

Degree in Computer Science and Engineering							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	PH-421	Applied Physics	3	0	2	5	4
2	MC-421	Environmental Studies	2	0	0	2	2
3	EC-421	Elements of Electronics Engineering	3	0	2	5	4
4	CS-421	Web Applications	2	0	4	6	4
5	EE-421	Elements of Electrical Engineering	3	0	2	5	4
6	CS-422	Object Oriented Programming	3	0	4	7	5
7	CS-423	Trouble Shooting & Maintenance Lab	0	0	2	2	1
		Total	16	0	16	32	24
Semester-II B (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations				80	S/US

B.Tech.(Chemical Engineering)							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CY-421	Applied Chemistry	3	0	2	5	4
2	MC-421	Environmental Studies	2	0	0	2	2
3	EC-421	Elements of Electronics Engineering	3	0	2	5	4
4	WS-421	Workshop Technology & Practice-II	2	0	4	6	4
5	EE-421	Elements of Electrical Engineering	3	0	2	5	4
6	CH-421	Fluid Flow	3	2	0	5	4
7	CH-422	Unit Operations Lab	0	0	4	4	2
		Total	16	02	14	32	24
Semester-II B (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations				80	S/US

B.Tech.(Electronics and Communication Engineering)							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	PH-421	Applied Physics	3	0	2	5	4
2	MC-421	Environmental Studies	2	0	0	2	2
3	EC-421	Elements of Electronics Engineering	3	0	2	5	4
4	EC-422	Electronic Workshop	2	0	4	6	4
5	EE-421	Elements of Electrical Engineering	3	0	2	5	4
6	EC-423	Electronic Devices & Circuits	3	0	4	7	5
		Total	16	0	14	30	23
Semester-II B (UG: Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations				80	S/US

FOUR YEAR DEGREE PROGRAM IN ELECTRICAL ENGINEERING							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	PH-421	Applied Physics	3	0	2	5	4
2	MC-421	Environmental Studies	2	0	0	2	2
3	EC-421	Elements of Electronics Engineering	3	0	2	5	4
4	EE-422	Circuit Theory	3	0	2	5	4
5	EE-423	Elements of Electrical Machines and Power System	3	0	2	5	4
6	EE-424	Electrical Engineering Materials	3	0	0	3	3
7	EE-425	Electrical Workshop	0	0	2	2	1
8	EE-426	Electrical Engineering Practises	0	0	2	2	1
		Total	17	0	12	29	23
Semester-II B (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations			5	80	S/US

Bachelor in Food Technology							
Semester-II (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CY-421	Applied Chemistry	3	0	2	5	4
2	MC-421	Environmental Studies	2	0	0	2	2
3	EC-421	Elements of Electronics Engineering	3	0	2	5	4
4	WS-421	Workshop Technology & Practice-II	2	0	4	6	4
5	EE-421	Elements of Electrical Engineering	3	0	2	5	4
6	FT-421	Food Chemistry	3	0	2	5	4
7	FT-422	Food Microbiology	3	0	2	5	4
		Total	19	0	14	33	26
Semester-III A (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations				40	

FOUR YEAR DEGREE PROGRAM IN INSTRUMENTATION AND CONTROL ENGINEERING							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	PH-421	Applied Physics	3	0	2	5	4
2	MC-421	Environmental Studies	2	0	0	2	2
3	EC-421	Elements of Electronics Engineering	3	0	2	5	4
4	IE-421	Instrumentation Workshop	2	0	4	6	4
5	EE-421	Elements of Electrical Engineering	3	0	2	5	4
6	IE-422	Electrical and Electronic measurements	3	0	0	3	3
7	ME-424	Fundamentals of Mechanical Engineering	3	0	0	3	3
		Total	19	0	10	29	24
Semester-II B (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations			5	80	S/US

UG- ME(Manufacturing Engineering) to be renamed as "Mechanical Engineering"							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CY-421	Applied Chemistry	3	0	2	5	4
2	EC-421	Elements of Electronics Engineering	3	0	2	5	4
3	WS-421	Workshop Technology & Practice-II	2	0	4	6	4
4	EE-421	Elements of Electrical Engineering	3	0	2	5	4
5	ME-421	Engineering Mechanics	3	0	2	5	4
6	ME-422	Machine drawing	0	0	4	4	2
7	ME-423	Basic Engineering Thermodynamics	3	0	0	3	3
		Total	17	0	16	33	25
Semester-II B (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations				80	S/US

UG- ME(Welding)							
Semester-II A (UG)							
S.No	Sub Code	Subject Name	L	T	P	Hrs.	Credits
1	CY-421	Applied Chemistry	3	0	2	5	4
2	EC-421	Elements of Electronics Engineering	3	0	2	5	4
3	WS-421	Workshop Technology & Practice-II	2	0	4	6	4
4	EE-421	Elements of Electrical Engineering	3	0	2	5	4
5	ME-421	Engineering Mechanics	3	0	2	5	4
6	ME-422	Machine drawing	0	0	4	4	2
7	ME-423	Basic Engineering Thermodynamics	3	0	0	3	3
		Total	16	0	16	32	24
Semester-II B (UG:Practical Training)							
	TP-401	Two weeks Practical Training during summer vacations				80	S/US

Title of the course : APPLIED PHYSICS
Subject Code : PH-421
 Weekly load : 5 LTP 3-0-2
 Credit : 4 (Lecture 3; Practical 1)

Unit	Main Topics	Lecture(s)
Unit-1	RELATIVITY Newtonian mechanics and Galilean transformations, Michelson-Morley experiment, postulates of special theory of relativity, Lorentz transformations, time dilation and length contraction, space-time interval, twin paradox, relativistic addition of velocities, variation of mass with velocity, mass energy equivalence, relativity and Doppler effect	12
	QUANTUM MECHANICS Need of quantum mechanics, Basis of quantum mechanics, wave function, Schrödinger's time-independent and time-dependent equations, expectation values of physical quantities (position, momentum and energy), applications of time independent equation; for a particle in a box (one dimensional), step potential, finite square well potential, tunnelling effect	12
Unit-2	RADIATION PHYSICS AND LASERS Elementary ideas about interaction of charged particles, electromagnetic radiations and neutrons with matter, detection of radiations by: proportional counter, GM counter, scintillation detectors, solid state detectors (basic principle only), applications of radiations in industry, agriculture and health science, radiation hazards. Principle of lasers, types of lasers: He-Ne, Ruby, CO ₂ and semiconductor laser, Applications of Lasers.	12
	FIBER OPTICS Optical Fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, Sources and sensors for optical fibers, applications of Optical fibers in communication.	06
	ELECTRO DYNAMICS Gauss's law in dielectric medium, Equation of continuity, displacement current, Maxwell's equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem & Poynting vector, vector potential, Lorentz gauge.	06

Recommended Books:

1. Arthur Beiser; Concepts of Modern Physics (McGraw Hill)
2. C. Kittel: Introduction to Solid State Physics (John-Wiley&Sons) Engineer
3. Serway, Moses and Moyer Modern Physics (Thomson)
4. N Subrahmanyam: A Text book of Optics by S Chand
5. David J. Griffiths: Introduction to Electrodynamics(Prentice-Hall)

List of Experiments

1. To find the value of Planck's constant by using a Photoelectric cell.
2. To verify inverse square law of radiation using a photoelectric cell.
3. To determine the frequency of an unknown signal by drawing the Lissajous patterns for various frequency ratios and evaluate the phase difference between two sinusoidal signals applied to X and Y input of cathode ray oscilloscope.
4. To measure the velocity of ultrasonic waves through a given liquid medium.
5. Measurement of wavelength of given He-Ne LASER by diffraction method.
6. To determine the wavelength of a sodium (Na) light by using the Michelson's Interferometer.
7. Determination of the value of e/m of an electron by helical method.
8. To determine the numerical aperture (NA) of a given multimode optical fiber by using Laser beam.
9. To determine the g – factor by using ESR Spectrometer.

Title of the course : **Environmental Studies**
 Subject Code : **MC-421**
 Weekly load : 2
 Credit : 2 (Lecture 2)

LTP 2-0-0

Unit	Main Topics	Lecture(s)
Unit-1	Ecology and environment Ecosystem; components, functioning, food chain and web, ecological pyramids. Biogeochemical cycles; water cycle, carbon cycle, nitrogen cycle. Biodiversity and its conservation.	08
	Sustainable development Sustainable development; conflict between development and environmental conservation, international endeavors. Sustainable utilization of resources; energy resources, water resources, forest resources.	08
Unit-2	Environmental pollution Water pollution; wastewater characterization, primary treatment, secondary biological treatment, general discharge standards. Air pollution; major pollutants, treatment devices, ambient standards. Solid waste management.	10
	Environmental Regulations Green House Effect and Kyoto Protocol. Ozone layer depletion and Montreal Protocol. Environment Protection Act. Hazardous waste management.	06

Recommended Books:

1. E. Bharucha, Textbook for Environmental Studies; UGC Publication.
2. K.D. Wanger, Environmental Management; W.B. Saunders Publication.
3. E.P. Odum, Fundamentals of Ecology; W.B. Saunders Publication..
4. Pollution Control Acts, Rules and Notifications; CPCB Publication.

Title of the course : **Elements of Electronics Engineering**
Subject Code : **EC-421**
 Weekly load : 5 LTP 3-0-2
 Credit : 4 (Lecture 3; Tutorial 0; Practical 1)

Theory

Unit	Main Topics	Lecture(s)
Unit-1	1. Semiconductors Semiconductors p-type, n-type, pn junction diodes, pn junction as a circuit element, its characteristics, half wave and full wave and bridge type rectifier circuits basic filter circuits, Diode as voltage multiplier, clipper & clamper circuit. Zener diode as a voltage regulator. LED its characteristics construction & applications	12
	2. Amplifiers Concept of d.c. and a.c. load line and operating point selection. Various amplifiers configurations their h-parameter equivalent circuits determination of voltage gain current gain input resistance and output resistance & power gain. Concept of feedback in amplifiers, different oscillators circuits (without analysis) Differential amplifier and its transfer characteristics.	12
Unit-2	3. Operational Amplifiers IC Op-Amps, its ideal & practical specifications and measurement of parameters. Op-Amp in different modes as inverting amplifier non inverting amplifier scale changer, differentiator & integrator.	12
	4. Transistors Characteristics of JFET, MOSFET, Various amplifier configurations using FET. Characteristics and Construction of SCR, TRIAC, UJT. Their basic areas applications.	12

Total=48

Recommended Books:

1. Electronic Devices & Circuits - Boylstad & Nashelsky
2. Integrated Electronics by Millman & Halkias
3. Electronic Principles – Malvino
4. Principles of Electronics – V.K. Mehta, Shalu Melta
5. Electronic Circuits – Donald L. Shilling & Charles Belowl

List of Experiments

1. To study single stage amplifiers and calculate its gain
2. To study the two stages R-C coupled amplifiers and calculates its gain
3. To study the two stages R-C coupled amplifier's frequency response
4. To study the frequency response of single stage amplifier
5. To study the voltage feedback amplifiers
6. To study the Wein bridge oscillator
7. To study the Hartley oscillator
8. To study the class-B push pull amplifier
9. To study the tuned collector oscillator
10. To study the crystal oscillator
11. To study the basic principles of R-C oscillator i.e. phase oscillator
12. To study the negative feedback, its merits, demerits and calculate its gain

Subject Code : EC-422
Weekly load : LTP 2-0-6
Credit : 5 (Lecture 2, Practical 3)

Unit	Main Topics	Lecture(s)
Unit-1	1.Introduction Introduction to active and passive components, fixed and variable resistances, their various types, fixed and variable capacitors, their various types and important specifications and colour codes.	06
	2. Voltage and current source Voltage and current sources – concept of constant voltage and constant current sources, symbol and graphical representation. Concept of variable voltage and variable current sources, symbol and graphical representation.	06
	3. Semi conductor diode Basic Idea of Semiconductors - P and N Types, PN junction, V-I characteristics of diode, static and dynamic resistance of diode, Q-point.	06
	4. Applications of diodes Use of a diode in rectifiers, half wave, full wave and bridge rectifiers, zener diode and its applications, light emitting diode (LED), liquid crystal display (LCD)	06
Unit-2	5. Transistor Introduction to transistor, working of a PNP and NPN transistor, transistor configuration, biasing of a transistor, amplifying action of a transistor.	08
	6. Field effect transistor FET, JFET, MOSFET, their characteristics and applications, uni-junction transistors (UJT)	08
	7. Transducers Introduction, working and application of LVDT, Strain Gauge and Thermistor.	08

Recommended Books:

1. VK Mehta, Basic Electronics; S. Chand
2. Grover, Jamwal, Electronic Components and Materials; Dhanpat Rai
3. SM Dhir, Electronic Components & Materials; McGraw Hill

List of Experiments

1. To observe the various passive components.
2. To observe various active components.
3. To observe the front panel control of CRO.
4. To test various electronic components using multimeter.
5. To find the value of a resistor using color coding scheme.
6. To plot the V-I characteristics of a diode.
7. To observe zener diode as a voltage regulator.
8. To observe the use of a diode as a half wave rectifier.
9. To observe the use of a diode as a full wave rectifier.
10. To show the amplifying action of a transistor.

Title of the course : **Electronic Devices & Circuits**
Subject Code : **EC-423**
Weekly load : LTP 3-0-4
Credit : 5 (Lecture 3, Practical 2)

Unit	Main Topics	Lecture(s)
Unit-1	1.Semiconductor Diodes PN junction Diode - VI characteristics, qualitative analysis of its behavior, Rectifiers-half wave and full wave, clippers, clampers, clamping circuit theorem, Voltage multipliers, Special purpose diodes - Zener diode, Tunnel diode, Varactor diode.	04
	2. Bipolar Junction Transistor Transistors-construction, operation, characteristics, parameters, Transistor as an amplifier at low frequency, Hybrid model of BJT, Analysis of amplifier using Hybrid model of BJT, Ebers-moll model, Transistor at high frequency and hybrid pi-model,	08

	Amplifier types-CE, CB, CC.	
	3. Transistor Biasing & Stabilization DC operating point, DC Biasing circuits-fixed bias, emitter bias, voltage divider bias, voltage feedback, Bias stability, Stabilization against variation in I_{CO} , V_{BE} and β , Bias compensation.	08
	4. Field-Effect Transistor The junction FET - construction, operation, characteristics, parameters, Biasing of JFET, Small signal analysis of JFET as an amplifier, MOSFET- construction, operation, characteristics, parameters, MOSFET as an amplifier, equivalent circuits, Biasing, Introduction to CMOS devices.	04
Unit-2	5. Power Amplifiers Analysis of Class A, B, C, AB amplifiers, Push-pull amplifiers, Power BJTs, heat sinks.	04
	6. Multistage and Feedback Amplifiers Amplifier frequency response-low frequency range and high frequency, Frequency response of multistage amplifiers, various coupling methods for multistage amplifiers, Feedback concept, Analysis of various configurations of feedback in amplifiers.	12
	7. Oscillators Criterion for oscillations, Oscillators based on RC and LC feedback circuits.	04
	8. OptoElectronic Devices Photodiode, Phototransistor, Solar cells, LED, Lasers, Optical Couplers.	04

Recommended Books:

1. Floyd, Thomas L, "*Electronic Devices*", Pearson Education Inc., Delhi, Sixth Edition, (2002)
2. Sedra, Adel S and Smith, Kenneth C, "*Microelectronic Circuits*", Oxford University Press, New York, Fourth Edition, (1997)
3. Millman, Jacob and Halkias, Christos C, "*Integrated Electronics*" Tata McGraw- Hill, New Delhi.
4. Boylestad Nashelsky, "*Electronic Devices and Circuit Theory*", 8th Ed., Pearson Education 7th Indian (2004) Reprint
5. Streetman Ben J, Sanjay Banerjee, "*Solid State Electronic Devices*", 5th Ed. PHI (2004)

List of Experiments:

1. To determine VI characteristic of the half wave & full wave rectifier
2. To determine effect of various filters circuits
3. To determine VI characteristic of pnp & npn transistor in common emitter & determine H-parameter from characteristics
4. To determine VI characteristic of pnp & npn transistor in CB & determine h-parameter from characteristics
5. To determine the A_v , A_i of RC coupled CE transistor amplifier
6. To determine the frequency of oscillation in hartley oscillator
7. To determine the frequency of oscillation in phase shift oscillator
8. To determine the effect of negative feedback on bandwidth & gain in CE, RC coupled amplifier
9. To determine VI characteristic Op-Amp as a inverting amplifier & scale changer
10. To determine VI characteristic Op-Amp as a non inverting amplifier
11. To determine VI characteristic Op-Amp as an integrator.
12. To determine VI characteristic Op-Amp as a differentiator.

Title of the course : **Web Applications**
 Subject Code : **CS-421**
 Weekly load : 2
 Credit : 4 (Lecture 2, Practical 4)

LTP 2-0-4

Unit	Main Topics	Lecture(s)
Unit-1	1. Introduction Understanding Web fundamentals, type of domains, URL, ISP, Internet technology and protocols, World-Wide-Web (WWW) – history & evolution.	04
	2. Internet basics Basics of Internet, IP addressing, type of domains, DNS, ISP, protocols – HTTP, TCP/IP.	02
	3. Web Services E-mail, Browsers, Search fundamentals, Search engines Telnet, FTP etc.	04
	4. HTML Structure of HTML program, basic tags, Headers and Footers, working with text layout tags, page layout tags, images, hyper-linking etc.	06
Unit-2	5. Enhancing HTML flavors Introduction to Tables, Frames, Forms, List & Links.	04
	6. Web site frills Introduction to Cascading style sheets, building better web pages, Navigation techniques, Web graphics - fancy buttons and menus, understanding multimedia - audio & video etc.	04
	7. Privacy & security Secure web documents, basics of Encryption-decryption, digital signatures, types & role of Firewalls.	04
	8. Dynamic functionality in Web pages Basics of DHTML, using HTML, CSS & XML , similarities & difference between HTML, CSS & XML, interactivity with Java Script, adding applets to web pages.	04

Recommended Books:

1. Matthew MacDonald, Creating a Web site; SPD-Oreilly.
2. Teodoru Gugoiu, HTML, XHTML, CSS & XML; Firewall Media.
3. Michael Morrison, Head First Java Script; SPD-O'reilly.
4. Raymond Greenlaw & Ellen Hepp, Fundamentals of Internet & WWW; TMH.
5. Ramesh Bangia, Learning HTML 4.0; Khanna Publisher.

LIST OF PRACTICALS:

1. Design & Discuss the structure of HTML program.
2. Introduction to URLs & URL classes and various types of domains.
3. Study & comparison between IPv4 & IPv6 addressing classes.
4. Design a web page using text layout tags
5. Design a web page using page layout tags.
6. Design a web page to insert images & hyper-links between different pages.
7. Write a HTML program using TABLE and its associated tags.
8. Design a web page to elaborate the attributes associated with FORMS.
9. Design a web page using nested FRAMES.
10. Design a web page to demonstrate the multimedia controls.
11. Design a web page using graphics & frills to make the web page user friendly.
12. Write a HTML program and explain various styles of cascading.
13. Write a program that elaborates the significance of table/ text using CSS.
14. Design a web page to demonstrate the working of applets programs.

Title of the course : **Object Oriented Programming**
 Subject Code : **CS-422**
 Weekly load : 3 LTP 3-0-4
 Credit : 5 (Lecture 3, Practical 4)

Unit	Main Topics	Lecture(s)
Unit-1	1. Review Review of basic concepts of object-oriented programming, Comparison between procedural programming paradigm and object-oriented programming paradigm.	04
	2. Classes and Objects Specifying a class, Creating class objects, Accessing class members, Access specifiers – public, private, and protected, Classes, Objects and memory, Static members, The const keyword and classes, Static objects, Friends of a class, Empty classes, Nested classes, Local classes, Abstract classes, Container classes, Bit fields and classes.	04
	3. Console Based I/O Concept of streams, Hierarchy of console stream classes, Input/output using Overloaded operators >> and << and Member functions of I/O stream classes, Formatting Output, Formatting using <i>ios</i> class functions and flags, Formatting using manipulators.	04
	4. Constructors and Destructors Need for constructors and destructors, Copy constructor, Dynamic constructors, Destructors, Constructors and destructors with static members, Initialize lists.	04
	5. Operator Overloading and Type Conversion Defining operator overloading, Rules for overloading operators, Overloading of unary operators and various binary operators, Overloading of new and delete operators, Type conversion - Basic type to class type, Class type to basic type, and Class type to another class type.	06
Unit-2	6. Inheritance Introduction, Defining derived classes, Forms of inheritance, Ambiguity in multiple and multipath inheritance, Virtual base class, Object slicing, Overriding member functions, Object composition and delegation, Order of execution of constructors and destructors.	06
	7. Pointers and Dynamic Memory Management Understanding pointers, Accessing address of a variable, Declaring & initializing pointers, Accessing a variable through its pointer, Pointer arithmetic, Pointer to a pointer, Pointer to a function, Dynamic memory management - new and delete Operators, Pointers and classes, Pointer to an object, Pointer to a member, <i>this</i> Pointer, Self-referential classes, Possible problems with the use of pointers - Dangling/wild pointers, Null pointer assignment, Memory leak and allocation failures.	06
	8. Virtual Functions and Polymorphism Concept of Binding - Early binding and late binding, Virtual functions, Pure virtual functions, Abstract classes, Virtual destructors & polymorphism.	05
	9. Exception Handling Review of traditional error handling, Basics of exception handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing an exception, Specifying exceptions.	05
	10. Managing Data Files File streams, Hierarchy of file stream classes, Error handling during file operations, Reading/Writing of files, Accessing records randomly, Updating files, Data formatting in memory buffers.	04

Recommended Books:

1. Lippman, S.B. and Lajoie, J., C++Primer, Pearson Education.
2. Stroustrup, Bjarne, the C++ Programming Language, Pearson Education.
3. Yashwant Kanetkar, Let Us C++, BPB
4. Robert Lafore, Turbo C++, Pearson India

LIST OF PRACTICALS

- 1) WAP to find the area of circle/rectangle.
- 2) WAP to find Simple Interest.
- 3) WAP to swap two numbers without using third variable.
- 4) WAP to illustrate the use of Implicit and Explicit type casting.
- 5) WAP to generate pyramid of digits using nested loops.

- 6) WAP to generate Fibonacci series.
- 7) WAP to find the maximum of given numbers.
- 8) WAP to pass arguments by value and by address.
- 9) WAP to illustrate the use of reference parameters.
- 10) WAP of Switch statement.
- 11) WAP to illustrate function overloading.
- 12) WAP to illustrate the use of default arguments.
- 13) WAP to reverse a string.
- 14) WAP to convert a given string from uppercase to lowercase.
- 15) WAP to count the number of vowels in a given sentence.
- 16) WAP to search a given item in a list.
- 17) WAP to add/multiply two matrices.
- 18) WAP to add diagonal elements of two matrices.
- 19) WAP to calculate the sum of all the elements of a matrix using function.
- 20) WAP to find the factorial of a number using recursive function.
- 21) WAP to illustrate the use of pointer variable.
- 22) WAP a program to implement the structures.
- 23) WAP to implement Union.
- 24) WAP to create a Class Employee with the following specifications:
Private members: name [20] characters,
Employee_ ID int,
Basic, DA, HRA Float
Salary Float
calculate_sal () function computes the salary and returns it. Salary is the sum of Basic, DA and HRA.
Public members: Readdata () function accepts the data values and invokes the calculate () function.
Display () function shows the results on screen.
- 25) WAP to create a friend function which would be able to swap the values of data members of two objects of same class.
- 26) WAP to initialize the objects using constructors.
- 27) WAP to implement function overloading.
- 28) WAP to implement polymorphism feature for '+' operator.
- 29) WAP to perform Program to illustrate Single/Multiple/Multilevel/Hybrid Inheritance.
- 30) WAP to illustrate the derivation and execution of constructor and destructor member functions in case of Inheritance.
- 31) WAP to create a file. Record structure and the name of file are given by user.
- 32) WAP that makes use of the: try, catch and throw keywords.
- 33) Create a function that throws an exception.
- 34) WAP that contains multiple catch statements.

Title of the course	: Troubleshooting & Maintenance Lab		
Subject Code	: CS-423		
Weekly load	: 2	LTP	0-0-2
Credit	: 1 (Practical 2)		

LIST OF PRACTICALS

1. Study different types of servicing and maintenance tools.
2. Study and installation of different Operating System.
3. Study of the beep diagnostic.
4. Switch on the computer and check the problems if hard disk is not present.
5. Study the different types of Troubleshooting techniques and procedures.
6. Check if the window is not opening, then troubleshoot the software fault.
7. Troubleshoot the problems if modem is not detected.
8. Troubleshooting of CD/DVD ROM.
9. Study the different types of analysis measured techniques.

Title of the course : **Basic Electrical Engineering**
Subject Code : **EE-421**
Weekly load : **5** **L T P: 3 0 2**
Credit : **4**

Unit	Main Topics	Lecture(s)
Unit-1	Basic Concepts Electric Charge, Current and Electromotive force, Potential and Potential Difference; Conductor, Semiconductor Insulator and dielectric; Electrical Power and Energy; Ohm's Law, Resistance and color coding; Capacitance and Inductance, their ratings; Effects of Temperature on Resistance, Series and Parallel connection, Kirchoff's Laws and Their Applications	06
	AC Fundamentals Concept of Alternating Voltage and Alternating Current, Difference between AC and DC, Various Terms Related with AC Waves; RMS and Average Values, Concept of Phase and Phase Difference, Single Phase and Three Phase Supply; 3-ph Star-Delta connections, Inter-Relation between phase voltage/current & line voltage/current; Alternating Voltage applied to Pure Resistance, Pure Inductance, Pure Capacitance and their combinations, Concept of Power and Power Factor in AC Circuit.	08
	Measuring Instruments Principle and Construction of Instruments used for Measuring Current, Voltage, Power and Energy, Concept and applications of digital multimeters, oscilloscopes, signal generators	03
	Electrical Safety Electrical Shock, Safety practices to prevent Electric Shock; Concept of Fuses- Classification, Selection and Application; Concept of Earthing, Types of Earthing, MCBs, ELCBs and their Applications.	04
Unit-2	Electromagnetic Induction Concept of Magnetic Field, Magnetic Flux, Reluctance, Magneto Motive Force (MMF), Permeability; Self and Mutual Induction, Basic Electromagnetic laws, Effects on a Conductor Moving in a Magnetic Field, various losses in magnetic circuits;	04
	Electrical Machines & Transformers Elementary concepts and classification of electrical machines, Common features of rotating electrical machines, Basic principle of a motor and a generator, Need of Starters and their classifications. Transformer- Classification, Principle of operation, Construction, Working and applications.	10
	Utilization of Electricity Concepts of Electricity for electrolysis process e.g., Electroplating, Electro refining etc., Electrochemical Cells & Batteries; Application of Electricity for Heating, Ventilating and air-conditioning, Welding and illumination.	04
	Basic Troubleshooting Basic Testing and faults diagnosis in electrical systems, various tools and their applications, replacement of different passive components e.g. fuses, lamps and lamp holders, switches, cables, cable connectors, electromagnetic relays.	04

Recommended Books:

Title	Author	Publisher
Electrical Technology	Edward Hugh	Pearson Education
Basic Electrical Engineering	D P Kothari & I J Nagrath	TMH
Electrical Machines	D P Kothari & I J Nagrath	TMH
Electrical Machines	S K Bhattacharya	TMH

List of Practicals

1. Study of various passive components and measuring instruments and their connections in electrical circuits.
2. Verification of Ohm's Law.
3. Verification of Kirchoff's laws (KCL & KVL).
4. Verification of equivalent resistances in series and parallel connections.
5. Measurement of various characteristic values of a Sinusoidal waveform with the help of CRO.

6. Measurement of voltage, current and power in RL and RLC circuits and Verification of phase angle and power factor concept.
7. Study of various types of earthings.
8. Study of various types of protection devices e.g. fuses, MCBs and ELCBs
9. Verification of Faraday's laws and Lenz's law.
10. Study of various types of DC motors and their starters.
11. Study of various types of AC motors and their starters.
12. Study of various types of transformers and Verification of turn's ratio.
13. Starting and reversing various AC and DC motors.
14. Fault diagnosis and removal in general electrical connection /apparatus.

Title of the course : Electronics Workshop

Title of the course : Circuit Theory
Subject Code : EE-422
Weekly load : 5
Credit : 4

LTP-3 0 2

Unit	Main Topics	Lecture(s)
Unit-1	BASIC CIRCUITS ANALYSIS Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy	12
	NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem	12
Unit-2	RESONANCE AND COUPLED CIRCUITS Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.	12
	THREE PHASE CIRCUITS Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits	12

Recommended Books-

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6 th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.
3. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
4. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, (2007).
5. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
6. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).

List of Practicals:

1. OHM'S LAW AND APPLICATIONS: Ohm's law and its applications are investigated in this experiment. The V-I characteristic of linear resistors is derived. Applications of Ohm's law include voltage and current division. Measurements of the equivalent resistance of a resistive arrangement are performed.
2. ANALYSIS OF NETWORKS: The purpose of this experiment is to introduce students to the nodal voltage and mesh current methods for solving circuits.
3. NETWORK THEOREMS: This experiment verifies some important network theorems: the Thévenin equivalent of a circuit, the maximum power transfer theorem, and the source superposition.
4. FIRST ORDER R-L AND R-C CIRCUITS: The objective of this experiment is to observe the response of the first order R-C and R-L circuits. The experiment demonstrates a method for measuring the time constant.
5. SECOND ORDER RLC CIRCUITS: This experiment demonstrates the response of a series and a parallel RLC circuit. The over-damped, critically damped and under-damped responses are derived for each circuit.
6. SINUSOIDAL STEADY STATE: This experiment demonstrates the properties of ac networks. The concept of impedance is discussed. Phasors are demonstrated through oscillograms

Title of the course : **Elements of Electrical Machines and Power System**
Subject Code : **EE-423**
Weekly load : **5** **L T P-3 0 2**
Credit : **4**

Unit	Main Topics	Lecture(s)
Unit-1	Electromechanical Energy Conversion Magnetic Circuits, Basic calculations of MMF, flux and other parameters of magnetic circuits, Elementary concepts of Electromechanical energy Conversion, Basic principle of a motor and a generator, Torque due to interaction of two magnetic fields and the concept of torque angle, Common features of rotating electrical machines, Classification of Electrical machines;	04
	DC Machines and Transformers Constructional details of dc machines-principle of operation of dc generator-emf equation, characteristics of different types of generators. Operation of dc motor-torque equation, characteristics of different types of motors-starting-speed control; Need of transformers, Classification, Constructional details and principles of operation of single phase and three phase transformers- equivalent circuit of single phase transformer-losses, regulation and efficiency; Autotransformers and special transformers.	07
	AC Machines Constructional details and operating principle of 3 phase alternator and synchronous motor-synchronizing and parallel operation. Starting of synchronous motor-V curve and inverted-V curves. Constructional features and operating principle of 3 phase induction motors-slip torque characteristics-methods of starting-speed control;	07
	Single phase and Special Machines principle of operation and type of single phase induction motors; Principle of working and special features of universal motor, repulsion motor, reluctance and hysteresis motors, stepper motors, linear induction motor, ac and dc servo motors and tacho-generator	06
Unit-2	Introduction to Electrical Power System Schematic representation of a power system – various components and data related to power system – per unit representation – Distinction between steady state and transient state of power system – Recent trends in power transmission – EHV AC and HVDC transmission	04
	Electric Power Generation Introduction to power generation scenario in India and world, Introduction to various sources of power Generation – conventional and renewable, Hydro, thermal, nuclear, gas power stations, types of turbines and their applications.	08
	Components of power system Various accessories used in power transmission system and substations, Fuses, relays, earthings, circuit-breakers, isolators, transmission towers, line insulators and other accessories.	08
	Utilization of Electrical power Utilization concepts of Electricity for various processes e.g. electrolysis process and metallurgy etc., Electrochemical Cells & Batteries; Application of Electricity for Heating, Ventilating and air-conditioning, Welding and illumination.	04

Recommended Books:

Title	Author	Publisher
Electrical Technology	Edward Hugh	Pearson Education
Power System	D P Kothari & I J Nagrath	TMH
Electrical Machines	D P Kothari & I J Nagrath	TMH
Electrical Machines	S K Bhattacharya	TMH
Computer Method in Power System Analysis	Stagg G.W and El.Abiad A.H	McGraw Hill

List of Practicals:

1. Study of three point starter of a DC motors.
2. Study of Four point starter of a DC motors.
3. Study of Star delta starter of Induction motor.
4. To perform Open circuit test on a single phase transformer.
5. To perform short circuit test on a single phase transformer.
6. To perform speed control of a DC motor using field control method.
7. To perform speed control of a DC motor using armature control method.
8. To Draw the OCC of a DC shunt generator.
9. To draw the Load characteristic of a DC shunt generator.
10. To study the constructional details of a single phase Induction motor.
11. To study various types of earthings.
12. To study various types of Fuses.
13. To study various types of Line Insulators.
14. To study the components of an electrical substation.

Title of the course : **Electrical Engineering materials**
Subject Code : **EE-424**
Weekly load : **3** **LTP-3 0 0**
Credit : **3**

Unit	Main Topics	Lecture(s)
Unit-1	Dielectric Materials Static dielectric constant, Polarization, atomic interpretation of the dielectric constant of mono-atomic and poly atomic gases, internal fields in the solids and liquids, static dielectric constants of solids, ferroelectric materials and spontaneous polarization, piezo- electricity. Frequency dependence of electronics, ionic and orientational polarization, complex dielectric constant and dielectric losses.	12
	Conductivity of Metals Ohm's Law and relaxation time of electrons, collision time and mean free path. Electron scattering and resistivity of metals. Heat developed in current carrying conductor, thermal conductivity of metals, superconductivity.	12
Unit-2	Magnetic Materials Magnetisation from microscopic view point, orbital magnetic dipole movement and angular momentum materials, diamagnetism, origin of permanent magnetic dipoles in material. Paramagnetic spin systems.	12
	Properties of ferromagnetic materials Spontaneous magnetisation and the curie-WeilsLaw. Ferromagnetic Domains and coercive force, antiferromagnetic and ferromagnetic materials. magnetic materials for electrical devices, introduction to permanent magnets	12

Recommended Books-

1. Electrical Engineering materials by A.J. Dekker.
2. Electrical Engineering Materials by G.P. Chhalotra.
3. Electrical Engineering materials by S.P. Seth and P.V. Gupta.

Title of the course : **Electrical Workshop**
Subject Code : **EE-425**
Weekly load : **2** **LTP-0 0 2**
Credit : **1**

List of Practicals:

1. Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
2. Study of electrical safety measures and demonstration about use of protective devices.
3. Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.
4. Lay out of complete wiring of a house (i) batten wiring (ii) plastic casing and capping.
5. Study of common electrical appliances such as electric iron, electric kettle, ceiling fan/ table fan, electric mixer, electric Geyser, desert cooler etc.
6. Testing and rectification of simulated faults in above said electrical appliances.
7. Introduction to a Lead-acid battery and its working.
8. Installation of a battery and to connect in series and parallel
9. Charging a battery and testing it with the help of hydrometer and cell tester.
10. Importance of three-phase wiring and its effectiveness.
11. Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.
12. Estimating and costing of power consumption.
13. Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.
14. Checking continuity of connection (with tester and lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.
15. Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.
16. Dismantling, servicing serving and reassembling of any of the above electrical appliances.
17. Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.
18. Reversing the rotation of a motor.

Recommended Books-

1. H Partab, *Electrical Gadgets*,
2. D K Sharma, *Basic Electrical & Electronics Engineering*, CBS publisher
3. Singh R P, *Electrical Workshop: A text Book*, I K International Publisher House Pvt. Ltd

Title of the course	:	Electrical Engineering Practises	
Subject Code	:	EE-426	
Weekly load	:	2	LTP-0 0 2
Credit	:	1	

List of Practicals:

1. Study of various passive components, protection devices e.g. fuses, MCBs and ELCBs and measuring instruments used in electrical circuits.
2. Verification of Ohm's Law and equivalent resistances in series and parallel connections.
3. Verification of Kirchoff's laws (KCL & KVL).
4. Measurement of various characteristic values of a Sinusoidal waveform with the help of CRO.
5. Measurement of voltage, current and power in pure R, pure L and pure C circuits and Verification of phase angle concept.
6. Measurement of voltage, current and power in RL, RC and RLC circuits and Verification of phase angle and power factor concept.
7. Measurement of power and power factor in a three phase circuit by different methods and Verification of voltage/current relationship in star and delta connections of three phases.
8. Verification of Faraday's laws and Lenz's law.
9. Study of various types of DC motors and their starters.
10. Study of various types of AC motors and their starters.
11. Study of various types of transformers and Verification of turn's ratio.
12. Verification of concepts of starting and reversing various AC and DC motors.
13. Testing of various passive components using electrical measuring instruments.
14. Fault diagnosis and removal in general electrical connection /apparatus.

Recommended Books-

Title	Author	Publisher
Electrical Technology	Edward Hugh	Pearson Education
Basic Electrical Engineering	D P Kothari & I J Nagrath	TMH
Electrical Machines	D P Kothari & I J Nagrath	TMH
Electrical Machines	S K Bhattacharya	TMH

Title of the course : Instrument Workshop
Subject Code : IE-421
Weekly load : 6 **LTP-2 0 4**
Credit : 4

1. Use of Various hand tools for manufacturing and testing e.g. pliers, cutter, crimpers, stripper, screw driver etc.
2. Familiarization , use and practice of measuring instruments for testing and measurement e.g. Analog and Digital Multimeters, CRO, frequency meter, signal generators, signal sources, LCR meter and IC tester.
3. Use of various chemicals used in instrumentation workshop and safety precautions to be observed.
4. Demonstration of various steps of PCB fabrication techniques:
 - (i) Identification of PCB board materials, their characteristics, corrosion and its prevention
 - (ii) Photo processing including photo print, etching, buffing, printing, high speed drilling, surface treatment, plated through holes, double sided PCBs.
 - (iii) Assembly of circuits on PCB, soldering and de-soldering techniques, wire shaping, edge connectors.

Recommended Books-

1. Modern Electronic Equipment by RS Khandpur, Tata McGraw Hill
2. Maintenance of Electronic Equipment by KS Jamwal, Dhanpat Rai and Sons

Title of the course : ELECTRICAL AND ELECTRONIC MEASUREMENTS
Subject Code : IE-422
Weekly load : 3 **LTP-3 0 0**
Credit :3

Unit	Main Topics	Lecture(s)
Unit-1	Analog instruments Analog instruments, classification of analog instruments, Principles of operation, operating forces, constructional details of PMMC, moving iron, electro-dynamometer and electrostatic types of instruments, ohmmeters-series and shunt type, rectifier type instruments, Advantages , disadvantages and their comparison	06
	Measurement of power and energy Power in ac and dc circuits, electro-dynamometer wattmeter, measurement of power in single and three phase circuits, Energy meter for ac circuits, single phase induction type watt hour meter, poly phase energy meters.	06
	Instrument Transformer Introduction, current and potential transformer, relationships, characteristics, constructional details, reduction of errors and their comparison.	06
	DC and AC Bridges Wheatstone bridge, measurements of resistance ,General form of ac bridge, Measurement of self inductance , capacitance , mutual inductance and frequency , sources of error and their minimization	06
Unit-2	Electronic measurements Introduction, Electronic voltmeter, VIVM Transistor voltmeter, , BJT, FET and MOSFET voltmeters, electronic multi-meters, vector voltmeter, vector impedance meter, Current measurements using electronic instruments.LCR meter.	06
	Cathode Ray Oscilloscope Introduction, CRO block diagram, CRT circuits, observation of waveform on CRO, Measurement of voltage, current, phase and frequency.	06
	Instruments for generation and analysis of waveforms Signal generators, function generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis	06
	Frequency and time interval measurement Frequency measurement, period measurement, errors in measurement, universal counters and extension of the range of counters	06

Recommended Books-

1. A K Sawhney: A course on electrical and electronic measurements and instrumentation, Dhanpat
2. David A Bell: Electronic Instrumentation and measurement, Prentice Hall of India

Title of the course : **Fluid Flow**
 Subject Code : **CH-421**
 Weekly load : 3 LTP 3-2-0
 Credit : 4 (Lecture 3, Tutorial 1)

Unit	Main Topics	Lecture(s)
Unit-1	1. Concept, Definitions Review of various types of flow and types of fluids, flow of incompressible fluid in pipes, Bernauli's equation and applications, laminar flow in pipes. Effect of roughness,	06
	2. Flow Measuring Devices Friction-factor chart, friction losses from sudden expansion and sudden contraction. Orifice meter, venturi meter, rotameter, Weirs and Notches, pitot tube	06
	3. Viscous Flow Reynolds experiment, boundary layer formation on a plate and enclosed conduits and boundary layer separation, mixing length. Flow past immersed bodies, Stock's Law, terminal velocity & drag coefficient, Pipes, fittings & valves; Estimation of economic pipe diameter.	12
Unit-2	4. Pumps and their Characteristics Pumps: Reciprocating: - single and double acting, single cylinder and multi cylinder. Rotary: Internal gear and external gear. Centrifugal, different types of impellers, characteristics curves of Centrifugal pumps, NPSH, Cavitations, pump priming, specific speed and pump selection,	10
	5. Fans & Blowers Principle, Construction & Working of Fans, Blowers, Compressors and Nozzles	04
	6. Flow of Compressible Fluids Processes of compressible flow through variable area conduits, adiabatic frictional flow, and isothermal frictional flow.	10

Recommended Books:

1. McCabe, Smith & Harriott, Unit Operation of Chemical Engineering, Tata McGraw Hill
2. Richardson & Coulson, Chemical Engg. Vol.-I & II, Pergamon Press.
3. Badger & Banchero, Introduction to chemical technology, Tata McGraw Hill.
4. Foust, Principles of Unit Operation, John Wiley.

Title of the course : **Unit Operations Lab**
 Subject Code : **CH-422**
 Weekly load : 0 LTP 0-0-4
 Credit : 2 (Practical 2)

Lists of Experiments:

1. To Find drag force for verifying Stock's law & plot a graph between Reynolds's number of a ball & drag coefficient.
2. To find the rate of filtration through Rotary Drum Vacuum filter.
3. To calculate the settling time and effect of different concentration for hindered settling.
4. To Verify Bernoulli's theorem.
5. To find out the moisture content of any sample.
6. To calculate cumulative fraction and differential analysis of given sample using sieve shaker.
7. To calculate the power required for jaw crusher for a given sample.
8. To calculate the power required for Ball mill for given sample.
9. To calibrate the given rotameter & calculate rotameter coefficient & also plot the graph between flow rate and rotameter reading.
10. To study the construction & working of Filter press (Plate & frame).
11. To study the performance of given Cyclone Separator.
12. To Study of Friction losses due to pipe fittings.
13. To Study the Friction losses in non circular pipes.
14. To measure the flow rate of fluid flowing in pipe using Venturi meter.
15. To calculate the volumetric flow rate through an orifice meter.

Title of the course : Food Chemistry
Subject Code : FT-421
Weekly load : 5
Credit : 4 (Lecture 3; Practical 2)

LTP 3-0-2

Unit	Main Topic	Lectures
1	Introduction Development of food chemistry and its role in food processing	2
	Water Importance of water in foods. Structure of water & ice. Concept of bound & free water and their implications. Sorption Phenomena and Sorption isotherms, examples–Dispersed systems–some basic considerations.	4
	Proteins Nomenclature, classification, structure, chemistry and properties of amino acids, peptides, proteins. Essential and non- essential amino acids, Isolation, identification and purity of amino acids, peptides, proteins. Qualitative and quantitative analysis of amino acids and proteins. Changes during processing, protein determination methods. Physical and chemical characteristics of proteins	8
2	Carbohydrates Nomenclature and classification, structure, physical and chemical properties of polysaccharides (cellulose, starch, fructans, galactans, hemi-cellulose, pectic substances) and their functions; dietary fiber, changes in carbohydrates during processing.	8
	Lipids Structure, classification, physical and chemical properties, utilization of fats and oils, margarine, shortenings, salad and cooking oils, importance of fats and oils in diet, introduction to hydrogenation and its importance.	6
	Browning reactions Enzymatic and non-enzymatic browning, advantages and disadvantages, factors affecting their reaction and control	4
	Vitamins Types of vitamins, chemistry and functions, source and deficiency diseases	4
	Plant pigment Structure and properties of chlorophyll, anthocyanins, tannin, myoglobin and carotenoids, chemical changes during processing	4
	Flavor and aroma of foods Importance and method of retention of flavour and aroma in foods, terpenes, esters, ketones and quinines.	4

Recommended Books:

Author	Title	Publisher
Meyer	Food Chemistry	CBS
Fenemba	Food Chemistry	
Belitz	Basic Food Chemistry	CBS
Lehninger	Principles of Biochemistry	

List of

Practicals:

1. Qualitative tests for the presence of carbohydrates in food samples
2. Qualitative test for the presence of protein in food and its products
3. Estimation of sugar in given food sample by Lane and Eynon and Nelson & Somogy method
4. Estimation of lactose in milk sample by titrimetric method
5. Determination of browning content and inhibition of browning reaction
6. Determination of acid value of given oil or fat sample
7. Estimation of amount of fat milk powder by Majonnier's method
8. Estimation of protein by micro-Kjeldhal method
9. Estimation of pectic substances and pectin in fruit
10. Determination of Vitamin B-complex in foods
11. Determination of saponification value and un-saponifiable matter
12. Determination of RM value, Polenske value of oil and fat.
13. Determination of proline content.
14. Determination of vitamin C in given sample.
15. Estimation of phosphatase activity in milk.

Title of the course : **Food Microbiology**
Subject Code : **FT-422**
Weekly load : 5 **LTP** 3-0-2
Credit : 4 (Lecture 3; Practical 2)

Unit	Main Topic	Lectures
1	Introduction Importance and historical developments in food microbiology, prokaryotic and eukaryotic cell, morphology, structure, microbiology and reproduction of bacteria, yeast and mold.	8
	Techniques of pure culture Serial dilution, pour plate, streak plate, spread plate, slant, broth and enrichment culture, lyophilization.	4
	Microbial growth and death kinetics Definition, growth curves (different phases), synchronous growth, doubling/generation time, intrinsic and extrinsic factors, relationship between number of generations and total number of microbes.	8
2	Microbiology and microbial spoilage of Food Products Microbiology of raw milk and fermented milk products viz. yoghurt, cheese; cereals products, fruits and vegetable, meat and meat product, egg and fish.	10
	Food spoilage Bacterial and fungal food spoilage, food poisoning, food borne infection, food borne intoxication. Toxins produced by Staphylococcus, Clostridium, Aspergillus; bacterial pathogens-Salmonella, Bacillus, Listeria, E. coli, Shigella, Campylobacter.	10
	Microbial Control Source of microorganisms, Physical and chemical agents used in microbial control, disinfected agents and its dynamics.	4

Recommended Books:

Author	Title	Publisher
W.C. Frazier	Food Microbiology	Tata McGraw Hill
H.J. Pleczar	Microbiology	Chapman and Hall
J. Heritage	Introductory Microbiology	

List of Practicals:

1. To study the working of various equipments related to Microbiology.
2. To isolate pure culture using pour plate technique.
3. To isolate pure culture using spread plate technique.
4. To isolate pure culture using pour plate technique.
5. To measure the size of given microbial cell using micrometry.
6. To enumerate total viable count in a culture.
7. To perform Gram staining technique of bacteria.
8. To study the growth curve of microorganisms.
9. Quantitative analysis of food sample by standard plate count (SPC) method.
10. To study quality of milk by methylene blue reductase test.
11. Demonstration of microbial production of curd.
12. To perform presumptive test for coliforms in milk.
13. To study the bacterial survival against UV irradiations.
14. To study the bacterial spoilage of given food sample.

Title of the course : **Engineering Mechanics**
 Subject Code : **ME-421**
 Weekly load : 5 LTP 3-0-2
 Credit :4 (Lecture 3;Practical 1)

Course Description	Lecture(s)
Unit-I	
Fundamentals of Mechanics Fundamental concept of mechanics and applied mechanics, idealization of mechanics, Basic dimensions and units of measurements, concept of rigid bodies, Laws of Mechanics	04
Laws for Forces Control Scalars and Vectors, Vector operations, Vector addition of forces, Force and its effects, characteristics of force vector, Bow's notation; Force systems: Coplanar and space force systems. Coplanar concurrent and non-concurrent forces. Free body diagrams,	04
Resultant and components of forces concept of equilibrium; parallelogram law of forces, equilibrium of two forces; super position and transmissibility of forces, Newton's third law, triangle law of forces, different cases of concurrent, coplanar two forces systems, extension of parallelogram law and triangle law to many forces acting at one point	04
Polygon law of forces Triangle law to many forces acting at one point - polygon law of forces, method of resolution into orthogonal components for finding the resultant, graphical methods, special case of three concurrent, coplanar forces, Lami's theorem	04
Moments & Couples Concept of moment, Varignon's theorem, Principle of moments, Moment of forces about a specified axis, concept of couple - properties and effect, Moment of couple, Movement of force on rigid body, Resultant of force and couple system, Reduction of force and couple system, Parallel forces - like and unlike parallel forces, calculation of their resultant	03
Trusses Simple trusses, analysis of simple truss, Method of Joints, Method of sections	05
UNIT II	
Friction Concept of friction, Characteristics of Dry friction, Laws of Coulomb friction, limiting friction, coefficient of friction; sliding friction and rolling friction, Belt friction, Ladder friction.	05
Centre of Gravity Concept of gravity, gravitational force, centroid and centre of gravity, centroid for regular lamina and centre of gravity for regular solids. Position of centre of gravity of compound bodies and centroid of composite area. CG of bodies with portions removed.	06
Simple Lifting Machines Concept of machine, mechanical advantage, velocity ratio and efficiency of a machine, their relationship, law of machine, Simple machines : lever, wheel and axle, differential wheel & axle, pulley systems, simple screw jacks, winch crab (single & double	06
Kinetics of particle Types of motion, linear motion with uniform velocity, uniform & varying acceleration, motion under gravity, motion of projectiles, relative motion of a particle. Newton's laws of motion, equation of motion, equation of motion for system of particles, D' Alembet's Principle, Motion of connecting bodies. Concept of momentum, Impulse momentum principle, Conservation of momentum, Principle of work and energy.	07

Recommended Books:

1. J. L. Mariam & L. G. Kraige , Engineering Mechanics. John Wiley & Sons
2. R. C. Hibbeler, Engineering Mechanics (Static & Dynamics), Prentice Hall
3. Beer & Johnston, Engineering Mechanics (Static & Dynamics), McGraw Hill
4. Boreis & Schimidt, Engineering Mechanics (Static & Dynamics), Cengage Learning
5. R. K. Rajput, Engineering Mechanics, Dhanpat Rai Publication, New Delhi
6. S. Rajshekharan, Engineering Mechanics, Vlkas Publishing House , New Delhi

List of experiments

1. To verify parallelogram law of forces addition.
2. To verify triangular law of forces addition.
3. To verify Lamis theorem.
4. To determine efficiency of screw jack.
5. To determine coefficient of friction on horizontal surface.
6. To determine coefficient of friction on inclined plane.
7. To calculate moment of inertia of a body.
8. To determine center of gravity of a 3 dimensional body.
9. To determine efficiency of wheel and Axle.

Title of the course : **Machine Drawing**
 Subject Code : ME-422
 Weekly load : 04 LTP 0-0-4
 Credit : 02

Theory

Course Description	Lecture(s)
Unit-I	
Basics of Machine Drawing	04
Machining symbols, surface finish characteristics, surface roughness symbols, limits, fits and tolerances.	
Screw Threads	06
Screw thread nomenclature, thread designation, conventional representation of screw threads, different types of threads and their representation.	
Fastenings	08
Nut, bolt and washer; types of nuts, types of bolts, Welding; types of welded joints, representation of a weld, welding symbols according to B.I.S.	
Unit-II	
Keys, Cotters and Joints	08
Introduction, proportions of a key, types of keys and their applications. A Cotter and a Gib with their uses. Types of joints used for connecting rods.	
Rivets and Riveted Joints	08
Types of rivets, types of riveted joints, general terms/rules used for riveted joints.	
Assembly and detail drawings	14
One assembly drawings of a Tail stock, details (drawings of different elements) of a screw jack assembly.	

Recommended Books

Title	Author(s)	Publisher
Machine Drawing	N D Bhatt	Khanna
Machine Drawing	P S Gill	Standard
Machine Drawing	R.K. Dhawan	S. Chand
Machine Drawing	Goutam Pohit & Goutam Ghosh	Pearson Education

Title of the course : **Fundamentals of Mechanical Engineering**
Subject Code : **ME-424**
Weekly load : **3** **LTP-3 0 0**
Credit : **3**

Unit	Main Topics	Course Outline	Lectures
Unit-1	Basic concept of fluid mechanics	Classification, types of fluids, properties, laws of pressure atmospheric, gauge, absolute pressure, pressure measurement, manometers, mechanical gauges.	6
	Flow of fluids	Types of fluid flow, velocity, rate equation of continuity, energy of a liquid in motion, head of a liquid, Bernoulli's theorem, orifice and venturimeter	6
	Dimensional and model analysis	Dimensions, dimensional analyses, Rayleigh's and Buckingham's method - similitude, dimensionless numbers and their significance, similarity laws, model studies.	6
	Pumps and Turbines	Introduction, types of pumps, reciprocating pump, construction details, co-efficient of discharge, slip, power required, centrifugal pump, classification, working principle, specific speed, turbine, classification working principle.	6
Unit-2	Basic Thermodynamics	Systems zeroth law, first law of thermodynamics, concept of internal energy and enthalpy applications to closed and open systems, second law of thermodynamics, concept of entropy, clausius inequality and principles of increase in irreversible processes. Basic IC engine and gas turbine cycles single and multistage reciprocating compressors	9
	Introduction to Refrigeration and Air Conditioning	Properties of steam, Ranking cycle, one dimensional flow through nozzles and applications to jet and rocket propulsion, basic thermodynamics of refrigerators and heat pumps.	9
	Introduction to Boilers and Steam Turbines	Types of Boilers: Water tube and Fire Tube Boilers, Mountings and Accessories, steam turbines: types, properties of steam.	6

Recommended Books-

1. Shames, I.H., 'Mechanics of fluids', Kogakusha, Tokyo, 1998.
2. Kumar, K.L., 'Fluid Mechanics', Eurasia publishers, 1990
3. Radhakrishnan, E., 'Introduction to fluid Mechanics', Prentice Hall, India 1999.
4. Rajput R.K., 'Fluid Mechanics and Hydraulic Machines', S.Chand and Co., India 1998.
5. Nag, P.K., Engineering Thermodynamics, Tata McGraw-Hill Co. Ltd., 1993.
6. Reynolds, Thermodynamics, Int. Student Edition, McGraw-Hill Co. Ltd., 1990.

Title of the course : Workshop technology & practice-II
Sub code : WS-421
Weekly load : 6
Credit : 4

LTP 2-0-4

Course Description	Lecture(s)
Unit -1	
Turning and shaping	
Principle, description and functions of a lathe, specifications, work holding devices, tool materials and various operations. Description of a shaper, specifications, quick return mechanism, operations that can be performed on a shaping machine.	06
Milling and drilling	
Principle, types of milling machines, specifications of a milling machine, multipoint cutting tool, Types of milling cutters, various operations. Description of a drilling machine, types of drilling machines, twist drills, speed and feed in drilling.	08
Forging	
Introduction to forging, cold and hot forging, tools used, flow lines, importance of forging process and limitations, various gorging operations.	06
Unit-II	
Arc welding	
Definition, classification of welding processes, Principle of arc welding, welding power source, welding electrodes, coding and coating of welding electrodes, welding parameters, Types of weld joints, welding positions, advantages, limitations and applications.	06
Gas welding	
Definition, oxy-acetylene welding, types of welding flames, welding techniques, welding filler rods and fluxes, welding torches and blow pipes, acetylene gas generator, gas cylinders and regulators, advantages, disadvantages and applications of gas welding	06

Recommended Books

1. Hajra Choudhury, Hazra Choudhary and Nirjhar Roy, 2007, Elements of Workshop Technology, vol. I, Media promoters and Publishers Pvt. Ltd.
2. W A J Chapman, Workshop Technology, 1998, Part -1, 1st South Asian Edition, Viva Book Pvt Ltd.
3. P.N. Rao, 2009, Manufacturing Technology, Vol.1, 3rd Ed., Tata McGraw Hill Publishing Company.
4. Kaushish J.P., Manufacturing Processes, 2008, Prentice Hall India
5. R.S. Parmar, Welding processes technology, Khanna Publishers, New Delhi.

List of Practicals:

Practical: 10-14 jobs from the following list.

MACHINE SHOP

1. Practice of turning operation on lathe
2. Practice of facing operation on lathe
3. Practice of taper turning on lathe
4. Practice of knurling on lathe.
5. Practice of producing rectangular block on shaping machine.

FORGING SHOP

1. Exercise on conversion of round to square with cold forging.
2. Exercise on conversion of round to square with hot forging.
3. Upsetting operation exercise.
4. Exercise on swaging.

ARC WELDING SHOP

1. To practice making of a butt joint on a flat piece
2. To practice making of lap joint on a flat piece
3. To practice making of a corner joint.
4. To practice making of T-joint.
5. To practice making of bead on flat and horizontal position.
6. To practice making of bead on vertical inclined position.

GAS WELDING SHOP

1. To practice making of making different types of flames.
2. To practice making of bead in left ward position.
3. To practice making of bead in left ward position.
4. To practice making of T- joint in M.S. Round pipe.
5. To practice making of corner joint.

Title of the course : **Applied Chemistry**
 Subject Code : CY-421
 Weekly load : 5 LTP 3-0-2
 Credit : 4 (Lecture 3; Practical 1)

Unit	Course outlines	Lecture(s)
Unit-1	Electro-analytical Chemistry Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference. Potentiometry: Principle, instrumentation and applications.	09
	Fuels Classification, examples, relative merits, Solid Fuels: Coal, Proximate and Ultimate analysis of coal. Gross and Net Calorific Value, Determination of calorific value by Bomb Calorimeter Carbonization process, Low and High Temperature Carbonization. Liquid fuels: Cracking, Thermal and Catalytic Cracking, Synthetic petrol, Knocking, Antiknocking, Octane number, Cetane Number. Antiknocking agents. Gaseous fuels: Biogas, LPG and CNG. Determination of calorific value by Junker's Calorimeter. Flue gas analysis by Orsat's apparatus, problems.	10
	Surface Chemistry Adsorption, chemisorption and physisorption, application of adsorption of gases on solids. Langmuir's adsorption isotherm, Freundlich's adsorption isotherm, BET theory of multi-layer adsorption (qualitative), adsorption chromatography. Colloidal particles, surfactants, micelles. Enzyme catalysis, Criteria for choosing catalyst for industrial processes.	09
Unit-2	Engineering Materials Abrasives – Moh's scale of hardness – natural abrasives (diamond, corundum, emery, garnets and quartz) – synthetic abrasives (silicon carbide, boron carbide) – refractories – characteristics – classification (acidic, basic and neutral refractories) – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina magnesite and zirconium bricks.	10
	Lubricants Classification of lubricant, lubricating oils, semisolid lubricants, solid and synthetic lubricants. Properties of lubricating oils (viscosity, flash and fire points, cloud and pour points, Iodine Value, Acid Value, R. M. Value, mechanical stability and saponification number).	07

Recommended Books:

Text Books

Author	Title	Publisher
P. C. Jain & M. Jain	Engineering Chemistry	Dhanpat Rai Publishing Company
B.R. Puri, L.R. Sharma, M.S. Pathania	Principles of Physical Chemistry	Vishal Publishing Company
F.W. Billmeyer	Textbook of Polymer Science 3rd Edn	Wiley. N.Y
C. N. Banwell & E.M. McCash	Fundamentals of Molecular Spectroscopy, 4th Edn	Tata Mc Graw-Hill Edition
S. S. Dara, S. S. Umare	a Text Book of Engineering Chemistry	S. Chand Publishing
J. D. Lee	Concise Inorganic Chemistry, 5th Edn	Chapman and Hall, London
B. Sivasankar	Engineering Chemistry	Tata Mcgraw Hill
A. Mallick	Engineering Chemistry	Viva Books
J. Clayden, Nick Greeves, S. Warren	Organic Chemistry	Oxford Press
Levine,	Physical Chemistry, 5/e (7th reprint)	Tata McGraw Hill
J.E. Huheey, E.A. Keitler, R.L. Keita, O.K. Medhi	Inorganic Chemistry, Principle, structure and reactivity	Pearson Education
J.E. McMerry and R.C. Fay	Chemistry 5th Ed	Pearson Education

List of Experiments

- Determination of strength of unknown solution of Mohr's salt using KMnO_4 and standard oxalic acid solution.
- Determination of ferrous, ferric and total iron in a given sample using standard $\text{K}_2\text{Cr}_2\text{O}_7$.
- Determination of copper in a given solution by iodometric method using $\text{Na}_2\text{S}_2\text{O}_3$ and standard $\text{K}_2\text{Cr}_2\text{O}_7$
- To find out the cell constant of a conductivity cell.
- To find out the strength of the given hydrochloric acid solution by titrating it against sodium hydroxide using pH meter.
- To prepare and describe a titration curve for phosphoric acid-sodium hydroxide titration using pH-meter.

7. Determine the strength of the given hydrochloric acid solution by titrating it against sodium hydroxide conductometrically.
8. Determination of EMF/oxidation/reduction potential of a given metal/metal ion in different conditions.
9. Determination of equilibrium constant of a reaction by potentiometric method.
10. To determine moisture and volatile contents in a given coal sample by proximate analysis.
11. To determine fixed carbon and ash contents in a given coal sample by proximate analysis.
12. To study the adsorption of acetic acid on active charcoal and to verify the Freundlich and Langmuir isotherm.
13. To study the adsorption of Iodine from alcoholic solution by charcoal.
14. Determination of viscosity of heavy oil by means of Redwood Viscometer.
15. Determination of coefficient of viscosity of the given liquids by Ostwald's Viscometer method.
16. Determination of Flash point of a given sample.
17. Determination of Fire point of a given sample.
18. Determination of acid value and saponification value of an oil.
19. Determination of aniline point of a lubricating oil.
20. Determination of Iodine value of an oil.
21. To determine the cloud and pour points of a lubricating oil.

(Any twelve to be performed)