business environment, there is a need for professionals with a knowledge and skill sets of multi-domain to handle the requirements of product development.

15   **Programme Aim**

The aim of the course is to develop skilled professionals to identify, analyze, implement the model, test, evaluate and diagnose the key elements of Mechatronic systems to meet the need of present industrial applications

16   **Programme Objectives**

- To impart knowledge on general education including physics, mathematics, electrical, electronics, sensor applications, control systems, robotics and industrial automation
- To accord the knowledge on modelling, controlling and testing of the different Mechatronic system applications.
- To correlate the knowledge of designing, modelling, analyzing and testing of the robotic
  Systems for Industry Specific applications
- To develop geometric models, simulate and analyze various mechatronics systems/assemblies for their kinematic and dynamic behavior
- To impart knowledge on managerial subjects like communication skills, Labor laws, Occupational Health, Safety and Environment, Project Management, Principles of Management and Organizational Behavior
- To impart the knowledge on Industry 4.0, Internet of Things and Future

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17   **Programme Specific Outcomes**

Programme specific outcomes are listed under three headings:
1. Knowledge and Understanding 2. Practical Skills and 3. Capability/Transferable Skills

Knowledge and Understanding

After undergoing this course, the student will be able to:
1. Explain Physics and Underlying principles of mechatronics systems
2. Describe various sensors, circuitry, components, machine elements, measurement systems, control systems and robotic systems
3. Read and interpret various engineering drawings and their usage related to mechatronic systems, safety regulations, labor laws connected with usage & operation of such mechatronic system
4. Describe various elements of IoT, Industry 4.0 and Understand Future Manufacturing technologies

Practical Skills

After undergoing this course, the student will be able to:
1. Identify various mechatronic systems and their applications.
2. Create views of robotic model that can be used in modelling and Simulation Process.
3. Select required sensors, circuitry, systems and networks for Industrial automation
4. Build robotic models, actuation systems and control systems
5. Identify various working stages of Industry 4.0, Sub systems of Internet Of Things and Future Manufacturing Technologies

Capability/Transferable Skills

After undergoing this course, the student will be able to :
1. Handle the various mechatronic system applications
2. Generate detailed drawings, modelling and analysis reports of various Mechatronic Systems
3. Communicate efficiently, manage and lead teams

18   **Course Structure**

A student is required to successfully complete the following modules for the award of the Degree. The course is delivered as per the Time-Table for every batch

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19 Programme Structure

Vocational Diploma

Semester-1

General Education: 12 Credits, 180 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VGE050	Mathematics	4	60
2	VGE058	Physics in Mechatronics	4	60
3	VGE017	Communication Skills - I	4	60
Vocational Education: 18 Credits, 270 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VMS001	Basic Computer Skills	6	90
2	VMS002	Basic Electronics Circuits	6	90
3	VMS003	Basic Electrical Circuits	6	90

Semester-2

General Education: 12 Credits, 180 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VGE052	Mechanical Engineering Sciences	4	60
2	VGE024	Digital Electronics and IC's	4	60
3	VGE028	Elements of Mechatronics	4	60
Vocational Education: 18 Credits, 270 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VMS004	Engineering Drawing	6	90
2	VMS005	Wiring and Soldering Practice	6	90
3	VMS006	Basic Mechanical Workshop	6	90

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20 **Programme Structure**

Advanced Vocational Diploma

Semester-1

General Education: 12 Credits, 180 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VGE007	Basic Electrical & Electronics Systems	4	60
2	VGE010	Basic Elements of Mechanical Systems	4	60
3	VGE063	Sensors and Signals	4	60

Vocational Education: 18 Credits, 270 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VMS007	Mechanical Drawing & Assembly	6	90
2	VMS008	Electrical and Electronics Systems Analysis and Simulation	6	90
3	VMS009	Mechanical Systems Analysis and Simulation	6	90

Semester-2

General Education: 12 Credits, 180 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VGE011	Basic Hydraulics and Pneumatics	4	60
2	VGE051	Measurement and Control Systems	4	60
3	VGE019	Communication Systems	4	60

Vocational Education: 18 Credits, 270 Hours				
S. No.	Code	Module Title	Credit	Hours
1	VMS010	Computer Applications and Networks	6	90
2	VMS011	Modelling and Building of Mechatronic systems -1	6	90
3	VMS012	Mechatronics Project - 1	6	90

21   **Programme Structure**

Vocational Degree

Semester-1

General Education: 12 Credits, 180 Hours				
S. No.	**Code**	**Module Title**	**Credit**	**Hours**
1	VGE046	Internet of Things and Industry 4.0	4	60
2	VGE016	Cloud Storage and Computing	4	60
3	VGE038	Future Manufacturing Technologies	4	60
Vocational Education: 18 Credits, 270 Hours				
S. No.	**Code**	**Module Title**	**Credit**	**Hours**
1	VMS013	PLC and its Applications	6	90
2	VMS014	HMI, SCADA and Robotics	6	90
3	VMS015	Industrial Automation	6	90

Semester-2

General Education: 12 Credits, 180 Hours				
S. No.	**Code**	**Module Title**	**Credit**	**Hours**
1	VGE047	Labour Laws, Occupational Health and Safety	4	60
2	VGE060	Principles of Management and Organizational Behavior	4	60
3	VGE062	Project Management	4	60
Vocational Education: 18 Credits, 270 Hours				
S. No.	**Code**	**Module Title**	**Credit**	**Hours**
1	VMS016	Modelling and Building of Mechatronic Systems-2	6	90
2	VMS017	Mechatronics Industrial Standards and Frameworks	3	45
3	VMS018	Mechatronics Project - 2	9	135

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22   Programme Delivery Structure

The course is in a semester pattern with an average of 30 hours of interactions per week and 15 weeks per semester

23   Teaching and Learning Methods

The module delivery comprises of a combination of few or all of the following

1. Face to Face Lectures using Audio-Visuals
2. Demonstrations
3. Laboratory-work/Field work/workshop
4. Industry Visit
5. Group Exercises
6. Project work
7. Project Exhibitions
8. Technical Festivals

24   Assessment and Grading

Each module is assessed for a total of 100 marks with two tests each of 25 marks and a final examination of 50 marks for general education modules and similar pattern is followed for vocational based modules with emphasis on skills. A candidate is required to score a minimum of 40% overall in each of the modules.

25   Failure

If a student fails in a module, he / she is required to take up the make-up examination

26   Attendance

A student is required to have a minimum attendance of 75% in each of the modules.

27   Award of Class

As per the Academic Regulations for Vocational Programme

28   Student support for Learning

1. Course Notes
2. Reference Books in the Library
3. Magazines and Journals
4. Internet Facility
5. Computing Facility
6. Laboratory Facility
7. Workshop facility
8. Staff support
9. Lounges for Discussions
10. Any other support that enhances their learning

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29 **Quality Control Measures**

Following are the Quality Control measures:

1. Review of module notes
2. Review of question papers
3. Student feedback
4. Moderation of assessed work
5. Opportunities for the students to see their assessed work
6. Review by external examiners and external examiners reports
7. Staff student consultative committee meetings
8. Student exit feedback
9. Subject Assessment Board
10. Programme Assessment Board

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Diploma

Semester 1

Course Title	Mathematics
Course Code	VGE050
Department	Department of mathematics
Faculty	Faculty of Mathematical and Physical sciences

Course Summary

The aim of the course is to study the basic concepts of Mathematics to implement all fields of the skill oriented Programme to derive the solutions for existing problems as it includes arithmetic operations and equations, Probability and statistics.

Course Outcomes

After undergoing this course students will be able to:

CO1: understand the different arithmetic operations
CO2: use Probability and Statistics and geometry in solving existing problems of industries.
CO3: understand the different geometrical concepts with axis and coordinates.
CO4: use the concepts of trigonometry in solving existing problems

Course Contents

Unit 1(Introduction): Introduction to Arthematic Operations and Algebraic Equations, Permutations and Combinations, Calculation mean and mode, Calculation median, Calculation of standard deviation, Application of Standard deviation

Unit 2 (Probability and Statistics): Introduction to probability, Laws of probability and Problems on probability, Probability of compound events, Probability distributions, Probability simulations, Pie chart representation of statistical data, Bar chart representation of statistical data and Histogram representation of statistical data

Unit 3 (Review of Geometry): Lines and Angles, Area and perimeter of a triangle and laws of triangles, Angles in a triangle, types of triangles and similar triangles, Squares, Rectangles, Rhombus, Area and perimeter of a rectangle, Area and perimeter of a rectangle and applications, Area and perimeter of a circle, Angles in a circle and construction of circles, Volume and surface area of sphere, Volume and surface area of cylinder, Volume and surface area of cone, Volume and surface area of prisms, Applications of sphere and cylinder and Applications of cone and prisms

Unit 4 (Axis and Coordinates): Introduction to Axis and Coordinates, Gradients and intercepts -1, Gradients and intercepts -2, Graphs of equations, Practical problems involving straight line-graphs-1 and Practical problems involving straight line-graphs-2

Unit5 (Introduction to Trignometry-1): Introduction to trigonometry-1, The theorem of Pythagoras-1, Sine's, cosines and tangents-1, Evaluating trigonometric ratios of acute angles-1, Solving right-angled triangles-1, Angles of elevation and depression-1, Graphs of trigonometric functions-1, The sine and cosine rules-1 and Solutions of Trigonometric Functions problems

Unit 6 (Introduction to Trignometry-2): The theorem of Pythagoras-2, Sine's, cosines and tangents-2, Sine's, cosines and tangents-3, Evaluating trigonometric ratios of acute angles-2, Solving right-angled triangles-2, Graphs of trigonometric functions-2, The sine and cosine rules-2 and Solutions of Trigonometric Functions problems

Course Resources

a. Essential Reading

1. Class Notes
2. Engineering Mathematics-I by Dr. R. Muthucumaraswamy (Ph.D.)
3. Engineering Mathematics-II by Dr. R. Muthucumaraswamy (Ph.D.)

b. Recommended Reading

1. The Elements of COORDINATE GEOMETRY Part-1 Cartesian Coordinates February 2016 by S L Loney.

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Module Title	Physics in mechatronics
Module Code	VGE058
Department	Department of Physics
Faculty	Faculty of Mathematical & Physical Sciences

Course Summary

The aim of this course is to enable the students to understand and apply the concepts of physics in mechatronics. The students are taught the fundamentals of elasticity, thermal expansion and conductivity, work and power. The course deals with analytical expressions for simple geometries and solve numerical problems related to these concepts.

Course Outcomes

After undergoing this course students will be able to:

CO1: identify and analyze different materials and their properties.

CO2: gain knowledge on principles related to work, power and energy

CO3: know about physics of machines

CO4: know about light sources and geometrical optics.

Course Contents

UNIT 1(Materials, material properties and physics of machines): Metals, polymers, composites, Thermal properties of materials-Thermal expansion, Specific heat, latent heat, thermal conductivity, Demonstration of the determination of latent heat of steam and ice, Demonstration of the determination of thermal conductivity of copper and steel, Temperature measurement, Various types of thermometers, thermostats, Air conditioners and refrigerators, Clothing and insulation Mechanical properties of materials, Various moduli of elasticity Knives and steel (Stress, strain, toughness, hardness and tempering)Demonstration of the determination of various elastic constants Introduction to Work and power, pulleys, Ramps. Lifts, escalators, Centrifuges, seesaws, wheels rockets, helicopters, Balloons, airplanes, rockets, helicopters, Water Faucets and Vacuum cleaners (viscous drag, Bernoulli Effect),Electric Motors, Physics and engineering of modern day sewing machine, Physics and engineering of modern day sewing machine, Demonstration of sewing machine, Demonstration of sewing machine, Physics of sound waves, Violins and pipe organs, Percussion instruments, Vibration, noise and insulation, Physics of Radio (AM and FM), TV, Mobile phone Glass, enamel, rubber, Timber, Porcelain, Cellulose, Detergents, Cotton and Synthetic polymers, Nuclear energy, Solar energy, Wind energy, Tidal energy

UNIT 2(light sources and geometrical optics): Light sources- light bulbs, Fluorescent lamps, LEDs, Lasers, Light intensity measurements, Light detectors, Principles of geometrical optics, Demonstration of image formation by lenses and mirrors, Demonstration of dispersion of light by prism and a grating, Physics of pinhole camera-focal length, aperture, exposure time, depth of view, Techniques of photography, Digital Camera-Physics of display devices, Colors, Physiology of vision, Colours-Additive and Subtractive, Basic theory of colour and perception, Colorimetry, Demonstration involving mixing of colours

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Course Resources

a. Essential Reading
1. Class Notes
2. Concept of Physics Part-1 by H.C Verma
3. Concept of Physics Part-2 by H.C Verma

b. Recommended Reading
    1. Handbook of Physics 2019 by Arihant Experts

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Module Title	Communication Skills
Module Code	VGE017
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

Language is the most commonly used medium of self-expression in all spheres of human life –personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this subject is to enable students to acquire proficiency, both in spoken (oral) and written, language. At the end of the subject, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English.

Course Outcomes

After undergoing this course students will be able to:

CO1: acquire proficiency in spoken language

CO2: acquire proficiency in written language

CO3: acquire good knowledge in conversation and reading skills

CO4: become good at professional Etiquette and Goal Setting

Course Contents

UNIT 1(Process of communication): Communication Skills Process of communication, Terminologies used in communication process Active listening, Communication barriers, Types of communication Verbal and non-verbal Communication, Sentence formation , Types sentence, Different parts of speech, Adjectives and articles, Verbs and preposition, Present and past tense, Future tense, Use of participles in different tenses, usage of tenses, Rules of subject verb agreement, Importance of spoken skills, competent pronunciation, appropriate use of language appropriate use of tone, pitch and volume, Practice -Use of tone, pitch and volume

UNIT 2(preparation for extempore): Preparation for extempore, Mind mapping for speaking readiness, Content of extempore – beginning, Body and conclusion, Delivery of extempore – body language and paralanguage

UNIT 3(conversation and reading skills): Body language in conversation, Tones in conversation, Conversation manners, Stages of conversation – introduction feed forward, close, order of introduction, conversation barriers, Reading and the Techniques , Skimming, Scanning and reading in details

UNIT 4(Writing skills): Paragraph Writing, Structure of a paragraph – topic sentence, supporting sentence Conclusion sentence, functions of paragraph, Paragraph patterns, paragraph writing principles – coherence, unity, order, length Practice, Comprehension -Purpose of comprehension, Low-level comprehension, High-level comprehension, Practice, Precise Writing- Paraphrasing techniques, Usage of appropriate words

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UNIT 5(Professional Etiquette and Goal Setting): Etiquette and its importance, Types of etiquette – workplace, meeting, telephone, dining, norms of etiquette, goals, types of goal, setting SMART goal.

Course Resources

a. Essential Reading
1. Class Notes
2. Communication Skills by Sanjay Kumar (Author), Pushpalata

b. Recommended Reading
1. Effective Technical Communication | 2nd Edition 2017 by M. Ashraf Rizvi
2. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India

c. Other Resources
1. https://nptel.ac.in/courses/109/104/109104031

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Module Title	Basic Computer Skills
Module Code	VMS001
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

Computer skills are abilities and knowledge which allow you to use computers and related technology. They let you use word processing software, access the Internet, manage files or create presentations. Advanced computer skills would let you access databases, use spreadsheets and even code. Ability to perform fundamental tasks on a computer.

Course Outcomes

After undergoing this course students will be able to:
CO1: to identify different tools of Microsoft office
CO2: to use different tools of Microsoft office like word and excel
CO3: to prepare MS office-PPT
CO4: understanding certain software, applications, programs and explore tools.

Course Contents

UNIT 1: Introduction to Computers, History of Computing, Computer Hardware and Software Components, Operating Systems, MS Office – Word – Identifying, Exploring the Word Window and Acquire hands on experience on MS Word, MS Office – Word – Understand, use the toolbars and Applying basic formatting techniques and Usage of Different available functions and Save, open, print a document and Creating a Table, Table of Contents, Index, and applying styles to documents and Acquire hands on experience on MS Word,

UNIT 2: MS Office – PPT - Creating and Opening Presentations, MS Office – Acquire hands on experience on MS PowerPoint, MS Office – PPT - Pre-Designed Slide Layouts, MS Office – Acquire hands on experience on MS PowerPoint, MS Office – PPT - Different Views in MS PowerPoint, MS Office – Acquire hands on experience on MS PowerPoint, MS Office – PPT -Templates and presentation graphics, MS Office – Acquire hands on experience on MS PowerPoint, MS Office – PPT - Using the Research Task Pane and other functions Creating Speaker Notes and setting up slides.

UNIT 3: MS Office – PPT – Previewing, printing a presentation and Acquire hands on experience on Presentation, MS Office – Excel - Understand the use of spreadsheets, Excel and Acquire hands on experience on MS Excel, MS Office – Excel - Scroll through a worksheets, navigate and Acquire hands on experience on MS Excel, MS Office – Excel - Gain knowledge of the basic features, facilities of spreadsheets and Acquire hands on experience on MS Excel, MS Office – Excel - Use Formulas, Format and Enhance Data, MS Office – Acquire hands on experience on MS Excel, MS Office – Excel - Create Charts and Graphs from a Spreadsheet and use Functions, Absolute Reference and Conditional Formatting, MS Office – Acquire hands on experience on MS Excel.
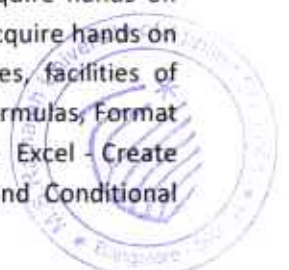
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Course Resources

a. Essential Reading
1.   Class Notes
2. Basic Computer Skills by Ds Rajendra Prasad, Ma Jayaram. Sapna Book House (Publisher)

b. Recommended Reading
1. BASIC COMPUTER COURSE by SOUMYA RANJAN BEHERA

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Module Title	Basic Electronics Circuits
Module Code	VMS002
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

The course objective is to make students to understand the efficacy of basics of electronics components, circuits and the principles which are pervasive in industrial applications

Course Outcomes

After undergoing this course students will be learning about:

CO1: Key elements of electronic circuits
CO2: Utilization of necessary theorems and principles to make electronic circuits
CO3: Rectifier, filter circuits (AC to DC) and other wave shaping circuits.
CO4: Transistor and Transistor applications.

Course Contents

UNIT 1(Basic concepts in Electronics): Introduction to materials, Classification of materials based on energy level diagram, Semiconductors, Intrinsic semiconductor, Extrinsic semiconductor, p-type, n-type, p-n Junction diode, Biasing of p-n junction, forward biasing, reverse biasing, V-I characteristic of diode, Diode DC load line, Problems on diode, Demo on Junction Diode Characteristics. Zener diode, Zener diode forward and reverse characteristics, Demo on Zener Diode Characteristics, Zener diode as a voltage regulator, Problems on regulators, Demo on Zener as voltage regulator, LED, Problems on LED, Demo on LED.

UNIT 2(Rectifiers and filters): Introduction to Rectifier, Half wave rectifier, Full wave rectifier, Bridge type rectifier, Problems on rectifier, Demo on rectifier, Capacitor charging, discharging, Filter circuit, C-filter, L-filter circuit , Problems on filter circuits, ,Demo on filter circuits, Diode as voltage multiplier, Voltage double, Voltage Tripler, quadruples.

UNIT 3(Clippers and clampers): Introduction, Clipper circuits, Series Clippers, Shunt Clippers, and Problems on clipper circuits, Demo on clipper circuits, Positive and negative clamper circuits, Different forms clamper circuits, Problems, Demo on Clamper circuit.

UNIT 4(Transistor and its applications): Introduction to BJT, Operation of NPN and PNP transistor, Transistor configurations: Common base configuration, Common emitter configuration & common collector configuration, Transistor parameters: alpha, beta and gamma and their relation and problems, Demo on transistor configurations, BJT applications, Working of transistor as a switch, Working of

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transistor as an Amplifier, Transistor as a voltage follower, Transistor biasing: fixed biasing, BJT DC load line and operating point, Demo on BJT DC load line and operating point, collector – base biasing, Voltage divider biasing, Problems on biasing.

Course Resources

a. Essential Reading
1. Class Notes
2. Basic Electronics: Solid State by B L Thereja.
3. D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education (India) Private Limited, 2014.

b. Recommended Reading
1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008

c. Other Resources
1. https://nptel.ac.in/courses/117/103/117103063

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Module Title	Basic electrical circuits
Module Code	VMS003
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

To provide comprehensive idea about basic components of electrical circuits with AC and DC analysis, working principles and applications.

Course Outcomes

After undergoing this course students will be learning about:

CO1: Key elements of electrical circuits (AC and DC)
CO2: Utilization of necessary theorems and principles to make electrical circuits
CO3: Single phase AC circuits and magnetic circuits
CO4: domestic wiring and wiring materials.

Course Contents

UNIT 1(Analysis of D.C Circuits): Introduction, Concept of E.M.F, potential difference, current, resistance, Resistivity, effect of temperature on resistance, ohm's law, Problems on ohm's law , Demo on ohm's law, Kirchhoff's laws, KCL and KVL and Simple problems on KVL and KCL. Demo on KVL and KCL, Voltage division and current division principles, Ideal and practical voltage and current sources, Mesh analysis, Problems on mesh analysis, Nodal analysis and simple problems, Star-delta transformation, Problems on Star/delta transformation, Demo on star-delta connections, Superposition Theorem in the context of dc voltage and current sources acting in a resistive network, Problems on Superposition Theorem Demo on super position theorem., The venin's theorem in the context of dc voltage and current sources acting in a resistive network, Problems, Norton's theorem in the context of dc voltage and current sources acting in a resistive network, simple Problems,, Maximum power transfer theorem, simple Problems, Source transformation, Problems, Max power transfer and Norton theorems

UNIT 2(Single-phase AC Circuits): Introduction, Generation of Sinusoidal Voltage Waveform (AC) and Fundamental Concepts, RMS and Average value, form factor , crest factor, Phasor relationship of pure R,L and C, Power and power factor for R,L and C circuits, Problems on pure R,L and C, Analysis of Simple series RL, RC and RLC circuits, Analysis of Simple   parallel RL, RC and RLC circuits, Phasor relationship of series RL, RC and RLC circuits, Problems on series RL, RC and RLC circuits.

UNIT 3(Magnetic circuits): Introduction, Fundamental concepts of magnetic circuit, Magnetic Flux, magnetic flux density, MMF, Reluctance, Permeability and magnetizing force, leakage and fringing flux, Analogy between magnetic and electric circuits, Oersted experiment, Magnetic effect of electric current,

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series magnetic circuits with and without air gap, Problems on series magnetic circuits, Parallel magnetic circuits with and without air gap, Problems on parallel magnetic circuits, Classification of magnetic materials, Electromagnetic Induction-Introduction, Faraday's laws of electromagnetic Induction, Classification of Induced E.M.F, Direction of induced E.M.F ,Problems on induced E.M.F, Self-inductance and expression for self-inductance, Mutual inductance and expression for mutual inductance, coupling co-efficient, inductance in series and parallel (Dot Convention), Energy stored in a magnetic field.

UNIT 4(Domestic Wiring): Introduction, Wiring materials and accessories, Wiring materials and accessories, Types of wiring systems, Types of wiring systems, Important lighting accessories, Circuit to control one lamp with one switch, Circuit to control one lamp with two 2-way switch, Necessity and types of earthing, Demo on Domestic Wiring.

Course Resources

a. Essential Reading
1. Class Notes
2. V. N. Mittal and Aravind Mittal;, " Basic Electrical Engineering" McGraw Hill
3. Basic Electrical Engineering by V.K Mehta (Author), Rohit Mehta

b. Recommended Reading
1. Vincent DelToro, "Electrical engineering Fundamentals", PHI second edition 2011
2. Edward Hughes, "Electrical Technology," Pearson Education

c. Other Resources
1. https://nptel.ac.in/courses/108/108/108108076

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Diploma

Semester-2

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Course Title	Mechanical Engineering Sciences
Course Code	VGE052
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study about the overall view of the Mechanical Engineering, Energy resources and its conversion for Economic usage, I C Engines and Turbines are the Energy conversion Products, Material behavior and physical properties are the important part of the element. Knowledge of Links and joints in the kinematics, Robots and Automation along with Programming will have the complete idea of working principle of Mechanical system

Course Outcomes

After undergoing this course students will be able to:

CO1: Energy Resources and its conversion process for Economic usage
CO2: Working principle of I C Engine and Turbines
CO3: Identify different types of materials and
CO4: Robotics Application and generate the Programming Numerical Codes for the automation

Course Contents

Unit 1(Energy Resources): Introduction to Energy Sources, Conventional and Non-Conventional Energy Sources, Renewable and Non-Renewable Sources of Energy, Advantages and Disadvantages of Renewable Sources, Differences between Renewable and Non-Renewable Resources, Introduction to Fuels, Fuel Combustion, Air-Fuel Ratio Products of Combustion, HCV and LCV, Classification of Fuels, L.P.G, C.N.G , Bio-Fuels and Bio-gas, Comparison of Bio-Fuels with Fossils with respect to Emission, Advantages and Dis-Advantages of different types of Fuels

Unit 2(Energy Conversion Resources): Solar Energy, Solar Energy Conversion, and Conversion Process, Brief on Helio-Chemical Process and Helio thermal Process, Principle of Helio Electrical Process or Photo-Voltaic Process of Energy Conversion, Types of Solar Energy Collectors(Flat Plat, parabolic and Tube) used in Solar Energy, Wind power-Wind Mill: principle of Conversion, Advantages and Disadvantages, Hydro-Power: Principle of Hydro-Power Generation, Advantages and Limitations, Nuclear Power: Fission and Fusion , Nuclear Power plant : Advantages and Limitations

Unit 3 (I C Engines): Introduction to I.C. Engines, Major Parts of I.C. Engines, 4-stroke Petrol Engine: Construction, Operation and Advantages, 4-Stroke Diesel Engine: Construction, Operation and Advantages,

Unit 4 (Turbines): Steam Turbines: Classification, Impulse Turbine and Reaction Turbine, Gas Turbines: Classification, Closed Cycle and Open Cycle Gas Turbines, Differences between Closed Cycle and Open

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Cycle Gas Turbine, Water Turbine: Classifications, Impulse Type and Reaction Type, Pelton Wheel, Francis Turbine and Kaplan Turbine

Unit 4 (I C Engines): Introduction to I.C. Engines, Major Parts of I.C. Engines, 4-stroke Petrol Engine: Construction, Operation and Advantages, 4-Stroke Diesel Engine: Construction, Operation and Advantages,

Unit5 (Engineering Materials and Mechanical Behavior of Elements): Introduction to Engineering Materials: Metals and Non-Metals, Ferrous and Non-Ferrous Metals and alloys, Composite Material: Classification and Applications, Introduction to Plastics and Fibers, Trade names of Engineering Plastics and Plastic Coating, Fibers and their Classification and Usage of Plastic and Fibers, Introduction to Mechanics of Materials: stresses and strains, shear stress and Stress - strain Relationship

Unit 6 (Refrigeration and Air Conditioning): Introduction to Refrigeration: Refrigerant Types, Properties of Refrigerants, COP, Vapour Compression and Vapour absorption Refrigeration System, Air-Conditioning: Principle of Air-Conditioning, Room Air Conditioners: Construction and Working, Split Air Conditioners: Construction and Working

Unit 7 (Basics of Kinematics): Kinematic Link and its Types, Kinematic Pairs and Classification, Kinematic Chain and Types, Grubler's Criterion for Plane Mechanisms, Types of Constrained Motion, Definition: Degrees of Freedom and Inversion of Mechanism

Unit 8(Introduction to Aeronautics, Robots and Automation): Introduction to Aeronautical Engineering: Fundamentals of Aerodynamics, Theory of Lift and Drag, Aircraft Engines: Types and Applications, Introduction to Robotics and Automation, Broad Classification of Robots, Application, Advantages and Disadvantages of Robots, Industrial Robots, Automation: Definition and Types, Industrial Automation, Advantages and Disadvantages

Unit 9(Introduction to NC/CNC Machines): Introduction to NC/CNC Machines, Basic Elements with Simple block diagrams, Advantages and Disadvantages of CNC Machines, Advanced Manufacturing Systems: Flexible Manufacturing Systems, Advanced Manufacturing Systems: Computer Integrated Manufacturing

Course Resources

a. Essential Reading
1. Class Notes
2. Gopala Krishna K R, Sudheer Gopala Krishna, Girish H N (January 2019),Elements of Mechanical Engineering, Subhas stores
3. Rajan T S (January 2015),Elements of Mechanical Engineering, New Age International(P) Ltd

b. Recommended Reading
1. Khushdeep Goyal, Deepak Bhandari (2021), Automation and Robotics, S K Kataria & Sons
2. Alavudeen A, Venkateshwaran N(2010), Computer Integrated Manufacturing

c. Other Electronic Resources
1. Laboratory

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2. Hardware: PCs
3. Software

Module Title	Digital electronics and IC's
Module Code	VGE024
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

The course objective is to make students to understand the efficacy of digital electronics components, circuits, IC's and the principles which are pervasive in industrial applications

Course Outcomes

After undergoing this course students will be learning about:

CO1: Key elements of digital electronics.
CO2: Utilization of necessary theorems and principles to make digital electronic circuits
CO3: Logic gates, flip flops and registers.
CO4: Multiplexers and DE multiplexers, decoder and encoders, counters and memories.

Course Contents

UNIT 1(Introduction to digital system): Definition and classification, Applications, Compare analog v/s digital signal, Number system and codes, Number system: Binary, Octal, Decimal, and Hexadecimal, Conversion: Binary-Decimal, Decimal-Binary, 1's and 2's complement of binary number, Binary, arithmetic: Addition, Subtraction & Multiplication, Brief note on ASCII & Gray code, Conversion: Binary-Gray, Gray-Binary.

UNIT 2(Logic gates and IC's): Logic gates, Definition, Study the symbol, truth table, and logic expression for the AND, OR, NOT, NOR, NAND, EX-OR, and EX-NOR], Universal gates: NAND, and NOR, Realization of logic gates using NAND & NOR, Define: propagation delay, power dissipation, and noise immunity, IC's-Basic gates

UNIT 3 (Boolean algebra): Introduction, Rules & laws of Boolean algebra, Demorgan's theorem, SOP & POS Boolean expressions, K-map, Simplification of Boolean expression using: k-map, and Boolean.

UNIT 4(Combinational logic and sequential logic): Introduction to Combinational logic, Definition, Study the working of : Half adder, Full adder, Half subtractor, 2-bit magnitude comparator, Decoder: definition, BCD-Decimal decoder, BCD-7 segment , Encoder: definition, Decimal-BCD encoder, priority encoder, Multiplexer: study 4:1 mux, and 8:1 mux, DE multiplexer: study 1:4 demux ,and 1:8 demux, Define sequential logic circuit, Flip-Flops, Compare combinational v/s sequential logic circuit, Define flip-flop, Define clock and mention types of triggering, Study the following types clocked edge triggered flip-, flop using NAND gate only, SR flip-flop, D flip-flop, T flip-flop, and JK flip-flop, Applications of flip-flops

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and IC's, Shift registers, Introduction, study the following types of shift registers, SISO, SIPO, PIPO, and PIPO, Study the working of Ring counter and Johnson counter, Applications of shift registers and IC's

UNIT 5(Counters and memory): Counters, Define modulus, synchronous and asynchronous counter, Compare synchronous v/s asynchronous counter, Study the following types of counters, 4 bit ripple counter, mod-10 counter, and 3 bit up/down , 3- bit synchronous counter, Counter applications and IC's, Semiconductor memories, Introduction: classification, ROM and its types, RAM and its types.

Course Resources

a. Essential Reading
   1. Class Notes
   2. Fundamentals of Digital Circuits January 2016 by Kumar A. Anand.
b. Recommended Reading
   1. Digital Electronics: Principles, Devices and Applications 2007 by Anil K. Maini (Author)
c. Other Resources
   1. https://nptel.ac.in/courses/108/105/108105132

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Module Title	Elements of Mechatronics
Module Code	VGE028
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

The aim of the course is to study the elements of mechatronics as mechatronics is the synergistic combination of mechanical and electrical engineering, computer science, and information technology, which includes the use of control systems as well as numerical methods to design products with built-in intelligence. It involves study of sensors, actuators, controlling mechanism/algorithm and common Mechatronics applications. The synergistic combination of all the aspects of Mechatronics which would be useful in developing a particular application.

Course Outcomes

After undergoing this course students will be learning about:

CO1: Key elements of mechatronics.
CO2: sensors and signal conditioning circuits.
CO3: Pneumatic and hydraulic systems.
CO4: Basics of embedded systems, modelling and design in mechatronics

Course Contents

UNIT 1(Introduction of Mechatronics):System: Definition and examples, Measurement system: Definition and examples, Measurement System Block Diagram, Control System: Definition and examples, Control System Block Diagram: open loop with examples, Control System Block Diagram: closed loop with examples, Differences between Open loop and Closed loop systems, Sequential Controllers with examples, Microprocessor Based Controllers, Engine Management System as an example, Water Level Controller: Mechatronics Approach.

UNIT 2(Sensors and Transducers): Introduction, Performance terminology of Transducers, Performance terminology of Transducers, Demonstration on Different Types of Sensors, Demonstration on Different Types of Sensors, Demonstration on Different Types of Sensors.

UNIT 3(Signal Conditioning Circuits): Introduction, Amplifiers: introduction with examples, Oscillators: introduction with examples, Signal Converters: introduction with examples, Demonstration on Different Types of Signal Conditioning Circuits using MULTISIM, Demonstration on Different Types of Signal Conditioning Circuits using MULTISIM, Demonstration on Different Types of Signal Conditioning Circuits using MULTISIM, Data Presentation Systems: introduction with examples, Analog Indicators and Recorders with examples, Digital Indicators with examples, Recorders-Printers with examples,

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UNIT 4(Pneumatic systems and hydraulic actuation systems): Introduction to Pneumatic systems with examples, Introduction to hydraulic systems with examples, Introduction to Mechanical actuation systems with examples, Introduction to Electrical actuation systems with examples, Demonstration of Pneumatic Actuation Systems, Demonstration of hydraulic Actuation Systems, Demonstration of Mechanical actuation Systems, Demonstration of Electrical Actuation Systems.

UNIT 4(System Modelling): Introduction with examples, Basic Building Blocks of System Modelling, Basic Building Blocks of System Modelling, Digital Combinational logic: introduction with examples, Digital Combinational logic: introduction with examples, Sequential Logic Circuits: introduction with examples, Sequential Logic Circuits: introduction with examples, Demonstration on Digital Combinational Logic Circuits using MULTISIM, Demonstration on Digital Combinational Logic Circuits using MULTISIM

UNIT 5(Micro-Processor, Micro-Controllers and logic controllers) Micro-Processor: introduction with examples, Micro-Controllers: introduction with examples, Introduction to Logic Controllers, Input/output Systems: introduction with examples, Input/output Systems: introduction with examples, Introduction to Distributed Control Systems, Distributed Control Systems with examples

UNIT 5(Introduction to Mechatronic Design) Design steps, Mechatronic Design with examples, Case Studies of Mechatronic System.

Course Resources

a. Essential Reading
1. Class Notes
2. W. Bolton, "Mechatronics – Electronic control systems in Mechanical & Electrical Engineering", Pearson Education Ltd., 2015

b. Recommended Reading
1. Shetty and Kolk, "Mechatronics System Design', Cengage learning, India, second edition.
2. Frank D petruzella, "Programmable logic controllers", Fourth edition, McGraw Hill higher education, 2016
3. Richard C. Dorf, Robert H. Bishop, "Modern Control Systems" Twelfth Edition, Pearson Education, 2014.

c. Other Resources
1. https://onlinecourses.nptel.ac.in/noc21_me27/preview

Course Title	Engineering Drawing
Course Code	VMS004
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study about the orthographic projection of the Three-dimension model, Projection of Points, Projection of lines with inclination, Projection of Planes with different orientation, Projection of solids, Development of sectioned solid model and Isometric projection of the any Visualized model and represent all the drawings in the AUTO-CAD Software to Validate the orthographic views with the accurate dimensions

Course Outcomes

After undergoing this course students will be able to:

CO1: Basic representation of drawing concepts and Convert from Three dimensional to two dimensional orthographic Projection of given model

CO2: Explore the AUTOCAD Software tool with all the commands to generate the Orthographic Views

CO3: Projection of Points, Lines, Solids and Development of sectioned model in both Manual and AUTOCAD Software

CO4: Generating Isometric view from Two-Dimensional drawings for both Manual and AUTOCAD Software

Course Contents

Unit 1(Introduction to Engineering Drawing): Introduction to Engineering Drawing, Drawing Instruments, Drawing sheet nomenclature, drawing standards, Drawing scales and geometric construction, Dimensioning: lines and symbols, sizes of dimensions, location, and standard detail, Lettering: styles, guidelines, sizes, composition in lettering, Representation of engineering materials, symbols used in engineering drawings and its significance, First and Third Angle Projections

Unit 2(Projection of Points): Projection of Points, Introduction to AutoCAD, Practice on AutoCAD-Drawing Commands, Text Commands, View commands and Drawing Settings, Practice on AutoCAD-Modify commands, Transformation features, Dimensioning and Annotations, file exporting options , Saving and Plotting, AutoCAD lab –Projection of Points

Unit 3(Projection of Lines): Straight lines and its inclinations with reference to planes, AutoCAD Lab-Straight lines and its inclinations with reference to planes, AutoCAD Lab- Straight lines and its inclinations with reference to planes

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Unit 4(Projection of Planes): Planes of Projection: Horizontal, vertical and profile planes, plans and elevations, AutoCAD Lab- Planes of Projection: Horizontal, vertical and profile planes, plans and elevations, Practice Problems on Projection of rectangle, triangle, Pentagon and Hexagon

Unit 5(Projection of Solids): Solids-Pyramids, prisms and cylinders, AutoCAD Lab - Solids-Pyramids, prisms and cylinders, Projection of Cube, rectangular prism, square and pentagonal prism, Projection of Square pyramid, pentagonal and hexagonal pyramid, Projection of Cylinder and cone

Unit 6(Sections and Development): Truncated section and development of square prism, square Pyramid, Pentagonal pyramid and Prism, hexagonal pyramid and prism, truncated section and development of Cylinder and Cone

Unit 7(Isometric Projection): Isometric projection of Cube, Square Prism, Square pyramid, Pentagonal prism, pentagonal pyramid, hexagonal prism and Pyramid, Isometric Projection on combination of solids like cylinder on cube, square pyramid on hexagonal prism, square pyramid on pentagonal prism

Course Resources

a. Essential Reading
    1. Class Notes
    2. Gopala Krishna K R, (2017), Engineering Drawing, Subhas stores, Volume I &2
    3. Bhatt N D (2011), Engineering Drawing, Charotor Publications, Fifth Edition

b. Recommended Reading
    4. Gill P S, (November 2019), Engineering Drawing

c. Other Electronic Resources
1. Laboratory: Engineering Graphics Laboratory
2. Hardware: PCs
3. Software: AUTO CAD 2021

Course Title	Wiring and Soldering Practice
Course Code	VMS005
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

The aim of the course is to give a practice on wiring and soldering

Course Outcomes

After undergoing this course:

CO1 Students will understand the purpose of Wiring and soldering.
CO2 Students will be able to identify the tools and materials used for Wiring and soldering.
CO3 Student will be able to explain the safety measures required during soldering.
CO4 Students will execute appropriate soldering and de-soldering.

Course Contents

Unit 1(Introduction to tools and equipment of wiring): Screw driver, Tester, Wire cutter and Plier, Spanner, Hammer, Ratchet, Knife, Soldering iron, Crimping tool, Wire strippers, Needle-Nose pliers, Tape measure, Multimeter, Megger.

Unit 2(Introduction to materials of wiring): Cleat wiring, Casing and Capping wiring, Batten wiring, PVC wiring, Lead sheathed wiring, Conduit wiring.

Unit 3 (Wiring practice): One lamp controlled by one SPT switch, Two lamp controlled by Two independent SPT switches, independently controlled one lamp and one socket, Connection of measuring instrument, (MEGGER, Energy meter, Tacho meter and Multimeter AC and DC) and its usage, Rotary switch connection.

Unit 4 (Testing): Continuity and Polarity Testing Practice, Earth Testing Practice, Battery test-charging and discharging, panel board test, Armature test-Resistance, cold and hot check, open and shot circuit test, Star-delta starter control circuit.

Unit5 (Introduction to tools and equipment of soldering): Different gauges of solder wire, Soldering Gun, Soldering iron, Soldering station, De soldering station, Soldering pencil, Butane Soldering iron, Solder flux, Solder flux pen, Soldering wick, Solder paste.

Unit 6 (Introduction to materials of soldering and types of soldering) Hand soldering practice: soldering iron tip selection and cleaning, wire soldering and component soldering practice,

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Assembling components, wiring and soldering practice, Hand soldering practice: 5 step hand soldering practice on PCB, Soldering practice on SMT

Course Resources

a. Essential Reading

1. Class Notes and Lab manual
2. Jagobin A D,(2012), Guide to Electronic Wiring and Soldering Techniques, FastPrint Publishers
3. Internet Sources

b. Recommended Reading

1. Marc de Vinck, (2017), Getting Started with Soldering

c. Other Electrical Resources

1. Laboratory: Electrical Circuits Laboratory
2. Hardware: PCs

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Module Title	Basic Mechanical Workshop
Module Code	VMS006
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

The aim of the course is to impart knowledge on Basic tools like Files to remove metal chips, measuring instruments such as height gauge, Vernier Calipers, Micrometer and Steel ruler. Equipment's to hold the work piece like Machine vice used in workshop to develop the models as per the given exercise.

Course Outcomes

After undergoing this course students will be able to:

CO1: Identify the basic tools used in workshop.
CO2: Work with tools and develop the fitting, sheet metal and carpentry models as per the given drawing.
CO3: Understand different types of welding concepts and develop the models with different types of welding machines.

Course Contents

Unit 1 (Introduction to Fitting): Introduction to Fitting tools, measuring equipment's and Demo of a model. Fitting Exercise-1 V-joint, Fitting Exercise-2 Half round joint, Fitting Exercise-3 Dovetail joint and Fitting Exercise-4 Diagonal joint

Unit 2 (Introduction to Welding): Introduction to Welding tools and techniques, Types and Demo of a model. Welding Exercise-1 – 4 Lap joint, Butt joint, T-joint and Corner joint (Arc welding), Welding Exercise- 4 – 6 (Spot welding, TIG welding). Introduction & Demonstration of Gas welding concepts.

Unit 3 (Introduction to Carpentry): Introduction to Carpentry tools and techniques and Demo of a model. Carpentry Exercise 1-3 Dowel joint, Grooved joint and Lap joint, Exercise 3-6 Mitre joint, Dovetail joint.

Unit 4 (Introduction to Sheet metal forming): Introduction to Sheet metal forming, Bending, and Rolling. Sheet Metal Forming Exercise

Course Resources

a. Essential Reading
1. Workshop Manual
2. Class Notes, PPTs and Slides
3. Hajra Choudhury A K, Amir Kumar Hajra Choudhury and Nirjhar Roy(2007),Elements Of Workshop Media Publishers & Promoters, India, Volume-1

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b. Recommended Reading
1. R.S. Khurmi & J.K Gupta (2008), A text book of workshop technology, S Chand & Co Ltd.

c. Other Resources
1. Laboratory: Mechanical Workshop
2. Hardware: PCs

Advanced

Diploma

Semester 1

Module Title	Basic electrical and electronics systems
Module Code	VGE007
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

To provide comprehensive idea about basic components of electrical circuits with AC and DC analysis, working principles and applications.

Course Outcomes

After undergoing this course students will be learning about:

CO1: Key elements of electrical circuits (AC and DC)
CO2: Utilization of necessary theorems and principles to make electrical circuits
CO3: Single phase AC circuits and magnetic circuits
CO4: domestic wiring and wiring materials.

Course Contents

UNIT 1(Analysis of D.C Circuits): Introduction, Concept of E.M.F, potential difference, current, resistance, Resistivity, effect of temperature on resistance, ohm's law, Problems on ohm's law , Demo on ohm's law, Kirchhoff's laws, KCL and KVL and Simple problems on KVL and KCL. Demo on KVL and KCL, Voltage division and current division principles, Ideal and practical voltage and current sources, Mesh analysis, Problems on mesh analysis, Nodal analysis and simple problems, Star-delta transformation, Problems on Star/delta transformation, Demo on star-delta connections, Superposition Theorem in the context of dc voltage and current sources acting in a resistive network, Problems on Superposition Theorem Demo on super position theorem., The venin's theorem in the context of dc voltage and current sources acting in a resistive network, Problems, Norton's theorem in the context of dc voltage and current sources acting in a resistive network, simple Problems,, Maximum power transfer theorem, simple Problems, Source transformation, Problems, Max power transfer and Norton theorems

UNIT 2(Single-phase AC Circuits): Introduction, Generation of Sinusoidal Voltage Waveform (AC) and Fundamental Concepts, RMS and Average value, form factor , crest factor, Phasor relationship of pure R,L and C, Power and power factor for R,L and C circuits, Problems on pure R,L and C, Analysis of Simple series RL, RC and RLC circuits, Analysis of Simple   parallel RL, RC and RLC circuits, Phasor relationship of series RL, RC and RLC circuits, Problems on series RL, RC and RLC circuits.

UNIT 3(Magnetic circuits): Introduction, Fundamental concepts of magnetic circuit, Magnetic Flux, magnetic flux density, MMF, Reluctance, Permeability and magnetizing force, leakage and fringing flux, Analogy between magnetic and electric circuits, Oersted experiment, Magnetic effect of electric current,

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series magnetic circuits with and without air gap, Problems on series magnetic circuits, Parallel magnetic circuits with and without air gap, Problems on parallel magnetic circuits, Classification of magnetic materials, Electromagnetic Induction-Introduction, Faraday's laws of electromagnetic Induction, Classification of Induced E.M.F, Direction of induced E.M.F ,Problems on induced E.M.F, Self-inductance and expression for self-inductance, Mutual inductance and expression for mutual inductance, coupling co-efficient, inductance in series and parallel (Dot Convention), Energy stored in a magnetic field.

UNIT 4(Domestic Wiring): Introduction, Wiring materials and accessories, Wiring materials and accessories, Types of wiring systems, Types of wiring systems, Important lighting accessories, Circuit to control one lamp with one switch, Circuit to control one lamp with two 2-way switch, Necessity and types of earthing, Demo on Domestic Wiring.

Course Resources

a. Essential Reading
1. Class Notes
2. V. N. Mittal and Aravind Mittal;, " Basic Electrical Engineering" McGraw Hill
3. Basic Electrical Engineering by V.K Mehta (Author), Rohit Mehta

b. Recommended Reading
1. Vincent DelToro, "Electrical engineering Fundamentals", PHI second edition 2011
2. Edward Hughes, "Electrical Technology," Pearson Education

c. Other Resources
1. https://nptel.ac.in/courses/108/108/108108076

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Course Title	Basic Elements of Mechanical Systems
Course Code	VGE010
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study about the basic elements of Mechanical System consists of Translation and Rotational Elements, Internal parts of the system such as Springs, Clutches, shafts, Couplings, Axle's bearings and flywheels. Power transmission elements like Belts, Chains, Gears and Power Screws, sealing elements such as O-Rings and Seals, damping elements to avoid shocks and vibrations along with Pipe fittings and Advanced Materials

Course Outcomes

After undergoing this course students will be able to:

CO1: Understand about the Translational and Rotational Elements
CO2: Identify the different elements of mechanical system
CO3: Basic designing aspects of elements based on its application
CO4: knowledge for building the complete product specification

Course Contents

Unit 1 (Introduction to Mechanical System): Introduction to Mechanical Systems: Translation and Rotational with Examples, Spring Elements Types: Compression, Extension, Torsion and Leaf Spring, Spring Elements Types: Constant Force Spring 1 and 2, Belleville Spring clip, Helical Spring and Spring Element Properties and Applications

Unit 2 (Belts and Chains): Belts: Types, Properties and applications, Chains: Kinematic Chains, link pair and Chain, Chains: Roller Chains and Silent Chains

Unit 3 (Clutches and Brakes): Brakes: Disc and Band Brakes, Block Brake with shoe, Air brakes, and Vacuum brakes, Hydraulic Brake, Electro-Magnetic Brake, single and Double acting Brakes, Clutches: Disc Clutch and Cone Clutch

Unit 4 (Gears and Keys): Gears: Terms and Functionality, Spur gear and Helical Gear, Bevel and Worm Gears, Rack & Pinion and Ratchet and Pawl, Keys: Sunk key and its types, Saddle keys and Tangent Keys Motoreta and Spline Keys

Unit 5 (Rivets and Joints and Screws): Joints: Knuckle Joint and Turnbuckle joint, Pin and Cotter Joint, Bolted and Screw Joint, Butt Joint and Fillet Joint, Rivets: Round Head and Semi Tubular Rivets, Blind, Oscar, Drive Rivets, Flush and Friction Lock Rivets, Screws, types and applications, Power Screws, Multiple Threaded Screw, Self-Locking Screws and Screw Jack, Cap Screws and Set Screws

Unit 6 (Shafts, Couplings and Axles): Shafts: Machine Shafts and Transmission Shafts and Applications, Stub shaft and Line Shaft, Sector Shaft, Jack shaft, Flexible Shaft and Hollow Shaft, Drive shaft, Tail Shaft and Pinion Shaft, Couplings: Sleeve or Muff Coupling and Clamp Coupling, Rigid Flange Coupling, Flexible Coupling: Beam Coupling and Elastic Coupling, CV couplings and Bush Pin Type Flange Couplings, Diaphragm Coupling and Disc Coupling, Fluid and Gear Couplings, Grid and Oldham's Couplings, Magnetic and Twin Spring Couplings, Schmidt Coupling and Hydro dynamic Couplings, Axles and Cranks

Unit 7 (Bearings and Flywheels): Bearings: Radial Bearing-Ball Bearings and Roller bearings, Thrust Bearing: Ball and Roller Bearings, Self-Aligning Bearings, Shaft Bearings, Journal Bearing: Hydro-dynamic and Hydro-Static Journal Bearings, Fly wheel: Disc and Rim Type, High Velocity and Low Velocity Flywheels

Unit 8 (O-seals & Ropes, Dampers and Advanced Machine Elements): Oil Seals and Types, O-rings and Types, Wire Ropes and Types, Nails and Spikes, Damper and its Types, Hydraulic dampers and Electro-Rheological Fluid Dampers, Metallic Dampers: Steel Dampers and Friction Dampers, Advanced Machine Elements, Piping and Tubing, Pipe Fittings

Course Resources

a. Essential Reading
1. Class Notes
2. Bhandari V B,(1994), Design of Machine Elements, Tata McGraw Hill Education Private Ltd, Third Edition
3. JBK Das, Srinivasa Murthy P L,(2019), Design of Machine Elements-1,Sapna book House
4. JBK Das, Srinivasa Murthy P L,(2019), Design of Machine Elements-2,Sapna book House

b. Recommended Reading
1. Shigley's,(2015),Mechanical Engineering Design, Tata McGraw Hill Education Private Ltd,Tenth Edition

c. Other Electronic Resources
1. Laboratory
2. Hardware: PCs
3. Software

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Module Title	Sensors and Signals
Module Code	VGE063
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

This course deals with the concepts of basic electronics and their applications. The course provides students an understanding of the essential principles and terminology that are used in basic electronics. The course deals with semiconductor devices such as sensors, Op-amp and measuring equipments. Students are also introduced to digital electronic circuit concepts.

Course Outcomes

After undergoing this course students will be able to:

CO1: Demonstrate the knowledge of the working principle of various semiconductor devices and circuits
CO2: Derive mathematical expressions for various parameters in electronic devices and circuits
CO3: Solve numerical problems related to analog circuits
CO4: Design simple analog circuits for a given applications

Course Contents

Unit 1(Sensors and Transducers): Introduction to Sensors and Transducers, Broad Classification , Mechanical and Electro-Mechanical Sensors: strain gauges, Resistive, Inductive Type of Sensors and Magnetic sensors, LVDT, RVDT and proximity sensors, Position sensors, crankshaft position sensor and Throttle angle sensors, Pneumatic Sensors, Capacitive Sensors and Pressure Sensors, Piezo-Electric Transducers and introduction to Temperature sensors, Thermistors, thermocouples, RTD, NTC and PTC, Piezo electric sensors in acceleration, velocity, displacement, vibration, measurement , Flow measuring sensors, Optical Sensors, IR Sensors, Gas Sensors, Gyro Sensors,

Unit 2(Signals and signal conditioning): Signals, Types of Signals, and Signal Conditioning Circuits: Amplifiers, Transistor Amplifiers, OPAMP as Comparator and Wave-Shaping Circuit

Unit 3(signal generators and Filters): Wave form generators and Filters: Oscillators, Signal Converters: ADC and its Types, DAC and its types, Signal Selectors: Multiplexes and De-Multiplexes, Signal Processors: Modulators and De-Modulators, DAQ Boards in Signal Acquisition

Course Resources

a. Essential Reading
1. Class Notes
2. Millman and Halkias, 2001, Integrated Electronics, Tata McGraw-Hill Education
3. Robert Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 7th Ed. Prentice Hall

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b. Recommended Reading

1. Albert Malvino, 2006, Electronic Principles, Tata McGraw - Hill Education
2. Donald L. Shilling & Charles Belowl, 1968, Electronic Circuits, New York: McGraw-Hill
3. Tocci R J and Widmer N S, 2001, Digital Systems – Principles and Applications, 8th Ed., Pearson Education India, New Delhi
4. Cooper and Helfrick, 1996, Modern Electronic Instrumentation and Measuring Techniques, 4th print Prentice Hall of India, New Delhi
5. H S Kalsi, 2007, Electronic Instrumentation, TMH, 2nd Edition
6. RA Gaikwad, 2001, Op-Amps and Linear Integrated Circuits, PHI, 4th edition
7. Millman and Grabel, 1999, Microelectronics, 2nd Ed. Tata McGraw-Hill

c. Magazines and Journals

1. Electronics for You
2. IEEE Transaction on Circuits and System I and II

d. Websites

1. http://www.electronics-lab.com
2. http://www.labmanager.com
3. http://electronicsforu.com
4. http://www.lifescienceleader.com

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Course Title	Mechanical Drawing and Assembly
Course Code	VMS007
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study about the Orthographic views of Three-Dimensional Model, gaining hands on experience on the software tool, Modelling of Screw jack, Plummer block, Machine Vice, knuckle joint and Oldham's couplings by understanding the function and Mechanism of each Component, Interpret the Industrial drawing

Course Outcomes

After undergoing this course students will be able to:

CO1: Generate the Orthographic views manually from the given 3D model
CO2: Explore the commands on Software to build the Part model and drafting
CO3: Assemble all the parts to generate the complete Product and Generate BOM
CO4: Analyze and Interpret the Manufacturing Industry Drawing

Course Contents

Unit 1 (Introduction to Mechanical Drawing): Introduction to Drawing & CAD software, Manufacturing Drawing Analysis and Identifying Operations, Isometric Drawing to Orthographic Views (Manual Sketching), Practice Session on Isometric Drawing to Orthographic Views (Manual Sketching)

Unit 2 (Basic Sketches on CAD Software): Basic Commands of Software Tool-Demonstration and Practice, 2D Sketching on Software Tool- Practice Session, 3D Part model on Software Tool- Demonstration and Practice, 3D Part model on Software Tool- Practice session, Detailed Drawing of Isometric part model on Software Tool –Demonstration and Practice Session, Assembly Work bench – Demonstration and Practice Session

Unit 3 (Modelling of Screw Jack): Part modelling of Screw Jack- Demonstration and Practice Session, Part modelling of Screw Jack- Practice Session, Assembly Modelling and Drafting of Screw Jack- Demonstration and practice session

Unit 4 (Modelling of Plummer Block): Modelling of Plummer Block –Demonstration and Practice Session, Modelling of Plummer Block –Practice Session

Unit 5 (Modelling of Knuckle joint): Modelling of Knuckle Joint- Demonstration and Practice Session, Modelling of Knuckle joint- Practice Session

Unit 6 (Modelling of Machine Vice): Modelling of Machine Vice-Demonstration and Practice Session, Modelling of Machine Vice-Practice Session

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Unit 7 (Modelling of Oldham's Coupling): Modelling of Oldham's coupling-Demonstration and Practice session, Modelling of Oldham's coupling- Practice session

Unit 8 (Surface Modelling and Concepts): Overall View of Surface Modelling – Demonstration and Practice Session, Overall View of Surface Modelling – Practice Session

Unit 9(Case Study): Case Study on Manufacturing Industry Drawing Analysis and Presentation

Course Resources

a. Essential Reading
1. Class Notes
2. Gopala Krishna K R, (2017), Machine Drawing in 1st angle Projection, Subhas stores

b. Recommended Reading
1. Narayana K L, Kanniah P, Venkata Reddy K, (1994),Machine Drawing, New Age International Publishers, Third Edition

c. Other Electronic Resources
1. Laboratory: **CAD Laboratory**
2. Hardware: PCs
3. Software: **CATIA V5 R19**

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Course Title	Electrical and Electronics systems analysis and simulation
Course Code	VMS008
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to provide the student with the fundamental skills to understand the basic of electronics and electrical components. It will build mathematical and numerical background for design of electronics and electrical circuit. Students equipped with the knowledge and training provided in the course will be able to participate in design, development and operation in the different area of electronics and electrical system design.

Course Outcomes

After undergoing this course students will be able to:

CO1: To study basics of electronics and electrical components and their applications in different areas
CO2: To study different biasing techniques to operate transistor, FET, MOSFET, operational amplifier, battery system, transformers in different modes.
CO3: Analyze output in different operating modes of different components.
CO4: Compare design issues, advantages, disadvantages, limitations, applications of basic electronics and electrical components

Course Contents

Unit 1: Introduction to Electrical and Electronic system analysis; MultiSim: Introduction to Basics of Electrical system analysis and simulation

Unit 2: Introduction to Transformer simulation: Step Down Transformer, Centre Tapped Transformer simulation

Unit 3: Introduction to RLC circuits response for different inputs, Series RLC circuit's response for different inputs using MultiSim simulator, Introduction to simple three phase circuit for balanced and unbalanced loads

Unit 4: AC to DC Convertors analysis and simulation, Voltage regulators analysis and simulation, Oscillators as waveform generators, Signal generators simulation: sinusoidal waveform generation Transistor Amplifiers: Operational amplifiers, Inverting , Non Inverting Amplifiers, Audio Amplifiers, High frequency resonant Amplifiers, instrumentation Amplifiers, Integrator and differentiator using OpAmp

Unit 5: Analysis of Different Battery charger systems, Introduction to 12V Battery Charger System and simulation, 5 V Battery Charger System Simulation

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Course Resources

a. Essential Reading
1. Class Notes
2. Circuit Analysis with Multisim,David Báez-López, Félix E. Guerrero-Castro,Morgan & Claypool Publishers, 2011 - Technology & Engineering
3. Electronic Simulation in Multisim,January 2018,by M E Herniter

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Course Title	Mechanical System Analysis and Simulation
Course Code	VMS009
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study about the kinematic and dynamic analysis of machines and to find out the position and velocity and Force analysis of the Mechanisms and Validate the same in the ADAMS Multibody dynamics tool, Concepts of dynamic balancing, Free and Forced Vibration acquiring the knowledge of software tool and to Analyze the given Mechanism

Course Outcomes

After undergoing this course students will be able to:

CO1: Understand the concepts of kinematics and Dynamics of Machines
CO2: Generate the manual graphical Analysis of Displacement and Position of Mechanisms
CO3: Hands on Experience on ADAMS Multi body Dynamics Software tool and exercise on the tool will be able acquire the knowledge on Mechanisms
CO4: Interpret and Analyze real type model
Course Contents
Course Contents

Unit 1 (Introduction to Kinematics and Dynamics of Machinery): Introduction to Kinematics and Dynamics of Machinery, Kinematic and Dynamic Analysis in the Design Process with an examples, Mechanisms and Kinematics: Four Bar Mechanism and its Inversion, Mechanisms and Kinematics: Slider Crank Mechanism and Special Purpose Mechanisms, Techniques of Mechanism Analysis: Traditional Drafting Techniques, CAD Systems, Analytical Techniques and Computer methods

Unit 2 (Position and Velocity Analysis): Graphical Analysis of Displacement and Position of Mechanisms, Velocity Analysis: Four-bar Mechanism, Velocity Analysis: Slider-Crank Mechanism

Unit 3 (Static Force Analysis): Static Force Analysis: Forces, Moments and Torques, Law of motion, Free Body Diagram, Static Force Analysis: Analysis of Two-Force Member and Case Study on Static Force Analysis

Unit 4 (Dynamics of Machines): Introduction of Dynamics of Machines: Direct Dynamics and Inverse Dynamics, Force and Equilibrium: Equations with simple examples, Dynamics of Rotating masses : Concept of unbalance and balance, Two plane method for balancing with an simple example and Dynamics of Reciprocating Machines: Mechanical Shaker, Fundamental Elements of a Vibration System, Spring Mass Damper Vibration system and Determination of Natural Frequency ,Equivalent Stiffness and Inertia of un-damped systems, Free vibration and Forced vibration with an example.

Unit 5 (Gyroscope): Gyroscopes: working Principle, Effect of Gyroscopic couple on aero-planes, Effect of Gyroscopic Couple on Naval Ship and Applications of Gyroscopes, Flywheels & their applications and Governors & their applications

Unit 6 (Overview of ADAMS Software and Mechanisms): Basic Commands of ADAMS Software and hands on practice of the tool

Unit 7 (Analysis of Four Bar and Slider Crank Mechanism): kinematic Analysis of Four bar and Slider Crank Mechanism

Unit 8 (Slider Crank Inversions): kinematic Analysis of Slider Crank Mechanism Inversions-Quick Return Mechanism

Unit 9 (Toggle Mechanism): Kinematic Analysis of Toggle Mechanism

Unit 10 (Force Analysis of Four bar Mechanism): Static Analysis of Four Bar Mechanism

Unit 11 (Force Analysis of Slider Crank Mechanism): Static Analysis of Slider Crank Mechanism

Unit 12 (Inversion of Double Slider Mechanism): Static Analysis of Elliptical Trammel and Scotch Yoke

Unit 13 (Case Study): Interpret and Analyze the I C Engine and Lift Mechanism

Course Resources

a. Essential Reading
  1. Class Notes
  2. Das J B K , Srinivasa Murthy P L,(2019), Kinematics of Machines ,Sapna book House
  3. Khurmi R S, Gupta J K,(2020),Theory of Machines, S Chand Publishers, 14th Edition

b. Recommended Reading
  1. Ratan S S, (2019), Theory of Machines, Tata McGraw Hill Education Private Ltd, 4th Edition

c. Other Electronic Resources
1. Laboratory: **CAD Laboratory**
2. Hardware: PCs
3. Software: **ADAMS 2014**

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Advanced Diploma Semester 2

Course Title	Basic Hydraulics and Pneumatics
Course Code	VMS009
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study of Fluid power system and its classification which includes fluid properties, Difference between hydraulic and pneumatic system followed by Hydraulic and pneumatic circuits, Sealing elements and Signal processing elements along with understanding the application of the system

Course Outcomes

After undergoing this course students will be able to:

CO1: Understand the Concepts of Fluid power system
CO2: Difference between Hydraulic and pneumatic System
CO3: knowledge of key elements like Actuators, motors and Cylinders of the system
CO4: knowledge of signal processing elements helps to build the complete Fluid power system

Course Contents

Unit 1 (Introduction to Fluid Power system): Concepts of Fluid Power and Properties of Fluids, Viscosity: Dynamic and Kinematic viscosity, Newton's law of viscosity, Vapour Pressure, perfect gas and universal gases Isothermal & Adiabatic Process, Bulk Modulus of Elasticity and Surface tension, Pascal's Law: Steady flow equation, Components of fluid power systems (Hydraulic system), Pneumatic system, Advantages and disadvantages of hydraulic system & Pneumatic system

Unit 2 (Pumps, Motors & Actuators): Source of Hydraulic Power, Pump Classification: Positive & Non-Positive Displacements, Gear Pumps: External and Internal, Vane pump of unbalanced Type & Balanced Type, Hydraulic actuators and motors: Linear hydraulic actuators, Hydraulic actuators and motors: Mechanics of Hydraulic cylinder loads (lever system), Hydraulic actuators and motors: Applications & symbolic representation, Hydraulic Motors: Gear motors, Vane motors, Piston motors: In-line and Axial

Unit 3 (Control Valves): Control Component in Hydraulic system: Directional Control valve, Control Component in Hydraulic system: Check Valve and Pilot check valve, Control Component in Hydraulic system: 3-way and 4-Way Valve, Manual and Mechanical Check Valve, Pressure valve and Pressure control Valve, Relief valve and reducing Valve, Flow Control valve and Needle Valve, Non-Pressure compensated valve and Pressure Compensated valve

Unit 4 (Hydraulic Circuit Design): Hydraulic circuit design and analysis: Introduction and symbolic representation, control of hydraulic cylinders: single and double cylinders, Regenerative Circuits and

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Regenerative Circuits and its applications, Pump unloaded circuits, Speed control of hydraulic motor, Accumulator and its types and Accumulator circuits

Unit 5 (O-Rings and Sealing Devices): Maintenance of Hydraulic systems: Types of fluids and sealing devices, O-rings and Packing's, Rings, Description of Reservoir system, Filters and Strainers, Locating filters in circuits , Trouble shooting, Pressure measurement,

Unit 6 (Pneumatic Control System): Pneumatic control System and Properties of air, perfect gas laws and description of Pneumatic actuators, Brief Description on End position cushioning, seals and Mounting arrangements, Rod less Cylinder, symbolic representation and circuit diagram, Brief Description on End position cushioning, seals and Mounting arrangements, Rod less Cylinder, symbolic representation and circuit diagram, Rotary actuators and its types, Cylinder Performance characteristics, Directional control valves: Introduction, Valve symbols and its symbolic representation and infinite position Value, Valve control positions: poppet valve, spool valve, simple pneumatic control(Direct and Indirect control of Pneumatic cylinder), Flow control Valves, Quick exhaust valve, speed control of cylinders, Memory function

Unit 7 (Signal Processing Elements): Signal Processing Elements, pressure dependent control and Time-delay valves, Introduction to Multi-cylinder application, Control diagram and symbolic representation, Color coding for push buttons, signal suppression and signal elimination (valve symbols and Circuit diagram), Concept of CASCADE, Electro Pneumatic control and pilot operated valves and Air relays, Control circuit for single acting cylinders, Electrical relays and Contact sensing, Production of compressed air, Compressor analysis, preparation of compressed air, Air dryers, Filters, Lubricators and Pressure regulators

Course Resources

a. Essential Reading
1. Class Notes
2. Andrew Parr,(January 2011), Hydraulics and pneumatics,3rd Edition
3. Patrik kettle J,(2010), Fluid Power System,3rd Edition

b. Recommended Reading
1. Esposito, (2013), Fluid power with applications, Pearson Education India, 7th Edition

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Module Title	Measurement and Control systems
Module Code	VGE051
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

The aim of the course is to study the Mechatronic measurement techniques and control schemes

Course Outcomes

After undergoing this course students will be able to:

CO1: understand measurement systems-analog meters

CO2: analyze systems related to digital measurement

CO3: understand CRO and DSO in measurement and analysis.

CO4: understand the basics of control systems.

Course Contents

UNIT 1: (Measurement systems-Introduction): Measurement: Definition and Significance, Block Diagram of Measurement systems, Performance Characteristics of Measuring Instruments, Electro-Mechanical Meters: Types, Galvano Meters, Moving Iron and PMMC instrument, Hall Effect-Clamp Meters

UNIT 2: (Measurement systems-analog & digital meters): Measurement of Voltage: Voltmeter, DVM Measurement of Current: Ammeter DMM: Block Diagram and Working, Watt Meter: Dynamometer Type, Digital Watt Meter: Block Diagram and Working, Watt-hour Meter: Construction and Working, Digital Energy Meter Block Diagram, Power Factor Meter: Working, Measurement of Resistance: Bridge Methods of Measurement, Megger: Working, Measurement of Capacitance and Inductance, Digital Capacitance Meter, Digital LCR Meter

UNIT 3: (Cathode Ray Oscilloscope & other meters): CRO: Block Diagram and Working, DSO Block Diagram, Working and its applications, DSO Block Diagram, Working and its applications, CRO Front Panel, DSO Front Panel, Digital Frequency Meter: Block Diagram and Working, Q-Meter: Block Diagram and Working, Digital Measurement of Time, digital Counter, Digital Tachometer: Block Diagram and Explanation, Digital pH Meter: Block Diagram and Explanation, Digital Height Gauge: Working and applications

UNIT 4: (Control systems-Basic): Introduction to control systems, Open loop control systems, Closed loop control systems, Differences between open loop and closed loop control systems with examples, Sequential controllers with an example, ON/OFF controllers, Proportional controller with an example, PI controller with an example, PD controller with an example, PID controller with an example, Pneumatic

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and electro pneumatic controllers: gas flow control, Hydraulic and electro hydraulic controllers: liquid flow control, Temperature control in industries, Servo controllers, DC servo controllers, AC servo controllers, Speed and voltage control, Digital controllers with an example, industrial process control, Velocity control, Adaptive control, Supervisory control, Numerical control & CNC, Programmable controllers, Fuzzy control with an example, Distributed control system, Robot controller with a simple example.

Course Resources

a. Essential Reading
1. Class Notes
2. A course in electronic measurements and instrumentation by A K sawhney & puneeth sawhney
3. W. Bolton, "Mechatronics – Electronic control systems in Mechanical & Electrical Engineering", Pearson Education Ltd., 2015

b. Recommended Reading
1. Measurement Systems: Application and Design by Ernest O. Doebelin
2. Control Systems: Principles and Design | 4th Edition by M Gopal

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Module Title	Communication systems
Module Code	VGE019
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

The aim of the course is to study the modulation and demodulation schemes of Amplitude modulation, Frequency Modulation and Pulse Modulation, Multiplexing methods and Fiber optic communication

Course Outcomes

After undergoing this course students will be able to:

CO1: understand Communication systems, Modulation and demodulation techniques.
CO2: analyze systems related to digital communication-pulse modulation
CO3: understand systems related to digital communication-multiplexing
CO4: understand technology involved in optical fibre communication

Course Contents

UNIT 1: (Introduction to Communication systems): Introduction to Communication systems: Block diagram, types, need.

UNIT 2: (Modulation and demodulation-AM, FM): Definition and Significance, Need for Modulation, types., Amplitude Modulation: Generation of AM waves (DSB-FC)Suppressed carrier systems (DSB-SC)Single side band modulation (SSB)Vestigial side band modulation (VSM)-comparison of various AM systems, Source of noise-Types, Demodulation of AM waves–Envelope Detectors, AM Transmitters-Low level and High level transmitters, AM Receiver– TRF receiver and Super heterodyne receiver, Introduction to angle modulation systems–Definitions for FM & PM, Narrowband FM–Wide band FMFM Modulators- Direct method, FM Transmitters, FM Demodulators, FM Receivers, Comparison between AM & FM Radio propagation-introduction, Ground wave and space wave propagation, Critical frequency and maximum usable frequency, Path loss and White Gaussian noise

UNIT 3: (DIGITAL COMMUNICATION): introduction, Pulse modulations-concepts of sampling, sampling theorem, PAM, and PWM, PPM, and PTM, quantization and coding, ASK, FSK,PSK,QPSK,PCM,DPCM, Applications of Data communication, Time division multiplexing–synchronous and asynchronous, Frequency Division Multiplexing

UNIT 4: (Introduction to optical fibre communication): Introduction to optical fibre communication: Evolution of fibre optics system, OFC cable: different parts of cable OFC cable: working, Types of fibres, Characteristics of fibres, advantages and disadvantages. Ray optics: laws Fibre losses, OFC system: block diagram, OFC: applications, advantages and disadvantages, OFC sources: LED , OFC sources: LASER

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diode, OFC receivers: Brief on PIN diode, OFC receiver: Brief explanation: APD diode, Typical bit rates: List of different schemes of OFC systems, Note on SNR and noises, Introduction to Digital transmission system: Types, Point- to- point link, Splicing and connectors, Introduction to WDM: block diagram, Advantages, dis advantages and applications of WDM

Course Resources

a. Essential Reading
1. Class Notes
2. Communication Systems, 4th Edition by Simon Haykin, Michael Moher

b. Recommended Reading
1. Communication Systems, 4th Edition by Sanjay Sharma
2. Communication Systems, 4th Edition by RP Singh.

c. Other Resources

1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee08

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Module Title	Computer Applications and Networks
Module Code	VMS010
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

This module discusses the protocols used in the networking and enables the students to design application using them. It covers in detail the concepts of communication protocols of each layer and their uses. The student gain experience in understanding the network applications using appropriate protocol on all seven layers of the networks.

Course Outcomes

After undergoing this course students will be able to:

CO1: able to learn IEEE standards for LAN Ethernet.
CO2: Compare and recommend suitable networking protocols for communication networks.
CO3: Understanding the different Transmission media.
CO4: Understanding the different internet communication services.

Course Contents

UNIT 1: (Computer Networks): Introduction, Classification of computer networks, types of computer networks, LAN Technologies, network Topologies, IEEE Standards for LAN Ethernet.

Introduction to network reference model, OSI Model, Layer architecture, internet model, cryptographic algorithms, Network security threats, Physical Layer Standards, Data link layer.

UNIT 2 :(OSI Model):   Network Layer- functionality, features, addressing, Network routing and networking issues, Unicast, multicast routing protocols and routing algorithms- DVR & LSR, Internet protocol (IPV4), Internet protocol (IPV6), TCP/IP model, Transport layer function: end-to-end communication, Transmission control protocol-TCP, User datagram protocol-UDP, Session layer-function, Presentation layer –function, Client server model, Client server model communication process, Application layer-function, Application layer protocols-DNS and SMTP, Application layer protocols-FTP,POP and HTTP.

UNIT 3: (Internet communication services): Introduction, Transmission media: fiber optic communication, Wireless networks, GSM and CDMA, Network access technologies: DSL standards, Hybrid fiber coaxial, Network access technologies: DSL standards, Hybrid fiber coaxial, Cable modem and Wi-Fi, 3G-Technology, UMTS architecture, 4G-Technology-features and challenges, Software defined radio, Cognitive defined radio, IMS architecture, ABWAS, MVNO, Long Term Evolution: LTE-system,

Advantages and disadvantages of LTE system, Voice over LTE: VoLTE-system, Advantages and disadvantages of VoLTE system.

Course Resources

a. Essential Reading
1. Class Notes
2. Data Communications and Networking , Forouzan, 5th Edition, McGraw Hill, 2016 ISBN: 1-25-906475-3

b. Recommended Reading
1. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013, ISBN: 0-273-76896-4
2. Introduction to Data Communication and Networking, Wayarles Tomasi, Pearson Education, 2007, ISBN:0130138282

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Course Title	Modelling and Building of Mechatronics System-1
Course Code	VMS011
Department	Department of Mechanical and Manufacturing Engineering
	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study the Modeling, Verification, and Validation and to acquire knowledge of building the mechatronic system in which the every stage of the modelling and building, the use of Mechanical and Electronic concepts with Programming aspects becomes necessary, so, the course is aimed at giving the hands on experience on MATLAB and ADAMS Software to give the solutions for building of mechatronics systems.

Course Outcomes

After undergoing this course students will be able to:

CO1: Understand Concepts of Modelling the Mechanical and Electronic system
CO2: Modelling in the Individual Platforms of MATLAB and ADAMS Software
CO3: Building the Mechatronics system using Co-simulation aspects
CO4: Generate the solution by using all the methodologies to the existing Problem virtually and apply to the realistic scenario

Course Contents

Unit 1 (Introduction to Mechatronics Modelling): Introduction to Mechatronics Modelling, Purpose of Modelling and Simulation of Mechatronic System, Stages of Modelling, Model Verification, Model Validation

Unit 2 (Introduction to System Model): Introduction to System Model: Mechanical System, Basics of System models: Electrical & Electronic System, Basics of System Model: Hydraulic System with Example, Basics of System Model: Pneumatic System with Example

Unit 3 (Introduction to MATLAB & ADAMS): Introduction to Basics of MATLAB, Introduction to MATLAB: M Files, Introduction to Simulink, Modelling in ADAMS Software, Introduction to CAD Model and Simulink Co-Simulation, Introduction to ADAMS & SIMULINK Co-Simulation

Unit 4 (DC Motor): Modelling of DC Motor using ADAMS Software, Modelling of DC Motor using ADAMS & SIMULINK (Co-Simulation).

Unit 5 (Spring Mass System): Spring Mass System Modelling in ADAMS Software, Spring Mass System Modelling in Simulink

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Unit 6 (Hydraulic and Pneumatic Control System): Hydraulic System Modelling with examples, Pneumatic System Modelling with examples, Hydraulic System Modelling with Pump, 4-Way Directional Valve & Double Acting Cylinder

Unit 7 (Slider Crank Mechanism): Slider Crank Modelling with Example

Unit 8 (Two Axis Robot): Modelling of Two Axis Robot Manipulator with Example

Course Resources

a. Essential Reading
1. Class Notes
2. Devdas Shetty and Richard A kolk , (2012),Mechatronics System Design, 2Nd Edition, Cengage learning

b. Recommended Reading
1. Klaus Janschek (2014), Mechatronic Systems Design: Methods, Models, Springer

c. Other Electronic Resources
1. Laboratory: CAD Laboratory
2. Hardware: PCs
3. Software: MATLAB and ADAMS Software

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Course Title	Mechatronics Project -1
Course Code	VMS012
Department	Department of Mechanical and Manufacturing Engineering
	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to prepare the students to impart the need and relevance of a structured approach to identify and undertake a project. This course provides an opportunity for students to apply theories and skills which are learnt from the academics.

Course Outcomes

After undergoing this course students will be able to:

CO1: Identify the need for developing a new or improving an existing product or system through An organized survey of literature
CO2: Design and model the product or system to meet the design specifications
CO3: Evaluate and justify the performance of the modelled system
CO4: Demonstrate the working of the product or system and make a presentation
CO5: Write a technical report

Course Contents

Collection of relevant literature and review of literature

Interaction with the users and collection of data

Data Analysis, Formulation of a problem of suitable size

Writing down the design specifications

Concept generation and concept selection

Detail design calculations

Choosing a modelling environment, learning the appropriate tools and techniques

Modelling, simulation and analysis of design

Defining performance parameters, Evaluation of performance, presentation of performance characteristics,

Verification of results

Demonstration to the defined audience and making a presentation to the assessing team

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Course Resources

a. Essential Reading
The Methodology to be followed for successful Completion of Project work

b. Recommended Reading
1. Course Notes, Manuals of Tools and Techniques Chosen to Solve the Design Problem

c. Other Electronic Resources
1. Laboratory: CAD lab, mechanical workshop and Control systems lab
2. Hardware: PC's
3. Software: AutoCAD, ADAMS, MATLAB, LABVIEW, MULTISIM

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Degree

Semester 1

Module Title	IOT and Industry 4.0
Module Code	VGE0046
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

Interpret the impact and challenges posed by IoT networks leading to new architectural models. Compare and contrast the deployment of smart objects and the technologies to connect them to network. Appraise the role of IoT protocols for efficient network communication. Illustrate different technologies for sensing real world entities and identify the applications of IoT in Industry 4.0

Course Outcomes

After undergoing this course students will be able to:

CO1: Assess the genesis and impact of IoT applications, architectures in real world.

CO2: Compare different Application protocols for IoT.

CO3: Infer the role of Data Analytics and Security in IoT.

CO4: Understanding the role IOT in Industrial Evolution.

Course Contents

UNIT 1: (IoT): Introduction, an architectural overview, Building an architecture, main design principles and needed capabilities, standard consideration, M2M and IoT Technology, fundamentals- Devices and gateway, Local and wide area networking, data management, Business processes in IoT, Every as a services, M2M and IoT Analytics

UNIT 2: (M2M and IOT Analytics): M2M and IoT analytics, Knowledge Management, IoT Architecture-state of the art-Introduction, IoT Reference model- IoT reference architecture, IoT Applications.

UNIT 3: (Industry 4.0): Introduction, Industrial Evolution, Six Design Principles, building blocks of Industry 4.0, potential implications, predictive maintenance, Additive manufacturing of complex parts, machines as a services, smart supply network, cloud computing, cyber security, Key challenges, impact on economy, business

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Course Resources

a. Essential Reading

3. Class Notes
4. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
5. Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017

b. Recommended Reading

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 stEdition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

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Module Title	Cloud storage and computing
Module Code	VGE0016
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

Some advanced topics that will characterize and drive research and development in cloud computing. These topics become particularly important as cloud computing technologies become increasingly consolidated. Given the huge size of the computing facilities backing the service offerings of cloud providers, energy-efficient solutions play a fundamental role. These involve smarter and greener datacenter designs, efficient placement of virtual machines, and energy-driven server management.

Course Outcomes

After undergoing this course students will be able to:
CO1: Learning of cloud computing technologies and services
CO2: create new applications and soft wares through cloud
CO3: understand the file storage and Backup in cloud.
CO4: cloud computing is that services previously provided by IT administrators will be accessible to any user at any time.

Course Contents

UNIT 1: Introduction to cloud computing, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing.

UNIT 2: Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies: AWS and Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjra soft Aneka, Virtualization, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology, Cloud Computing Architecture: introduction, Cloud Reference Model: Architecture, Cloud Reference Model: Infrastructure / Hardware as a Service, Cloud Reference Model: Platform as a Service, Cloud Reference Model: Software as a Service, Types of Clouds, Public Clouds ,Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Cloud Platforms in Industry: in brief, types, Cloud Applications: introduction, Scientific Applications, Healthcare: ECG Analysis in the Cloud.

UNIT 3: Biology: protein structure prediction, Biology: gene expression data analysis for cancer diagnosis, Geoscience: satellite image processing, Business and consumer applications: introduction, Business and consumer applications, Social Networking, Media Applications, Multiplayer Online Gaming, Energy efficiency in clouds: a brief, Information storage, Storage strategy and governance, Security and regulations: introduction, Security and regulations, Designing secure solutions: introduction, Designing

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secure solutions, Securing storage in virtualized, cloud environments: introduction, cloud environments, Monitoring and management; Security auditing and SIEM, Note on cloud service providers, Comparison of Cloud service providers.

Course Resources

a. Essential Reading

   1.   Class Notes

   2. Reference from "Mastering Cloud Computing Foundations and Applications Programming" by Raj Kumar Buyya.

   3. The Cloud Computing Book- The Future of Computing Explained by Douglas Comer.

b. Recommended Reading

   1. Tanenbaum AS, Van Steen M. Distributed systems: principles and paradigm. Upper Saddle River, NJ, USA: Prentice Hall PTR; 2001.

   2. Buyya R. High-performance cluster computing: architecture and systems. Upper Saddle River, NJ, USA: Prentice Hall PTR; 1999.

c. Other Resources

1. http://www.freebookcentre.net/Networking/Cloud-Computing-Books.html

2. https://www.bookslock.org/cloud-computing-textbook-jntu/

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Course Title	Future Manufacturing Technologies
Course Code	VGE038
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study of Future Manufacturing Technologies includes the knowledge of Traditional machining, Non-traditional machining along with future manufacturing aspects, Machining process with higher end technologies which involves Electrical, Electronic and chemical Engineering aspects and also to understand about the emerging forming process methods with MEMS and Nano technology

Course Outcomes

After undergoing this course students will be able to:

CO1: Understand the difference between Traditional and Non-traditional Machining Process
CO2: New Various technologies used for Machining, Micro-Machining and Forming Process
CO3: New trends in the Manufacturing Technologies like MEMS and Nano Technology
CO4: Basic understanding of Nano tubes, Nano wires and Nano Fabrication methods

Course Contents

Unit 1 (Introduction to Future Manufacturing Technologies): Introduction to Future manufacturing Technologies, Different types of modern Manufacturing process, Mechanical Machining process: Abrasive jet Machining (AJM), Mechanical Machining process: Ultrasonic Machining (USM), Mechanical Machining process: Abrasive Finishing processes- Abrasive Flow Finishing(AFF), Mechanical Machining process: Magnetic Abrasive Finishing(MAF), Mechanical Machining process: Water jet Machining(WJM), Mechanical Machining process: Abrasive Water jet Machining(AWJM)

Unit 2 (Thermo-Electric Machining Process): Introduction to Thermo-Electric Machining Process, Thermo-Electric Machining Processes: Electric Discharge Diamond Grinding, Wire Electric Discharge Machining, Laser Beam Machining (LBM), Plasma Arc Machining (PAM)

Unit 3 (Electron Beam and Chemical Machining): Introduction to Electron Beam Machining (EBM), Electro-chemical Machining: Electro Discharge Machining (ECM), Electro-Mechanical Grinding (ECG), Electro-Chemical Drilling (ECD), Electro-chemical DE burring(ECDe), Chemical Machining(ECM)

Unit 4 (Forming and Micro Machining Process): Introduction to Forming and high velocity Forming Processes, Explosive forming processes, Propellant forming, Electro-hydraulic forming, Electro-Magnetic forming, Pneumatic/Mechanical Forming, Introduction to Micro-Machining, Classification of Micro-Machining, Different types of Micro-Machining Processes: Abrasive Micro-Machining, Ultrasonic Micro-machining, Micro EDM, Micro ECM and Laser Micro-Machining

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Unit 5 (Introduction to MEMS and Nano-Technology): Introduction to MEMS and Nano Technology, Development and need of MEMS, Over View of MEMS, and Nano Materials, Nano Tubes, Nano wires, Introduction to Nano fabrication, Nano fabrication: Methods and Applications

Course Resources

a. Essential Reading
1. Class Notes
2. Omkar I K, Samarth P, Non-Traditional Machining, Notion Press.

b. Recommended Reading
1. Kalpak Jain, (2002), Manufacturing Engineering and Technology, 4th Edition

Module Title	PLC and its applications
Module Code	VMS013
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

Programmable Logic Controller (PLC) is a very important device to control any system and is widely used in industries now a day. Therefore the person who wants to work in control and automation industries must have enhanced knowledge of PLC. This course gives a detailed knowledge and practice of PLC programming for different applications.

Course Outcomes

After undergoing this course students will be able to:

CO1: Compare conventional sequential control with programmable logic control system

CO2: Develop programs using different PLC programming languages for sequential and continuous process

CO3: Interface analog and digital input/ output devices with PLC using different communication protocol

CO4: Test the PLC based system and troubleshoot the errors associated with it with examples.

Course Contents

UNIT 1: (Introduction to programmable logic controllers): PLC History, Ladder Logic and Relays: introduction, PLC Programming, PLC Operation, PLC architecture and hardware configurations.

UNIT 2: (Input and outputs-PLC): Input and outputs types, Electrical wiring for inputs and outputs, Relays, Logical sensors Logical actuators.

UNIT 3: (PLC programming): Logic design, Event based logic, Sequential logic, Latches with examples, Timers with examples, Counters.

UNIT 4: (Program design methods): Program design methods, SFC with examples, FBD with examples,

Ladder logic with examples

UNIT 5: (Advanced ladder logic): Advanced ladder logic with examples, Ladder logic comparison for different PLCS, Traffic light ladder programming, Water level controller ladder programming, Conveyor ladder programming, Lift control ladder programming, Pick and place ladder programming, Component segregation ladder programming, FMS using SMC-Mitsubishi PLC

Course Resources

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a. Essential Reading
1. Class Notes
2. Programmable Logic Controllers by W. Bolton, Elsevier Newnes publication, 4th edition

b. Recommended Reading
1. Programmable logic controller by Frank D. Petrusella, Tata McGraw-Hill publication
2. Introduction to programmable logic controller by Gary dunning, Thomson Asia Pte Ltd. Publication, Singapore
3. Programmable Logic Controllers: Principles and Applications by John W. Webb and Ronald A. Reis, Prentice – Hall India publication, 5th edition
4. Programmable Controllers An engineer's guide by E.A.Parr, Elsevier Newnes publication 3rd Edition
5. S7-200, PLC Manual of Siemens for Instructions
6. S7-300, PLC Manual of Siemens for Instructions
7. Programmable Controller by T. A. Huges, ISA publication, 2nd edition
8. Programmable Logic Controllers: Programming methods and applications by
9. John R. Hackworth and Frederick D. Hackworth Jr., Pearson publication

c. Other Resources
1. Laboratory: PLC Kits
2. Hardware: PCs
3. Software: Keyence simulation software

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Module Title	HMI, SCADA AND ROBOTICS
Module Code	VMS014
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

This module gives a detailed description of practices related to theory and laboratory about Supervisory Control And Data Acquisition (SCADA)/Human to Machine Interface (HMI) and Robotics systems developed for didactic purposes

Course Outcomes

After undergoing this course students will be able to:

CO1: build HMI screen
CO2: create new SCADA application
CO3: understand the types of projects based on SCADA
CO4: write and run programs for robotics manipulator (ABB)

Course Contents

UNIT 1: (Human machine interface): Introduction, Human machine interface setup, Different Human machine interfaces, discrete control and indicator units, advanced human-machine interfaces, advanced human-machine interfaces, advanced human-machine interfaces, Industrial PC's with development software, Exchange modes

UNIT 2: (Supervisory control and data acquisition system): Direct manual control and supervisory control, SCADA: introduction, SCADA architecture and various advantages and disadvantages of each system, Single unified standard architecture IEC 61850SCADA system components: PLC, IED and RTUSCADA communication, various industrial communication technologies, open standard communication protocols, SCADA applications in transmission and distribution sector, industries etc.

UNIT 3: (Robotics): Robotics; introduction, Robot component recognition, Manipulating the robot, Recording the position, Writing and running robot programs, Pick & Place tasks. Inputs (Digital, Analog, Sensors) with examples, Output with examples, Relative positions.

Course Resources

a. Essential Reading
1. Class Notes
2. PLCS & SCADA - THEORY AND PRACTICE by Rajesh Mehra (Author), Vikrant Vij (Author)
3. Introduction to Robotics by Saha S.

b. Recommended Reading

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1. Richard D Klafter, Thomas Achmielewski and MickaelNegin, "Robotic Engineering – An integrated Approach" Prentice HallIndia, New Delhi, 2001.
2. Mikell P Groover, "Automation, Production Systems, and Computer-Integrated Manufacturing", Pearson Education, 2015

c. Other Resources

1. Laboratory: Control systems and Robotics (ABB)
2. Hardware: PCs
3. Software: Keyence simulation software

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Module Title	INDUSTRIAL AUTOMATION
Module Code	VMS015
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

This course provides an overall exposure to the technology of Industrial Automation as widely seen in factories of all types both for discrete and continuous manufacturing and drives related to automation.

Course Outcomes

After undergoing this course students will be able to:

CO1: analyze industrial automation configurations
CO2: simulate and build circuits related to industrial drives
CO3: understand pneumatic and hydraulic systems in automation
CO4: understand technology involved in present industrial automation

Course Contents

UNIT 1: (Introduction to automation): Introduction to automation, Functional elements of industrial automation, Industrial Sensing elements: Functional configuration of a typical sensor system, Industrial actuation elements: Functional configuration of a typical actuation system, Signal processing element with an example- Simulation example using MATLAB

UNIT 2 :(Power devices): Power devices, their applications in power amplification and conversion elements Thyristor: SCR construction and working, SCR rectifiers: half wave rectifier, 1-phase, Study of SCR characteristics using MultiSim1-phase Half Wave Rectifier simulation using MultiSim, SCR rectifiers: half wave rectifier- 3-phase, full wave rectifier-1-phase1-phase Full Wave Rectifier simulation using MultiSim, SCR rectifiers: full wave rectifier, 3-phase, SCR triggering methods: R and RCSCR triggering methods: UJT based-Triggering circuit simulation, Choppers as DC/DC convertors, Inverters as DC/AC convertors, Cyclo-convertors as AC/AC convertors:1 phase to 1 phase mid-point, resistive load ,DC motor drives-Simulation example using MultiSim, Breaking methods in servo drives, Stepper motor drive using MultiSim, Transistor PWM DC convertor

UNIT 3: (Industrial drives): Closed loop speed and position control of a separately excited DC motor (analysis and simulation) Induction motor drives with examples (analysis and simulation), BLDC drives, Non-electrical power convertors: hydraulic and pneumatic, hydraulic control system: Conduction of an experiment using Hydraulic trainer, pneumatic control system: Conduction of an experiment using Pneumatic trainer, Industrial control systems, Introduction to Automatic Guided Vehicles, FMS: Demonstration-using SMC kit

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Course Resources

a. Essential Reading
1. Class Notes
2. Industrial Drives and Applications by Prof.G.K DUBEY
3. Industrial Automation and Robotics by A K Gupta and Arora

b. Recommended Reading
1. Handbook of Industrial Automation by Richard L. Shell, E-book

c. Other Resources
1. Laboratory: Control systems and Robotics (assembly mini cell)
2. Hardware: PCs
3. Software: Multisim

Degree
Semester 2

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Module Title	Labour Laws, Occupational health and Safety
Module Code	VGE047
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering & Technology

Course Summary

India introduced the Minimum Wages Act in 1948, giving both the Central government and State government jurisdiction in fixing wages. The act is legally non-binding, but statutory. Payment of wages below the minimum wage rate amounts to forced labour. The main purpose of the Act is to protect workers from health and safety hazards on the job. It sets out duties for all workplace parties and rights for workers. It establishes procedures for dealing with workplace hazards and provides for enforcement of the law where compliance has not been achieved voluntarily

Course Outcomes

After undergoing this course students will be able to:
CO1: Understand labour laws, Occupational health and safety
CO2: know about Key principles and aim of occupational health and safety (OHS) programs
CO3: Learn about governments enact labour laws on industrial relations and rights of labour.
CO4: Explain about economic and social justice to workforce in any organization

Course Contents

UNIT 1 (Labour laws) : Introduction to labour laws, occupational health and safety, Constitutional rights, Contract and rights, Scope of protection, Employment contracts, Wage regulation, Working time, Health and safety, Pensions and insurance, Workplace participation, Trade unions, Management participation, Collective action, Sex discrimination, Migrant workers, Vulnerable groups, Dismissal regulation, International comparison of Indian labour laws.

UNIT 2 (Occupational Safety and Health, Safety): occupational Safety and Health, Safety Legislation, Workers Compensation and Recordkeeping, Safety Related Business Law, Accident Causation and Investigation, Introduction to Industrial Hygiene, Ergonomics and safety management, Fire Prevention and Protection, System Safety. Managing the safety function, Psychology and safety, Workplace Violence, Terrorism Preparedness, Hazardous materials, Transportation Safety, Required written programs, Resources on safety and health, working at different weather, Indian Scenario, Health and Safety Concerns across Sectors in India.

Course Resources

a. Essential Reading
1. Class Notes
2. Reference from "Kahn-Freund's LABOUR AND THE LAW by Paul Davies, M.A., LL.M Fellow of Balliol College, Oxford; Lecturer in Law at the University of Oxford Mark Freedland, LL.B., M.A., D.

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Phil., of Gray's Inn,   Barrister; Fellow of St. John's College, Oxford. University Lecturer in Labour   Law at the University of Oxford.

    3. The FUNDAMENTAL PRINCIPLES OF OCCUPATIONAL HEALTH AND SAFETY Second edition Benjamin O. ALLI O. ALLI, INTERNATIONAL LABOUR OFFICE -GENEVA.

b. Recommended Reading
    1. https://labour.gov.in/sites/default/files/Last_Date_Extended_for_OSH_Code_0.pdf.
    2. https://www.free-safety-training.com/product/occupational-health-and-safety-books-pdf/.

c. Other Resources
1. http:// https://ecu.au.libguides.com/c.php?g=410557&p=6665306
2. https://labour.gov.in/e-book-1

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Course Title	Principles of Management
Course Code	VGE059
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to provide an overview of management and its evolution. It examines management functions of planning, organizing, staffing, leading, directing and controlling and its impact on the business organization. It discusses necessary skills and functions required for efficient manager in contemporary business environment.

Course Outcomes

After undergoing this course students will be able to:

CO1: Describe the primary functions of management and roles of managers
CO2: Explain how managers align the planning process with company vision and mission
CO3: Identify common organizational structures and describe staffing process
CO4: Explain the importance of directing and need for control within the organization

Course Contents

Unit 1(Introduction to Management): Management - Introduction, Concept, Meaning and Definition of Management, Characteristics and Importance of Management, Difference between Administration and Management, Process and significance of management, Functions of Management, Managerial roles (Mintzberg), Roles and Functions of a Manager, Levels of Management, Development of Scientific Management and other Schools of thought and approaches, Objectives of Management, Principles of Management.
Case study on Basics of Management and Analysis - I
Case study on Basics of Management and Analysis - II

Unit 2(Planning): Planning; Introduction, Meaning, Importance, Characteristics, Elements of good planning, Types of Planning – Objectives and policies, , Planning Process (steps), Benefits of Planning, Limitations of Planning, Requisites of making effective Planning, SWOT Analysis, Strategic planning and Operational planning, Introduction to Management by objective, Management by objectives; Corporate planning; Environment analysis and diagnosis; Strategy formulation
Case Study on Planning – I
Case Study on Planning – II

Unit 3 (Types of Decisions): Nature, type, importance, principles and techniques of Decision making, Problems involved in Decision making
Case study and Analysis on Decision-Making - I
Decision making and its process, Objectives and policies- Decision making

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Case study and Analysis on Decision Making - II

Unit 4 (Organisation): Introduction, Meaning, Definition, Functions of Organization, Importance, Principles of Organisation, Organization design, Types of Organization (functional, project, matrix and network), Types of authority: Line, staff and functional authority Power - The sources of power - Difference between Authority and power, Delegation - Advantages of Delegation, Barriers to Delegation, Guidelines for Effective Delegation , Decentralization v/s Centralization, Advantages and Disadvantages of Decentralisation, Responsibility, Organisation Structure - Span of Control, Committees, Departmentalisation, Formal and informal organization , Authority and Responsibility, Definition and Types of Responsibility and Accountability, Organization chart
Case Study and Analysis on Organisation - I
Case Study and Analysis on Organisation - II

Unit5 (Staffing): Introduction, Definition, Functions of staffing, Recruitment, Sources of recruitment, Stages of selection procedure, Training, Methods of training and performance appraisal, Factors affecting staffing, job design, Teamwork, Stages of Team Building
Case study and Analysis on Staffing - I
Case study and Analysis on Staffing – II

Unit 6 (Communication)
Significance, Channels of communication, types and process of communication
Communication - barriers and remedies, Effective communication
Case study and Analysis on Communication - I
Case study and Analysis on Communication - II

Unit 7 (Leadership): Functions, qualities, Leadership-Concept and leadership styles ,Leadership – Functions and Types – X, Y and Z Theories, Qualities and Traits of a good Leader, Coordination and Cooperation, concept, significance, principles of coordination, Techniques, obstacles in co-ordination
Case study and Analysis on Coordination - I
Case study and Analysis on Coordination – II

Unit 8 – (Direction):
Concept, nature, importance and principles of Direction
Written vs. Oral Directives. Techniques of Direction
Case study and Analysis on Direction - I
Case study and Analysis on Direction – II

Unit 9: (Control): Definition of Controlling - Meaning and Importance of controlling, Relationship between Planning and Controlling, Control Process - Characteristics of Good control System. Types of Control, Barriers to control making and how to overcome them, Control techniques, budget and non-budgetary control devices, Introduction to TQM Budgetary Control, Management Audit. Management Audit, Components of Management Audit
Case study and Analysis on Control
Case study and Analysis on Budgeting - I
Case study and Analysis on Budgeting - II

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Course Resources

a. Essential Reading

4. Class Notes
5. Harold Koontz, O'Donnell and Heinz Weihrich, 2012. Essentials of Management. New Delhi, 9th edition, Tata McGraw Hill

b. Recommended Reading

1. Stephen P. Robbins, David A. Decenzo, 2016. Fundamentals of Management, Pearson Education, 9th Edition
2. Management Fundamentals: Concepts, Applications, & Skill Development, 6th edition, Sage. 2014

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Course Title	Project Management
Course Code	VGE062
Department	Department of Mechanical and Manufacturing Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to students will be able to demonstrate practical knowledge of the functional areas of business, be able to integrate current technology in support of business operations. To demonstrate collaboration for effective leadership and decision making to develop strategies to initiate, plan, execute, monitor and control, and close projects in business environments.

Course Outcomes

After undergoing this course students will be able to:

- CO1: To demonstrate practical knowledge of the functional areas of business

- CO2: To demonstrate highly developed communication skills, evaluate complex financial and operational data and information for decision making

- CO3: To evaluate strategic objectives that enhance organizational effectiveness and operational performance

Course Contents

Unit 1 (Introduction to project management): introduction to project management, need for project management, project management knowledge areas and processes Project lifecycle, Phases of project management life cycle, Project Manager, Impact of delays in project competitions, Essentials of project management philosophy, Project Identification process

Unit 2 (Feasibility studies): Project Initiation, prefeasibility study, Feasibility studies, Project planning, project breakeven point, Work Breakdown Structure (WBS), Project Leader, relationship between project manager and line manager, Development of project network, CPM model, Network cost System

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Unit 3 (Scheduling and Risk management): Introduction, resource allocation, scheduling, risk management, role of risk management in overall management, steps in risk management, risk identification, risk analysis, reducing risks

Unit 4 (value Engineering): Basic concepts of value engineering, Value engineering cycle, Value engineering job plan, Types of product functions, Applications

Course Resources

a. Essential Reading

6. Class Notes
7. PROCESS PLANNING AND COST ESTIMATION,PANNEERSELVAM, R. , SIVASANKARAN, P.,PHI Learning Pvt. Ltd., 2016
8. ESTIMATION AND COSTING,BY B.N. DUTTA
9. The Art of Project management, by Scott Berkun
10. Fundamentals of Project Management by Joseph Heagney

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Course Title	Modelling and Building of Mechatronics System-2
Course Code	VMS016
Department	Department of Mechanical and Manufacturing Engineering
	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to study of given exercises or model and generate the Mechatronic system by using the MATLAB and ADAMS Platform and have a knowledge of working on basics of Robotic System

Course Outcomes

After undergoing this course students will be able to:

CO1: Modelling of Spring-Mass Damper system and its Characteristics
CO2: Modelling of Anti-Lock Braking System and difference of ABS and Non-ABS
CO3: Modelling and Understanding the concepts of Back Hoe System
CO4: Modelling and working on 6-DOF Robot Manipulator

Course Contents

Unit 1 (Spring Mass Damper): Modelling of Spring mass damper with Controller, Modelling of Three mass damper with Controller

Unit 2 (Anti-Lock Braking System): Modelling of Anti-Lock Braking System and Non Anti-Lock Braking System

Unit 3 (Back Hoe Hydraulic System): Modelling of Back hoe Hydraulic System

Unit 4 (Inverted Pendulum): Modelling of Inverted Pendulum

Unit 5 (Two Mass Train System): Modelling of Two mass train problem

Unit 6 (3-DOF Robot): Modelling of 3-DoF Robot Simulation

Unit 7 (6-DOF Robot): Modelling of 6-DOF Robot Simulation and Demonstration on 6-DOF Robot

Course Resources

a. Essential Reading
1. Class Notes
2. Devdas Shetty and Richard A kolk , (2012),Mechatronics System Design, 2Nd Edition, Cengage learning

b. Recommended Reading
1. Klaus Janschek (2014), Mechatronic Systems Design: Methods, Models, Springer

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c. Other Electronic Resources
1. Laboratory: CAD Laboratory
2. Hardware: PCs
3. Software: MATLAB and ADAMS Software

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Module Title	Mechatronics industrial standards and framework
Module Code	VMS017
Department	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering & Technology (FET)

Course Summary

The course objective is to make students to understand the importance of mechatronics industrial standards and framework in industrial applications.

Course Outcomes

After undergoing this course students will be learning about:
CO1: Key elements of Industrial Standards
CO2: Mechatronics Occupational and industrial standard Frame work

Course Contents

UNIT 1(Industrial standards-Mechatronics): Role of Industrial standards, Bureau of Indian standards(BIS), Industrial Safety standards, Standard industrial guidelines for mechatronics design, Mechatronic product – model abstraction levels in the modeling process, Mechatronic product – model abstraction levels in the modelling process-model in Mechatronics.

UNIT 2(Framework-Mechatronics): Competency based Occupational framework, a standard framework for small and medium scale mechatronics industries, Research framework for mechatronics design.

Course Resources

a. Essential Reading
   1. Class Notes
   2. IEEE/ASME Transactions on Mechatronics (Volume: 1, Issue: 1, March 1996) 1. N. Kyura Yaskawa Electric Corporation, Kitakyushu, Japan H. Oho Yaskawa Electric Corporation, Kitakyushu, Japan

b. Other resources
   3. https://www.researchgate.net/publication/320748158_A_standard_framework_for_mechatronics

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Course Title	Mechatronics Project -2
Course Code	VMS018
Department	Department of Mechanical and Manufacturing Engineering
	Department of Electronics and Communication Engineering
Faculty	Faculty of Engineering and Technology

Course Summary

The aim of the course is to prepare the students to impart the need and relevance of a structured approach to identify and undertake a project. This course provides an opportunity for students to apply theories and skills which are learnt from the academics. In case of sponsored projects, the students will carry out the project work in respective companies so that they get exposure to the real time projects.

Course Outcomes

After undergoing this course students will be able to:

CO1: Identify the need for developing a new or improving an existing product or system through
An organized survey of literature
CO2: Design and model the product or system to meet the design specifications
CO3: Evaluate and justify the performance of the modelled system
CO4: Demonstrate the working of the product or system and make a presentation
CO5: Write a technical report

Course Contents

Collection of relevant literature and review of literature
Interaction with the users and collection of data
Data Analysis, Formulation of a problem of suitable size
Writing down the design specifications
Concept generation and concept selection
Detail design calculations
Choosing a modelling environment, learning the appropriate tools and techniques
Modelling, simulation and analysis of design
Defining performance parameters, Evaluation of performance, presentation of performance characteristics,
Verification of results
Demonstration to the defined audience and making a presentation to the assessing team

Director – Training and Lifelong Learning
Ramaiah University of Applied Sciences

Dean - Academics
M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

Course Resources

a. Essential Reading
The Methodology to be followed for successful Completion of Project work
b. Recommended Reading
1. Course Notes, Manuals of Tools and Techniques Chosen to Solve the Design Problem

c. Other Electronic Resources
1. Laboratory: CAD lab, mechanical workshop and Control systems lab
2. Hardware: PC's
3. Software: AutoCAD, ADAMS, MATLAB, LABVIEW, MULTISIM

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