DAYANANDA SAGAR UNIVERSITY

Shavige Malleshwara Hills, Kumaraswamy Layout,
Bengaluru - 560078, Karnataka.

SCHOOL OF ENGINEERING

SCHEME & SYLLABUS
FOR
BACHELOR OF VOCATION

SPECIALIZATION: MECHATRONICS

(With Effect from 2018-19)

SEMESTER – 1

GENERAL EDUCATION COMPONENTS: 12 CREDITS, 180H				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CREDITS**	**HOURS**
1	18VM101	ENGLISH-I	2	30
2	18VM102	MATHEMATICS-I	3	45
3	18VM103	APPLIED SCIENCE	2	30
4	18VM104	ELECTRONICS – I	3	45
5	18VM105	BASICS OF COMPUTER - I	2	30
SKILL COMPONENTS: 18 CREDITS, 270H				
6	18VM106	APPLIED SCIENCE LAB	3	45
7	18VM107	BASICS OF COMPUTERS LAB	3	45
8	18VM108	ELECTRONICS LAB – I	4	60
9	18VM109	WORKSHOP PRACTICE – I	4	60
10	18VM110	ENGINEERING DRAWING	4	60

SEMESTER – 2

GENERAL EDUCATION COMPONENTS: 12 CREDITS, 180H				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CREDITS**	**HOURS**
1	18VM201	ENGLISH-II	2	30
2	18VM202	MATHEMATICS-II	2	30
3	18VM203	ELECTRONICS – II	2	30
4	18VM204	ELECTRICAL ENGINEERING SCIENCE	2	30
5	18VM205	MECHANICAL ENGINEEERING	2	30
6	18VM206	METROLOGY	2	30
SKILL COMPONENTS: 18 CREDITS, 270H				
7	18VM207	CADD	5	75
8	18VM208	WORKSHOP PRACTICE - II	5	75
9	18VM209	ELECTRICAL LAB	4	60
10	18VM210	ELECTRONICS LAB-II	4	60

SEMESTER – 3

GENERAL EDUCATION COMPONENTS: 12 CREDITS, 180H				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CREDITS**	**HOURS**
1	18VM301	DIGITAL ELECTRONICS	3	45
2	18VM303	COMPUTER PROGRAMMING – C,C++	3	45
3	18VM311	CONTROL SYSTEMS	2	30
4	18VM312	INDUSTRIAL ELECTRONICS	2	30
5	18VM313	MECHANICS OF MACHINES	2	30
6	19AU0009	ENVIRONMENTAL STUDIES	AUDIT	
SKILL COMPONENTS: 18 CREDITS, 270H				
7	18VM306	COMPUTER PROGRAMMING – C,C++ LAB	5	75
8	18VM308	PCB DESIGN AND FABRICATION LAB	4	60
9	18VM310	DIGITAL ELECTRONICS LAB	5	75
10	18VM314	INDUSTRIAL ELECTRONICS LAB	4	60

SEMESTER – 4

GENERAL EDUCATION COMPONENTS: 12 CREDITS, 180 H				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CREDITS**	**HOURS**
1	18VM401	MICRO CONTROLLER & APLICATIONS	2	30
2	18VM404	MEMS	3	45
3	18VM411	PYTHON PROGRAMMING	3	45
4	18VM412	PLC	2	30
5	18VM413	MEASUREMENT SYSTEMS	2	30
6	19AU0004	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS	AUDIT	
SKILL COMPONENTS: 18 CREDITS, 270H				
7	18VM410	MICRO CONTROLLER & APLICATIONS LAB	5	75
8	18VM414	PYTHON PROGRAMMING LAB	5	75
9	18VM415	PLC LAB	4	60
10	18VM416	MEASUREMENT AND INSTRUMENTATION LAB	4	60

SEMESTER – 5

GENERAL EDUCATION COMPONENTS: 12 CREDITS, 180H				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CREDITS**	**HOURS**
1	18VM513	EMBEDDED SYSTEM AND IOT	3	45
2	18VM514	PRODUCT DESIGN AND DEVELOPMENT	2	30
3	18VM515	CNC TECHNOLOGY	2	30
4	18VM516	ROBOTICS	2	30
5	18VM5XX	ELECTIVE – I	3	45
6	19AU0020	KANNADA KALI – I	AUDIT	*
SKILL COMPONENTS :18 CREDITS,270H				
7	18VM517	EMBEDDED SYSTEM LAB	3	45
8	18VM518	CNC TECHNOLOGY LAB	3	45
9	18VM519	ADVANCED PLC LAB	3	45
10	18VM520	ROBOTICS LAB	3	45
11	18VM521	PROJECT PHASE – I	6	90

SEMESTER – 6

GENERAL EDUCATION COMPONENTS: 12 CREDITS, 180H				
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CREDITS**	**HOURS**
1	18VM608	INDUSTRIAL MANAGEMENT	3	45
2	18VM609	INDUSTRIAL EQUIPMENT MAINTENANCE	3	45
3	18VM610	ADDITIVE MANUFACTURING	3	45
4	18VM6XX	ELECTIVE II	3	45
SKILL COMPONENTS: 18 CREDITS, 270H				
5	18VM611	AUTOMOTIVE ELECTRONICS LAB	4	60
6	18VM612	PROJECT PHASE II	8	210

LIST OF ELECTIVES – I

SL	COURSE CODE	COURSE TITLE
1	18VM522	ADVANCED PLC
2	18VM523	PROCESS CONTROL

LIST OF ELECTIVES – II

SL	COURSE CODE	COURSE TITLE
1	18VM613	AUTOMOTIVE ELECTRONICS
2	18VM614	ADVANCED MICROCONTROLLERS

Course code: 18VM101 Total Hours: 30 Hrs	English-I	L	T	P	C
		2	-	-	2
Course Objectives	The objective of this course is to enable students : 1. To improve their lexical, grammatical competence. 2. To enhance their communicative skills. 3. To equip students with oral and appropriate written communication skills. 4. To inculcate students with employability and job search skills.				
Course Outcomes	Students after the completion of this course will be able to : 1. Achieve proficiency in English 2. Demonstrate good oral and written communication skills 3. Write resume with reasonable competence				

MODULE-1

Understanding the alphabet, Middle and last alphabet, Final consonants, Capital & Small letters, Basic punctuation, Reading activity. Articles- 'a', 'an', & 'the, Reading activity, Writing in patterns, Reading activity, Common nouns, Proper nouns, Singular and plural nouns, writing short sentences, Reading activity. Masculine and feminine nouns.

Description of simple objects like a note book, a pen, a watch, a switch etc, Pronouns, Reading activity, Adjectives. **[05 Hrs]**

MODULE-2

Vocabulary- simple, Articles and diterminers, Information in order,Common noun, Singular and plural noun, Countable and uncountable nouns, Masculine and femine nouns, Proper nouns. Pronouns. Using word families. Adjectives, Adverbs, Verb- "Be",Prepositions, Questions, Have, Has, Do, Does, Did, Tenses, Making sentences, Connectors. **[05 Hrs]**

MODULE-3

Common noun, Proper noun, Singular and plural, Forming plurals. Possessives, Syllables, Hidden words and silent words, Using prefixes and suffixes, Proof reading for spelling errors, Adjectives of numbers- cardinal and ordinal. Action verb, Simple present tense, Simple past tense, Formation of past tense. Questions, Negative sentence, Contractions. Types of sentences. **[05 Hrs]**

MODULE-4

Common and proper noun, Collective and abstract noun, Possessive noun, Noun numbers, Adjective of quality, Adjective of number, Parts of speech. Infinitives, Tense formation, Active and passive voice, Direct and indirect speech, Writing in time, Pick a noun, Using relative pro nouns, Reading activity, Writing activity. Reading activity.

Conjunctions, writing activity, Reading activity, Types of adverbs. Comparison of adverbs, short talk, Writing activity- writing an autobiography Degrees of comparison, Reading activity, Auxiliary verb or models. Homophones, The gerund, Transitive and intransitive verbs.Tag questions, Simple conversation, Question answer session **[07 Hrs]**

MODULE-5

Sentence transformation- simple, compound, complex Common errors in English. Synonyms & Antonyms; one word substitutions.

Communication- definition-basic purpose- types- process Skills in communication-reading skills-guidelines, definition-types, Listening skills: definition-essentials for good listening- barriers-difference, between hearing & listening, Speaking skills- guidelines for effective oral communication, Writing skills- guidelines. speaking skill- activity, listening skill – activity

Business correspondence – ii: Layout & form, Types of letters: letter of request, letter of complaint, letter of enquiry

Graphic communication: Definition, types & uses uses/Interpreting graphs and figures / Drawing, graphs using a set of information. **[08 Hrs]**

Text Books:

1. English Communication - TTTI Publication
2. A Practical English Grammar - A J Thomson
3. Intermediate English Practice - Pitt. S. Corden
4. Modern Business Letter Writing - J.S Bright
5. English without tears – Bhat

Reference Books:

Day.RA., Scientific English: A Guide for Scientists and Other Professional, 2nded. Hyderabad: Universities Press,2000.

Course code: 18VM102 Total Hours : 30 hrs	MATHEMATICS-I	L	T	P	C
		2	-	-	2

Course Objectives	The objective of this course is to make the students : 1. Exposed to fundamentals of Mathematics including fractions, Logarithms, Matrices & Determinants 2. Understand concepts of Complex Numbers & Trigonometry and their applications in engineering 3. Understand the basics of differentiation and differential calculus and solve application 4. Apply the concepts of mathematics to engineering problems.
Course Outcomes	Upon successful completion of this course, the trainee will be able to: 1. Analyze and apply mathematical equations 2. Solve mathematically technical problems 3. Apply the concepts of mathematics to engineering problems.

MODULE-1

Fundamentals of Mathematics- Fractions-Definition, Types of fractions, Algebra of fractions (Addition,Subtraction, Multiplication and Division), Use of Logarithmic table, Simple problems, Logarithmic laws, Indices and Laws of Indices, Solution of linear equations, Solutions of Quadratic equations-Factorization, Using formula. **[05 Hrs]**

MODULE-2

Matrices and determinants-Definition of matrix and its types and matrix algebra, Problems on matrices addition, subtractions and multiplication, Transpose of a Matrix, Definition of determinant and its Evaluation, Properties of determinants.(Without Proof), Minors, Co-factors and Adjoint of a matrix, Inverse of a matrix, Solution of linear simultaneous equations using determinant method (Cramer's Rule). **[05 Hrs]**

MODULE-3

Complex numbers-Introduction of complex numbers, Representation of complex numbers, Algebra of complex numbers, Polar form of complex numbers, Exponential form of complex, Exercises on polar and exponential forms. **[04 Hrs]**

MODULE-4

Trigonometry-Defining the trigonometric functions, finding trigonometric values, Values of the trigonometric functions of 30°, 45°, 60° and 90°, Trigonometric functions of any angle and signs of trigonometric functions, Exercises on signs of trigonometric functions, Trigonometric identities, Exercises on trigonometric identities, Compound angles (sum or difference of two angles without proof), Exercises on compound angles, Multiple and Sub-Multiple angles, Exercises on multiple and sub multiple angles, Product formulae (No Problems), Heights and distances, Exercises on heights and distances(Simple Problems), Graphs of Trigonometric functions(Only Sin and Cos). **[08 Hrs]**

MODULE-5

Differential calculus- Limits definition and evaluation of limits (No derivations), Types of functions (only odd and even functions), Definition of derivative of a function and slope of tangent of the curve, Differentiation of algebraic and exponential funtions(Without Proof), Differentiation of trigonometric functions (Without Proof), Differentiation of sum, difference, product quotient of functions, Exercises on derivations of sum, difference, product, quotient of functions, Exercises on derivative of trigonometric functions, Derivatives functions of functions rule,Derivatives of inverse function, Differentiation of parametric equations, Successive differentiation, Application of differentiation-velocity and acceleration. **[08 Hrs]**

Text Books:

1. Technical mathematics - Rice and Knight,Mc-Graw Hill Book he.
2. Applied mathematics for Polytechnics-H.K.Dass

Reference Books:

1. Higher Engineering mathematics-B.S.Grewal
2. Higher Secondary Mathematics.

Course code: 18VM103 Total Hours: 30 Hrs	APPLIED SCIENCE	L	T	P	C
		2	-	-	2
Course Objectives	The objective of this course is to make the students understand : 1. Usages of SI units and laws of motion 2. Composition and resolution of forces and condition of equilibrium 3. Understand properties of solids and fluids 4. Understand physics of heat transfer 5. acidic, basic and neutral nature of solutions 6. Basics of Industrial and Organic Chemistry 7. Fundamentals of Modern Physics, Wave motion and Laser technology				
Course Outcomes	After successful completion of the course, the students should be able to : 1. Understand fundamentals of Force, Motion & Energy and Laws governing them 2. Apply concepts of resolution of forces and Principles of Equilibrium 3. Understand properties of solids & fluid and physics of heat 4. Understand basics of industrial & organic chemistry and their applications 5. Understand fundamentals of Modern Physics, Wave motion and Laser technology				

MODULE-1

Physical World: Physical quantities, Types of systems of units, Fundamentals and derived quantities, S.I. Units, Dimensions.

Force, Motion and Energy: Linear motion, Displacement, velocity, acceleration, Equations of motion, Problems, Newton's law of motion, Momentum, Law of conservation of momentum, Force, inertia, Work, power, energy, Law of conservation of energy, Circular motion, Angular displacement, angular velocity angular acceleration. **[06 Hrs]**

MODULE-2

Composition and resolution of Forces: Definition of composition, resultant, equilibrant, Law of parallelogram of forces, Triangle law of forces, Polygon law of forces.

Equilibrium of forces: Introduction, System of forces, Principal of equilibrium, Lamis theorem, Problems, Moments and its applications, Couple.

Center of gravity & Moment of Inertia: Introduction, Centroid of plane figures, Methods of finding out centre of gravity of plane, Axis of reference, Problems, Center of gravity of solid bodies, Moment of inertia of an irregular plane area. **[06 Hrs]**

MODULE-3

PROPERTIES OF SOLIDS AND FLUIDS: Plasticity, Elasticity, Stress, Strain, Hooke's Law, Young's modulus, Bulk modulus, Rigidity modulus, Surface tension, Capillarity, Viscosity.

Heat: Definition of heat, Thermometry, Platinum resistance thermometer, Thermocouple, Pyrometer, Calorimetry, Specific heat capacity, Heat transfer, Expansion of gas. **[06 Hrs]**

MODULE-4

Theory of Acids and Bases: Introduction, Hydrogen ion Concentration (pH Value)

Industrial Chemistry: Corrosion, Types of corrosion, Industrial Water, Disadvantages of using hard water in industry

ORGANIC CHEMISTRY: Introduction, Aliphatic hydrocarbons, Aromatic hydrocarbons (Benzene hydrocarbons), Nuclear Fission - Phenomenon of fission with example, Nuclear fusion - Phenomenon of fusion with example. **[06 Hrs]**

MODULE-5

MODERN PHYSICS: Structure of atom with schematic diagram, Radio activity, Nuclear Fission, Nuclear Fusion.

WAVE MOTION: Simple Harmonic Motion, Relation between wave velocity, frequency and wave length, Newton's Laplace equation for velocity of sound.

LASER: Meaning, materials used, types, Working principle, Application, Reflection, Refraction, Optical fiber, types, Working principle, Application. **[06 Hrs]**

Text Books:

1. Applied Science (Physics and Chemistry) - TTTI, Madras
2. Applied Mechanics and Strength of Material - R.S. Khurmi
3. Text book of Applied Mechanics – Ramamrutham

Reference Books:

1. Engineering Mechanics (Statics & Dynamics) - Irving H.Shames
2. Engineering Mechanics - S.Timoshinko & Young

Course Code: 18VM104 Total Hours :45 Hrs	ELECTRONICS - I	L	T	P	C
		3	-	-	3
Course Objectives	The objective of this course is to make the students : 1. Effectively use digital multi-meter, function generator and oscilloscope. 2. Analyze the working of dc circuits of a diode, transistor and field effect transistor. 3. Understand the characteristics of different electronic devices. 4. Test the different electronic devices for its condition				
Course Outcomes	Students after the completion of this course will be able to : 1. Identify the unique vocabulary associated with electronics and explain the basic concepts of Semiconductor diodes such as p-n junction diode, characteristics and ammeters, DC loadline, Zener diode. 2. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers. 3. To solve examples on rectifiers for parameters such as Capacitance, load and source effect, line and load regulations, and circuit current				

MODULE-1

Fundamentals of Electronics: History & development of electronics, Structure of an atom, electric charge, Movement of Electrons [Current] And Potential Difference (voltage)

Resistance & resistivity Types of Resistors Colour coding of resistors. ohm's law problems based on ohm's law resistors in series combination-simple problems resistors in parallel combination-simple problems resistors in series and parallel combination-simple problems Kirchhoff's voltage law Kirchhoff's current law. Problems based on KVL Problems based on KCL **[08 Hrs]**

MODULE-2

Capacitor and Inductor
Capacitor, capacitance
Types of Capacitor Capacitor in series Capacitor in Parallel

Inductor, inductance Types of Inductors
Alternating current, Direct current
Continuous Waveform terms and definition-Waveform, cycle, frequency, period
Instantaneous value,rms value, peak value, peak to peak value, amplitude
Relationship between frequency and time.
Revision **[08 Hrs]**

MODULE-3

Introduction to Semiconductors

Introduction to matter and its classification

Energy level Diagram, Importance of energy band in solids classification of solids on the basis of energy bands Temperature co-efficient and its classifications Intrinsic semiconductor Doping Extrinsic semiconductor extrinsic semiconductors N—type extrinsic semiconductors P-type majority and minority carriers Revision **[10 hrs]**

MODULE-4

Semiconductor Diode and Applications

Introduction to PN -Junction theory, Barrier potential PN junction under Forward bias PN junction under Reverse bias Diode, Forward and Reverse bias characteristics Ideal diode and practical diode Temperature effect on diode characteristics Application of diodes as Half wave Rectifier Application of diodes as Full wave rectifier Application of diodes as Bridge rectifier rectifiers with filters peak detector voltage multiplier-half wave doubler voltage multiplier-full wave doubler Clipper Circuits Clamper Circuits Revision **[10 hrs]**

MODULE-5

Special Diodes

Zener diode and its characteristics, Zener diode as voltage regulator

Zener and avalanche breakdown, Light emitting diode, Photodiode

Revision

Text Books:

1. Electronic principles - Malvino
2. Linear Integrated Circuits - D.RoyChoudhury&Shail Jain
3. OP-AMPS and Linear Integrated Circuits - RamakantA.Gayakwad

Reference Books:

1. Electronic devices and circuit - Allan Mottershed.
2. Electronic devices and circuit theory - Boylested & Nashelsky.

Course code: 18VM105 Total hours: 30	BASICS OF COMPUTER -I	L	T	P	C
		2	--	--	2
Course Objectives	At end of the semester the trainee would be able to understand about 1. Computer generations and architecture 2. Computer Components 3. Classification of Computers 4. Input / Output devices 5. Printers and its types 6. Secondary storage devices 7. Operating Systems and user Interfaces				
Course Outcomes	Students after the completion of this course will be able to : 1. Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components 2. Understand the difference between an operating system and an application program, and what each is used for in a computer 3. Describe some examples of computers and state the effect that the use of computer technology has had on some common products				

MODULE-1

Introduction to Computers, Computer Definition

Early History Types of Computer, Computer Architecture

Components of Computer

Essential Computer hardware Essential Computer Software Firmware

Classification of Computers **[10 Hrs]**

MODULE-2

Classification of Computers

Classification based on Size Classification based on Function Mobile Computers

Instruction to Computer Representing Data Processing Data Factors affecting the speed **[08 Hrs]**

MODULE-3

Input and Output Devices

Basic Input/output devices

Inputting and outputting data in other ways

Classification of Monitors Projectors Sound Systems **[10 Hrs]**

MODULE-4

Printer and its Types

Characteristics of Printers

Types of Printers

Other high quality printers

Plotters

Computer memory & Data Storage devices

Types of storage devices

Magnetic storage device types

Optical storage device types

Measuring Performance **[10 Hrs]**

MODULE-5

Operating System and User Interfaces

Types of User Interfaces

Operating System and functions

Example Operating Systems

Text Books:

1. Basics of Information Technology by Priti Srivastava, North Publication
2. Fundamentals of Computer by E Balagurusamy,Tata McGraw Hill Education Pvt. Ltd, New Delhi
3. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
4. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd. Jungpura, New Delhi

Reference Books:

1. MS Office by BPB Publications, New Delhi

Course Code: 18VM106 Total Hours: 45	Applied Science Lab	L	T	P	C
			--	6	3
Course Objectives	The objective of this course is to make the students: Understanding the basic instruments				
Course Outcomes	Students after the completion of this course will be able to: Familiarize and use of basic instruments				

1. Venire Callipers: Determination of volume of solid cylinder and Sphere.
2. Screw Gauge: Determination of the thickness of a thin wire and glass plate.
3. Parallelogram law: Verification of the law of parallelogram of forces.
4. Verification of the converse of the law of triangle of forces
5. Verification of Lami's theorem
6. Determination of focal length of a convex lens by u-v method
7. Determination of acceleration due to gravity by using Simple pendulum
8. Determination of spring constant of the given helical spring

Course Code: 18VM107 Total Hours: 45	Basics of Computer Lab	L	T	P	C
			--	6	3
Course Objectives	The objective of this course is to make the students : 1. Identify and list functions of various components and peripherals of given Computer 2. Exercises on entering text and data 3. Understandings of Internet				
Course Outcomes	Students after the completion of this course will be able to : 1. Familiarize with computer and peripherals 2. Familiarize with Internet and MS office.				

Exercise 1: DOS Commands

Write the syntax and definition of following commands: cls, cd, copy, copycon, Mem, Tree, ver, exit, find, sort, time, edit, erase, date,del, dir, md, rd,type.
Write the syntax for appending the content of two files, copy the output of dir command to file, listing of files and directories: dir/b, dir/l, dir/on, dir/w, definition of following commands: dir/ad, dir/oe, dir/p, dir/ar.

Exercise 2: Typing Tutorial

Familiarize typing in standard QWERTY keyboards.
Touch Typing Course: In this course, Trainee will learn the positions of the letter keys and common punctuation by heart, after completing the course you will be able to type with all ten finger without looking at the keyboard
Speed Building course: This course is designed to increase your typing Speed and confidences. The Trainee will focus on the keys for each finger, type longer texts and train with some of the most common English words
Numbers, Special marks and 10-key pad

Exercise 3: Creating Document

Create the document in word pad with following information Name, qualification, city, date of birth, phone number, and increase the size of Font to 24, make it bold, put the heading as information and align it centre.
Create your bio data in note pad with suitable formats.
Demonstrate procedure for creating, naming, renaming of a folder in computer and familiarize properties like changing the icon, hiding a folder

Exercise 4: Applications

How to open DOS, NOTEPAD, PAINT, CALCULATOR, WORDPAD THROUGH RUN. ?
How to create shortcuts, disappearing the desktop items, auto hide the Task bar?
What is Status bar, Menu bar, Taskbar, Standard Toolbar, and specify Their locations.
What is the extension of the following application: WordPad, Notepad,Paint?

Exercise 5: MS-Office

Create your CV (Bio Data) in MS-word with suitable alignments.
Create the paint file insert the picture in it by choosing from different place and modify it in WordPad. What is Border and Shading? Write the steps for applying Border & Shading to a Paragraph in WordPad.
What is Bullets and Numbering? Write the steps for applying Bullets and Numbering, and its different types in WordPad.
What is spelling and grammar check? Write the steps for this and Different option present in it in WordPad.
What is the use of Find and Replace and Goto option? Write the steps for that with example in WordPad.
Write the steps for inserting Symbols and special characters and inserting Date and Time, File, Object with example in WordPad.
Type the invitation for calling your friends on the occasion of your birthday Using mail merge, WordArt, select the field names yourself.
Write the steps for creating a table. Explain merge cells and split cells Options.
Open Ms-Excel and insert 10 sheets, apply different backgrounds to Different sheets, fill different colours in different cells.
Open Ms-Excel insert 4 sheets hide the sheet 2 and 3 and apply different Colour to sheet tabs.
Demonstrate mathematical function in MS-Excel.
How to insert Rows, Columns, Cells and Worksheet in MS-Excel?
Create the presentation about you daily activity
Create the presentation of your organization company with suitable Diagrams.
Create the presentation to explain any technology with suitable diagrams.
Create the presentation for any educational organization which should consist of hyperlinks, custom animation, slide transition
Create the DATABASES for the Company consisting of the tables:
EMPLOYEE, DEPARTMENT, DESIGNATION, ACCOUNTS. And the fields are as follows EMP: Name, City, Add, Phnoe, Place, and Id.
DEPARTMENT: Id, Dep Name, and Location. DESIGNATION: Id, Qualification, Experience, Skills. ACCOUNTS: Id, Basics , DA, HRA, PF.(MAKE ID AS PRIMARYKEY)
and create the query to select the fields as: EMP=ID, NAME, PHNO, PALCE. DEP=DEPNAME, LOCATION. DESIG=QUALIFOCATION, EXP.ACCOU=TOTAL, BASICS, DA, PF.

Exercise 6: Internet

Write the steps to create the email.
Write the steps to search the details about historical places in internet.
Write the steps to create a mail and send it your friend.
Write the steps to create a mail which should attach some data and send it to your friend.

Reference Books:

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd. Jungpura, New Delhi
3. MS Office by BPB Publications, New Delhi

Course Code: 18VM108 Total Hours: 60	Electronics Lab – I	L	T	P	C
			--	8	4
Course Objectives	The objective of this course is to make the students: 1. Aware of Lab safety procedure 2. Study and use of C.R.O. (single trace & Dual trace) for measuring frequency and amplitude 3. Study and use MULTIMETER,Diodes				
Course Outcomes	Students after the completion of this course will be able to: 1. Get familiarized to use of various soldering tools, Components & different cables. 2. Familiarise with the symbols of electronic circuit components by drawing				

1. Introduction to lab safety, procedure, rules and regulations
2. Color coding of Resistors
3. Familiarization of Function generator
4. Familiarization of CRO
5. Calculation of amplitude, time-period, frequency, using CRO
6. Familiarization of MULTIMETER
7. Familiarization of power supply
8. Active and passive components- value identification& polarity checking
9. Familiarization of Tool kit and basics of bread board connections
10. Soldering Basics
11. Ohm's law
12. Kirchhoff's current law
13. Kirchhoff's voltage law
14. PN junction characteristics of diode
15. Temperature dependence of diode
16. Half wave rectifier with and without filter
17. Full wave Centre tap rectifier with and without filter
18. Bridge full wave rectifier with and without filter
19. Clipper and clamper circuits
20. Peak Detector

Reference Lab Manual:

1. Electronic Devices and Circuits by David A Bell 4 Edition PHI
2. Hand soldering and circuit board repair by H.(Ted)Smith, Thomas Delmar.
3. Electronic instruments and systems – principles, maintenance and Troubleshooting. by R.G. Gupta.

Course Code: 18VM109 Total Hours: 60	Work Shop Practice - I	L	T	P	C
			--	8	4
Course Objectives	The objective of this course is to make the students : 1. Aware of safety aspects in handling of fitting tools and equipment and create different fitting joints 2. Fabricate various metal joining process including soldering, brazing and welding joints 3. Learn basics of development and create sheet metal models				
Course Outcomes	Students after the completion of this course will be able to : 1. Demonstrate fitting skills and create fitting joints 2. Exhibit welding, soldering & brazing skills and create models				

1. U – Channel
2. Angle Iron
3. Rod Hammering
4. Marking & Dot Punching
5. Number & Letter Punching
6. Drill Plate
7. Store Box
8. Cylinder Pipe

Text Books:

1. DSU Work shop manual.

Course Code18VM110 Total Hours : 60 hrs	Engineering Drawing	L	T	P	C
		2	-	8	6
Course Objectives	The objective of this course is to make the students : 1. Understand the importance of engineering drawing and application of computer. 2. use engineering drawing instruments competently 3. Competency to write engineering script. Understand the importance of SP46 standards 4. Ability to construct &understand standard geometrical shapes. 5. In depth practice of pictorial projection with example. & in depth practice of orthographic projection with example. 6. Understand the Importance dimensioning in engineering drawing practice with examples				
Course Outcomes	Students after the completion of this course will be able to: 1. Analyze and design the basic electronic circuits containing semiconductor devices. 2. Identify the need of Integrated Circuits and use the mineralizing circuit applications. 3. Analyze and implement basic Digital Electronic circuits for a given application. 4. Identify the applications and significance of electronics in interdisciplinary engineering domains.				

MODULE -1

Introduction - Engineering drawing: Importance of engineering drawing & role of drawing in engineering education, engineering drawing equipment's, Basic drawing instruments T-square, Set Square. Compass, dividers, mini drafter pro-circles, Drawing board & pencil. Introduction to computer aided drafting Importance of computer aided drafting, menu selection, begin new drawing editing existing menu selection practice on computers.

Basics of Engineering drawing: Features' of lettering (Selection of suitable size of letters & numbers as per SP 46). Introduction to CAD. By using screen menu, tool bar &cursor menu, button menu Practice on computer.

Exercises: Writing notes in engineering script. Introduction & explanation on utility commands, Help, End, Quit, Save, Limits, Units, function key & Drafting setting practice. Drawing sheet sizes, (as per SP 46).Scale, full scale, reduced scale, Enlarged scale (as per SP 46) lines (As per SP 46). Introduction to entity draw commands Line, absolute, relative, polar co-ordinates, direct distance entry, Points, Undo, redo, and Move. Practice on computers Title block & sheet layout, (As per SP 46) **[30 Hrs]**

MODULE -2

Dimensioning: Importance of dimensioning, Elements of dimensioning &general rules of dimensioning size of arrowhead , placing of dimension line ,projection line , value of dimension &leader lines, System &method of indicating dimensions, Arrangement of dimensions chain dimensioning, parallel dimensioning, superimposed dimensioning, combined dimensioning, superimposed dimensioning & co-ordinate dimensioning, Special indication for dimensions (dimensioning practice). **[15 Hrs]**

MODULE -3

Geometric construction: Arc joints, by using compasses, exercises, Line joints. [Circle, arc, polygon ellipse hatch Practice on computers. 1 h for computers], Terminology of different shape, Bisecting an angle ,bisecting a line, finding a center of given circle &divide a line equal and un equal Conic section Construction of ellipse. Arc intersecting method, understand about parabola& hyperbola, cycloid construction, helix construction &understand about involute, [layers, line type properties modify command erase , copy mirror ,offset Practice. **[15 Hrs]**

MODULE-4

Projection: Introduction about projections. Practice on computers. [Array, rotate, scale, trim, extend, break2 h for computer] Isometric drawings, steps involved in preparing, construction of circle in isometric view isometric drawings. Practice on computer [chamfer, fillet, stretch, explode2 h for computer] Exercise on Isometric drawings. From the reference of direct isometric view Practice on computer [edit and display command, isometric snap, object snap, iso plane. **[15 Hrs]**

MODULE-5

Ortho graphic projections, planes of projections, first angle projection and third angle projection, why second angle and fourth angle not used in engineering drawing, construction details of front view top view and side view in first angle projection Exercise on orthographic projection. Practice on computer, Exercise on Isometric drawings. From the reference of orthographic view, Identification of view & missing view. **[15 Hrs]**

Note: All the drawing exercises are performed using AutoCAD.

Text Books:

1. Machine drawing - P I Varghese and K.C John
2. SP46 - BIS
3. Engineering Drawing - N.D. Bhatt
4. IS 696 - BIS
5. IS 8000 - BIS

Reference books:

1. PSG Hand book - PSG
2. CMTI Hand book

Course code: 18VM201 Total Hours: 30 Hrs	English-II	L	T	P	C
		2	-	-	2
Course Objectives	The objective of this course is to enable students : 1. To improve their lexical, grammatical competence. 2. To enhance their communicative skills. 3. To equip students with oral and appropriate written communication skills. 4. To inculcate students with employability and job search skills.				
Course Outcomes	Students after the completion of this course will be able to : 1. Achieve proficiency in English 2. Demonstrate good oral and written communication skills 3. Write resume with reasonable competence				

MODULE-1

Business correspondence 2: **Documents for internal communication**, internal note, Memorandum- Format Incident report (Theft, internal clash, facility problems) **[05 Hrs]**

MODULE-2

Business correspondence 3: Technical writing: Importance and types of formal report. Layout of a technical report. Procedure of writing a report.

Business correspondence 4, Meeting and its documentation, Notice and agenda, Minutes of meeting [**06 Hrs]**

MODULE-3

Writing activity, Description: Physical description. writing a set of instructions: *for any of your labs/ work shop/ equipment/machines. * to ride a bike/to make a cup of tea/ an omelet/to bake a cake,etc. **[06 Hrs]**

MODULE-4

Public Speaking, Shop talk. Oral presentation of technical information Stages: Topic selection planning- collection of information-outlining-developing the technical content-attaching introduction and conclusion –practice-rehearsal and feedback ,Presentation skills: Personal appearance- posture- gesture-voice speed – language- pauses- eye contact- visual aids-articulation time Management. **[06 Hrs]**

MODULE-5

Recruitment Process, Resume and cover letter,Job interview-tips to face interviews successfully, Mock interview.Group discussion: Rules –do's and don'ts – qualities to be observed in candidates. GD- practice sessions **[07 Hrs]**

Text Books:

1. Dhanavel.S.P. English and Communication Skills for Students of Science and Engineering**,** Orient Black swanLtd., 2009.
2. Meenakshi Raman and Sangeetha Sharma**.** Technical Communication-Principles and Practice, Oxford UniversityPress, 2009.

Reference Books:

1. Day.RA., Scientific English: A Guide for Scientists and Other Professional, 2nded. Hyderabad: Universities Press,2000.
2. Intermediate English Practice - Pitt. S. Corden

Course code: 18VM202 Total Hours : 30Hrs	Mathematics-II	L	T	P	C
		2	-	-	2

Course Objectives	The objective of this course is to make the students : 1. Exposed to fundamentals of Mathematics including fractions, Logarithms, Matrices & Determinants 2. Understand concepts of Complex Numbers & Trigonometry and their applications in engineering 3. Understand the basics of differentiation and differential calculus and solve application 4. Apply the concepts of mathematics to engineering problems.
Course Outcomes	Upon successful completion of this course, the trainee will be able to: 1. Analyze and apply mathematical equations 2. Solve mathematically technical problems 3. Apply the concepts of mathematics to engineering problems.

MODULE-1

PERCENTAGE, RATIOS AND PROPORTIONS, Simple Problems (like if percentage is given find the number and vice versa) **[03 Hrs]**

MODULE-2

ANALYTICAL GEOMETRY: Area and perimeter of triangle, Areas and perimeter of Rectangle.Area and perimeter of Square, Area and perimeter of Parallelogram,Area and perimeter of Rhombus, Area and perimeter of Trapezium, Area and perimeter of Circle, Length of an arc, Area of sector(Direct Problems),Cartesian Co-Ordinates, Equation of axis, Distance formula, Section formula & midpoint,(Direct Problems),Definition of Centroid of Triangle(Direct Problems),
Slope: Definition, finding slope of straight line using (given two points, equation of a line and angle) , Condition for Perpendicularity and parallelism(Simple Problems). Equation of straight line: a) Y=mx+c, b) Point slope form c) Two point form d) Intercept form

Circle-Definition, Standard form (centre(h,k)and radius r), General Equation of a circle (Simple problems) to find center and radius ,Basic concept of parabola, To find focus, vertex, directrix and axis of the parabola, Basic Concept of Ellipse, length of major and minor axis. Basic Concept of Hyperbola, length of transverse and conjugate axis. **[10 Hrs]**

MODULE-3

3D Shapes, T.S.A, L.S.A and Volume of Cylinder , T.S.A, L.S.A and Volume of Cube, Cuboid, T.S.A, L.S.A and Volume of Cone, T.S.A, L.S.A and Volume of Sphere, T.S.A, L.S.A and Volume of Hemi-Sphere, T.S.A and Volume of Pipe **[05 Hrs]**

MODULE-4

Integral calculus and differential equations, Define Integrals of function and standard formulae of trigonometric functions, Problems using standard formulae. Integration by parts. Definite Integral and evaluation of definite integrals and simple problems.

Area under plane curves – simple problems. Define differential equations with example. Define order and degree of differential equations. Solve differential equations of the type a) $ad^2y/dx^2 + b\ dy/dx + cy = 0$ b) $ad^2y/dx^2 + b\ dy/dx + cy = e^{mx}$ **[07 Hrs]**

MODULE-5

Statistics**,** Mean, Median and Mode (Raw Data), Rage and Standard Deviation. Problems on above methods. **[05 Hrs]**

Text Books:

1. Technical mathematics - Rice and Knight, Mc-Graw Hill Book he.
2. Applied mathematics for Polytechnics-H.K. Dass

Reference Books:

1. Higher Engineering mathematics-B.S. Grewal
2. Higher Secondary Mathematics.

Course code: 18VM203 Total hours: 30	Electronics-II	L	T	P	C
		2	--	--	2
Course Objectives	The objective of this course is to make the students understand: 1. Understand the transistor operations and its applications. 2. To study and analyze the operation of Differential amplifier. 3. To familiarize with Op-Amp parameters. 4. To study the linear and non linear applications Op Amp . 5. Understand the operation of voltage regulators.				
Course Outcomes	Upon successful completion of this course, the trainee will be able to: 1. Familiarize Transistors, BJT and FET 2 Familiarize with OPAM, Filters and power supply				

MODULE-1

Transistors: Basic structure of a Transistor, Transistor operation, Transistor parameters-alpha, beta & characteristics- input, output, DC LOADLINE,Q Point, importance of Q point & biasing, Transistor biasing –emitter, collector feedback, voltage feedback, Configuration characteristics –CC, CB, CE, Transistor rating and specifications – current, voltage, power, Temperature etc.

Transistor applications, Basics of JFET & MOSFET, Transistor applications- as a switch (using LED, Relay), As a constant current source, as an inverter(NOT gate). Concept of amplification – transistor amplifiers, coupling Bypass capacitors. Cascaded amplifiers –need of cascading, power calculating Equation. **[15 Hrs]**

MODULE-2

Basics of JFET & MOSFET, Basics of JFET –symbol, structure, operation, applications, MOSFET-symbol, structure, operation, applications.

Power amplifier, Amplifier Terms –DC Load Line –AC Load Line, Classes operations, Types of coupling and Frequency ranges, Power rating of a Transistor, Frequency effects –Frequency Response Of an amplifier Decibel Power. **[12 Hrs]**

MODULE-3

Differential Amplifiers: Introduction about differential amplifier, DC and AC Analysis of Differential amplifiers, Input characteristics, common mode gain and CMRR

OPEARTIONAL AMPLIFIERS: OPERATIONAL AMPLIFIERS-Introduction & Pin, Configuration Of OP AMP 741, Block Diagram of 741 OP- AMP, OP-AMP Parameters –Slew Rate, Bias, Offset,Input & Output Impedance, Ideal OP-AMP and Open loop operation of OP-AMP, Datasheet of OP- AMP 741 **[03 Hrs]**

MODULE-4

LINEAR OPERATIONAL AMPLIFIER: Linear Circuits- inverting, non-inverting amplifiers, applications, voltage follower, instrumentation & summing amplifiers, current boosters & current sources.

NON LINEAR OPERATIONAL AMPLIFIER: NON LINEAR OP – AMP CIRCUITS – comparator, Zero crossing detector, inverting & differentiator, Wave form generators, a) square, triangular, saw tooth, b) Active diode circuits. **[08 Hrs]**

MODULE-5

Filters & Oscillators: Ideal Responses, Low Pass and High Pass Filters, Band pass, Band stop and All pass Filters, Sinusoidal Oscillators, RC and LC Oscillators, Timer IC 555 – Pin configuration , Monostable, Astable Operation and its application.

REGULATED POWER SUPPLIE: Power Supply characteristics, Series and Shunt Regulators, Linear and Switching Regulators, Variable Regulators - LM 317 **[04 Hrs]**

Text Books:

1. Electronic principles - Malvino
2. Linear Integrated Circuits - D.RoyChoudhury&Shail Jain
3. OP-AMPS and Linear Integrated Circuits - RamakantA.Gayakwad

Reference Book:

1. Electronic devices and circuit - Allan Mottershed.
2. Electronic devices and circuit theory - Boylested & Nashelsky.

Course code: 18VM204 Total Hours : 30	Electrical Engineering Science	L	T	P	C
		2	-	-	2
Course Objectives	The objective of this course is to make the students understand: 1. The importance of basic principles of electrical electronics for industrial application. 2. Electrical and Electronic measuring instruments and their usage 3. Working principles of Electrical motors				
Course Outcomes	Students after the completion of this course will be able to: 1. Learn basic concepts and working of electrical devices. 2. Apply the electronic and electrical measuring instruments for practical applications.				

MODULE-1

POWER SOURCES: Classification of power sources, Electrochemical primary and secondary batteries and introduction to fuel cells

NETWORK THEOREMS, Kirchhoff's laws, voltage sources and current sources, Source conversion, simple problems in source conversion. Superposition theorem, simple problems in super position theorem, Thevenin's theorem, Norton's theorem, simple problems, Reciprocity theorem, Maximum power transfer theorem, simple problems, Delta/star and star/delta transformation. **[04 Hrs]**

ELECTROSTATICS AND CAPACITANCE: Static electricity, absolute and relative permittivity of a medium, laws of Electrostatics, electric field, field strength, electric flux density energy stored in a capacitor, Charging and discharging of a capacitor, current voltage relationships in a capacitor.

MODULE-2

MAGNETISM: Basic definition of flux, m.m.f, reluctance, relation between B,H,I, Comparison between electric and magnetic circuits. **[04 Hrs]**

ELECTROMAGETISM AND INDUCTION: Relation between magnetism and electricity, production of induced e.m.f and current and Faraday's laws of electromagnetic induction, Direction of induced e.m.f and current-Lenz's law–self-inductance and mutual inductance, Magnetic hysteresis, residual magnetism, energy stored in magnetic field Rise and decay of current in inductive circuits.

SINGLE PHASE A.C. CIRCUITS: Generation of alternating voltage and current, Different forms of E.M.F equations, A.C. through R, L and C and power factor, AC through R,R-C and R-L series and parallel circuits, Active and reactive components of circuit & Active, reactive and apparent Power

MODULE-3

POLY PHASE A.C.CIRCUITS: Generation of Poly phase Voltages, Phase Sequence, Star or Wave (Y) connection - Values of Phase currents Voltages in star and delta connection.

TRANSFORMERS: Definition, Construction & Principle of operation, Types of Transformers, E.M.F Equation and Voltage Transformation Ratio, Tests on Transformers – OC & SC Test, Losses & Efficiency of a Transformer, Three Phase Transformer and connections, Auto Transformers& Instrument transformer –Principle & Working.

DC GENERATORS: Generator Principle, Construction & working, Parts of a Generator, EMF equation of Generator, Losses and Efficiencies in DC Generators, Characteristics of DC generators. **[06 Hrs]**

MODULE-4

DC MOTORS: Motor Principle, Comparison of motor and generator principle, Back EMF and Voltage Equation of a Motor, Torque, Armature Torque and shaft Torque, Rated Speed and speed regulation and sped control of D.C.Motors, Selection parameters of DC Motors.

MOTOR CHARACTERISTICS, T vs la, N vs la of A DC Shunt and series motor, T vs la, N vs la of A DC Compound motor.

INDUCTION MOTORS: Classification of AC Motors, Single Phase and Three Phase Induction Motors, General Principle & Construction, Starting of Induction Motor, Relationship between Slip, Torque, Power Stages in Induction Motor, Speed control of an Induction Motor. **[06 Hrs]**

MODULE-5

SPECIAL PUPOSE MOTORS: Universal motors and its specialty, Stepper Motors and PMDC Motor, Introduction to servo Motors.

ALTERNATORS: Basics Principle & Details of Construction, Stationary Armature & Rotor, Speed and Frequency Relation **[07 Hrs]**

Text Books:

1. Electrical Technology Vol 1 &2 by B.L. Theraja
2. Electrical Technology by Hughes

Reference Books:

Electrical, Electronic Measurements and Instruments by Sahney

Course Code: 18VM205 Total Hours :30	Mechanical Engineering	L	T	P	C
		2	-	-	2
Course Objectives	The objective of this course is to make the students understand: 1. Trainees will be able to understand the mechanical concepts used in various machines. 2. To understand various manufacturing methods used in a company. 3. To understand various cutting tools and work holding devices used in conventional machines.				
Course Outcomes	Students after the completion of this course will be able to: 1. Familiarize hand tools for benchwork 2. Familiarize with Conventional Machine 3. Familiarize with Manufacturing methods				

MODULE-1

ENGINEERING MATERIALS: The structure of materials; origin of engineering materials, forming engineering materials from the elements, properties. The solid state, Material classification-metals-ceramics-polymers, Properties and selection-types of polymers. **[05 Hrs]**

MODULE-2

HAND TOOLS FOR BENCH WORK: safety;Metal working hand tools and devices: Work bench - vices, types of vices, Files: Specification of files - parts of files - different types of files. Hammers: Parts of hammer - use of hammer - specification of hammer - types of hammers: ball peen hammer - cross peen hammer - straight peen hammer. Hacksaw: Different types of frames - parts of the blade - types of blades - setting of saw teeth - material of blade - selection of blade - fixing of the blades. Chisel: Different types of chisels - designation of the chisel. Screwdrivers, Spanners: Different types of spanners- Use method. **[05 Hrs]**

MODULE-3

CONVENTIONAL MACHINES: Types of drills-materials of drills, Drilling machine-parts- machine-block diagram, types of drilling machine, work, tool holding devices, tool holding devices, drilling machine operations, and. Speed time calculation. Milling Machine, types of milling machine-parts, machine-block diagram, milling cutters- milling process, up milling, down milling, materials of cutters, work holding devices, speed calculations. Lathe, functions of lathe-block diagram, types of lathe, lathe parts, work holding devices, lathe operations, taper turning, lathe cutting tools. Grinding Machine. Kinds of grinding, surface grinders-four types, surface grinding, machine-operations, wheels-Types of wheels, cylindrical grinding machine, work holding devices, wet and dry grinding. cutting tool materials. Cutting fluids and its importance. **[04 Hrs]**

MODULE-4

MANUFACTURING METHODS: Introduction to various methods of manufacturing like forming, joining methods (fabrication), Forming process- An over view on casting, forging, rolling, drawing,press work, etc, Joining methods-Temporary joints like screws, bolts, nuts, keys and cotters. Permanent joints like Rivets- Types and types of riveted joints, Arc and Gas welding. (Injection Moulding) **[05 Hrs]**

Text Books:

1. Elements of workshop technology volume 01- Hajra choudhury.
2. Elements of workshop technology volume 02- Hajra choudhury.

Reference Books:

1. Production technology-O P Khanna.

Course code: 18VM206 Total hours: 30	Metrology	L	T	P	C
		2	--	--	2
Course objectives	The objective of this course is to make the students : 1. To understand the importance of inspection, measuring instruments in industries. 2. Awareness of limits, fits and its tolerance and its importance in manufacturing. 3. To understand the errors in measurements and calibration importance.				
Course Outcomes	Students after the completion of this course will be able to : 1. Explain the basics of standards of measurement, limits, fits & tolerances industrial applications. 2. Identify the uses of gauges and comparators 3. Understand the significance of measurement system, errors, transducers, intermediate modifying and terminating devices				

MODULE-1

INTRODUCTION TO METROLOGY: Definition and concept of metrology need of inspection, principles of measurements, process of measurements, methods of measurements, measuring system and accuracy of measurements, precision and accuracy. Linear measuring instruments, steel rule, calipers-inside and outside, vernier caliper, micrometer, error surface plate, angle plate, v-block, feeler gauge, radius gauge, wire gauge. Introduction precision measuring instruments- vernier caliper, vernier height gauge, micrometer. **[08 Hrs]**

MODULE-2

LIMITS FITS AND TOLERANCE: Introduction; limits, tolerance, system of writing tolerance, unilateral, bi-lateral system; relation between tolerance and cost. Maximum and minimum metal limits; conventional diagram for limits and fits, terminology for limits. Types of fits, allowance, system obtaining different types of fits; hole basis and shaft basis system. Types of assemblies; interchangeability; selective assembly. **[08 Hrs]**

MODULE-3

GAUGES: Introduction; gauges-its types, plain gauges, limit plug gauges, snap, adjustable type, Materials for gauges. work shop gauges, inspection gauges, Slip gauges; wringing of slip gauges, selection of slip gauge. **[04 Hrs]**

MODULE-4

ERRORS IN MEASURMENTS AND CALIBRATION: Introduction; Measurement error, types, controllable and systematic error. random error Calibration; its needs, calibration procedure, calibration of vernier caliper, Screw thread measurement; terminology, errors in thread, pitch errors, measurements of various elements of thread. **[05 Hrs]**

Module-5 Measurement of Power and Flow [05 Hrs]

Text Books:

1. Elements of workshop technology volume 01- Hajra choudhury.
2. Elements of workshop technology volume 02- Hajra choudhury.

Reference Books:

1. Metrology- M Mahajan.

Course Code: 18VM207 Total Hours : 75 Hrs	CADD	L	T	P	C
		-	-	10	5
Course Objectives	The objective of this course is to make students : 1. Understand Concept of CAD, Tool bars in CAD, coordinate system, snap,grid, and ortho mode 2. Understand Drawing commands – point, line, arc, circle, ellipse.				
Course Outcomes	Students after the completion of this course will be able to: 1. Familiarize with CAD system 2. Familiarize with orthographic Projections.				

LIST OF EXPERIMENTS

INTRODUCTION TO CAD: Importance of CAD, menu selection, begin new drawing, editing existing practice simple drawing, Co-ordinate system in CAD-absolute, relative and polar, Introduction to utility commands-Help, End, Quit, Save, Limits, Units-practice, Introduction to entity draw commands-Line, Point circles, Oops Undo, Copy, Move practice, Introduction to display commands-Zoom, Pan, Redraw-practice, Layers and its uses, Various file formats – export and import of files

ORTHOGRAPHIC PROJECTIONS CONTINUED: Exercises on drawing the 3 views of different types of objects in 1st angle projection

Text Books:

1. Auto CAD 2000: George Omura

LIST OF EXPERIMENTS

1. Try-square
2. Left Hand Knife Tool Grinding
3. Taper Plug Gauge
4. Stud
5. T-Nut
6. Channel Milling
7. Parallel Block Grinding
8. Tray
9. T – weld (Welding Exercise)

Text Books

DSU Work shop manual.

Course code: 18VM208 Total Hours: 75	Workshop Practice – II	L	T	P	C
		-	-	10	5
Course Objectives	The objective of this course is to make students : 1. Introduce to importance of different angles required for single point cutting tool. 2. Practicing for different angle grinding on pedestal grinding machine. 3. Introduce to lathe machine and different turning operations. 4. Practicing various turning operations such as straight, step, taper etc. 5. Practicing of die passing on lathe machine. 6. Introduce to milling machine and different milling operations. 7. Practicing the setting of work piece on machine. 8. Practicing of various milling operations such as face, step milling etc. 9. Introduce to surface grinding, cylindrical grinding machine and its operations. 10. To understand the importance of grinding and practicing different surface grinding. 11. Practicing sheet metal fabrication and to understand its importance. 12. Introduce to welding process and welding machine. 13. Practicing edge preparation and welding operation.				
Course Outcomes	Students shall be able to 1. Familiarize with various workshop tools and practices.				

Course code18VM209 Total Hours: 60	Electrical Lab	L	T	P	C
			-	8	4
Course Objectives	Students after the completion of this course will be able to: 1. Familiarize students with electrical Wiring 2. Familiarize students with transformers 3. Introduction to Motors and Generators				

Course outcomes	Students after the completion of this course will be able to: 1. Understand Stair case wiring 2. Have acquired the proper procedure of plugging and unplugging Transformer 3. Understand various motors and Generators

LIST OF EXPERIMENTS

ELECTRICAL WIRING: Staircase wiring, Go down wiring, 2 Lamps by 1 switch, Parallel and Series wiring, One lamp by one switch, Extension box

TRANSFORMERS: Transformer familiarization, Transformer ratio, polarity test and measurement of internal resistance, Open circuit test and short circuit test on transformers, Load test on single phase transformer, Three phase transformer star and delta connection

GENERATORS: Familiarization of generators

MOTORS: Familiarization of timer/contactors, starting of 3-phase induction motor by auto-Transformer, Starting of 3-phase induction motor by DOL Starter. Automatic starting of three phase induction motor. Automatic starting of two 3-phase induction motor.

Reference Books:

1. ALTERNATING CURRENT MACHINES – A. Langsdorff
2. ELECTRICAL MACHINES – BHIMBRA
3. AC COMMUTATOR MOTORS – Taylor

Course code18VM210 Total Hours: 60	Electronic Lab – II	L	T	P	C
			-	8	4

Course Objectives	Students after the completion of this course will be able to: 1. Familiarize students with basic laboratory instruments used in circuits and electronics 2. Introduce laboratory techniques to implement and analyze electronic circuits 3. Familiarize students with various circuit and electronic devices and their applications
Course Outcomes	Students after the completion of this course will be able to: 1. Understand the application of Transistor 2. Understand OPAMP 3. Understand the usage of IC 555 for various applications

LIST OF EXPERIMENTS

Transistor Characteristics:
a. Ic vs IB
b. VBEvs !B
c. VBE vs lc

Transistor as switch,
Characteristics of FET.
JFET as switch
Familiarization of IC 741 & Verification of its Parameters.

Op Amp Applications – Voltage Follower, Summing Amplifier.
Design and Verification of Inverting Amplifier Circuit.
Design and Verification of Non Inverting Amplifier Circuit.
Op Amp as Comparator with Zero and Non Zero references.
Op Amp as Integrator and Differentiator.
Op Amp as Schmitt Trigger.
Op Amp as Filter Circuits and Study of Frequency Response LPF, HPF, BPF)
Op Amp as RC Phase Shift Oscillator.

Monostable Multivibrators using IC 555
Astable Multivibrators using IC 555

Familiarisation of Fixed Regulators – 7805, 7905
Familiarisation of Variable Regulators – LM 317.

Text Books:

1. Electronic Devices and Circuits by David A Bell 4 Edition PHI
2. Hand soldering and circuit board repair by H.(Ted)Smith, Thomas Delmar.

Reference Books:

1. Electronic instruments and systems – principles, maintenance and Troubleshooting. by R.G. Gupta.

SEM/YEAR : THIRD/SECOND
COURSE CODE : 18VM301
TITLE OF THE COURSE : DIGITAL ELECTRONICS

Course Objectives:

1. Understand number systems and codes and their application to digital circuits and
2. understand Boolean algebra, Karnaugh maps and its application to the design and
3. characterization of digital circuits.
4. Analyze a given combinational or sequential circuit using Boolean algebra as a tool
5. to simplify and design logic circuits.
6. Understand the logic design of programmable devices, including PLDs
7. Demonstrate various synchronous & Asynchronous counters and Universal Shift
8. Registers.

Course Outcomes:

1. Infer different Number systems, Codes, Logic Gates, Boolean laws and theorems.
2. Apply the knowledge of Boolean algebra to deduce optimal digital circuits.
3. Construct & Implement different types of combinational logic circuits using Logic gates
4. Develop and test different types of Sequential logic circuits using flip flops, counters
5. Design State Machines and sequence generators & sequence detectors
6. Modify traditional design techniques to yield innovative designs

MODULE-1

Introduction to Digital System
Difference between Analog and Digital Systems
Logic Levels and Pulse Waveforms
Importance of digital circuits
Decimal, Binary, Octal, Hexadecimal Numbers
9's & 10's Complements - 1's & 2's Complements
Conversion of Number Systems
BCD Code - Digital Codes – Weighted and Non-weighted Codes
Perform Arithmetic operations on all basic number system **[09 Hrs]**

MODULE-2

Inverter, AND, OR, NAND, NOR, EX-OR, EX-NOR gate
Universal Property of NAND & NOR
Boolean Operations, Logic Expression
Rules and Laws of Boolean Algebra
De Morgan's Theorem
Simplifications of Boolean Expressions-- Karnaugh Map of 2Varible,3 Variable & 4 Variable

QM/ Tabular Method for Boolean Simplification [09 Hrs]

MODULE-3

Combinational logic: Half and Full Adders, Applications
Explain the Concept, comparison and Applications of Serial adders & Parallel adders
Explain the Concept of Magnitude Comparators (1 bit, 2 Bit & 4 Bit comparator)
Explain the Concept of Decoder, Encoder & code conversion circuits
Multiplexers **(1:N MUX)** and De multiplexers/**Decoder(N:1), Boolean Simplification using MUX, Encoders**
Parity Generators and Checkers –Even & odd Parity
Operating Characteristics & Applications of Flip Flops
Sequential Circuits clock & explain the types of triggering
Latches & Flip Flops – Different Types of Flip Flops
Operation of R-S, D, J-K& T Flip flop, **Flip flop conversion**
Positive & Negative edge triggered Flip flop & Importance of synchronous and asynchronous signals

MODULE- 4

Types of Registers - SISO, SIPO, PISO, PIPO and application
Bidirectional Shift Registers, Introduction to IC Shift Registers
Shift Register Counters-Ring Counter & Johnson Counter with timing diagrams & application

Introduction to Counters & Modulus of a counter
Asynchronous Counters
4- Bit binary counter using IC 7493/IC 74293 Decade counters using IC 7490/IC 74290
MOD-N counters using flip flop
4-bit Synchronous counters - using flip flop.
Synchronous counters using IC 74161
Up/Down Counters – Synchronous & asynchronous
Counter Design
Applications of counters **[09 Hrs]**

MODULE-5

Introduction to PAL, PLA, PROM, **Implementation of Boolean expressions, VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries,**
VHDL model for a counter. [09 Hrs]

Text Books:

1. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
2. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 3rd Edition.1998.
3. The Designer's Guide to VHDL, Third Edition (Systems on Silicon) 3rd Edition

Reference Books:

1. Switching & Finite Automata theory – Zvi Kohavi, TMH, 2nd Edition
2. Modern Digital Electronics by RP Jain, TMH.
3. **E-course**: https://www.udemy.com/course/vhdl-and-fpga-development-for-beginners-and-intermediates/

SEM/YEAR : THIRD/SECOND
COURSE CODE : 18VM311
TITLE OF THE COURSE : CONTROL SYSTEMS

Course Objectives:

1. Understanding types of control systems and block diagram of an open loop and closed loop control systems
2. Modeling and transfer function evaluation of control system elements and components
3. Modeling and analysis of speed control and velocity control servo system

Course Outcomes:

1. Identify open and closed loop control system
2. Formulate mathematical model for physical systems
3. Simplify representation of complex systems using reduction techniques.
4. Analyze performance characteristics of system using Frequency response method

MODULE-1 **[08 Hrs]**

Introduction to Control System

Control System - System Definition, Control System Definition, Difference between System & Control System, Control System Classification, Examples, Advantages & Disadvantages, Basic Elements of Closed Loop Control System and Difference between Open Loop & Closed Loop Control System. Transfer Function of Control System & Feedback Types Mathematical modeling of a System. Translational Mechanical system and Basic elements, Translational motion in mechanical System, Mathematical modeling of a Translational System. Rotational Mechanical system and Basic elements, Rotational motion in mechanical System, Mathematical modeling of a Rotational System.

MODULE-2 **[08 Hrs]**

Components of Control System

Introduction to Control System Components - Block diagram of Closed loop control system - Basic components of closed loop control system - Devices used for Control system Components. Controllers in Control System - Function, Uses, Types & Advantages

MODULE-3 **[08 Hrs]**

Time response analysis- Transient Response, Steady State Response, Test signals, Response of First Order System, Response of Second Order System, Time Domain Specifications. Steady State Errors-Definition, Steady State Errors for Unity Feedback Systems Stability - Definition of Stability, Analysis of Stable, Unstable, Critically stable and Unconditionally stable. Relative stability, Stability relationship with poles. Frequency response analysis - Introduction, Frequency domain specifications, Methods of Frequency Response Analysis in Control system, Stability Analysis using Bode Plots

MODULE -4 **[06 Hrs]**

Basics of Process Control and Control methods - Introduction to Process Control, Terms and definitions of Process control and Control methods - Cascade control & Feed forward Control. Adaptive Control System - Introduction, Definition of Adaptive Control Machining, and Functions of Adaptive control system. Computerized Process Control - Role of Computer in measurement and Process control, Basic Components of Computer based measurement and Control System, Case Study, Types of Computerized Process Control & Advantages of Computers in Measurement and Control.

Text Books:

1. Control systems, A Nagoor Kani, (RBC Publishers-First Edition)
2. Computer Control of Manufacturing Systems, Yoram Korner, (TATA McGRAW-Hill- 2005 Edition)

Reference Books:

1. Process Control Instrumentation Technology, Curtis D. Jhonson, (PEARSON Education - Seventh Edition)
2. Control Systems Principles and Design, M. Gopal, (TATA McGRAW-Hill)

SEM/YEAR : THIRD/SECOND
COURSE CODE : 18VM303
TITLE OF THE COURSE : COMPUTER PROGRAMMING – C,C++

Course Objectives:

1. Acquire the knowledge about computer hardware and software.
2. Learn the problem solving techniques.
3. Gain knowledge in C and C++ programming.
4. Gain knowledge in implementing Data Structure using C

Course Outcomes:

1. Demonstrate the basic knowledge of computer hardware and software.
2. Ability to write algorithms for solving problems in C and C++.
3. Ability to draw flowcharts for solving problems in C and C++
4. Ability to select the data structures that efficiently model the information in a problem.
5. Ability to assess efficiency trade-offs among different data structure implementations or combinations.

MODULE-1 **[09 Hrs]**

Introduction to Computing – Computer Systems-Hardware and Software, Computer Languages, Algorithm, Flowchart, Representation of Algorithm and Flowchart with examples. Introduction to C– History of C, Features of C, Structure of C Program, Character Set, C Tokens-Keywords, Identifiers, Constants, Variables, Data types, Operators.

MODULE-2 **[09 Hrs]**

Selection statements (Decision Making), Repetition statements (loops), Unconditional statements, Functions, Arrays,Strings, Pointers, Structures

MODULE-3 **[09 Hrs]**

Object oriented Programming,Functions,Class and destructor, Operator overloading and Type Conversion

MODULE- 4 **[09 Hrs]**

Inheritance and polymorphism, **Console IO operations, Working with files**

MODULE-5 **[09 Hrs]**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

Text Books:

1. Let Us C - Yashvant Kanetkar, BPB publications, 16th Edition, 2017
2. Object-Oriented Programming with C++ - Balaguruswamy, McGraw-Hill, 4th Edition, 2008.
3. Data structures, Algorithms, and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.

Reference Books:

1. The C Programming Language - Brian W. Kernighan / Dennis Ritchie, PHI publications, 2nd Edition, 2105
2. Object Oriented Programming using C++, Robert Lafore, Galgotia publication 2010
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

SEM/YEAR : 3rd SEM
COURSE CODE : 18VM312
TITLE OF THE COURSE : INDUSTRIAL ELECTRONICS

Course Objectives:

1. Design and troubleshoot circuits for demagnetizing inductors with switch.
2. Selections of Power switch for a given application.
3. To understand the working of Drive Circuits
4. To understand the working and specifications of UPS Analyze and evaluate performance parameters of AC and DC motors.

Course Outcomes:

1. The student will have an in-depth understanding of the theory of electrical energy conversion using power electronic systems
2. Understanding the applications within renewable energy, energy saving and industrial applications.
3. Discuss the device properties and its working principle.

MODULE-1 [10 Hrs]

Introduction to Industrial Electronics

Introduction Power Electronics Vs. Linear Electronics. Scope & Applications of industrial electronics. POWER DIODE - Construction, Operation, Characteristics. IGBT - Construction and working.

Introduction to Thyristor Family

SCR – Construction, Operation, Characteristics, Triggering and commutations methods.GTO - Construction and working, TRIAC - Construction and working. Introduction to new members of the family, SUS – Silicon Unilateral Switch and SBS – Silicon Bilateral Switch RCT – Reverse conducting Thyristor and LASCR – Light Activated Silicon Controlled Rectifier, SITh or SITS-Static Induction Thyristor and MCT – MOS Controlled Thyristor.

MODULE-2 [10 Hrs]

Control of DC Drives And AC Drives

Introduction to DC Drives: Need of Drives, DC Machine basic equations, Braking modes of DC drives, Speed control methods for DC Machines. Types of DC drives Single phase DC motor drives. Three phase DC motor driver Chopper drives, Closed loop control of DC drives, PLL control of DC drives, Microcomputer control of DC drives

Introduction to AC drives: Introduction to AC Motor drives, Advantages and dis-advantages of AC Drives, Torque - speed characteristic of induction motor, Speed control of induction motor - Stator voltage control, Variable frequency control, Rotor resistance control, Slip power recovery scheme.

MODULE-3 **[10 Hrs]**

Programmable Logic Controller

Evolution – advantages over relay logic, Introduction to PLC – Relays, Block diagram of PLC - PLC Programming Languages - Arithmetic Functions – (add, sub, mul, div,) – Comparison of functions- Basics of Input and output module (digital input and output module) - Logic functions- AND logic, OR logic, NAND logic, EX-OR logic -symbols used in ladder logic diagram.

Text Books:

1. James T Homphires & Lestie P Sheets, "Industrial electronics", P sheets publications.
2. M H Rashid "Power Electronics Circuits Devices & applications", Pearson publications.
3. Programmable Logic Controllers - "Frank D Petruzela" PHI publications.

Reference Books:

1. Industrial & Power Electronics By Harish C Rai, Umesh Publication, 5 th Edition 1994
2. Programmable Logic Controllers – Principles and applications - John W. Webb. Ronal A.Reis PHI publications 2017
3. Programmable Logic Controller –Pradeep Kumar & Srivashtava- BPB Publications

SEM/YEAR : THIRD/SECOND
COURSE CODE : 18VM313
TITLE OF THE COURSE : MECHANICS OF MACHINES

Course Objectives:

1. To make the student familiar with commonly used mechanism for industrial application.
2. Understand the fundamentals of the theory of kinematics of machines
3. Understand techniques for studying motion of machines and their components.

Course Outcomes:

1. Identify mechanisms in real life applications
2. Perform kinematic analysis of simple mechanisms.
3. Knowledge on different types of Drives, Gears

MODULE-1 **[10 Hrs]**

Introduction to Simple Machines

Definitions – Work, Energy, Load, Effort, Mechanical advantages, Work Input and Output, Efficiency, Velocity ratio. Simple Machines – Introduction to simple machines, Types of simple machines and example. Lifting machines – Introduction to lifting machines, Law of a lifting machines, Types of lifting machines. Simple Screw Jack – Definitions, Principle, Applications and calculations on velocity ration, Mechanical advantages and efficiency

MODULE-2 **[10 Hrs]**

Basics of Kinematics, Mechanism of Machines

Introduction to theory of machines, Difference between machine and machine Structure. Kinematic Link – Introduction to Kinematic link, Types of Kinematic links. Kinematic Pairs - Introduction to Kinematic Pairs, Types of Kinematic Pairs.
Kinematic Chain - Introduction to Kinematic chain, Types of Kinematic chains.
Intermittent Motion Mechanisms – Geneva wheel Mechanism, Ratchet and Pawl Mechanism. Mechanism used to convert rotary motion to linear motion.

MODULE-3 **[10 Hrs]**

Drives

Flat Belt – Materials for flat belt, Applications of flat belts, Speed ratio and RPM calculations of flat belt drives, Care and Maintenance of flat belts.
V-Belt drives – Types of V- Belt, Specification and Applications, Speed ratio and RPM calculations of V-belt drives, Care and Maintenance of V-belts.
Introduction to chain drives, Types, specification and applications of chains and sprockets.
Introduction to Gears, Types of Gears – Spur, Bevel, Helical, Rack & Pinion, Worm wheel.

Text Books:

1. Theory Of Mechanisms And Machines C. S. Sharma, Kamlesh Purohit PHI Learning Pvt. Ltd
2. Mechanics of Machines viswanatha RamamurtI CRC Press

Reference Books:

1. Theory of machines and mechanisms Joseph Edward Shigley Pearson
2. Theory of Machines R.S Khurmi and J.S Gupta S.Chand Publications

SEM/YEAR : THIRD/SECOND
COURSE CODE : 18VM310
TITLE OF THE COURSE : DIGITAL ELECTRONICS LAB

Course Objectives:

1. Know the fundamentals of Boolean algebra and theorems, Karnaugh maps including the minimization of logic functions to SOP or POS form and analyze logic to minimize gate count, signals, IC count or time delay.
2. Strengthen the principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.
3. Infer the logic design of programmable devices, including PLDs.
4. Fortify the documentation standards for logic designs, standard sequential devices, including counters and registers.

Course Outcomes:

1. Minimize logic functions to SOP or POS form and Implement practically using basic gates.
2. Design simple combination logic and experiment using logic gates.
3. Conduct practical experiments to implement design of complex combinational logics.
4. Verify functioning of sequential elements like flip flops,
5. Design counters and implement practically.
6. Design and implement sequence generator
7. Training on usage of Digital trainer boards

LIST OF EXPERIMENTS

Note: Use discrete components to test and verify the logic gates.

1. Study of simple logic gates (IC 7400, 7402, 7404, 7432, 7486)
2. Simplification, realization of Boolean expressions using logic gates/Universal gates
3. Realization of Half/Full adder and Half/Full Subtractors using logic gates and **parallel**
4. **adder/Subtractors using 7483 chip**
5. BCD to Excess-3 code conversion and vice versa.
6. Realization of Binary to Gray code conversion and vice versa.
7. **Design of decoders, encoders and priority encoders and function table verification**
8. Verification of the functioning of Multiplexer and De-multiplexers and **Boolean function Implementation**
9. Realization of One/Two bit comparator and study of 7485 magnitude comparator
10. Truth table verification of **Flip-Flops along with Asynchronous inputs: (i) JK Master slave (ii) T type and (iii) D type.**
11. **Realization of 4 bit counters as a sequential circuit and MOD – N counter design.**
12. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S195.
13. Wiring and testing Ring counter/Johnson counter.

SEM/YEAR : THIRD/SECOND
COURSE CODE : 18VM306
TITLE OF THE COURSE : COMPUTER PROGRAMMING C AND C++ LAB

Course Objectives:

1. Develop modular, efficient and readable C and C++ programs by hands-on experience.
2. Interpret good profound knowledge in C and C++programming language and enable them to build programs using operators, control structures, arrays, strings, functions, pointers and structures to solve the real world problems. .

Course Outcomes:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems related to Computer Science and Engineering.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems related to Computer Science and Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems related to Computer Science and Engineering and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

List of Experiments

1. Write a C program to check whether a number is even or odd using ternary operator.
2. Write a C program to perform the addition of two numbers without using + operator.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to count and display positive, negative, odd and even numbers in an array.
6. Write a C program to print the transpose of a given matrix using function.
7. Create a Book structure containing book_id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details.
8. Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
9. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).

10. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.

11. Write a C++ program to create multilevel inheritance.

12. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.

13. Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent. Implement the stack using an array.

14. Write C programs to implement a double ended queue ADT using

    i. array and
    ii. doubly linked list respectively

15. Write a C program that uses functions to perform the following:

    i. Create a singly linked list of integers.
    ii. Delete a given integer from the above linked list.
    iii. Display the contents of the above list after deletion.

a) Write a C program that uses functions to perform the following:

    i. Create a doubly linked list of integers.
    ii. Delete a given integer from the above doubly linked list.
    iii. Display the contents of the above list after deletion.

SEM/YEAR : III SEM
COURSE CODE : 18VM314
TITLE OF THE COURSE : Industrial Electronics Lab

Course Objectives:

1. To teach fundamental principles of thyristor family.
2. To develop an overall approach for students from construction of control rectifier, inverter, choppers, study its specification, the functionality, design and practical applications
3. To become familiar with power devices and their application in various fields
4. Learners are expected to understand various controllers, converters, inverters and choppers.

Course Outcomes:

1. Demonstrate an understanding of fundamentals of thyristor family.
2. Analyze the various applications and circuits based on thyristor.
3. Build and test circuits using power devices such as SCR, IGBT and UJT.
4. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters, how to analyze these inverters and some basic application examples.

LIST OF EXPERIMENTS

Note: Last 5 experiments will be executed by PLC Software using Ladder diagram.

1. Familiarization of digital oscilloscope.
2. General Design and winding of an inductor.
3. General Magnetization and demagnetization of L load using diode and resistor.
4. Reverse recovery characteristics of power diode.
5. VI characteristics of IGBT, SCR and TRIAC.
6. Resistance triggering of SCR and RC triggering of SCR.
7. UJT as a relaxation oscillator and Chopper fed DC motor driver.
8. Case study of Half bridge converter and Full bridge converter.
9. Case study of buck converter and boost converter.
10. Design a PLC Program for the following condition Switch– ON Light – Glows.
11. Design a program DOL Starter for motor. Design a program for forward – Reverse – stop with mutual interlock.
12. Design a program for motor start & stop by using Set & Reset Function
13. Design a program for switching on & off of light using Flip-flop.
14. Design a program for Basic Gates (AND, OR, NOT, NAND, NOR, Ex-or and Ex-Nor Gate).
15. Draw a program file for following expression (L+M+N) + (Q.R) R = S

SEM/YEAR : III SEM / II
COURSE CODE : 18VM308
TITLE OF THE COURSE : PCB DESIGN AND FABRICATION LAB

Course Objectives:

1. Understand the need for PCB Design and steps involved in PCB Design and Fabrication process
2. Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools

Course Outcomes:

1. Understand the steps involved in schematic, layout, fabrication and assembly process of PCB design.
2. Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits
3. Design (schematic and layout) and fabricate PCB for simple circuits.

LIST OF EXPERIMENTS

1. Basics of eagle software.
2. Properties of copper clad laminates
3. Layout general rules & parameters
4. Pcb layout design
5. Design a pcb layout for the 5v power supply circuit
6. Design a pcb layout for the given multi-vibrator circuit.
7. Design the pcb layout for automatic street light circuit
8. Design a pcb layout for the given tone generator circuit
9. Design a pcb layout for the given ir sensor circuit
10. Design a pcb layout for the given remote control receiver circuit
11. Design a plc program for the following condition switch– on light – glows.
12. Layout planning
13. Photo printing
14. Plating
15. Etching
16. Multilayer pcb

Audit Course

SEM/YEAR : III SEM / II
COURSE CODE : 19AU0009
TITLE OF THE COURSE : ENVIRONMENTAL STUDIES

Course Objectives:

1. Recognize concepts in environmental sciences
2. Demonstrate the understanding of the environment.
3. Demonstrate the knowledge of social responsibility

Course Outcomes:

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community.
4. Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

MODULE-1

Environment, Components of Environment Ecosystem- Types & Structure of Ecosystem, Balanced ecosystem Human Activities, Food, Shelter, and Economic and Social Security.
Impacts of Agriculture and Housing Impacts of Industry, Mining and Transportation Environmental Impact assessment, Sustainable Development.

MODULE-2

Natural Resources, Water resources and Energy-Availability and Quality aspects, Water borne diseases and water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles, Carbon Cycle, Nitrogen Cycle and Sulphur Cycle.

Energy: Different types of energy, Conventional sources and Non-Conventional sources of energy, Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass and Biogas Fossil Fuels, Hydrogen as an alternative energy.

MODULE-3

Environmental Pollution and Global Environmental Issues- Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water and Waste Water Management.

MODULE-4

Air Pollution, Automobile Pollution and Waste Management - Definition, Effects, Global Warming, Acid rain and Ozone layer depletion, controlling measures. Waste Management, E - Waste Management and Biomedical Waste Management, Sources, Characteristics and Disposal methods.

MODULE-5

GIS, Environmental Acts and Regulations-Introduction to GIS & Remote sensing, Applications of GIS and Remote Sensing in Environmental Engineering Practices.
Environmental Acts and Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs), Environmental Education and Women Education.

Text Books:

1. Benny Joseph, "Environmental Studies", Tata McGraw – Hill Publishing Company Limited, 2005.
2. R.J. Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.

Reference Books:

1. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005.
2. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
3. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.

SEM/YEAR : FOURTH / SECOND
COURSE CODE : 18VM401
TITLE OF THE COURSE : MICROCONTROLLERS & APPLICATIONS

Course Objectives:

1. Familiarization of Micro controller
2. Describe architecture & Instruction set of 8051
3. Understand the programming and Applications of 8051

Course Outcomes:

1. Students can analyze Micro controller
2. Write assembly language coding with the help of instruction set
3. Write programming for various application.

MODULE-1

Introduction to Microprocessors & Microcomputers, Evolution of Microprocessors, Introduction to Microcontrollers, Microcontroller Survey, Comparison of Microprocessors & Micro

Basic memory storage element, 4x8 Bit Register, R/W Memory Model, ROM Memory Model Memory Map and Addresses, Memory Classification, Memory Decoding, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Stacks.

MODULE-2

Functional Pin Description & Architecture of 8051, I/O ports, Memory organization, 8051 addressing modes Instructions set, Assembler directives,8051 assembly language programming and Time delay calculations, Software simulators of 8051, Introduction to Keil Compiler

MODULE-3

8051 Timer/counter, Serial communication Interrupts of 8051

MODULE-4

Square wave generator, Rectangular wave generator, Staircase ramp generator, Temperature controlling system using 8051 , DC Motor Control, Stepper Motor Control, Interfacing 8051 to LCD

MODULE-5

Arduino Microcontroller

Fundamentals of Embedded system, Getting Started with Arduino Exploring the Board of IDE (with its installation procedure). Interfacing with Arduino: Control LEDS from GPIO Pins, Input-Switch Buttons, DC Motor, Stepper motor, Relay, Sensor Interface: LDR, Analog POT, LM35 and Serial Communication

Text Books:

The 8051 micro controller architecture, programming & applications - Kenneth.J.Ayala

Reference Books:

The 8051 micro controller & embedded systems - M.A.Mazidi

SEM/YEAR : FOURTH
COURSE CODE : 18VM411
TITLE OF THE COURSE : PYTHON PROGRAMMING

Course Objectives:

1. Understand the need of python programming
2. Understand data collection using python
3. Understand Functions in python
4. Ability to do programming in python

Course Outcomes:

1. Understand the advantage of python in various fields.
2. Can to analysis on various data collection using python
3. Can create his own Functions in python
4. Can to do programming in python for his own application

MODULE-1

Introduction to Python Programming Language:

- Strengths
- Naming Conventions,
- String Values,
- String Operations,
- String Slices,
- String Operators,
- Numeric Data Types,
- Conversions,
- Built in Functions

MODULE-2

Data Collections and Language Component:

- Introduction,
- Control Flow and Syntax,
- Indenting,
- The if Statement,
- Relational Operators,
- Logical,
- Operators,
- True or False,
- Bit Wise Operators,
- The while Loop,
- The for Loop, Lists,
- Tuples,
- Sets,
- Dictionaries,

MODULE-3

Object and Classes:

- Classes in Python
- Principles of Object Orientation
- Creating Classes
- Instance Methods
- File Organization
- Special Methods
- Class Variables
- Inheritance
- Polymorphism
- Type Identification
- Custom Exception Classes

MODULE-4

Functions

- Introduction
- Defining Your Own Functions
- Parameters
- Function Documentation
- Keyword and Optional Parameters
- Passing Collections to a Function
- Variable Number of Arguments
- Passing Functions to a Function
- Mapping Functions in a Dictionary

MODULE-5

I/O and Error Handling In Python:

- Introduction
- Data Streams
- Creating Your Own Data Streams
- Access Modes
- Writing Data to a File
- Reading Data From a File
- Additional File Methods
- Using Pipes as Data Streams
- Handling IO Exceptions
- Working with Directories
- Metadata
- Errors
- Run Time Errors
- The Exception Model
- Exception Hierarchy
- Handling Multiple Exceptions

Text Books:

1. Kuhlman, Dave. *A python book: Beginning python, advanced python, and python exercises*. Lutz: Dave Kuhlman, 2009.

Reference Books:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd Edition)

SEM/YEAR : FOURTH
COURSE CODE : 18VM404
TITLE OF THE COURSE : MEMS

Course Objectives:

1. Understand the MEMS fundamentals
2. Understand the MEMS fabrication technology
3. Understand Packaging
4. Understanding Micro sensors and actuators

Course Outcomes:

1. Analyze MEMS fabrication technology.
2. Analyze the various Packaging technology
3. Application of MEMS in various fields.

MODULE-1

Overview and Introduction

New trends in Engineering and Science: Micro and Nanoscale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Microelectromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon, silicon compounds, polymers, metals

MODULE-2

Mems Fabrication Technologies

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology;

MODULE-3

Packaging

Microsystems packaging, Essential packaging technologies, Selection of packaging materials

MODULE-4

Micro Sensors

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- engineering mechanics behind these Microsensors. Case study: Piezo-resistive pressure sensor

MODULE-5

Micro Actuators

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators

References:

1. Marc Madou, "Fundamentals of Microfabrication", CRC press 1997.
2. Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers,2001
3. Tai Ran Hsu ,"MEMS and Microsystems Design and Manufacture" ,Tata Mcraw Hill, 2002.
4. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2006,
5. Sergey Edward Lyshevski, "MEMS and NEMS: Systems, Devices, and Structures" CRC Press, 2002

SEM/YEAR : FOURTH
COURSE CODE : 18VM412
TITLE OF THE COURSE : PLC

Course Objectives:

1. Understand the PLC fundamental
2. Understand the PLC hardware component
3. Understand programming concept in PLC

Course Outcomes:

1. Analyze hardware component in the PLC
2. To do programming in PLC

MODULE-1

PLC BASICS
Introduction to PLC
Overall look inside PLC
BASIC PLC PROGRAMMING
General PLC programming procedure and I/O devices
On/Off inputs and On/Off outputs
Relation between digital gates & coil/contact logic
Creating ladder diagrams for process control

MODULE-2

BASIC FUNCTIONS
Registers basics
Timer functions
Counter functions
INTERMEDIATE FUNCTIONS
Arithmetic functions
Number comparison functions
Number conversion functions

MODULE-3

DATA HANDLING FUNCTION
PLC SKIP & MASTER CONTROL RELAY functions
JMP instruction
Data Movement instruction
Other Functions
Digital bit functions & their applications
Sequencer functions
Robot control with PLC

MODULE-4

ADVANCED PLC FUNCTIONS
Analog input & output functions
Networking PLC –Profibus
Troubleshooting PLC

MODULE-5

Introduction to HMI,SCADA
Introduction to HMI
Introduction to SCADA

Reference Books:

1. Programmable Logic Controllers: Principles and Applications
2. Introduction to Programmable Logic Controllers

SEM/YEAR : FOURTH
COURSE CODE : 18VM413
TITLE OF THE COURSE : MEASURING SYSTEMS

Course Objectives:

1. To get an overview of various industrial instrumentation and its utility
2. To understand various sensors/transducers
3. To understand different electrical/electronics measuring instruments

Course Outcomes:

1. Understand various industrial instrumentation and its utility
2. Analyze various sensors/transducers
3. Analyze different electrical/electronics measuring instruments

MODULE-1

Definition of measuring system.
Measurement system and its constituent elements.
Sensors and transducers.
Performance Terminology.
Static and Dynamic characteristics
Electronic instrumentation
V-F Converter
F-V Converter

MODULE-2

Introduction to Temperature Measurement
Non electrical type temperature sensor: Bimetallic Strip.
Electrical type temperature sensors: Thermistor, RTD, Principles, Types,
Selection of RTD's and signal conditioning circuits.
Thermocouples, Principle, Types, Selection, Standard table of
Thermocouples and signal conditioning circuits
Measurement of temperature using Diodes
IC temperature Transducer using LM35 and AD590

MODULE-3

Introduction to pressure measurement.
Pressure Standards.
Conventional Pressure sensors.
Electrical and Electronic pressure transducers.
Introduction to Calibration and Calibration of Pressure Gauge

MODULE-4

Introduction to displacement measurement.
Potentiometer Sensor, Types, Construction, Operation and Errors.
LVDT, Principle, Operation and Application
Inductive Proximity Switch
Digital Encoder: Contact, Magnetic and Optical Encoder
Rotational Displacement/Angular position: Using optical Encoder and Signal Conditioning circuits.

MODULE-5

Introduction to force, weight and flow measurement. Strain gauge and its function, Load Cell, principle and operation of load cell. Flow measurement using Orifice plate.Introduction, mechanical tachometers, electrical tachometers, types like contact less, frequency type. Basic Ultrasonic Transmission Link, piezoelectric, ultrasonic transmitter and receiver, principle and example.

Reference Books:

1. Principle of measurement systems 2000 JP Bentlley Addision Wesley
2. Instrumentation and Control system Bhasker, Anuradha Agencies

SEM/YEAR : FOURTH
COURSE CODE : 19AU0004
TITLE OF THE COURSE : CONSTITUTION OF INDOA & PROFESSIONAL AND ETHICS

Course Objectives:

1. To provide basic information about Indian constitution.
2. To identify individual role and ethical responsibility towards society.
3. To understand human rights and its implications

Course Outcomes:

1. Have general knowledge and legal literacy and thereby to take up competitive Examinations
2. Understand state and central policies, fundamental duties
3. Understand Electoral Process, special provisions
4. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
5. Understand Engineering ethics and responsibilities of Engineers.
6. Have awareness about basic human rights in India

Module-1

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.

Module-2

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties, Union Executives – President, Prime Minister Parliament Supreme Court of India.

Module-3

State Executives – Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments.

Module-4

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions, Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India, Powers and functions of Municipalities, Panchayats and Co - Operative Societies

Module-5

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility, Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering

Text Books:

1. Durga Das Basu 'Introduction to the Constitution of India' (Students Edn.) Prentice Hall EEE – 2001
2. 'Engineering Ethics' by Charles E Haries, Michael. S Pritchard and Michael J Robins Thompson Asia, 2003
3. Constitution of India & Professional Ethics by Raman & Yaji

Reference Books:

1. 'An Introduction to the Constitution of India' by M V Pylee, Vikas Publishing. 2002
2. Engineering Ethics _ by M Govindarajan, S Natarajan, V S Senthail Kumar, Prentice Hall of IndiaPvt Ltd. New Delhi, 2004
3. Brij Kishore Sharma, **"Introduction to the Constitution of India"**, PHI Learning Pvt.
4. Ltd., New Delhi, 2011.
5. Latest Publications of Indian Institute of Human Rights, New Delhi.

SEM/YEAR : FOURTH / SECOND
COURSE CODE : 18VM410
TITLE OF THE COURSE : MICROCONTROLLERS & APPLICATIONS LAB

Course Objectives:

1. Understand programming in controller and interfacing

Course Outcomes:

1. Do programming in controller and interfacing

S. No	List of experiment
	Microcontroller 8051
1	Familiarization of Keil Compiler
2	Write a program to place the number 8Dh in RAM locations from 30h to 34h
3	Write a program to copy the contents of DPTR to registers R0 (DPL) & R1 (DPH)
4	Write a program to add two 8 bit numbers and store the result in RAM location 35h
5	Write a program to subtract the contents of RAM location 13h from the Ram location 2Bh put the result in RAM location 2Ch
6	Write a program to add two 16 bit numbers without carry and store the result in 30h(LSB) and 31h(MSB)
7	Write a program to exchange the contents of B register and RAM address 30h
8	Write a program to swap the bytes in timer 0.put TL0in TH0 and TH0 inTL0
9	Write a program to Double the number in register R2, and put the result in register in R3 (high byte) and R4 (low byte)
10	Write a program to add the unsigned numbers found in internal RAM locations 25h, 26h and 27h together and put the result in RAM locations31h (MSB) and 30h(LSB)
11	Write a program to multiply unsigned numbers in register R3 by the number in register in R4and put the result in external RAM locations 10h (MSB) and 11h (LSB).
12	Write a program to divide the data in RAM location 3Eh by the number 12h,put the quotient in R4 and the reminder in R5
13	Write a program to place any number in the internal RAM location 3Ch and increment it until the number equal 2Ah
14	Write a program to move a block of data from memory X to Y.
15	Write a program to find the factorial of the number stored in the internal RAM locations 30h.
16	Interfacing programs with 8051
17	LED & Switch Interfacing and display the status in LED
18	Seven segment display interface
19	Alpha numeric LCD interface
20	DC Motor Interfacing
21	Stepper Motor Interfacing
22	Waveform generation:- a) Square Wave b) Rectangular Wave
23	4x4 Matrix Keypad Interfacing
24	Interfacing of ADC

SEM/YEAR : FOURTH / SECOND
COURSE CODE : 18VM414
TITLE OF THE COURSE : PYTHON PROGRAMMING LAB

Course Objectives:

1. Understand using list in python
2. Understand the instructions in python
3. Creating function using python
4. Understand inbuilt function in python

Course Outcomes:

1. Write a coding using list in python
2. Write instructions in python
3. Creating his own function using python
4. Use the inbuilt function in python to his application

List of Experiments:

1. Write python program to print Hello World
2. Write python program to Hello World using string variable
3. Write python program to store data in list and then try to print them.
4. Write python program to do basic trim and slice on string.
5. Write python program to print list of numbers using range and for loop
6. Write python program to store strings in list and then print them.
7. Write python program to find maximum number in the list
8. Write python program in which a function is defined and calling that function prints Hello World
9. Write python program using a function to print the square root of a number.
10. Write python program to find the exponentiation of a number.

SEM/YEAR : FOURTH / SECOND
COURSE CODE : 18VM415
TITLE OF THE COURSE : PLC LAB

Course Objectives:

1. Understand automation and its importance
2. Understand working of PLC
3. Understand I/O modules of PLC

Course Outcomes:

1. Known the importance of automation in the field of interest
2. Implement the various task using PLC
3. Develop programming knowledge in PLC

List of Experiments:

Sl. No	List of Experiment
1	Basic Programming
2	Design a PLC Program for the following condition Switch ON Light – Glows Switch – OFF Light - Puts Off Design a program DOL Starter for motor. Design a program for forward – Reverse – stop with mutual interlock.
3	Design a program for forward – Reverse – stop with direct reversal.
4	Design a program for start – stop – jog. Design an Alarm system.
5	Design a program for motor start & stop by using Set & Reset Function
6	Design a program for switching on & off of light using Flip-flop
7	Design a program that there are three machines, each with its own start and stop functions, only one may run at a time Design a program that the circuit consist of two start and stop button, when any one button is pressed ,the motor runs , even it is released and the stop button is used to stop the motor
8	Design a program a) AND, OR and NOT gate. b) NAND and NOR gate. c) Ex-or and Ex-Nor Gate
9	Design a conveyer control system in which conveyer 'C' is to run when Any one of the 4 inputs is ON & it should stop when any one of the 4 other inputs are ON. Write a program that a fan 'P' will run the equation is getting satisfied. (I1) (I2+I3) (I5.I6) = P
10	Draw a program file for following expression (L+M+N) + (Q.R) R = S

SEM/YEAR : FOURTH / SECOND
COURSE CODE : 18VM416
TITLE OF THE COURSE : MEASUREMENT AND INSTRUMENTATION LAB

Course Objectives:

1. Understand the Procedure of System Measurement
2. Understanding the Use of sensors
3. Understand the concept of temperature control

Course Outcomes:

1. Analyze of various measuring instruments.
2. Use the sensor and measure various parameters
3. Use the various control for various application of interest.

LIST OF EXPERIMENTS:

Sl. No	List of Experiment
1.	Converters V to F Converter using ICL 8038 F to V Converter using LM2907
2.	Thermocouples & RTD Study of types of Thermocouple and characteristics of Thermocouple. Study of RTD and characteristics of RTD.
3.	Sensors Temperature sensing using Diodes. Using LM35 and AD590 as temperature sensor
4.	Temperature Controllers Study of ON OFF control using temperature controller using Thermocouple and RTD.
5.	Pressure gauges Finding error in the given pressure gauge with respect to Digital Gauge. Finding error in the given pressure gauge with respect to Dead Weight Tester.
6.	Measurement of displacement Measurement of Displacement using LVDT.
7.	Design of Counter Designing a counter circuit using Proximity Sensor.
8.	Measurement of load by using Load cell, a. Expansion Method b. Compression method.
9.	Measurement of Speed a. Contact type (Tachometer) b. Non- Contact Type (Proximity Sensor & Stroboscope)
10.	Familiarization of Proximity switch- Familiarization of Inductive Proximity, Capacitive Proximity, IR and Reed Switch. Calibration Experiments

SEMESTER	**V**					
YEAR	**3rd**					
COURSE CODE	**18VM513**					
TITLE OF THE COURSE	**Embedded System and IOT**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/ Projects Hours**	**Total Hours**	**Credits**
	3	**-**	**-**	**-**	**45**	**3**

Perquisite Courses (if any)			
S. No	**Sem./Year**	**Course Code**	**Title of the Course**
1.	3rd/2nd	18VM301	Digital Electronics
2.	3rd/2nd	18VM303	Computer Programming - C, C++
3.	4th/2nd	18VM401	Micro-controller & Applications

Course Objectives:

1. Describe the architecture instruction set of PIC16F87X.
2. Describe an Embedded System
3. Describe IoT and providing knowledge in Programming

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Able to identify architecture and advanced features of embedded processors and micro-controllers	L1
CO2	Able to Understand architecture, instruction set and programming of advanced embedded processors and controllers.	L2
CO3	Able to solve specific real world applications by working with specific microprocessor / micro-controllers	L3
CO4	Able to Understand basic components and building blocks of Internet of Things	L2
CO5	Able to explain about IoT based communication protocols	L1

Course Content:

MODULE-1 **[09 Hrs]**

Introduction: Categories, Overview of embedded system architecture, Applications, Recent trends. Hardware architecture, software architecture. Special Features: Power on reset feature, Watch dog timer, SLEEP mode, Interrupt handling capability.

MODULE-2 **[09 Hrs]**

Introduction to Peripheral Interface Controller and its features. Pin diagram, Architecture, Memory organization. I/O Ports, Timers, Programming of PIC.

MODULE-3 **[09 Hrs]**

Introduction to Node MCU and its features, Pin configuration of NODE MCU, Introduction to Arduino and its features, Variables, Data Types Constants, Programming Structure, Programming Structure, Programming Structure, Serial Data Monitoring.

MODULE-4

Definition, Basic terminologies used in IoT, Components of IoT, Architecture of IoT, Four Stages of IoT Architecture, Industrial IoT – Process, Advantages and Applications

MODULE-5

Networking Layers and Protocols, Networking Layers and Protocols, MQTT, Comparison of MQTT with other protocols and PUB/SUB approach, Control the Interface through Mobile App Using Node MCU.

Text Books:

1. Embedded / Real-Time Systems: Concepts, Design and Programming K.V.K. Prasad Dream tech Press.
2. PIC Microcontroller and Embedded System: Using assembly and C for PIC 18 - Mazidim Muhammad Ali – Pearson.

References:

1. PIC Microcontroller and Embedded System: Using assembly and C for PIC 18 - Mazidi Muhammad Ali – Pearson.
2. The Fourth Industrial Revolution" by Klaus Schwab.

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM514**					
TITLE OF THE COURSE	**Product Design and Development**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/ Projects Hours**	**Total Hours**	**Credits**
	2		-	-	30	2

Perquisite Courses (if any)			
S. No	**Sem./Year**	**Course Code**	**Title of the Course**
1	Nil		

Course Objectives:

1. Introducing a learner or students to concepts of Engineering design
2. Introducing a learner or students to concepts of Product design and development according to the market need.

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Understanding the basic theories in production planning in product development	L2
CO2	Imparting the knowledge of design thinking & innovation	L3
CO3	Applying design thinking knowledge to develop a prototype of an desired product	L3
CO4	Understanding Product Life Cycle in production planning	L3
CO5	Analysis of Product Design	L4

Course Content:

MODULE-1 **[06 Hrs]**

Design Process, Key Elements for Design, Bottom up and Top down Design, Characteristics of Structural model – Hierarchy, Modularity, Regularity and Locality

MODULE-2 **[06 Hrs]**

Introduction to design thinking, Design Thinking Process, Emphasize, Define the Problem, Ideate, Develop Prototype, Test the Product, Case Studies.

MODULE-3 **[06 Hrs]**

What is a Product? Defining Product by Nature of Demand, New Product Strategy, Production Classification, Product Life Cycle and various stages of PLC, Managing Product Life Cycle.

MODULE-4 **[06 Hrs]**

Introduction to Product design practice, Product strategies, Time to market, Analysis of the Product, The Three S's - Standardization, Simplicity and Specialization.

MODULE-5 **[06 Hrs]**

Plan and Define Program, Product Design and Development Verification, Process Design and Development Verification, Product and Process Validation.

Text Books:

1. Product design and process Engineering - Benjamin W. Nebel Alnab - Draper – McGraw Hill edn.

References:

1. Mechatronics: Electronics in Product and Process - Bradley Dawson, N C Burd A Loader

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM515**					
TITLE OF THE COURSE	**CNC Technology**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/ Projects Hours**	**Total Hours**	**Credits**
	3	-	-	-	30	2

Perquisite Courses (if any)			
S. No	**Sem/Year**	**Course Code**	**Title of the Course**
1	III/ II	18VM311	Control System

Course Objectives:

- To gain knowledge in NC and CNC
- Gain knowledge in different types of cutting tool materials, holders, ATC

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Understanding the introduction and classification of CNC	L2
CO2	Imparting the knowledge on various tools used in CNC	L3
CO3	Imparting the knowledge on manual operation	L3
CO4	Understanding Functions for Milling and Turning	L2
CO5	Analysis of Machine Maintenance and problems associated	L4

Course Content:

MODULE-1 **[06 Hrs]**

CNC: Introduction - Application - Advantages - Disadvantages - Development - Economy, Classification of CNC based on Feed Back control system. Open loop control system - Closed loop control system, Classification of CNC based on Motion control system - Point to Point - Straight cut - Contouring, Types of Spindle drive: AC Servo Motor - Special features of servomotor, Hydraulic drives, Types of Axis Drive – stepper motor – servo motor - Features of stepper motor, Friction reducing elements, Reciprocating ball bushes - Metallic and non-metallic guide ways - Spindle Bear- ing - Ball lead screw, Feedback devices,Machine Control Unit, Automatic Tool Changer, Automatic Pallet Changer, Automatic swarf removal mechanism, Tool and Work holding devices

MODULE-2 **[06 Hrs]**

CNC Turning Centre - Application of Face Tool, Turn Tool, Groove Tool, Bore Tool, Thread Tool, CNC Machining Centre - Application of End Mill cutter, Ball Nose Cutter, Slab Mill Cutter, Hollow Mill Cutter, Thread Mill Cutter, Face Mill Cutter, Dovetail Cutter, Special profile milling cutters

MODULE-3 **[06 Hrs]**

Manual Operating Mode, Jogging an Axis, Continuous Jog, Incremental Jog,Hand Pulse Generator (HPG) Jog, Arbitrary Angle Jog, Jog Offset, Resetting over travels, Mechanical Handle Feed, Removing an Axis, Manual Machine Homing.

MODULE-4 **[06 Hrs]**

Axis Nomenclature, Coordinate System, Tool Length Compensation, Cutter Radius Compensation, Preparatory and Miscellaneous Functions for Milling and Turning, Program Format, exercise on Part Programming in Milling and Turning.

MODULE-5 **[06 Hrs]**

Coolant - Function, Types and Application, Understanding and Responding to Alarms in CNC, Types of Machine Maintenance, Maintenance Tools and Accessories required for CNC Machine Main- tenance, Problems related to Mechanical Systems in CNC, Causes for the failure of Electronic System in CNC, Deviations from Normal Performance in CNC Machine, Backlash, Checklist for CNC Main- tenance, Best Maintenance Practices, Troubleshooting - Causes and Remedie.

Text Books:

1. Student Workbook for Programming of CNC Machines - KEN EVANS - Industrial Press Inc
2. CNC Programming Techniques: An Insider's Guide to Effective Methods and Applications -Peter Smid - Industrial Press Inc.

Reference Books:

1. CNC Programming Techniques: An Insider's Guide to Effective Methods and Applications - Peter Smid - Industrial Press Inc
2. CNC Machines - M.Adithan - B S Pabla - New Age International Publishers

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM516**					
TITLE OF THE COURSE	**Robotics**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	2	-	-	-	30	2

Perquisite Courses (if any)			
#	**Sem/Year**	**Course Code**	**Title of the Course**
1	I	18VM104	Electronics-1
2	II	18VM205	Mechanical Engineering

Course Objectives:

- Familiarization to industrial robot and its application.
- Familiarization to the robot programming language.
- Familiarization to Robot Maintenance Safety

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Gaining knowledge on introduction to robotics.	L1
CO2	Understand the mechanics of robotics.	L2
CO3	Learn about Robotic Programming Language	L3
CO4	Understand the applications of Robotics	L3
CO5	Design and analyze the robotics.	L4

Course Content:

MODULE-1 **[06 Hrs]**

Introduction to Robotics and Basic Structure, Laws of Robotics, Definition of Robot, Robot Component Recognition – Robot Arm, Robot Controller, End Effector, Robot Arm components, Robot Controller Components, Accessories and Input devices, Types of Robot, Selection of Robot- Payload, Speed, Reach, Parts of Industrial Robots, Links, Joints and Joints Notation Scheme, Degrees of Freedom, Required DOF in a Manipulator, Arm Configuration and Wrist Configuration, Work Cell, Work Envelope, and Work Volume, Robot End Effectors – Definition, Classification of End Effectors, Types of Grippers, Consideration in gripper selection and designing.

MODULE-2 **[06 Hrs]**

Introduction, link description, Joint link connection description, Kinematic modelling of manipulator, Direct and Inverse manipulator Kinematics, Manipulator dynamics, Trajectory planning – Basics, Robot Communication methods for I/O Interfacing, Robot Communication methods for I/O Interfacing.

MODULE-3 **[06 Hrs]**

Types of Programming methods, Types of Programming methods, Robot Programming Languages.

MODULE-4 **[06 Hrs]**

Industrial applications: Material Handling, Machining, Welding, Painting, Non-industrial applications

MODULE-5 **[06 Hrs]**

Introduction Risks specific to robots, General Robot maintenance ,Different start modes in Robot, Mastering of Robot

Text Books:

1. Introduction to Robotics: Mechanics and Control - John. J. Craig - Pearson Education India
2. Robotics: Beginner to Expert - Peter Mckinnon - Create Space Independent Publishing Platform

References:

1. Robotics and Control - RK Mittal, I.J.Nagra - McGraw Hill Education - Peter Smid - Industrial Press Inc.
2. Industrial Robotics (Special Indian Edition) - Groover - Tata McGraw-Hill Education

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM522**					
TITLE OF THE COURSE	**Advanced PLC**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	3	-	-	-	45	3

Perquisite Courses (if any)			
S. No	**Sem/Year**	**Course Code**	**Title of the Course**
1	IV	18VM412	Programmable logic Controllers

Course Objectives:

1. Familiarization with PLC Hardware & Troubleshoot the PLC connections
2. Understanding the various communication protocols in PLC
3. Understanding the concept of distributed control system.

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Familiarizing with PLC Wiring and Analog & Digital I/O	L2
CO2	Interfacing PLC to external devices using different Communication Protocols	L3
CO3	Understanding Trouble shooting of PLC Connection	L3
CO4	Understanding the Role of Distributed Control System in an industrial Process	L3
CO5	Apply the knowledge of Troubleshooting, Programming to design Distributed Control System	L4

Course Content:

MODULE-1 **[09 Hrs]**

Representing Analog signals with Binary Numbers, Bits and Bytes, A/D Converter, Resolution of Analog Signals, Analog Signal Range, Analog Input, Wiring of Analog Inputs, Voltage Analog Input Wiring, Current Analog Input Wiring, 3 2- Wire, 3- Wire and 4- Wire Analog Input, Analog Input Scaling, Analog Output, Wiring of Analog Outputs, Voltage Analog Output Wiring, Current Analog Output Wiring, Analog Output Scaling and Un-scaling.

MODULE-2 **[09 Hrs]**

ADVANCED PLC PROGRAMMING LANGUAGES – BASICS:
Types of PLC Programming, Functional Block Diagram (FBD)
PLC COMMUNICATION PROTOCOLS: PLC Communication Protocol and Types, Modbus RTU, Ethernet/IP and Ethernet TCP/IP, Mod- bus TCP/IP, Profibus and Profinet

MODULE-3 **[09 Hrs]**

PLC TROUBLE SHOOTING: Module Failure in the input and output I/O system, Electrical Noise Interference, Corrupted Memory, Power Problems, Communication Issues
HUMAN MACHINE INTERFACE – HMI
Introduction to MMI/HMI, Types of Operator Interface, Data handling with HMI, HMI Wiring Procedure, Configuration and Interfacing to PLC and HMI, Communication Protocols, Advantages and Applications of HMI

MODULE-4 **[09 Hrs]**

DISTRIBUTED CONTROL SYSTEM: Introduction, Architecture of DCS, Elements of DCS, Features of DCS, Comparison of PLC and DCS, Advantages and Applications of DCS

MODULE-5 **[09 Hrs]**

Advantages and Applications of DCS: Introduction, Role of SCADA in Automation, Difference between SCADA and HMI, Components of SCADA System – Field Instruments, Field Controllers (RTUs/PLCs), HMI, Network Connectivity, Data Base, SCADA Architecture, Types of SCADA System, Features of SCADA, Application Example of SCADA, SCADA Communication Protocol-IEC, Distributed Network Protocol (DNP3), OPC Communication.

Text Books:

1. Programmable Logic Controllers: Principles and Applications - John. Webb, Ronald.A. Reis - Prentice Hall India Learning Private Limited
2. Programmable Logic Controllers - Frank D Petruzella - McGraw - Hill Education

References:

1. Programmable Logic Controllers: Industrial Control - Khaled kamel - Mc Graw - Hill Education.

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM523**					
TITLE OF THE COURSE	**Process Control**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	3	-	-	-	45	3

Perquisite Courses (if any)			
S.No	**Sem/Year**	**Course Code**	**Title of the Course**
1	III/ II	18VM311	Control System

Course Objectives:

- To Prepare the students/learner to understand how a Process is controlled in industries.
- To enable the students to understand the concept of instrumentation, various sensors and transducers used to control the process.
- Impart the knowledge of various controller.

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Interpret PLC architecture and configure DCS to handle local and distributed automation tasks	L3
CO2	Design and Conduct experiments, as well as analyze and interpret data	L3
CO3	Analyze Various types of Controllers to configure proper process control.	L4
CO4	Recommend necessary final control element for a given application.	L3
CO5	Design or configure various subsystems for industrial automation	L3

Course Outcomes:

MODULE-1 **[09 Hrs]**

Definition – Process – Functional block diagram of an Automatic process control system – Set point – Measured variable – Comparator – Error – Controller – Final control element. Controlled variable – Manipulated variable – disturbances –Advantages of Automatic control system – Simple Liquid level control system – Flow control system – Temperature control system with transportation Lag – Self Regulation – Capacitance and Capacity. Piping and Instrumentation flow Diagram (BIS standard) for the above system

MODULE-2 **[09 Hrs]**

Controller – Block diagram, Types, General properties – Reverse and Direct action, Controller modes – Discontinuous – On – Off Control with differential gap, without differential gap – Neutral zone– Continuous – Proportional controller – Proportional band (PB) – Effect of PB on a controller output – Offset –Integral control – PI – PD – PID – Definition, salient features, applications and limitations of the above controllers – Selection of control action – Electronic controllers – Error detector Two position controller – P,I,D,PI,PD, PID controllers –reverse action – pneumatic controllers – Flapper– Nozzle mechanism, Pneumatic relay.

MODULE-3 **[09 Hrs]**

Concept of tuning – Criteria for controller tuning – Quarter decay ratio, IAE, ISE, ITAE – Methods of tuning – Open loop response method – Process reaction curve –Closed loop response method – Ultimate cycle method, Damped oscillation method.

MODULE-4 **[09 Hrs]**

Signal converters – P to I Converter, I to P Converter – Actuators – Electrical, Pneumatic, Hydraulic and Electro pneumatic – Valve Positioners – Control valve –Characteristics Quick opening, Linear, Equal percentage – Control valve sizing – Cv rating – Selection of a control valve – Effects of Cavitation and Flashing on control valve performance

MODULE-5 **[09 Hrs]**

Cascade control system, Ratio control systems, feed forward control system, Comparison of feedback control system and feed forward control system. (One specific application for each of the above systems) – Introduction DCS and SCADA Block Diagram of Fuzzy logic controller – block diagram – typical application-washing machine.

Text Books:

1. Donald P Eckman, Process control,Wiely Eastern limited,1991
2. Peter Hariot, Process control,TataMcgraw Hill.

References:

1. George Stephanopoulos, Chemical process control.
2. B. SankaraGomathi, Process control (Principles and applications), J J Publications, 1981

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**19AU0020**					
TITLE OF THE COURSE	**Kannada Kali - 1**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/ Projects Hours**	**Total Hours**	**Credits**
	2	-	-	-	20	-

Perquisite Courses (if any)			
S.No	**Sem/Year**	**Course Code**	**Title of the Course**
1	Nil		

Course Objectives:

1. To acquire the ability to communicate in Kannada with others
2. To acquire the ability to read the hoardings, notices etc.
3. To acquire the ability to translate Kannada words into English and vice versa.
4. To acquire the ability to write some simple letters

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Knowledge on introducing and enquiring in kannada	L2
CO2	Knowledge on basic kannada grammar	L2
CO3	Knowledge on kannada reading	L2
CO4	Knowledge on kannada spelling	L2
CO5	Knowledge on kannada writing	L3

Course Content:

MODULE-1 **[05 Hrs]**

Lesson-1: Introducing each other-Personal Pronouns, Possessive forms, Interrogative forms.
Lesson-2: Introducing each other-Personal Pronouns, Possessive forms, Yes/No type, Interrogation
Lesson-3: Absolute Ramayana. Possessive forms of nouns, dubietive question, Relative nouns
Lesson-4: Enquiring about a room for rent, Qualitative and Quantitative adjectives
Lesson-5: Enquiring about the college, Predicative forms, locative case

MODULE-2 **[05 Hrs]**

Verb-iru, negation-illa, non-past, no-past continuous, past tense, verbal principle, reflexive form, past and present perfect, past continuous and their negation

MODULE-3 **[05 Hrs]**

Karnataka(Lessonforreading),KannadaBhaashe(Lessonforreading),Manataruva Sangatialla(Lesson for reading), Beku Bedagalu(Lesson for reading).

MODULE-4 **[03 Hrs]**

Direct-Indirect Speech Vocabulary Usage Homonyms, Correcting Spelling, One-word Equivalents.

MODULE-5 **[03 Hrs]**

Precis Writing Essay/Report Writing, Letter Writing Personal, Official, Applications Idioms Phrases Meaning Usage in sentences

Text Books:

1. SLN Sharma K Shankaranarayana "Basic Grammar", Navakarnataka Publications
2. Jones "New International Business English", published by Cambridge University Press

Reference Books:

1. G. Sankaran, "English Rank Scorer", Addone Publishing group, Thiruvanantapuram, Kerala
2. Wren Martin "English Grammar"
3. John Seely, "Oxford Guide to Speaking and Writing", 2000

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM517**					
TITLE OF THE COURSE	**Embedded System Lab**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	-	-	3	-	45	3

Course Objectives:

1. Familiarization to Embedded Systems
2. Familiarization to Programming and Interfacing

Course Outcomes:

1. Understand the Embedded Controller
2. Understand basic concepts of Programming

LIST OF EXPERIMENTS

1. Write a program to place a number FFh in memory location 20h to 25 h
2. Write a program to add two 8-bit numbers without carry
3. Write a program to subtract two 8- bit numbers and store the result in memory location 25h
4. Write a program to shift an 8 {bit number to the left by two bits
5. Write a program to move a block of 05 numbers present in memory location 20h to 30h
6. Write a program to mask the lower four bits of an 8 {bit data present in memory location 25h'
7. Write a program to check the D3 rd bit of an 8 bit data is 1 or not if it is 1 store FF in memory location 25h else store 00h
8. Write a program to SWAP an 8-bit data and store the result in 25h
9. Write a program to complement an 8-bit data and store the result in 21h
10. Interfacing Programs On Pic Micro Controller Led Blinking

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM518**					
TITLE OF THE COURSE	**CNC Technology Lab**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	-	**-**	**3**	**-**	**45**	**3**

Course Objectives:

1. Familiarization to CNC Machine
2. Familiarization with Maintenance of CNC machine

Course Outcomes:

1. Understand of CNC Machine
2. Understand the Maintenance of CNC Machine

LIST OF EXPERIMENTS

1. Introduction to CNC Machine
2. Machine specification
3. Machine Control Panel
4. Settings of Offset
5. Editing of program
6. Single Block, Dry run
7. Measuring work co-ordinate offset, DNC
8. Introduction to Master CAM
9. 2D Drafting
10. 2D Contour
11. Pocket
12. Drill
13. Facing
14. 3D Counter Surface Machining

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM519**					
TITLE OF THE COURSE	**Advanced PLC Lab**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	-	-	3	-	45	3

Course Objectives:

1. To understand the ladder logic programming using PLC.
2. To develop an overall approach for students, learn basics of Hardware and Software of PLC family.
3. Learners are expected to understand Timer, Counters, Conveyors and PID Controllers
4. To apply knowledge of PLC in real world applications.

Course Outcomes:

1. Understand and develop the programming language in PLC
2. Demonstrate the understanding of fundamentals of Timers and Counters.
3. Analyze the various real time applications using PLC
4. Different Advanced Case Studies using PLC

LIST OF EXPERIMENTS

Note : All the experiments will be demonstrated using Rexroth Bosh Labs(Hydraulics, Pneumatics, PLC)

1. Study Hardware and Software Used in PLC
2. Study understand perform experiments on Timers
3. Implementation of ON and OFF delay Timers
4. Study understand perform experiments on Counters.
5. Implementation of UP and Down Counters.
6. Demonstration of UP-Down Counter.
7. Implementation of PLC Arithmetic Instructions
8. Logic Implementation for Bottle Filling Application
9. Logic Implementation of Traffic Control applications
10. Design PLC Program for Direct and Indirect Double acting Cylinder
11. Case study of Conveyor System Using PLC
12. Case Study of PID controller Using PLC

SEMESTER	**V**					
YEAR	**III**					
COURSE CODE	**18VM520**					
TITLE OF THE COURSE	**Robotics Lab**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	-	-	3	-	45	3

Course Objectives:

1. Familiarization of Robotics handling
2. Familiarization with writing and running robotics programming

Course Outcomes:

1. Understand Robotics handling
2. Understand writing and running robotics programming

LIST OF EXPERIMENTS

1. Robot component recognition
2. Manipulating the robot
3. Recording the position
4. Writing and running robot programs
5. Creating a Program using
6. Control Instruction
7. Create a Pick and Place Program using control Instruction
8. Robot Simulation
9. Coordinate System
10. Macros, Mastering, Backup and restore

SEMESTER	**VI**					
YEAR	**III**					
COURSE CODE	**18VM608**					
TITLE OF THE COURSE	**Industrial Management**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	3	**-**	**-**	**-**	**45**	**3**

Perquisite Courses
No Prerequisite courses.

COURSE OBJECTIVES:

1. Familiarization of levels of management.
2. Familiarization of productivity.
3. Familiarization of with the definition of TQM/TPM

Course Outcomes:

CO No.	Outcomes	Bloom's Taxonomy Level
CO1	Understand the definitions and levels of management	L3
CO2	Understand the meaning of productivity.	L3
CO3	Understand the programming and Applications of Arduino	L4
CO4	Understand the industrial factories act.	L3
CO5	Understand the recruitment Procedure.	L2

Course Content:

MODULE-1 **[09 Hrs]**

Basics of management and Functions, Levels of management, role and responsibility, Quality control, inspection, 7 QC tools, SQC and SPC, Quality standards, ISO 9000 Clauses and Steps to Implement ISO 9000.

MODULE-2 **[09 Hrs]**

Types of Pollution and Environmental issues, Environment Management System - ISO 14001, Losses due to Industrial Accidents, Direct Indirect Losses, Preventive Measures, Safety Committee Safety Management System(OSHAS 18001)

MODULE-3 **[09 Hrs]**

Brief about TPS 14 Principles of Toyota, Definition of Lean, Lean thinking, 8 Waste of Lean Manufacturing and Common lean tools, JIT (JUST IN TIME) in lean and Lean Deployment

MODULE-4 **[09 Hrs]**

Definitions Descriptions of TPM, Benefits of Implementing TPM, TPM Model and 8 Pillars of TPM, Introduction to Overall Equipment Effectiveness(OEE), TQM Overview and Principles of TQM, Cost of Quality and 6 Cs of Quality, 5 Core Tools, TQM Implementation

MODULE-5 **[09 Hrs]**

Recruitment Procedure, Training Training Needs, Leadership,Team Building Creativity, Employee's welfare facilities, Industrial relations-Industrial disputes, Trade union act-rights and Liabilities, In- dian factories act, Payment of wages act, workmen's compensation act, workmen's compensation act

Text Books:

1. Industrial Engineering and Management - O P Khanna.

Reference Books:

1. Hi-Tech Industrial Management – B C Prabhakar

SEMESTER	**VI**					
YEAR	**III**					
COURSE CODE	**18VM609**					
TITLE OF THE COURSE	**Industrial Equipment Maintenance**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	3	-	-	-	45	3

Perquisite Courses (if any)			
S.No	**Sem/Year**	**Course Code**	**Title of the Course**
1	II/I	18VM204	Electrical Engineering Science
2	III/II	18VM312	Industrial Electronics
3	V/III	XXXXX	CNC Technology

Course Objectives:

1. To understand and become familiar with Industrial Equipment.
2. To become familiar with Condition based Maintenance of Instruments.
3. To be able understand on electrical equipment maintenance.

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Understand the concept of reliability aspects of Electronics equipment	L2
CO2	Understand importance of calibration of Electronics equipment	L3
CO3	Understand the maintenance of Power Transmission Devices	L2
CO4	Understand the maintenance Material Handling equipment.	L4
CO5	Understand the electronics equipment test maintenance.	L2

Course Content:

MODULE-1 **[09 Hrs]**

Introduction, Objectives of Maintenance, Maintenance Policies, Types of maintenance – Scheduled, Proactive, Preventive, Breakdown. Organizational setup and Maintenance Departments, Maintenance Planning, Planning Scheduling, Repair Cycle, Repair Complexity, Equipment History card, Master Schedule Card, Work-Order, Work-Report, Controlling – Maintenance Reliability Spare Parts Planning – Codification of Spares, Preservation of Past Data, Practice to use standard spares, Effective Purchase Procedures ,Classification of spare Parts – ABC Analysis Utilization of Human Resources in Maintenance; Maintenance – Work Specification–Work Measurement; Maintenance organization, training of maintenance personnel, planning of spares inventory, assessment of spare parts requirement Example of engine lathe and milling machine overhaul, inspection and checking.

MODULE-2 **[09 Hrs]**

Introduction of Maintenance of Power Transmission Devices, Maintenance of bearings, clutches, brakes and couplings Installation and alignments, Maintenance of power transmission elements like belt drives, chain drives and gear Drives, Trouble in hydraulic systems and their causes, technical environment required for assembly of hydraulic transmission Pumps its Repair, Maintenance of portable electric tools, Maintenance of portable pneumatic tools, Maintenance of air compressors.

MODULE-3 **[09 Hrs]**

Installation, Erection, Commissioning Maintenance Of CNC Machines, Installation, Erection, Com- missioning Of CNC Machines, Maintenance Of CNC Machines.

MODULE-4 **[09 Hrs]**

MAINTENANCE OF MATERIAL HANDLING EQUIPMENTS:
Maintenance of rope – wire rope and fiber rope, Maintenance of hoist equipment, Wrench and EOT Crane, Maintenance of belt conveyors, Maintenance of hydraulic and pneumatic conveyors.
CONDITION BASED MAINTENANCE:
Condition Monitoring – Methods Of Load Monitoring, Temperature Monitoring, Lubrication Monitoring, Leak Detection, Corrosion Monitoring OFF – Load Monitoring – Crack Detection, Vibration Monitoring Lubrication Monitoring – Debris Deposited, Debris In Suspension, Condition Of Used Oil, Ferro Graph. Thermal Monitoring, Location Of Temperature Measurement, Temperature Monitoring Devices, Sensors, Optical Pyrometer, Radiation Pyrometer. Vibration And Noise Monitoring
Causes, Measurement, Noise Signals, Signature Analysis.

MODULE-5 **[09 Hrs]**

REPAIR OF A.C. AND D.C. MACHINES:
Repair of A.C. Machines – starting of induction motor, sparking at slip rings, abnormal heating of the bearings, oil leakage and oil splashing from bearings Dismantling and assembling of induction motor, adjustment, testing and repair of A.C. machines Main faults of D.C. motors, brush sparking, commutator overheating, Armature overheating of pole coils, motor fails to start, Dismantling and assembly of D.C. motors, adjustment, testing of assembled motor after repair of transformers, dismantling of transformers, repair of windings, testing of transformers
ELECTRONICS TEST EQUIPMENT MAINTENANCE:
Trouble shooting and servicing of Electronics test equipment Calibration of Electronics Test Equipment Fault detection techniques, watchdog techniques Parity and error coding checks, common hard- ware faults Microprocessor systems, Emulation and simulation Reliability Aspects Of Electronic Equipment

Text Books:

1. Testing of Machine Tools Dr. George Schlesinger, Pergamon Press
2. Industrial Maintenance by HP Chand Co

Reference Books:

1. Management of Industrial Maintenance, A Kelly M J Harris
2. Maintenance Engineering, L C Morrow

SEMESTER	**VI**					
YEAR	**III**					
COURSE CODE	**18VM610**					
TITLE OF THE COURSE	**Additive Manufacturing**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	3	-	-	-	45	3

Perquisite Courses (if any)			
S. No	**Sem/Year**	**Course Code**	**Title of the Course**
1	I/I	18VM105	Basics of Computer I
2	III/II	18VM313	Mechanics of Machines
3	V/III	XXXX	CNC Technology

Course Objectives:

1. To understand the fundamentals for additive manufacturing and how it is different and discuss about various types of liquid based, solid based and powder-based AM technologies
2. To understand the various types of Pre-processing, processing, post-processing errors in AM. Also to know the various types of data formats and software's used in AM.
3. To know the various applications of AM in design analysis, aerospace, automotive, biomedical and other fields

Course Outcomes:

CO No.	**Outcomes**	**Bloom's Taxonomy Level**
CO1	Understand the fundamentals of Additive manufacturing	L2
CO2	Understand the system and analysis of the same	L4
CO3	Understand the power based AM system	L2
CO4	Understand the AM format and analyzing the software needs	L4
CO5	Applying the AM knowledge for various application	L5

MODULE-1 **[09 Hrs]**

Prototyping fundamentals: Need for time compression in product development, Need for Additive Manufacturing, Historical development, Fundamentals of Additive Manufacturing, AM Process Chain, Advantages and Limitations of AM, Commonly used Terms, Classification of AM process, Fundamental Automated Processes: Distinction between AM and CNC, other related technologies.

MODULE-2 **[09 Hrs]**

Liquid-based AM Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing

(SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Polyjet: Process, Principle, working principle, Applications, Advantages and Disadvantages, Case studies. Microfabrication. Solid-based AM Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Multi-Jet Modelling (MJM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

MODULE-3 **[09 Hrs]**

Powder Based AM Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three-dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Laser Engineered Net Shaping (LENS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Electron Beam Melting (EBM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Arc Spray Metal Deposition, Investment Casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

MODULE-4 **[09 Hrs]**

AM Data Formats: Reengineering for Digital Representation, STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Mesh Refining by Sub division Techniques. AM Software's: Need for AM software, Features of various AM software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor, SurgiGuide, 3-matic, Simplant, MeshLab.

MODULE-5 **[09 Hrs]**

AM Applications: Application – Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customised Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visulization of Biomolecules. Web Based Rapid Prototyping.

Text Books:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S,
2. World Scientific publications , Third Edition, 2010.
3. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001

Reference Books:

1. Wholers Report 2000 – Terry Wohlers, Wohlers Associates, 2000
2. Rapid Prototyping & Engineering Applications – Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.

SEMESTER	**VI**					
YEAR	**3rd**					
COURSE CODE	**18VM611**					
TITLE OF THE COURSE	**Automotive Electronics Lab**					
SCHEME OF INSTRUCTION	**Lecture Hours**	**Tutorial Hours**	**Practical Hours**	**Seminar/Projects Hours**	**Total Hours**	**Credits**
	-	-	4	-	60	4

Course Objectives:

1. Familiarization of Code Warrior IDE
2. Familiarization with Interfacing Concepts, driver Concepts and CAN

Course Outcomes:

1. Understand Code Warrior IDE
2. Understand Interfacing Concepts, driver Concepts and Controller Area Network

LIST OF EXPERIMENTS

1. Introduction to HCS12 Demonstration board and Code Warrior IDE
2. I/O Configuration and Port Integration Module of HCS12 Microcontroller
3. Interface a LED with the Board and Write a driver to control it
4. Interface a SWITCH with the Board and Write a driver to control it
5. Write a driver to control a the device using ADC (Analog to Digital Conversion)
6. Write a driver to establish a SCI communication between a host PC and the HCS 12 demo board
7. Write a driver to configure the Timer of HCS12 controller
8. Write a driver to configure the PWM of HCS12 and control the actuator
9. Write a driver to establish a SPI communication between a host PC and the HCS 12 demo board
10. Write a driver to establish a CAN (Controller Area Network) communication between a host PC and the HCS 12 demo board