VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

DEPARTMENT

OF

COMPUTER ENGINEERING

COURSE SYLLABUS

for

B. Tech – Artificial Intelligence & Data Science

(Applicable for batches admitted from 2020-2021)

VASIREDDY VENKATADRI
INSTITUTE OF TECHNOLOGY

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

(Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUK,

NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

I- Year I - Semester	Name of the Course	L	T	P	C
BS1101	Mathematics -I	2	1	0	3

Course Objectives

1. This course will illuminate the students in the concepts of calculus.
2. To enlighten the learners in the concept of differential equations and multivariable calculus.
3. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Unit-1

Differential equations of first order and first degree **10 Hrs**

Linear differential equations-Bernoulli's equations - Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

Unit-2

Linear differential equations of higher order **10 Hrs**

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$ and $x^n V(x)$ - Method of Variation of Parameters.

Applications: LCR circuit – Simple harmonic motion

Unit-3

Mean value theorems **10 Hrs**

Mean value theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

Unit-4

Partial differentiation **10 Hrs**

Introduction – Homogeneous function – Euler's theorem - Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Unit-5

Multiple integrals **08Hrs**

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar) –Triple integrals.

Applications: Areas by double integrals and Volumes by triple integrals.

TEXT BOOKS

1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS

1. **H. K. Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Course Outcomes: At the end of the course, the student will be able to

CO1. solve the differential equations related to various engineering fields.
CO2. utilize mean value theorems to real life problems.
CO3. familiarize with functions of several variables which is useful in optimization.
CO4. apply double integration techniques in evaluating areas bounded by region.
CO5. learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3 – dimensional coordinate systems.

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

CO6. (Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of MATHEMATICS – I (Calculus)

Unit-1: Differential equations of first order and first degree:

Linear differential equations-Bernoulli's equations - Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

Unit	Module	Micro content
1a. & 2a. Differential equations of first order and first degree	Linear differential equations	Solution of Linear differential equations in $'y'$
		Solution of Linear differential equations in $'x'$
		Initial value problem
	Non-Linear differential equations	Bernoulli's equations
		Equations reducible to Linear differential equations
	Exact differential equations	Solution of Exact differential equations
	Non-Exact differential equations	Equations reducible to Exact equations
		Integrating factor found by inspection
		Integrating factor of a Homogeneous equation
		Integrating factor for an equation of the type $f_1(xy)\,ydx + f_2(xy)\,xdy = 0$
		Integrating factor, if $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$ be a function of $'x'$
		Integrating factor, if $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ be a function of 'y'
1b. & 2b. Applications	Application of differential equations of first order and first degree	Newton's Law of cooling
		Law of natural growth and decay
		Orthogonal trajectories
		Electrical circuits

Unit-2: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$ and $x^n V(x)$ - Method of Variation of Parameters.

Applications: LCR circuit – Simple harmonic motion

Unit	Module	Micro content
3a. & 4a. Linear differential equations of	Homogeneous equations of higher order with constant coefficients	Finding the Complementary function
	Non-homogeneous	Particular integral of the type $'e^{ax}'$

higher order	equations of higher order with constant coefficients	Particular integral of the type $'\sin ax'$ (or) $'\cos ax'$
		Particular integral of the type x^n
		Particular integral of the type $'e^{ax}\,V(x)'$
		Particular integral of the type $'x^n v(x)'$
3b. & 4b. Applications	Applications of Non-homogeneous equations of higher order with constant coefficients	Method of variation of parameters
		LCR circuit
		Basic problems on simple harmonic motion

Unit-3: Mean value theorems:

Mean value theorems (without proofs): Rolle's theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

Unit	**Module**	**Micro content**
5a. & 6a. Mean value theorems	Mean value theorems	Rolle's theorem
		Lagrange's mean value theorem
5b. & 6b. Mean value theorems	Mean value theorems	Cauchy's mean value theorem
		Taylor's expansions of $f(x)$
		Maclaurin's expansions of $f(x)$

Unit-4: Partial differentiation:

Introduction – Homogeneous function – Euler's theorem - Total derivative – Chain rule – Jacobians – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Unit	**Module**	**Micro content**
7a. & 8a. Partial differentiation	**Partial Differentiation**	Euler's theorem
		Total derivative
		Chain rule
		Jacobians
7b. & 8b. Applications	**Applications of Partial Differentiation**	Taylor's and Mc Laurent's series expansion of functions of two variables
		Maxima and Minima of functions of two variables
		Lagrange's method of undetermined multipliers

Unit-5: Multiple integrals:

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar) –Triple integrals.

Applications: Areas by double integrals and Volumes by triple integrals.

Unit	Module	Micro content
9a. & 10a. Multiple integrals	Evaluation of Double Integrals	Double integrals
		Change of order of integration
		Double integrals in Polar co-ordinates
		Change of variables
9b. & 10b. Applications	Evaluation of Triple Integrals	Triple integrals
	Applications of Multiple Integrals	Areas by double integrals
		Volumes by triple integrals

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I- Year I - Semester	Name of the Course	L	T	P	C
BS1102	Applied Chemistry	3	0	0	3

Pre-Requisites:

Knowledge of basic concepts of chemistry for Engineering students will help them as professional engineers later in design and material selection as well as utilizing the available resources.

Course Objectives

1. Significance of various types of plastic materials in household appliances and composites (FRP) in aerospace and automotive industries.
2. Understand the basic concepts of electrochemistry, which are useful to construct the electrochemical cells, batteries and fuel cells.
   Illustrate the theories and mechanism of corrosion and its prevention.
3. Importance of advanced materials and their engineering applications.
4. Make use of molecular machines in supramolecular chemistry and need of green chemistry.
5. Design and construction of advanced instrumental techniques and recall their importance.

Unit-1

POLYMER TECHNOLOGY **10Hrs**

Polymerisation*:* Introduction-Methods of polymerisation-(emulsion and suspension)-Physical and mechanical properties.

Plastics*:* Compounding-Fabrication (compression, injection, blown film, extrusion)-Preparation, properties and applications of PVC, ploycarbonates and Bakelite-Mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers*:* Natural rubber-Drawbacks-Vulcanization-Preparation-Properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes)

Composite Materials: Fiber reinforced plastics-CFRP and GFRP

Conducting polymers: Polyacetylene, doped conducting polymers -p-type and n-type doping.

Bio degradable polymers: Biopolymers and biomedical polymers.

Unit-2

ELECTROCHEMICAL CELLS AND CORROSION **10Hrs**

Single electrode potential-Electrochemical series and uses of series-Standard hydrogen electrode, calomel electrode, concentration cell, construction of glass electrode, Batteries: Dry cell, Ni-Cd

cells, Ni-Metal hydride cells, Li-ion battery, Zinc air cells, Fuel cells-H_2 –O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

***Corrosion**:* Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, water-line corrosion- passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control: (proper designing, cathodic protection)-protective coatings: cathodic and anodic coatings, electroplating, electroless plating (nickel), paints (constituents and its functions).

Unit-3

MATERIAL CHEMISTRY **10 Hrs**

Non-elemental semiconducting materails: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) – Semiconductor devices (p-n junction diode as rectifier, junction transistor)

***Nano materials**:* Introduction, sol-gel method, characterization by BET, SEM and TEM methods, applications of graphene-carbon nanotubes and fullerenes: Types, preparation of carbon nanomaterials by carbon-arc, laser abalation methods.

***Liquid crystals**:* Introduction-types-applications.

Superconductors: Meissner effect, type- I and type- II superconductors, characteristics and applications.

Unit-4

ADVANCED CONCEPTS AND GREEEN CHEMISTRY **10 Hrs**

Molecular switches and machines: Introduction to supramolecular chemistry, characteristics of molecular motors and machines. Rotaxanes and Catenanes as artificial molecular machines. Protypes linear motions in Rotaxanes, and acid-base controlled molecular shuttle, a molecular elevator, an autonomous light –powered molecular motors, natural molecular motors and machine.

Green chemistry: Principles of green chemistry, green synthesis – aqueous phase, microwave assisted chemical reactions and phase transfer catalysis (PTC).

Unit-5

SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES

8 Hrs

Spectroscopic Techniques: Electromagneticspectrum-types of molecular spectra and their absorption criteria.

UV-visible spectroscopy (electronic spectroscopy), Frank-Condon principle, Beer-Lambert's law and its limitations, chromophores and auxochromes – *applications of UV visible spectroscopy.

IR spectroscopy – functional group and finger print region – molecular vibrations – stretching and bending vibrations – *applications of IR.

NMR (Nuclear magnetic resonance): Working principle and instrumentation of NMR – chemical shift(δ) – *applications of NMR.

(*only general applications – without any spectroscopic problems regarding quantitative and qualitative analysis.)

Non-conventional energy sources: Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, organic photo-voltaic, hydropower, geothermal power, tidal, ocean thermal energy conversion (OTEC) – open cycle OTEC, closed cycle OTEC and hybrid cycle OTEC.

REFERENCE BOOKS

1. A text book of Engineering Chemistry by S.S. Dara, S. S. Umare; S. Chand & Co., Ltd., Latest Edition.
2. Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co., Latest Edition.

TEXT BOOKS

1. Engineering Chemistry by Jain & Jain; Dhanpat Rai Publicating Co., Latest Edition
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 Edition.
3. Engineering Chemistry by Prasanth Rath, B. Ramadevi, Ch. Venkata Ramana Reddy, Subendu Chakravarthy; Cengage Publications, 2019 Edition.

Course Outcomes: At the end of the course, the students will be able to

CO1. **explain** the preparation, properties and applications of thermoplastics, thermosettings, elastomers and conducting polymers.
CO2. **know** the importance of various materials and their uses in the construction of batteries and fuel cells.
CO3. **know** the applications of advanced materials in various industries.
CO4. **apply** the principles of supramolecular chemistry in the applications of molecular machines, need of green chemistry.
CO5. **explain** the principles of spectrometry such as UV, IR, and NMR.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2					3					
CO2	2	2					2					
CO3	2	2					2					
CO4	2	2					3					
CO5	2	2					3					

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of Applied Chemistry

UNIT-I: POLYMER TECHNOLOGY **14 HRS**

Polymerisation*:*Introduction-Methods of polymerisation-(emulsion and suspension)-Physical and mechanical properties.

Plastics*:* Compounding-Fabrication (compression, injection, blown film, extrusion)-Preparation, properties and applications of PVC, ploycarbonates and Bakelite-Mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers*:* Natural rubber-Drawbacks-Vulcanization-Preparation-Properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes)

Composite Materials: Fiber reinforced plastics-CFRP and GFRP.

Conducting polymers: Polyacetylene, doped conducting polymers- p-type and n-type doping.

Bio degradable polymers: Biopolymers and biomedical polymers.

Unit	Module	Micro content
Polymerization	Introduction, Methods of Polymerization And Properties of Polymers	Introduction - Polymer, monomer, functionality and polymerization. Methods of polymerisation - Emulsion and suspension Physical and mechanical properties of polymers.

Plastics	Compounding of plastics, fabrication of polymer articles, preparation, properties and applications of some polymers, e-plastic and disposal of e-plastic waste.	Compounding of plastics Fabrication of polymer articles – compression, injection, blowing, extrusion Preparation, properties and applications of PVC, ploycarbonates and Bakelite Mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.
Elastomers	Natural Rubber, vulcanization, synthetic rubbers	Natural rubber – Drawbacks – Vulcanization Preparation – Properties and applications of synthetic rubbers – Buna S, thiokol and polyurethane rubbers.
Composite materials	Fiber reinforced plastics	Fiber Reinforced Plastics (FRP) – CFRP and GFRP.
Conducting polymers	Polyacetylene polymer, p-type and n-type doping	Polyacetylene, doped conducting polymers- p-type and n-type doping.
Biodegradable polymers	Biopolymers and biomedical polymers	Biopolymers and biomedical polymers – polylactic acid polyglycolic acid polymers

UNIT-II: ELECTROCHEMICAL CELLS AND CORROSION

12 HRS

Single electrode potential - Electrochemical series and uses of series - Standard hydrogen electrode, calomel electrode, concentration cell, construction of glass electrode, Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li-ion battery, Zinc air cells, Fuel cells-H_2 –O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

Corrosion*:* Definition - theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, water-line corrosion- passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control: (proper designing, cathodic protection)-protective coatings: cathodic and anodic coatings, electroplating, electroless plating (nickel), paints (constituents and its functions).

Unit	**Module**	**Micro content**
Introduction	Single electrode potential	Oxidation potential
		Reduction potential
Concentration cells	Electrode concentration cell and electrolyte concentration cell	Electrode concentration cell and electrolyte concentration cell
Electro chemical series	Electro chemical series	Definition – Electro chemical series
		Significances of Electro chemical series
		Differences between Electro chemical series and galvanic series

Reference electrodes	Standard Hydrogen Electrode	Working Principle and Construction of a – Standard Hydrogen Electrode – Calomel Electrode – Glass Electrode
	Calomel Electrode	
	Glass Electrode	
Corrosion	Introduction	Definition – Corrosion
	Theories of Corrosion	Chemical Theory of Corrosion / Dry Corrosion Electro Chemical Theory of Corrosion / Wet Corrosion
	Types of Corrosion	Galvanic corrosion, Differential aeration corrosion, Stress corrosion, Water-line corrosion
	Passivity of metals	Passivity, Examples for passive metals
Factors affecting rate of Corrosion	(a) Nature of metal	*(a) Nature of metal:* (i) Position of metal in the Galvanic series (ii) Purity of metal (iii) Relative surface area of anodic and cathodic metal (iv) Nature of oxide film (v) Physical state of metal (vi) Solubility and volatility of corrosion products
	(b) Nature of environment	*(b) Nature of environment:* (i) Temperature (ii) Humidity (iii) pH of the medium (iv) Establishment of oxygen concentration cell (v) Impurities of the atmosphere (vi) Polarization of electrodes
Corrosion control methods	Cathodic protection	Sacrificial anodic protection, impressed cathodic current
	|Cathodic and Anodic coatings	Galvanizing and Tinning
	Electroplating	Electroplating with example
	Electroless plating	Nickel Electroless plating
	Paints	Constituents of paints and its functions

UNIT-III: MATERIAL CHEMISTRY **12 HRS**

Non-elemental semiconducting materails: Stoichiometric, controlled valency & chalcogen photo / semiconductors - Preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) – Semiconductor devices (p-n junction diode as rectifier, junction transistor)

Nano materials: Introduction, sol-gel method, characterization by BET, SEM and TEM methods, applications of graphene-carbon nanotubes and fullerenes: Types, preparation of carbon nanomaterials by carbon-arc, laser abalation methods.

Liquid crystals: Introduction – types-applications.

Superconductors: Meissner effect, type- I and type- II superconductors, characteristics and applications.

Unit	Module	Micro content

Non elemental semiconducting materials	Non elemental semiconductors	Stoichiometric, controlled valency & chalcogen photo / semiconductors
	Preparation, purification and fabrication of semiconductors	Preperation – Distillation, zone refining, Czochralski crystal pulling technique
	Applications of semiconducting devices	p-n junction diode as rectifier, junction transistor
Nano materials	Introduction, sol-gel method, characterization of nano materials	Introduction to Nano materials, Sol-gel method, characterization by BET, SEM and TEM methods,
	Applications of graphene	Carbon nanotubes and fullerenes. Types,
	Preparation of carbon nanomaterials	Carbon-arc, laser abalation methods.
Liquid crystals	Introduction, Types, Applications	Introduction,Thermotropic and Lyotropic liquid crystals, nematic and smectic liquid crystals, Applications of liquid crystals
Superconductors	Introduction, Characteristics and Applications	Introiduction, Meissner effect, type-I and type-II superconductors,characteristics and applications.

UNIT-IV: ADVANCED CONCEPTS AND GREEEN CHEMISTRY 10 HRS

Molecular motors/ machines: Introduction to supramolecular chemistry, characteristics of molecular motors. Rotaxanes and Catenanes as artificial molecular machines. molecular shuttle, a molecular elevator, an autonomous light –powered molecular motors.

Green chemistry: Principles of green chemistry, green synthesis – aqueous phase, microwave assisted chemical reactions and phase transfer catalysis (PTC).

Unit	**Module**	**Micro content**
Molecular motors/ machines	Introduction to supramolecular chemistry Moleculatr Motors.	Introduction to supramolecular chemistry, characteristics of molecular motors.
	Natural Molecular Motors and Artificial Molecular Motors	Natural Molecular Motors, Artificial Molecular Machines: Rotaxanes and Catenanes. Molecular shuttle, a molecular elevator, an autonomous light –powered molecular motors
Green chemistry	Principles of Green Chemistry Green Synthetic Methods	12 Principles of green chemistry, green synthesis – aqueous phase, microwave assisted chemical reactions and phase transfer catalysis (PTC).

UNIT-V: SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES 12 HRS

Spectroscopic Techniques:Electromagneticspectrum-types of molecular spectra and their absorption criteria.

UV-visible spectroscopy (electronic spectroscopy), Frank-Condon principle, Beer-Lambert's law and its limitations, chromophores and auxochromes – *applications of UV visible spectroscopy.

IR spectroscopy – functional group and finger print region – molecular vibrations – stretching and bending vibrations – *applications of IR.

NMR (Nuclear magnetic resonance): Working principle and instrumentation of NMR – chemical shift(δ) – *applications of NMR.

(*only general applications – without any spectroscopic problems regarding quantitative and qualitative analysis.)

Non-conventional energy sources: Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, organic photo-voltaic, hydropower, geothermal power, tidal, ocean thermal energy conversion (OTEC) – open cycle OTEC, closed cycle OTEC and hybrid cycle OTEC.

Unit	Module	Micro content
Spectroscopic Techniques	Introduction to Electromagneticspectrum	Electromagneticspectrum-types of molecular spectra and their absorption criteria.
UV	UV Visible Spectroscopy Applications	UV – Visible spectroscopy (electronic spectroscopy), Frank-Condon principle, Beer-Lambert's law and its limitations, chromophores and auxochromes – *applications of UV visible spectroscopy.
IR	IR Spectroscopy, Applications	***IR*** spectroscopy – functional group and finger print region – molecular vibrations – stretching and bending vibrations – *applications of IR.
NMR	NMR Spectroscopy, Applications	***NMR*** (Nuclear magnetic resonance): Working principle and instrumentation of NMR – chemical shift(δ) – *applications of NMR. **(Note:** *only general applications – without any spectroscopic problems regarding quantitative and qualitative analysis.)
Non-conventional energy sources	Photovoltaic cells, Organic Photovoltaic cells, hydropower, geo thermal power, tidal and ocean thermal energy conversion	Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, organic photo-voltaic cell, hydropower, geothermal power, tidal, ocean thermal energy conversion (OTEC) – open cycle OTEC, closed cycle OTEC and hybrid cycle OTEC.

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I- Year I - Semester	Name of the Course	L	T	P	C
ES1101	Basic Electrical and Electronics Engineering	2	1	0	3

Course Objectives

0. To introduce basics of electric circuits and to teach DC and AC electrical circuit analysis.
1. To explain the working principles DC machines and speed control of various DC motors.
2. To explain the working principles of transformers and AC machines and its applications.
3. To introduce the basics of semiconductor physics and operation and applications of Diodes.
4. To introduce the basics of transistors and explain the transistor configurations

Unit-1

DC & AC Circuits **10 Hrs**

DC Circuits: Electrical circuit elements (R - L and C) – Kirchhoff's laws -Voltage and Current division rules-series, parallel circuits and star-delta and delta-star transformations- [Elementary treatment only]

AC Circuits: Representation of sinusoidal waveforms - Peak and RMS values - phasor representation - real power - reactive power - apparent power - power factor. [Elementary treatment only]

Unit-2

DC Machines **10 Hrs**

DC Generator: Construction-Principle and operation of DC Generator - EMF equation -Types– Applications [Elementary treatment only]

DC Motor: Principle and operation of DC Motor – types-Torque equation - Speed control of DC Motor-Brake test- Swinburne's test-Applications. [Elementary treatment only]

Unit-3

AC Machines **10 Hrs**

Single Phase Transformer: Construction, Principle and operation of Single-Phase Transformer –EMF Equation-Losses-Efficiency. [Elementary treatment only]

Three Phase Induction Motor: Construction- Principle and operation of three phase Induction Motor-Types- Applications. [Elementary treatment only].

Unit-4

Semiconductor Devices **10 Hrs**

Semiconductor Physics, PN Junction Diode & Zener Diode-characteristics- Applications: Rectifiers (Half Wave Rectifier & Full Wave Rectifier) [Elementary treatment only], Clippers and Clampers.

Unit-5

Bipolar Junction Transistors **8 Hrs**

Construction and working of bipolar junction transistor, CB, CE and CC Configurations and characteristics. [Elementary treatment only], Transistors as amplifiers, op-amp basics.

Text Books

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

References

1. L. S. Bobrow- "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.

Course Outcomes: At the end of the course, the student will be able to

CO1. Apply concepts of KVL/KCL in solving DC circuits.(Apply, Find, Solve)
CO2. Choose correct machine for a specific application. (Understand, Apply)
CO3. Illustrate working principles of DC and AC Machines. (Understand, Apply)
CO4. Describe working principles of diodes and transistors. (Understand, Apply)
CO5. Understand the applications of diodes and transistors. (Understand, Analyze)

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3											1
CO4	3	2										1
CO5	3											1

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of Basic Electrical & Electronics Engineering

<table>
<tr><td colspan="3">UNIT-I: DC & AC Circuits:
DC Circuits:
Electrical circuit elements (R - L and C) – Kirchhoff’s laws -Voltage and Current division rules-series, parallel circuits and star-delta and delta-star transformations- [Elementary treatment only]
AC Circuits:
Representation of sinusoidal waveforms - Peak and RMS values - phasor representation - real power - reactive power - apparent power - power factor.[Elementary treatment only]</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td rowspan="4">1.a or 2.a
DC Circuits</td><td rowspan="2">Definitions & circuit elements</td><td>Definitions of Voltage, Current, Power & Energy</td></tr>
<tr><td>Types and Classification of circuit elements: R, L, C elements Active, Passive; unilateral, bilateral; linear, nonlinear; lumped, distributed elements</td></tr>
<tr><td rowspan="2">Ohm’s law,
KCL, KVL, Voltage & Current Division rules</td><td>Ohm’s Law. Active elements -Representation of Voltage and current sources in ideal and Practical cases and Passive elements –Voltage & Current relationship of R - L and C elements</td></tr>
<tr><td>Kirchhoff’s Voltage and current laws –series and parallel circuits of R, L & C elements, Voltage and Current division rules for resistive circuit only</td></tr>
<tr><td>STAR-DELTA transformation</td><td>star-delta and delta-star transformations of resistive circuit only [Elementary treatment only]</td></tr>
<tr><td rowspan="3">1.b or 2.b
AC Circuits</td><td rowspan="2">Phasor representation & AC fundamentals</td><td>Representation of sinusoidal waveforms –Phase difference and phasor representation of sinusoidal waveforms</td></tr>
<tr><td>Peak, Average and RMS values for sinusoidal waveforms only</td></tr>
<tr><td>AC circuits & Power</td><td>Definitions of reactance and Impedance, real power - reactive power - apparent power - power factor. [Elementary treatment only]</td></tr>
<tr><td colspan="3">UNIT-II: DC Machines:
DC Generator:
Construction-Principle and operation of DC Generator - EMF equation -Types– Applications [Elementary treatment only]
DC Motor:
Principle and operation of DC Motor – types-Torque equation - Speed control of DC Motor-Brake test- Swinburne’s test-Applications. [Elementary treatment only]</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td>3.a or 4.a</td><td>DC generator principle</td><td>Construction details of dc generator-Field</td></tr>
</table>

DC generators	of operation & applications	System, Armature
		Principle and operation of DC generator
		derivation of generated EMF-Simple problems on generated EMF
		Types of dc generators- Separately and Self excited (Shunt and series generators equivalent circuit [Elementary treatment only]) and applications.
3.b or 4.b DC Motors	DC Motor principle of operation & Back EMF	Principle operation of DC Motor
		Significance of Back EMF-Simple problems on Back EMF
		Derivation of Torque Equation-Simple problems on Torque Equation Torque equation of DC motor
	Types of DC motors & Applications	Types of DC Motors (Shunt and series motors equivalent circuit) and Applications
	DC motor Speed control techniques	speed control (armature and field control methods)
	Testing of DC machines	Brake test procedure-Swinburne's test procedure [Elementary treatment only]

UNIT-III: AC Machines:

Single Phase Transformer:

Construction, Principle and operation of Single-Phase Transformer –EMF Equation-Losses-Efficiency. [Elementary treatment only]

Three Phase Induction Motor: Construction- Principle and operation of three phase Induction Motor-Types- Applications. [Elementary treatment only].

Unit	Module	Micro content
5.a or 6.a Single Phase transformer	Basics of transformer	Construction, principle of operation of single-phase transformer, Types of single-phase transformer
	EMF equation & Phasor diagram	EMF Equation of a transformer and simple problems on EMF equation of single-phase transformer
		Ideal Transformer on NO load with phasor diagram
	Transformer performance	Losses, Efficiency. [Elementary treatment only]
	Basics of 3-phase induction motor	Construction and principles of 3-phase induction motor

5.b. or 6.b Three Phase Induction Motor	Types and applications	Types (Squirrel Cage and slip ring induction motor construction)- Applications
UNIT – IV: Semiconductor Devices Semiconductor Physics, PN Junction Diode & Zener Diode-characteristics- Applications: Rectifiers (Half Wave Rectifier & Full Wave Rectifier) [Elementary treatment only], Clippers and Clampers.		
Unit	**Module**	**Micro content**
7.a. or 8.a Semiconductor physics & Diodes	Semiconductor Physics	Classification of materials based on energy band diagram
		Current density in conductor, Intrinsic semiconductor & properties of silicon and germanium
		Extrinsic semiconductor: P-type and N-type, Conductivity of extrinsic semiconductor and law of mass action, Diffusion & Drift currents-N junction formation.
	PN Junction Diode & Zener Diode	Working principle of PN junction diode: forward bias, reverse bias
		Diode current equation (Expression only), Basic problems on usage of diode current equation.
		Diode circuit models: Ideal Diode Model, Ideal Diode Model with $V_{\gamma,}$. Reverse breakdown phenomena, Zener diode characteristics
7.b or 8.b Diode Applications	Voltage regulator	Zener Diode as Voltage Regulator
	Diode Rectifier Circuits	PN junction Diode Rectifiers (Working principle, Input and Output Waveforms and Expressions of output DC voltage for each) PN junction Diode Rectifiers (Working principle, Input and Output Waveforms and Expressions of output DC voltage for each)
	Clipper circuits	Bridge. Basics of Clippers: Series Positive, Series negative, Shunt Positive, Shunt negative, Dual clipping (without bias voltage).
UNIT V: Bipolar Junction Transistors Construction and working of bipolar junction transistor, CB, CE and CC Configurations and characteristics. [Elementary treatment only], Transistors as amplifiers, op-amp basics.		

Unit	Module	Micro content
9.a or 10.a BJT	BJT construction & working	Periodic functions Construction, Configuration and models
		Working of BJT, Definitions of α, β and γ
	BJT CB, CE characteristics	CB characteristics: Input, output characteristics, current relation, dynamic input and output resistances and base-width modulation
		CE characteristics: Input, output characteristics, current relation, dynamic input and output resistances
	BJT Amplifier	Transistor as an amplifier
9.b or 10.b OP-Amp basic	Basics of OP-amp & characteristics	Block diagram of OP-AMP (Qualitative treatment)
		Ideal characteristics of OP-AMP
	Basic OP-amp circuits	Inverting amplifier circuit
		Non-inverting amplifier circuit

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I- Year I - Semester	Name of the Course	L	T	P	C
ES1102	Computer Engineering Workshop	1	0	4	3

Course Objectives

1. To make the students aware of the basic hardware components of a computer and installation of operating system.
2. To introduce Raptor Tool for flowchart creation.
3. Each student will familiar with Productivity tool: LaTeX and Microsoft (MS) office
4. To get knowledge in awareness of cyber hygiene that is protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
5. To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

Unit-1 **10 Hrs**

Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people. Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices.

Unit-2 **10 Hrs**

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents. Programming Languages: Machine Language and assembly language, high -level and low level languages, Assemblers, Compilers, and Interpreters

Unit-3 **10 Hrs**

Operating systems: Introduction, Evolution of operating systems, Command Interpreter, Popular operating systems- Microsoft DOS, Microsoft Windows, UNIX and Linux.

Introduction to Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

Unit-4 **10 Hrs**

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Basic Networking Commands.

Unit-5 **8 Hrs**

Introduction to HTML : Basics in Web Design, Brief History of Internet ,World Wide Web Why create a web site ,Web Standards, HTML Documents ,Basic structure of an HTML document Creating an HTML document ,Mark up Tags ,Heading-Paragraphs ,Line Breaks ,HTML Tags.

Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia ,Working with Forms and controls.

List of Tasks

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

TASK 3: **Drawing flowcharts (Raptor Tool)**

1. Create flowcharts for take-off landing of an Aeroplane.
2. Create a flowchart to validate an email id entered by user.
3. Create flowchart to print first 50 prime numbers.

TASK 4: Productivity tool: LaTeX and Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word, Power Point, Excel.

TASK 5: Operating System Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

TASK 6: Basic Commands: Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

TASK 7: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.

TASK 8: Networking Commands:

ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

TASK 9: Basic HTML tags

1. Head Section and Elements of Head Section, Paragraphs, Formatting Styles.

2. Colour tags, Creating Hyperlinks, Images, Tables, lists

3. HTML Forms, Form Attributes, Form Elements.

TASK 10: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

TASK 11: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Text Books

1. Fundamentals of Computers –Reema Thareja-Oxford higher education
2. Computer Fundamentals, Anita Goel, Pearson Education, 2017
3. PC Hardware Trouble Shooting Made Easy, TMH
4. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.

Reference Books

1. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.
2. An Introduction to Computer studies –Noel Kalicharan-Cambridge

Course Outcomes: At the end of the course, the students will be able to:

CO1. Identify various hardware components of a system and apply their knowledge about computer peripherals to identify / rectify problems onboard.
CO2. Assemble the computer.
CO3. Use various Microsoft tools.
CO4. Integrate the PCs into local area network and re-install operating system and various application programs.
CO5. Manage data backup and restore operations on computer and update application software.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	3	2			
CO2	3		2		
CO3			3		3
CO4	2		2		
CO5				3	

(Strong – 3; Moderate – 2; Weak – 1)

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I- Year I - Semester	Name of the Course	L	T	P	C
ES1103	Problem Solving Using C	2	1	0	3

Course Objectives

1) To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2) To gain knowledge of the operators, selection, control statements and repetition in C
3) To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
4) To assimilate about pointers, dynamic memory allocation and know the significance of Pre-processor.
5) To assimilate about File I/O and significance of functions

Unit-1 **10 Hrs**

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

Unit-2 **10 Hrs**

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

Unit-3 **10 Hrs**

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

Unit-4 **10 Hrs**

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands

Unit-5 **8 Hrs**

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

Course Outcomes: After completing this course, Students will be able to-

CO1. **Understand** algorithms and basic terminology of C
CO2. **Solve** problems using control structures and modular approach
CO3. **Demonstrate** 1D and 2D arrays along with strings for linear data handling
CO4. **Determine** the use of pointers and structures
CO5. **Implement** various operations on data files.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	1	-	-	-	3	3	1	2	1	2
CO2	2	3	3	2	-	-	-	-	1	1	2	2	2	2
CO3	3	3	3	2	-	-	-	-	2	1	2	2	2	3
CO4	2	2	2	2	-	-	-	-	2	1	2	2	2	2
CO5	2	2	2	2	-	-	-	-	2	1	2	2	1	2

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of Problem Solving in C

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

Unit	Module	Micro content
Introduction to Computers, C Language	Introduction to Computers	Creating and running Programs
		Computer Numbering System
		Storing Integers, Storing Real Numbers
	Introduction to C Language	C Tokens
		I/O Functions
		Scope and Storage classes
		Type Qualifiers
	Structure of a C Program	Expressions
		Side effects in evaluation of expressions
		Precedence and Associativity
		Command Line Arguments

UNIT - II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

Unit	Module	Micro content
Control Statements	Bitwise Operators	Exact Size Integer Types
		Logical Bitwise Operators and Shift Operators
	Selection Statements	Two Way Selection
		Multi Way Selection
		More Standard Functions
	Iterative Statements	Counter Controlled Loops
		Logic Controlled Loops
		Other Statements related to looping
		Applications of looping and examples

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays,

<table>
<tr><td colspan="3">Multidimensional Arrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td rowspan="12">Derived and User Defined Data types</td><td rowspan="4">Arrays</td><td>One Dimensional Arrays: Theory and Practice Exercises</td></tr>
<tr><td>Two Dimensional Arrays: Theory and Practice Exercises</td></tr>
<tr><td>Introduction to Multi-Dimensional Arrays</td></tr>
<tr><td>Some more Example Programs on Arrays</td></tr>
<tr><td rowspan="5">Strings</td><td>Introduction to the concept of a String in C</td></tr>
<tr><td>String I/O Functions</td></tr>
<tr><td>Manipulation Functions on Strings</td></tr>
<tr><td>String/Data Conversion</td></tr>
<tr><td>Programming Example – Morse Code</td></tr>
<tr><td rowspan="4">Structures, Unions and Enumeration</td><td>Introduction to the Concept of ‘typedef’</td></tr>
<tr><td>Structures: Theory and Practice</td></tr>
<tr><td>Unions: Theory and Practice</td></tr>
<tr><td>Enumeration Data type</td></tr>
<tr><td colspan="3">UNIT IV
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application
Processor Commands: Processor Commands</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td rowspan="7">Pointers and Processor Commands</td><td rowspan="3">Pointers</td><td>Introduction to Pointers</td></tr>
<tr><td>Pointers to pointers</td></tr>
<tr><td>Compatibility, L-value and R-value</td></tr>
<tr><td rowspan="3">Applications of Pointers</td><td>Pointer Arithmetic</td></tr>
<tr><td>Dynamic Memory Allocation</td></tr>
<tr><td>Pointer to Arrays and Array of Pointers</td></tr>
<tr><td>Processor Commands</td><td>Processor Commands</td></tr>
<tr><td colspan="3">UNIT V
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions</td></tr>
</table>

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.		
Unit	**Module**	**Micro content**
Functions and Files	User Defined Functions	Designing, Structured Programs, Function in C
		Inter-Function Communication, Standard Functions
		Passing Array to Functions
		Passing Pointers to Functions
		Recursion
	Text Input / Output	Files, Streams
		Standard Library Input / Output Functions
		Formatting Input / Output Functions
		Character Input / Output Functions
	Binary Input/ Output	Text versus Binary Streams
		Standard Library
		Functions for files
		Converting File Type

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I- Year I - Semester	Name of the Course	L	T	P	C
BS1101L	Applied Chemistry Lab	0	0	3	1.5

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations quantitative analysis .

Course Objectives

1. To furnish the students with a solid foundation in Chemistry Laboratory required to solve the Engineering problems.
2. To expose the students in practical aspects of the theoritical concepts like pH, hardness of water etc.
3. To guide the students on how to handle the instruments like UV-visible spectrophotometer, potentiometer and conductometer.

List of Experiments

Students should do any 10 experiments listed below

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Copper (II) using standard EDTA solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Iron (III) by colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metric method).
9. Determination of concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ presence in an egg shell.
13. Estimation of vitamin- C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Prepatation of nylon-6, 6 and Bakelite (demonstration only)

Reference Books:

A Text Book of Quantitative Analysis, Arthur J. Vogel.

Course Outcomes: At the end of the course, the students will be able

CO1. To estimate the amount of metal ions present in different solutions (L4 & L3)
CO2. To analyze the quality parameters of water (L4)
CO3. To determine the strength of different solutions by using different instrumentation techniques (L3)

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3							2			
CO2	2	2							2			
CO3	2	3							2			

(Strong – 3; Moderate – 2; Weak – 1)

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I- Year I - Semester	Name of the Course	L	T	P	C
ES1102L	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5

Course Objectives

- To Verify Kirchhoff's laws, Voltage and Current division rules.
- To learn speed control and testing of DC Shunt Motor.
- To learn and understand the operation of induction motor.
- To learn applications of diodes and transistors.

List of Experiments

Cycle-1

1. Verification of Kirchhoff laws.
2. Verification of Voltage division rule and current division rule.
3. Speed control of DC Shunt Motor.
4. Perform Brake test on DC Shunt Motor.
5. Conduct Swinburne's test on DC Shunt Motor.
6. Brake test on 3-phase Induction Motor.

Cycle-1I

1. V-I characteristics of P-N Junction Diode.
2. Understand Zener Diode Characteristics.
3. Understand Half wave rectifier and Full wave rectifier with and without filter.
4. Characteristics of BJT in Common Base Configuration.
5. Characteristics of BJT in Common Emitter Configuration.
6. Zener diode as voltage regulator.

Text Books

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

References

3. L. S. Bobrow- "Fundamentals of Electrical Engineering" – Oxford University Press – 2011.
4. E. Hughes – "Electrical and Electronics Technology" – Pearson – 2010.

Course Outcomes: Able to

CO1. Verify Kirchhoff's Laws and voltage and current division rules for DC supply.
CO2. Analyze the performance of AC and DC Machines by testing.
CO3. Perform speed control of DC shunt motor.
CO4. Perform the half wave and full wave rectifier.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3											1
CO4	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
ES1102L	Problem Solving Using C Lab	0	0	3	1.5

Course Objectives

1. Apply the principles of C language in problem solving.
2. To design flowcharts, algorithms and knowing how to debug programs.
3. To design & develop of C programs using arrays, strings pointers & functions.
4. To review the file operations, pre-processor commands.

Exercise 1

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.

2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.

3. Write a C program to display multiple variables.

Exercise 2

1. Write a C program to calculate the distance between the two points.

2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3

1. Write a C program to convert a string to a long integer.

2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4

1 .Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum.

1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.

3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5

1. Write a program in C to print all unique elements in an array.

2. Write a program in C to separate odd and even integers in separate arrays.

3. Write a program in C to sort elements of array in ascending order.

Exercise 6

1. Write a program in C for multiplication of two square Matrices.

2. Write a program in C to find transpose of a given matrix.

Exercise 7

1. Write a program in C to search an element in a row wise and column wise sorted matrix.

2. Write a program in C to print individual characters of string in reverse order.

Exercise 8

1. Write a program in C to compare two strings without using string library functions.

2. Write a program in C to copy one string to another string.

Exercise 9

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11

1. Write a program in C to add numbers using call by reference.

2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12

1. Write a program in C to swap elements using call by reference.

2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13

1. Write a program in C to show how a function returning pointer.

2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand & write the difference.

2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15

1. Write a program in C to check whether a number is a prime number or not using the function.

2. Write a program in C to get the largest element of an array using the function.

Exercise 16

1. Write a program in C to append multiple lines at the end of a text file.

2. Write a program in C to copy a file in another name.

3. Write a program in C to remove a file from the disk.

Course Outcomes: By the end of the Lab, the student able to

CO1. Comprehend the various concepts of a C language
CO2. Develop algorithms and flowcharts
CO3. Design and development of C problem solving skills.
CO4. Acquire modular programming skills.

CO-POS MAPPING

Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes (PO's & PSO's)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2	3	2	1	-	-	-	3	3	1	2	1	2
CO2	2	3	3	2	-	-	-	-	1	1	2	2	2	2
CO3	3	3	3	2	-	-	-	-	2	1	2	2	2	3
CO4	2	2	2	2	-	-	-	-	2	1	2	2	2	2

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	Name of the Course	L	T	P	C
BS1201	Mathematics-II	2	1	0	3

Course Objectives

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications

Unit-1

Iterative methods **10 Hrs**

Introduction–Bisection method–Method of false position–Iteration method–Newton-Raphson method (one variable)–Jacobi and Gauss-Seidel methods for solving system of equations.

Unit-2

Interpolation **10 Hrs**

Introduction–Errors in polynomial interpolation–Finite differences–Forward differences–Backward differences–Central differences –Relations between operators–Newton's forward and backward formulae for interpolation–Gauss's forward and backward formulae for

Interpolation – Interpolation with unequal intervals–Lagrange's interpolation formula–Newton's divide difference formula.

Unit-3

Numerical integration and solution of ordinary difference equations **10 Hrs**

Trapezoidal rule–Simpson's $1/3^{rd}$ and $3/8^{th}$ rule–Solution of ordinary differential equations by Taylor's series–Picard's method of successive approximations–Euler's method–Modified Euler's method–Runge-Kutta method (second and fourth order).

Unit-4

Laplace Transforms **10 Hrs**

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function –Periodic function - Inverse Laplace transforms – Convolution theorem (without proof)

Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.

Unit-5

Fourier series and Fourier Transforms **8 Hrs**

Fourier series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

Text Books

3. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books

3. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
4. **H.K.Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
5. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Course Outcomes: At the end of the course, the student will be able to

CO1. Evaluate approximate in the roots of polynomial and transcendental equations by different algorithms (EVALUATE)

CO2. Solve system of linear algebraic equations using Gauss Jacobi, Gauss Seidel and apply Newton's forward and backward interpolation and Lagrange's formulae for equal and unequal intervals (SOLVE , APPLY,FIND)

CO3. Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations and also by Laplace the transforms for solving differential equations (SOLVE , APPLY,FIND)

CO4. Find or compute the Fourier series of periodic signals (SOLVE ,APPLY, FIND, ANALYSE)

CO5. Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms (SOLVE , APPLY, FIND)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of MATHEMATICS-II

UNIT-1: Iterative methods:

<table>
<tr><td colspan="3">Introduction–Bisection method–Method of false position–Iteration method–Newton-Raphson method (one variable)–Jacobi and Gauss-Seidel methods for solving system of equations.</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td rowspan="4">1a. & 2.a Solving given polynomial</td><td rowspan="4">Numerical solution of algebraic and transcendental polynomials</td><td>Bisection method</td></tr>
<tr><td>Method of false position</td></tr>
<tr><td>Iteration method</td></tr>
<tr><td>Newton-Raphson’s method</td></tr>
<tr><td rowspan="2">1b. & 2b. Solving linear system</td><td rowspan="2">Solving linear system</td><td>Jacobi’s method</td></tr>
<tr><td>Gauss-seidel method</td></tr>
<tr><td colspan="3">UNIT-2 : Interpolation:
Introduction–Errors in polynomial interpolation–Finite differences–Forward differences–Backward differences–Central differences –Relations between operators–Newton’s forward and backward formulae for interpolation–Gauss’s forward and backward formulae for
Interpolation – Interpolation with unequal intervals–Lagrange’s interpolation formula–Newton’s divide difference formula.</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td rowspan="4">3a. & 4a. Equal-Spaced difference tables</td><td rowspan="2">Finite difference tables</td><td>Forward, backward & central difference tables</td></tr>
<tr><td>Errors in polynomials</td></tr>
<tr><td rowspan="2">Finding functional values for given data</td><td>Newton’s forward and backward difference interpolation formula</td></tr>
<tr><td>Gauss forward and backward difference interpolation formula</td></tr>
<tr><td rowspan="2">3b. & 4b. Unequal spaced data & relation between various operators</td><td rowspan="2">Unequal spaced data & relation between various operators</td><td>Lagrange’s interpolation formula</td></tr>
<tr><td>Relation between various operators(Shift, forward, backward, central, average & differential operators)</td></tr>
<tr><td colspan="3">UNIT-3: Numerical integration and solution of ordinary difference equations:
Trapezoidal rule–Simpson’s 1/3rd and 3/8th rule–Solution of ordinary differential equations by Taylor’s series–Picard’s method of successive approximations–Euler’s method–Modified Euler’s method–Runge-Kutta method (second and fourth order).</td></tr>
<tr><td>Unit</td><td>Module</td><td>Micro content</td></tr>
<tr><td rowspan="3">5a. & 6a. Numerical integration</td><td rowspan="3">Numerical Integration</td><td>Trapezoidal rule</td></tr>
<tr><td>Simpson’s 1/3rd rule</td></tr>
<tr><td>Simpson’s 3/8th</td></tr>
<tr><td rowspan="4">5b. & 6b. Numerical solution of</td><td rowspan="4">Numerical solution of ordinary differential equations for single variable</td><td>Taylors series method</td></tr>
<tr><td>Picard’s method</td></tr>
<tr><td>Euler’s method</td></tr>
<tr><td>Modified Euler’s method</td></tr>
</table>

ordinary differential equations for single variable		
UNIT – 4: Laplace Transforms: Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function –Periodic function - Inverse Laplace transforms – Convolution theorem (without proof) Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.		
Unit	**Module**	**Micro content**
7a. & 8a. Laplace Transforms	Laplace transforms and theorem	Shifting theorems
		Derivatives and integrals
		Multiplication and division
7b. & 8b. Inverse Laplace transforms and Applications	Periodic functions &Inverse Laplace Transforms	Periodic functions
		Dirac delta functions
		Evaluation integrals using Laplace Transforms
		Solving differential equations using Laplace transforms
UNIT 5: Fourier series and Fourier Transforms: Fourier series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series. Fourier Transforms: Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.		
Unit	**Module**	**Micro content**
9a. & 10a. Fourier Series	Fourier Series	Periodic functions
		Dirichlet's conditions
		Even and odd function's
		Change of interval
		Half range sine and cosine series
9b. & 10b. Fourier Transforms	Fourier Transforms	Fourier Sine and Cosine integral
		Properties of Fourier Transforms
		Fourier and Inverse Fourier Transforms
		Fourier cosine and Inverse Fourier cosine Transforms
		Fourier sine and Inverse Fourier sine Transforms
		Finite Fourier Transforms
		Inverse Finite Fourier Transforms

I- Year II - Semester	Name of the Course	L	T	P	C
BS1202	Applied Physics	2	1	0	3

Course Objectives

Applied Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Vasireddy Venkatadri Institute of Technology, which serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in electronic devices.
- Impart the knowledge of materials with characteristic utility in appliances.

Unit-1

Wave Optics **10 Hrs**

Interference: Principle of Superposition-Interference of light – Conditions for sustained Interference-Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry) **Diffraction:** Fraunhofer Diffraction:- Diffraction due to single slit (quantitative), double slit(qualitative), N –slits(qualitative) and circular aperture (qualitative) – Intensity distribution curves - Diffraction grating – Grating spectrum – missing order– resolving power – Rayleigh's criterion – Resolving powers of Microscope(qualitative), Telescope(qualitative) and grating (qualitative).

Unit-2

LASERs and Holography **10 Hrs**

LASERs: Interaction of radiation with matter – Spontaneous and Stimulated emission of radiation – population inversion – Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium-Neon laser – Applications.

Holography: Introduction – principle – differences between photography and holography – construction and reconstruction of hologram – applications of holograms

Unit-3

Magnetism and Dielectrics **10 Hrs**

Magnetism: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Bohr Magneton-Classification of

magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Dielectrics: Introduction- Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field- Claussius – Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.

Unit-4

Quantum Mechanics **10 Hrs**

Introduction– matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainty Principle–Schrödinger time independent and time dependent wave equations – physical significance of Schrödinger wave function – Particle in a potential box (determination of energy).

Unit-5

Semiconductor Physics **8 Hrs**

Origin of energy bands (qualitative) –Classification of solids based on energy bands–Intrinsic semiconductors-density of charge carriers –Electrical conductivity-Fermi level – extrinsic semiconductors-P-type & N-type – Density of charge carriers- Dependence of Fermi energy on carrier concentration and temperature- Hall effect-Hall coefficient- Applications of Hall effect-Drift and Diffusion currents - Einstein's equation.

TEXT BOOKS

1. "Engineering Physics" by B. K. Pandey, S. Chaturvedi - Cengage Publications, 2012

2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand, 2017.

3. "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

4. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

REFERENCE BOOKS

1. "Engineering Physics" by M.R.Srinivasan, New Age international publishers (2009).

2. "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.

3. "Solid State Physics" by A.J.Dekker, Mc Millan Publishers (2011).

Course Outcomes: The students will be able to

CO1. Understand the principles such as interference and diffraction to design and enhance the resolving power of various optical instruments.
CO2. Learn the basic concepts of LASER light Sources and Apply them to holography
CO3. Study the magnetic and dielectric materials to enhance the utility aspects of materials.
CO4. Learn the fundamental concepts of Quantum behaviour of matter.
CO5. Identify the type of semiconductors using Hall Effect.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of Applied Physics

Unit-I: Wave Optics

Interference: Principle of Superposition-Interference of light – Conditions for sustained Interference-Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry) **Diffraction:** Fraunhofer Diffraction:- Diffraction due to single slit (quantitative), double slit(qualitative), N –slits(qualitative) and circular aperture (qualitative) – Intensity distribution curves - Diffraction grating – Grating spectrum – missing order– resolving power – Rayleigh's criterion – Resolving powers of Microscope(qualitative), Telescope(qualitative) and grating (qualitative).

Unit	Module	Micro content
Ia. Interference	Principle of Superposition & Interference of light	Introduction to interference
		Principle of superposition
		Coherence
		Conditions for sustained Interference
	Interference in thin films	Interference in thin films by reflection (cosine's law)
		Complementary nature
		Colours of thin film
	Newton's Rings	Newton's Rings(reflected geometry)
		Experimental arrangement & conditions for diameters

		Applications: determination of wavelength of monochromatic source and refractive index of the given transparent liquid.
Ib. Diffraction	Fraunhofer Diffraction - Diffraction due to single slit	Differences between Fresnel's and Fraunhofer's diffraction
		Differences between interference and diffraction
		Fraunhofer diffraction due to single slit(quantitative)
		Fraunhofer diffraction due to circular aperture (qualitative)
	double slit (qualitative) & N – slits(qualitative)	Fraunhofer diffraction due to double slit (qualitative)
		Fraunhofer diffraction due to grating (N- slits) (qualitative)
		Intensity distribution curves
	Diffraction grating& Resolving powers	Grating spectrum, missing orders and maximum number of orders possible with a grating
		Rayleigh's criterion for resolving power
		Resolving power of grating, Telescope and Microscope (qualitative)

Unit– II: LASERs and Holography

LASERs: Interaction of radiation with matter – Spontaneous and Stimulated emission of radiation – population inversion – Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium-Neon laser – Applications.

Holography: Introduction – principle – differences between photography and holography – construction and reconstruction of hologram – applications of holograms

Unit	**Module**	**Micro content**
IIa. LASERs	Interaction of radiation with matter	Introduction to LASERS
		Spontaneous emission
		Stimulated emission
	Einstein's coefficients	Einstein's coefficients
		Population inversion
		Pumping mechanisms
	LASERS construction and working	Ruby laser
		Helium-Neon laser
		Applications of Lasers
IIb. Holography	Principle of holography	Introduction and Principle of holography
		Differences between photography and holography
	construction and reconstruction of	Construction of hologram
		Reconstruction of hologram

	hologram	Applications of holography
Unit-III: Magnetism and Dielectrics **Magnetism**: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Bohr magneton-Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material. **Dielectrics:** Introduction- Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field-Claussius –Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.		
Unit	**Module**	**Micro content**
IIIa. Magnetism	Introduction& Origin of permanent magnetic moment	Introduction to Magnetism, Definitions of Magnetic dipole moment, Magnetization, Magnetic susceptibility and Permeability
		Origin of magnetic moment
		Bohr magneton
	Classification of magnetic materials	Dia magnetic materials
		Para magnetic materials
		Ferro magnetic materials
	Domain concept of Ferromagnetism & Hysteresis	Domain concept of Ferromagnetism
		Hysteresis Curve (B-H Curve)
		Soft and hard magnetic materials classification based on Hysteresis Curve
		Applications of magnetic materials
IIIb.Dielectrics	Introduction& definitions	Introduction to dielectrics
		Dielectric polarization, Dielectric polarizability, susceptibility
		Dielectric constant
	Types of polarizations	Electronic polarization (Quantitative)
		Ionic polarization (Quantitative)
		Orientational polarizations (Qualitative)
	Internal field& Claussius –Mossotti's equation	Lorentz Internal fields in solids
		Clausius-Mossotti's equation
		Frequency dependence of polarization
		Applications of Dielectrics
Unit– IV: Quantum Mechanics Introduction– matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G.P.Thomson experiment – Heisenberg's Uncertainty Principle–Schrödinger time independent and time dependent wave equations – physical significance of Schrödinger wave function – Particle in a potential box (determination of energy).		
Unit	**Module**	**Micro content**

IV. Quantum Mechanics	Introduction& de Broglie's hypothesis	Introduction to Matter waves
		de Broglie's hypothesis
		Properties of Matter waves
	Davisson-Germer experiment & G.P.Thomson experiment	Davisson and Germer's experiment
		G. P. Thomson experiment
		Heisenberg's uncertainty principle
	Schrödinger wave function & equations	Schrödinger's wave function and it's physical significance
		Schrodinger Time Independent wave equation
		Schrodinger Time Dependent wave equation
		Application to particle in one dimensional box
Unit– V: Semiconductor Physics Origin of energy bands (qualitative) -Classification of solids based on energy bands –Intrinsic semiconductors – density of charge carriers – Electrical conductivity-Fermi level – extrinsic semiconductors - P-type & N-type – Density of charge carriers - DependenceofFermienergyoncarrierconcentrationandtemperature-Halleffect-Hallcoefficient-Applications of Hall effect- Drift and Diffusion currents - Einstein's equation.		
Unit	**Module**	**Micro content**
V. Semiconductor Physics	Origin of energy bands	Introduction to energy bands and Origin of energy bands in crystalline solids
		Classification of solids into conductors, semiconductors and insulators based on energy bands
	Intrinsic &extrinsic semiconductors	Intrinsic semiconductor and Carrier Concentration
		Equation for Conductivity
		Extrinsic Semiconductors (p-type and n-type)and Carrier Concentration
	Drift and Diffusion & Halleffect	Drift and Diffusion in semiconductors
		Einstein's Equation
		Hall Effect and it's applications

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I- Year II - Semester	Name of the Course	L	T	P	C
HS1201	Communicative English	3	0	0	3

Course Objectives

1. Adopt activity based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
2. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
3. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
4. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
5. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
6. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Unit 1

Detailed Study: A Proposal to Girdle the Earth (Excerpt) by Nellie Bly **10 Hrs**

Theme: Exploration

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Non-Detailed Study:

1. “How to Fashion Your Own Brand of Success” by Howard Whitman

2. “How to Recognize Your Failure Symptoms” by Dorothea Brande

Unit 2

Detailed Study: An excerpt from The District School as It Was by One Who Went to It by Warren Burton 10 Hrs

Theme: On Campus

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices - linkers, signposts and transition signals; use of articles and zero article; prepositions.

Non-detailed Study:

3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock

4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz

Unit 3

Detailed Study: The Future of Work? 10 Hrs

Theme: Working Together

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Non-Detailed Study:

5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand

6. "How to Raise Your Self-Esteem and Develop Self-confidence" by James W Newman

Unit 4 **10 Hrs**

Detailed Study: H.G Wells and the Uncertainties of Progress by Peter J. Bowler

Theme: Fabric of Change

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role-plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Non-Detailed Study

7. "How to Win Your War against Negative Feelings" by Dr Maxwell Maltz

8. "How to Find the Courage to Take Risks" by Drs. Tom Rusk and Randy Read

Unit 5

Detailed Study: Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far **8 Hrs**

Theme: Tools for Life

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Reading: Reading for comprehension.

Writing: Writing structured essays on specific topics using suitable claims and evidences

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Non-Detailed Study

9. "How to Become a Self-Motivator" by Charles T Jones

10. "How to Eliminate Your Bad Habits" by OgMandino

Text Books

5. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019
6. University of Success by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press, 2018.
2. Pushplata and Sanjay Kumar. Communication Skills, Oxford University Press, 2018.
3. Kulbushan Kumar. Effective Communication Skills. Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing

1-language.com

http://www.5minuteenglish.com/

https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online

http://www.bbc.co.uk/learningenglish/

http://www.better-english.com/

http://www.nonstopenglish.com/

https://www.vocabulary.com/

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/

https://www.englishclub.com/reading/short-stories.htm

https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613

http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/

http://www.world-english.org/

http://learnenglish.britishcouncil.org/

Course Outcomes

At the end of the course, the learners will be able to

CO1. identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and formulate sentences using proper grammatical structures and correct word forms **(Describe, relate, tell, find L-3)**

CO2. speak clearly on a specific topic using suitable discourse markers in informal discussions **(Discuss, outline, explain, predict – L3)**

CO3. write summaries based on global comprehension of reading/listening texts **(Use, categorize, complete, solve L-3)**

CO4. produce a coherent paragraph interpreting a figure/graph/chart/table **(Identify, compare, explain, illustrate- L4)**

CO5. take notes while listening to a talk/lecture to answer questions **(explain, relate, outline, complete -L3)**

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									2	3		1
CO2									2	3		1
CO3									2	3		1
CO4									2	3		1
CO5									2	3		1

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of Communicative English

Unit 1

Detailed Study: A Proposal to Girdle the Earth (Excerpt) by Nellie Bly

Theme: Exploration

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Non-Detailed Study:

1. "How to Fashion Your Own Brand of Success" by Howard Whitman

2. "How to Recognize Your Failure Symptoms" by Dorothea Brande

Unit	Module	Micro content
1a.Detailed Study	**Listening**	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
	Speaking	Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
	Reading	Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.
	Grammar and Vocabulary	Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic

		sentence structures; simple question form - wh-questions; word order in sentences.
1b.Non-Detailed Study	**"How to Fashion Your Own Brand of Success" by Howard Whitman**	Introduction to Whitman Summary of the Essay
	How to Recognize Your Failure Symptoms" by Dorothea Brande	Introduction to Dorothea Brande Summary of the Essay

Unit 2

Detailed Study: The District School As It Was by One Who Went to It by Warren Burton

Theme: On Campus

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices - linkers, signposts and transition signals; use of articles and zero article; prepositions.

Non-detailed Study:

3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock

4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz

Unit	**Module**	**Micro content**
2a. Detailed Study	**Listening**	Answering a series of questions about main idea and supporting ideas after listening to audio texts.
	Speaking	Discussion in pairs/ small groups on specific topics followed by short structured talks.
	Reading	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
	Writing	Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.
	Grammar and Vocabulary	Cohesive devices - linkers, signposts and transition signals; use of articles and zero article; prepositions.
2b. Non-Detailed Study	**"How to Conquer the Ten Most Common**	Introduction to Louis Binstock Summary of the Essay

	Causes of Failure" by Louis Binstock	
	"How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz	Introduction to Maxwell Maltz Summary of the Essay
Unit 3 **Detailed Study: The Future of Work** **Theme: Working Together** **Listening:** Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes. **Non-Detailed Study:** **5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand** **6. "How to Raise Your Self-Esteem and Develop Self-confidence" by James W Newman**		
Unit	**Module**	**Micro content**
3a. Detailed Study	**Listening**	Listening for global comprehension and summarizing what is listened to.
	Speaking	Discussing specific topics in pairs or small groups and reporting what is discussed
	Reading	Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
	Writing	Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
	Grammar and Vocabulary	Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
3b. Non-Detailed Study	**"How to Make the Most of Your Abilities" by Kenneth Hildebrand**	Introduction to Kenneth Hildebrand Summary of the Essay
	How to Raise Your Self-Esteem and Develop Self-	Introduction to James Newman Summary of the Essay

	confidence" by James W Newman	

Unit 4

Detailed Study: H.G Wells and the Uncertainties of Progress by Peter J. Bowler

Theme: Fabric of Change

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role-plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Non-Detailed Study

7. "How to Win Your War Against Negative Feelings" by Dr Maxwell Maltz

8. "How to Find the Courage to Take Risks" by Drs. Tom Rust and Randy Read

Unit	**Module**	**Micro content**
4a. Detailed Study	**Listening**	Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
	Speaking	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions..
	Reading	Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
	Writing	Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.
	Grammar and Vocabulary	Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
4b. Non-Detailed Study	**"How to Win Your War Against Negative Feelings" by Dr Maxwell Maltz**	Introduction to Dr Maxwell Maltz Summary of the Essay

	"How to Find the Courage to Take Risks" by Drs Tom Rust and Randy Read	Introduction to Drs. Tom Rust and Randy Read Summary of the Essay

Unit 5

Detailed Study: Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far

Theme: Tools for Life

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Reading: Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Non-Detailed Study

9. "How to Become a Self-Motivator" by Charles T Jones

10. "How to Eliminate Your Bad Habits" by OgMandino

Unit	Module	Micro content
5a. Detailed Study	**Listening**	Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
	Speaking	Formal oral presentations on topics from academic contexts - without the use of PPT slides.
	Reading	Reading for comprehension.
	Writing	Writing structured essays on specific topics using suitable claims and evidences
	Grammar and Vocabulary	Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
5b. Non-Detailed Study	**"How to Become a Self-Motivator" by Charles T Jones**	Introduction to Charles T Jones Summary of the Essay
	"How to Eliminate Your Bad Habits" by OgMandino	Introduction to Og Mandino Summary of the Essay

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I- Year II - Semester	Name of the Course	L	T	P	C
ES1201	Problem Solving using Python	3	0	0	3

Course Objectives

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Unit-1 **10 Hrs**

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

Unit-2 **10 Hrs**

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration, While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

Unit-3 **10 Hrs**

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

Unit-4 **10 Hrs**

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

Unit-5 **8 Hrs**

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

TEXT BOOKS:

3. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
4. Python Programming: A Modern Approach, VamsiKurama, Pearson.

REFERENCES:

4. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
5. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Course Outcomes: After completing this course, Students will be able to-

CO1: Develop essential programming skills in computer programming concepts like data types, containers
CO2: Solve coding tasks related to conditions, loops and String processing
CO3: Experiment with various Data structures in interpreted Language and to build modules and packages for real software needs.
CO4: Implement Files and object-oriented principles in Python
CO5: Identify solutions using GUI in Python.

CO – PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	1	-	-	-	-	-	-	-	-
CO3	1	3	3	2	1	-	-	-	-	-	-	-
CO4	1	2	2	2	-	-	-	-	-	-	-	-
CO5	1	2	2	2	1	-	-	-	-	-	-	1

[1-Slight (low), 2-Moderate (Medium), 3-Substantial (High)]

Micro-Syllabus of Problem-Solving using Python

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

Unit	Module	Micro content
Introduction to Python Language	Introduction Data Types and Expressions	Program Development Cycle, I/O Functions
		Comments, Variables, Operators
		Reading From Keyboard, Type Conversions
		Numeric Data types.
		Strings and Character set.
		String Functions
		Comments
	Decision Structures and Boolean Logic	Conditional Statements
		Nested Conditional Statements
		Looping Techniques
		Nested Loops

UNIT – II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration, While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

Unit	Module	Micro content
Control Statements	Control Statements	For loop formatting text for output
		Selection if and if else statement
		Conditional iteration, While loop
	String and Text Files	Character and substring in strings
		Data Encryption
		Strings and Number Systems, String methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

Unit	Module	Micro content
Data Structures, Functions and Modules	List and Dictionaries	Lists
		Functions of Lists
		Dictionaries
		Functions of Dictionaries
	Design with Function Modules	Functions and there usage in python
		Recursive Functions
		Managing a Programs Namespace
		Gathering Info from a File System
		Higher Order Function
		Standard Modules
		Packages and their usage.

UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

Unit	Module	Micro content
File Operations, Object Oriented Programming	File Operations	Reading and Writing Files in python using read and write functions
		File operations using seek and other operations

	Object Oriented Programming Design With Classes	Class, Object, constructor and destructor, OOP Principles.
		Objects and Classes, Data modeling Examples
		Adding and retrieving dynamic attributes of classes
UNIT V **Errors and Exceptions:** Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. **Graphical User Interfaces:** The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources. **Programming:** Introduction to Programming Concepts with Scratch.		
Unit	**Module**	**Micro content**
Errors and Exceptions, GUI and Programming	Errors and Exceptions	Syntax Errors, Exceptions, Handling Exceptions
		Raising Exceptions, User-defined Exceptions
		Defining Clean-up Actions
		Redefined Clean-up Actions
	GUI Programming	Terminal Based Programs and GUI – Based
		Simple GUI-Based Programs and other useful GUI Resources
		Introduction to Programming
		Scratch Programming

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I- Year II - Semester	Name of the Course	L	T	P	C
ES1202	Digital Logic Design	2	1	0	3

Course Objectives

1. To understand common forms of number representation in digital circuits and Boolean algebra.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems and simplify logic expressions using basic theorems, K-map and Tabular methods.
3. To understand the concept of Combinational logic design and realize logic expressions using MUXand Decoder
4. Illustrate the concept of sequential logic design; analyze the operation of flip-flop and conversion from one flip-flop to another, and application of flip-flop.
5. To impart to student the concepts of sequential machines of digital system.

Unit-1

Number Systems and Boolean Algebra **10 Hrs**

Number systems: Introduction to different number system and their conversions, complement of number system and subtraction using complement method, Floating-Point Representation, Weighted and Non-weighted codes and its properties.

Boolean Algebra: Boolean algebra and logic gates, Basic theorems and properties of Boolean Algebra, Boolean functions, canonical and standard forms, Universal Gates.

Unit-2

Minimization Methods of Boolean functions **10 Hrs**

Minimization of logic expressions by algebraic method, Sum of Products (SOP), Product of Sums (POS), K-Map Method, Don't Care Combinations, Multilevel NAND/NOR realizations, Prime and essential Prime Implicants, Tabular Method, Prime Implicants Chart, Simplification Rules.

Unit-3

Combinational Circuits **10 Hrs**

Design procedure, Half/full adders, Half / full substractors, Carry look ahead adder, BCD adder, Multiplexer/De-Multiplexer, Encoder/Decoder, Priority encoders, Implementation of Higher-

Order Device Using Lower Order devices, Implementation of combinational logic using MUX/Decoder, Magnitude Comparator, Error detection and correction codes.

Unit-4

Sequential Circuits **10 Hrs**

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers Left, Right and Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Unit-5

Sequential Machines **8 Hrs**

Finite State Machines, Synthesis of Synchronous Sequential Circuits, Serial Binary Adder, Sequence Detector, Paritybit Generator, Synchronous Modulo N –Counters, Finite state machinecapabilities and limitations, Mealy and Moore models.

Note: Case Studies / Small Projects ofDigital Circuits and Logic Design

TEXT BOOKS

1. Digital Design by Mano, PHI

2. Modern Digital Electronics by RP Jain, TMH

3. Switching Theory and Logic Design by A. Anand Kumar, PHI.

REFERENCE

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition

2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers

Course Outcomes

CO1. Distinguish the analog and digital systems, apply positional notations, number systems, computer codes in digital systems. **(Remember, Understand, and Apply)**

CO2. To understand the Boolean Algebra theorems, simplify and design logic circuits. **(Understand, Apply, Analyze and valuate)**

CO3. Implemented combinational logic circuit design and modular combinational circuits using encoders, decoders, multiplexers and demultiplexers. (**Apply, Analyze, valuate, and create)**

CO4. To understand the basic elements of sequential logic circuits. **(Understand, Apply, Analyze)**
CO5. Able to design and analyze sequential circuits. **(Apply, Analyze and create)**

CO-PO MAPPING

Mapping	PO1	PO2	PO3	PO10
CO1	3	2	2	1
CO2	3	2	2	1
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1

(Strong – 3; Moderate – 2; Weak – 1)

Micro-Syllabus of Digital Circuits and Logic Design

Unit-1: Number Systems and Boolean Algebra **14 Hours**

Number systems: Introduction to different number system and their conversions, complement of number system and subtraction using complement method, Floating-Point Representation, Weighted and Non-weighted codes and its Properties, Error detection and correction codes,

Boolean Algebra: Boolean algebra and logic gates, Basic theorems and properties of Boolean Algebra, Boolean functions, canonical and standard forms, Universal Gates.

Unit	Module	Micro content	No of hrs
1a. Number systems	Introduction to different number system and their conversions	Introduction to number system Binary, Octal, Decimal, Hexadecimal. Number base Conversions	3
	Complement of number system and subtraction using complement method	1's, 2's Compliments r-1's Compliments r's Compliments signed Binary numbers Compliment Arithmetic	3
	Floating-Point Representation	IEEE 754 Standard 32-bit single precision, 64-bit double precision	1
	Weighted and Non-weighted codes and its Properties	BCD Code, 2421, Excess-3, 84-2-1, Gray Code, ASCII Character Code	2
	Error detection and correction codes,	Parity bit, Hamming Code	1
1b.Boolean Algebra	Introduction to Boolean algebra and Boolean theorems	Postulates of a mathematical system and Axiomatic Systems, Algebra Basic Theorems and Properties	2

		Boolean Functions of Canonical and Standard Forms	2
		logic gates, Universal Gates and justification of all logic gates	

Unit-2: Minimization Methods of Boolean functions 11 Hours

Minimization of logic expressions by algebraic method, Sum of Products (SOP), Product of Sums (POS), K-Map Method, Don't Care Combinations, Multilevel NAND/NOR realizations, Prime and essential Prime Implicants, Tabular Method, Prime Implicants Chart, Simplification Rules.

Unit	Module	Micro content	No of hrs
1. Minimization Methods of Boolean functions	Minimization of logic expressions by algebraic method	Boolean function	3
		Minimization of Boolean expressions	
		Minterms, Maxterms, Sum of Products (SOP), Product of Sums (POS)	
		Canonical forms, Conversion between canonical forms	
	K-Map Method	Introduction to 2 - 5 variable K-Map with Implicants, prime Implicants, and Essential Prime Implicants	5
		POS minimization with K-Map	
		K-Maps with don't care terms	
		Multilevel NAND/NOR realizations of minimization functions	
	Tabular method	Introduction to Tabular (Q-M) method with examples	2
		Q-M method with don't care terms	
		Prime Implicants Chart, Simplification Rules	1

Unit-3: Combinational Circuits 14 Hours

Design procedure, Half/full adders, Half / full subtractors, Carry look ahead adder, BCD adder, Multiplexer/De-Multiplexer, Encoder/Decoder, Priority encoders, Implementation of Higher-Order Device Using Lower Order devices, Implementation of combinational logic using MUX/Decoder, Magnitude Comparator, Programmable logic devices

Unit	Module	Micro content	No of hrs
3. Combinational Logic Design	Designing of Half/Full Adder /Subtractor and Carry look ahead adder, BCD adder	Introduction to Design Procedures of Combinational Circuits	2
		Designing of Half Adder and Subtractor	
		Full Adder and Subtractor	
		Full adder by HA	

		Realization of above circuits with NAND & NOR	
		Carry look ahead adder	1
		Designing of Magnitude comparator and BCD adder	2
	Multiplexers, Demultiplexers, Decoders, Encoders and Code Converters	Multiplexers, Demultiplexers	1
		Decoders, Encoders, Priority encodes	1
		Function realization using Multiplexers and Decoders	3
		Code Converters	1
	Implementation of Higher-Order Device Using Lower Order devices	Multiplexers, Demultiplexers, Decoders, Encoders	1
	Programmable logic devices	PROM,PAL,PLA	2

Unit-4: Sequential Circuits **12 Hours**

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers Left, Right and Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Unit	**Module**	**Micro content**	**No of hrs**
4a. Sequential Circuits Fundamentals	Analysis of Sequential Circuits	Basic Architectural Distinctions between Combinational and Sequential circuits	1
		SR latch by NAND / NOR gates and introduction of flip flop	
	Storage elements: Flip Flops	Design various flip flops like SR, D, JK, JK Master Slave & T with truth tables, logic diagrams	3
		Excitation Table of all Flip Flops, Timing and Triggering Consideration	2
4b. Registers and Counters	Registers	Introduction of registers and Design of Shift Registers Left and Right	1
		Design of Bidirectional Shift Registers, Applications of Shift Registers	1
	Counters	Designing Asynchronous/Ripple counters	1
		Designing basic Synchronous Counters	1

		of UP/DOWN	
		Other counters: modulo-n counters, Ring and twisted ring counters, Johnson Counter,	2
Unit-5: Sequential Machines **8 Hours** Finite State Machines, Synthesis of Synchronous Sequential Circuits, Mealy and Moore models, Serial Binary Adder, Sequence Detector, Parity-bit Generator Synchronous Modulo N – Counters, Finite state machine capabilities and limitations.			
Unit	**Module**	**Micro content**	**No of hrs**
5. Sequential Machines	**Analysis of Sequential Machines**	Finite-state machine (FSM), State Assignment, state table, excitation table	**1**
		Synthesis of Synchronous Sequential Circuits	**2**
		Mealy and Moore models by Serial Binary Adder	
		Problems on Sequence Detector	**2**
		Parity-bit Generator, Synchronous Modulo N – Counters	**2**
		Finite state machine capabilities and limitations,	**1**

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I- Year II - Semester	Name of the Course	L	T	P	C
BS1201L	Applied Physics and Virtual Lab	0	0	3	1.5

Course Objectives: The Applied Physics Lab is designed to

- **Understand** the concepts of interference and diffraction and their applications.
- **Apply** the concept of LASER in the determination of wavelength.
- **Recognize** the importance of energy gap in the study of conductivity and Hall Effect.
- **Illustrate** the magnetic and dielectric materials applications.
- **Apply** the principles of semiconductors in various electronic devices.

LIST OF EXPERIMENTS

(Any 10 of the following listed 15 experiments)

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.

2. Newton's rings – Radius of Curvature of Plano - Convex Lens.

3. Determination of thickness of a spacer using wedge film and parallel interference fringes.

4. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.

5. Energy Band gap of a Semiconductor p - n junction.

6. Characteristics of Thermistor – Temperature Coefficients

7. Determination of dielectric constant by charging and discharging method

8. Variation of dielectric constant with temperature

9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).

10. LASER - Determination of wavelength by plane diffraction grating

11. Determination of resistivity of semiconductor by Four probe method.

12. Determine the radius of gyration using compound pendulum

13. Rigidity modulus of material by wire-dynamic method (torsional pendulum)

14. Dispersive power of diffraction grating.

15. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall Effect.

Course Outcomes: The students will be able to:

CO1. Operate optical instruments like microscope and spectrometer
CO2. Determine thickness of a paper with the concept of interference
CO3. Estimate the wavelength of different colours using diffraction grating and resolving power
CO4. Plot the intensity of the magnetic field of circular coil carrying current with distance
CO5. Calculate the band gap of a given semiconductor

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

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I- Year II - Semester	Name of the Course	L	T	P	C
HS1201L	Communicative English Lab	0	0	3	1.5

Course Objectives

The main objective of the course is to adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions and appear confidently for competitive examinations for career development.

The specific objectives of the course are to

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native and non-native speakers
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials like newspapers, magazines, periodicals, journals, etc.
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
4. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Introduction to Sound system of English

Articulation - Airstream mechanism, Manners of Articulation, Places of Articulation, English phonetic symbols.

Accent - Syllabification, word stress and accent, stress rules and stress shift, exceptions to rules.

Intonation - Stress and accent in connected speech. Types and functions of Intonation in English.

I. **A. Speaking**: Introducing Yourself and Others
B. Listening: Conversation between two and more people.

II. **A. Speaking:** Speak for a minute in response to a question about personal experience / wish.
B. Listening: Identifying the main idea of a talk or a conversation

III. **A. Speaking: Group discussion** – 5 minutes followed by a summary –1 or 2 minutes: Topics-1. Features that make a place beautiful, 2. The most challenging job you can think of, 3. Some skills that everyone should learn, 4. The best criteria to measure success, 5. A recent news story that is interesting, 6. Impact of technology on the music industry, 7. An app that has helped society, 8. Pros and Cons of after school tutorials, 9. How to stay safe on Social Media, 10. The most common reasons why friendships fall apart, 11. Interactions with seniors on campus, 12. Coping with peer pressure, 13. Others' opinion vs your belief, 14. Feeling that plants would express if they could, 15. Growing up alone vs Growing up with siblings, 16. Uniforms stifle individuality, 17. In India summer is the best and worst of times, 18. A good sense of humour is a definite perk, 19. All fast food is not junk food and 20. Ideas to make your common room in college more inviting. Question Answer sessions – 1.

Idea of a Tech Startup, 2. Training programme of T&P Cell, 3. Inter-college Cultural Fest, 4. 3-day Foreign University delegation visit to the campus, 5. Computer training programme by a reputed MNC, 6. Shifting your Dept or Classrooms to new location on campus, 7. How to manage attendance while attending additional courses (Minors/Honors), 8. How to choose placement offers? 9. Involvement in Student Affairs through SAC, 10. Planning an excursion.

B. Listening:1. Comprehension Exercise on Teamwork, 2. Predicting what the speaker would say from the title of the talk, 3. Comprehension based on a narrative or a short video, TED Talks

IV. **A. Speaking:** Preparing speech using picture clues, asking Q&A using pictures.
B. Listening: Listening Comprehension using short films, audio files, interviews of famous personalities

V. **A. Speaking:** Preparing 30-day planner, Using important phrasal expressions in speech, Oral Presentations on – 1. Setting goals is important2. Asking the right question is the skill you need to develop, 3. Do college students want their parents' attention4. Everyone needs to learn how to cook5. Doing household chores is everyone's responsibility 6. Study groups facilitate peer-monitoring7. Is it OK for students to do things just because they want to fit in? 8. Students should compulsorily make time for physical activity, 9. Taking breaks to pursue other interests improves academic performance, 10. Strategies to avoid stress, 11. How best to use the media for educational activities, 12. Why volunteer for service activities? 13. International student exchange programme, 15. Work-life balance 16. Strategies to build on your strength and overcome weaknesses, 17. Strategies to build confidence and self-esteem18. Procrastination kills opportunities, 19. Setting a budget and sticking to it, 20. Grooming and etiquette 21. Pros and Cons of being Competitive, 22. Virtual classroom vs real classroom, 23. Freedom brings more responsibility 24. To-do lists help you become more productive 25. Having a diverse group of friends is an asset 26. One thing you wish you had learnt in High school 27. Why is it important to be non-judgmental towards others? 28. Humans need empathy, 29. Public speaking is a necessary skill 30. How to build and maintain good professional relationships.
B. Listening: Listening Comprehension, Speeches by Famous personalities

Pair work, Role-play, conversational practice and Individual speaking activities based on following essays from University of Success.

1. "How to Fashion Your Own Brand of Success" by Howard Whitman
2. "How to Recognize Your Failure Symptoms" by Dorothea Brande
3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock
4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz
5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand
6. "How to Raise Your Self-Esteem and Develop Self-Confidence" by James W. Newman
7. "How to Win Your War against Negative Feelings" by Dr Maxwell Maltz

8. "How to Find the Courage to Take Risks" by Drs. Tom Rust and Randy Reed

9. "How to Become a Self-Motivator" by Charles T Jones

10. "How to Eliminate Your Bad Habits"by Og Mandino

Text Books

1. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019
2. University of Success by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press, 2018.
2. Pushplata and Sanjay Kumar. Communication Skills, Oxford University Press, 2018.
3. Kulbushan Kumar. Effective Communication Skills. Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing

1. 1-language.com
2. http://www.5minuteenglish.com/
3. https://www.englishpractice.com/

Grammar/Vocabulary

4. English Language Learning Online
5. http://www.bbc.co.uk/learningenglish/
6. http://www.better-english.com/
7. http://www.nonstopenglish.com/
8. https://www.vocabulary.com/
9. BBC Vocabulary Games
10. Free Rice Vocabulary Game

Reading

11. https://www.usingenglish.com/comprehension/
12. https://www.englishclub.com/reading/short-stories.htm
13. https://www.english-online.at/

Listening

14. https://learningenglish.voanews.com/z/3613
15. http://www.englishmedialab.com/listening.html

Speaking

16. https://www.talkenglish.com/

17. BBC Learning English – Pronunciation tips
18. Merriam-Webster – Perfect pronunciation Exercises
19. **All Skills**
20. https://www.englishclub.com/
21. http://www.world-english.org/
22. http://learnenglish.britishcouncil.org/
23.

Course Outcomes: At the end of the course, the learners will be able to

CO1. identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)

CO2. take notes while listening to a talk/lecture; to answer questions in English; formulate sentences using proper grammatical structures and correct word forms; and use language effectively in competitive examinations (L3)

CO3. write summaries based on global comprehension of reading/listening texts; produce a coherent write-up interpreting a figure/graph/chart/table; and use English as a successful medium of communication. (L3)

CO PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1									2	3		1
CO2									2	3		1
CO3									2	3		1

(Strong – 3; Moderate – 2; Weak – 1)

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I- Year II - Semester	Name of the Course	L	T	P	C
ES1201L	Problem Solving using Python Lab	0	0	3	1.5

Course Objectives

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

List of Problems

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3. Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4. Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5. Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

   *

   **

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6. Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7. Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and Not close otherwise.
8. Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9. Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
10. In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

11. Write a program that generates a list of 20 random numbers between 1 and 100.
    a) Print the list.
    b) Print the average of the elements in the list.
    c) Print the largest and smallest values in the list.
    d) Print the second largest and second smallest entries in the list
    e) Print how many even numbers are in the list.
12. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
13. Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
14. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
15. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
16. Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
17. Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
18. Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
19. Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise
20. Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
21. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
22. Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.

a) Do this using the sort method. b) Do this without using the sort method.

23. Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
24. Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
25. Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
26. Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should

also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.

27. Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
28. Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
29. Write a Python class to implement pow(x, n).
30. Write a Python class to reverse a string word by word.
31. Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
32. Write a program to demonstrate Try/except/else.
33. Write a program to demonstrate try/finally and with/as.

Course Outcomes: After completing this course, Students will be able to-

CO1: Comprehend how software easily to build right out of the box.
CO2: Demonstrates the use of an interpreted language for problem solving through control statements including loops and conditionals.
CO3: Practice with data structures for quick programming solutions.
CO4: Demonstrates software building for real needs by breaking out code into reusable functions and modules.
CO5: Comprehend the software reliability through exception handling.

CO – PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	2	2	-	-	-	2	-	-	-
CO2	2	2	2	2	2	-	-	-	2	-	-	-
CO3	2	2	2	2	3	-	-	-	2	-	-	-
CO4	2	1	2	2	2	-	-	-	3	2	-	-
CO5	-	3	3	2	3	-	-	-	3	2	-	-

[1-Slight (low), 2-Moderate (Medium), 3-Substantial (High)]

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I- Year II - Semester	Name of the Course	L	T	P	C
MC1201	Environmental Science	2	0	0	0

Course Objectives

- To make the students to get awareness on environment,
- to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- to save earth from the inventions by the engineers.

Unit-1

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit-2

ECOSYSTEMS, BIODIVERSITY, AND ITS CONSERVATION

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation : Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-3

ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Unit-4

SOCIAL ISSUES AND THE ENVIRONMENT

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit-5

HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXT BOOKS

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

REFERENCES

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

Course Outcomes: At the end of the course, the student will be able to:

COURSE OUTCOMES

CO1 Able to U**nderstand** The concepts of the ecosystem
CO2 Able to U**nderstand** The natural resources and their importance
CO3 Able to learn The biodiversity of India and the threats to biodiversity, and **Apply** conservation practices
CO4 Able to learn Various attributes of the pollution and their impacts
CO5 Able to U**nderstand** Social issues both rural and urban environment
CO6 Able to U**nderstand** About environmental Impact assessment and **Evaluate** the stages involved in EIA

CO PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												1
CO2												1
CO3												1
CO4												1
CO5												1
CO6												1

(Strong – 3; Moderate – 2; Weak – 1)

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II- Year I - Semester	Name of the Course	L	T	P	C
BS2101	Mathematics - III	2	1	0	3

Pre-Requisites: Mathematics-I and Mathematics-II

Course Objectives:

1. To instruct the concept of Matrices in solving linear algebraic equations
2. To familiarize the techniques in partial differential equations
3. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications

UNIT-I: Solving system of linear equations, Eigen values and Eigen Vectors 10 Hrs

Rank of a matrix by Echelon form and normal form–solving system of homogeneous and non-homogeneous linear equations–Gauss elimination, Gauss Jordan for solving system of equations-Eigen values and Eigen vectors and their properties

UNIT-II: Cayley-Hamilton theorem and quadratic forms: 10 Hrs

Cayley-Hamilton theorem (without proof)–Finding inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form–Quadratic forms and nature of the quadratic forms–Reduction of quadratic form to canonical forms by orthogonal transformation.

Application: Free vibration of two mass systems.

UNIT – III: Vector Differentiation: 10 Hrs

Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives– Divergence – Curl – Laplacian second order operator- Vector identities- Scalar Potential.

UNIT– IV: Vector Integration: 10 Hrs

Line integral – Work done – Circulation- Surface integral- Volume integral Vector integral theorems (without proof): Greens theorem in a plane- Stokes theorem- Gauss Divergence theorem.

UNIT– V: Solutions of Partial differential Equations 8 Hrs

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

Second order PDE: Solutions of linear partial differential equations with constant coefficients RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Text Books:

4. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books:

6. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
7. **H.K.Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
8. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Course Outcomes: At the end of the course, the student will be able to

CO1: develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)

CO2: solve system of linear algebraic equations using Gauss elimination, Gauss Jordan (L3)

CO3: to interpret the physical meaning of different operators such as gradient, curl and divergence (L5)

CO4: estimate the work done against a field, circulation and flux using vector calculus (L5)

CO5: identify the solution methods for partial differential equation that model physical processes (L3)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

Micro Syllabus of MATHEMATICS – III

UNIT-I: Solving system of linear equations, Eigen values and Eigen Vectors Rank of a matrix by Echelon form and normal form–solving system of homogeneous and non-homogeneous linear equations–Gauss elimination, Gauss Jordan for solving system of equations-Eigen values and Eigen vectors and their properties		
Unit	**Module**	**Micro content**
1a. Solving system of linear equations	Rank of the given matrix	Find rank of the given matrix by reducing into Echelon form.
		Find rank of the given matrix by reducing into Normal form.(Canonical form)

	System of linear equations	Solve the system of homogeneous linear equations.
		Solve the system of Non- homogeneous linear equations.
		Solve the given system of linear equations using Gauss Elimination method.
		Solve the given system of linear equations using Gauss Jordan method.
1b.Applications	Eigen values and Eigen vectors	Find eigen values and Eigen vectors of given matrix.
	Properties of Eigen values and Eigen vectors	If λ is an eigen value of Matrix A then find Eigen values of A^m or A^{-1} or $B = A^2+k_1A+K_2I$ or ….
		The Eigen vectors corresponding to distinct Eigen values of real symmetric matrix are orthogonal.

UNIT-II: Cayley-Hamilton theorem and quadratic forms:

Cayley-Hamilton theorem (without proof)–Finding inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form–Quadratic forms and nature of the quadratic forms–Reduction of quadratic form to canonical forms by orthogonal transformation.

Unit	**Module**	**Micro content**
II	Cayley-Hamilton theorem	Verify Cayley-Hamilton theorem for given matrix A and hence find A^{-1} or A^4.
II	Quadratic Forms	Reduce the given matrix into diagonal form.
		Reduce the quadratic form into canonical form using orthogonal transformation method.

UNIT – III: Vector Differentiation:

Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives Divergence – Curl – Laplacian second order operator- Vector identities- Scalar Potential.

Unit	**Module**	**Micro content**
3a. Vector Differential operator	Divergent, Curl and Gradient	Find Gradient of given scalar function.
		Find Unit normal vector at given point on given surface.
		Find divergent or Curl of given vector function.
3b. Vector identities	Vector identities	Find Scalar potential function.
		Problems on Laplacian second order operator.
		Prove the given vector identity.

UNIT– IV: Vector Integration:

Line integral – Work done – Circulation- Surface integral- Volume integral Vector integral theorems (without proof): Greens theorem in a plane- Stokes theorem- Gauss Divergence theorem.

Unit	**Module**	**Micro content**
4a.	Line integration,	Evaluate given line integration along the given curve.

Vector integration	surface integration & volume integration	Find work done by force in moving a particle from A to B along curve C.
		Find surface integral of vector function.
		Find volume integral of vector function.
4b. Vector integration theorems	Green's theorem, Stoke's theorem and Gauss Divergence theorem.	Verify Green's theorem.
		Evaluate using stoke's theorem.
		Evaluate using Divergence theorem.
UNIT– V: Solutions of Partial differential Equations: Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations. Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.		
Unit	**Module**	**Micro content**
5a. First order PDE	Formation of PDE	Form PDE by eliminating arbitrary constants.
		Form PDE by eliminating arbitrary functions.
	Solve First order PDE	Solve first order linear PDE.
		Solve first order non-linear PDE.
5b. Higher order PDE	Solve Second order PDE.	Solve Second order linear PDE with constant coefficients with RHS terms $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

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II- Year I - Semester	Name of the Course	L	T	P	C
PC2101	Mathematical Foundations of Computer Science	2	1	0	3

Course Objectives:

- To introduce concepts of mathematical logic.
- To introduce concepts and perform operations with sets, relations and functions.
- To solve counting problems by applying elementary counting techniques.
- To introduce algebraic structures, generating functions and recurrence relations.
- To use graph theory for solving problems.

Unit-1: Mathematical Logic & Calculus **8 hrs**

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, and Indirect Method of Proof.

Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

Unit-2: Set theory & Relations **10 hrs**

***Set Theory*:** Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion.

Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, *Functions:* Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.

Unit-3: Algebraic Structures and Number Theory **10 hrs**

Algebraic Structures: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism.

Number Theory: Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, and Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

Unit-4: Combinatorics & Recurrence Relations **10 hrs**

Combinatorics: Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, Pigeonhole Principle and its Application.

Recurrence Relations: Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving non homogeneous Recurrence Relations.

Unit-5: Graph Theory **10 hrs**

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multi graphs, Planar Graphs, Euler's Formula, Graph Colouring, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P.Mohapatra, 3rdEdition, Tata McGraw Hill.

3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.

Reference Books:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel,T.P. Baker, 2nd Edition, Prentice Hall of India.

2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon CutlerRoss, PHI.

3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2020

E-resources

1. https://nptel.ac.in/courses/106/103/106103205/
2. https://nptel.ac.in/courses/106/106/106106183/

Course Outcomes:

By the end the of the course, the student will be able to

CO-1: Apply mathematical logic to solve problems(L3)
CO-2: Understand sets, relations and discrete structures
CO-3: Apply number theory to perform modulo arithmetic and computer arithmetic. (L3)
CO-4: Solve problems on recurrence relations and counting principles (L3)
CO-5: Analyze and solve real world problems using graphs and trees. (L5)

CO-PO-PSO Mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	-

Micro-Syllabus of Mathematical Foundations Of Computer Science

II B.Tech I Semester

Unit-1: 12 Hours

Mathematical Logic : Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof.

Predicate Calculus: Predicate Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus

Unit	Module	Micro content	No of hrs
1.Mathematical Logic & Predicate calculus	Introduction to Propositional logic	Def. of Proposition, Examples	2
		logical connectives	
		Truth tables	
	Truth tables for compound propositions	Well Formed Formulas	2
		Tautology,contradiction, contingency	
		Equivalence of Formulas	
		Duality Law	
	Normal forms	DNF,PDNF	2
		CNF,PCNF	
	Rules of inference	Formulae and problems on rules of inference	3
		Consistency of premises	
		Indirect method of proof	
	Predicate calculus	Predicate Logic-II	3

		Variables ,Quantifiers, Free and Bound Variables	
		Inference Theory for Predicate logic-II	

Unit-2: **12 Hours**

***Set Theory*:** Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion.

Relations:Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, *Functions:* Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties

Unit	Module	Micro content	No of hrs
2. Set theory and Relations	Set theory	Introduction, Operations on Binary Sets	2
		Principle of Inclusion and Exclusion.	
	Relations	Properties of Binary Relations	6
		Relation Matrix and Digraph	
		Partition and Covering	
		Operations on Relations, Transitive Closure	
		Compatibility and Partial Ordering Relations	
		Hasse Diagrams	
	Functions	Bijective Functions, Composition of Functions, Inverse Functions.	2
		Permutation Functions, Recursive Functions	
		Lattice and its Properties	2

Unit-3: **12 Hours**

Algebraic Structures:Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism.

Number Theory:Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem

Unit	**Module**	**Micro content**	**No of hrs**
3. *Algebraic Structures & Number Theory*	Algebraic structures	Algebraic Systems, Examples, General Properties,	5
		Semi Groups and Monoids,	
		Group, Subgroup, Abelian Group	
		Homomorphism, Isomorphism	
		Division Theorem	1
		GCD&LCM	1
		Prime factorization, Testing of primes	2
	Number theory	The Fundamental Theorem of Arithmetic	3
		Fermat's Theorem and Euler's Theorem	

Unit –4: Combinatorics & Recurrence Relations (12 hrs)

Combinatorics:Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems,Pigeonhole Principle and its Application.

Recurrence Relations: Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving non homogeneous Recurrence Relations.

Unit	**Module**	**Micro content**	**No of hrs**
4a.Combinatorics	Binomial and Multinomial Theorems	Binomial and Multinomial Coefficients and problems	2
	Pigeonhole Principle and its Application	Pigeonhole Principle Statement and problems	2
4b.	Solution of First and	Substitution method	8

Recurrence Relations	second order RR	Generating function method	
		Method of characteristic roots	
		Problems	
Unit	**Module**	**Micro content**	**No of hrs**
5.Graph Theory	Basic terminology of graph theory	Vertex,edge ,degree of vertex,Directed and un directed graphs, Matrix Representation of Graphs: Adjacency Matrix, Incidence Matrix	**3**
		Paths and circuits	**3**
	Graph theory	Eulerian and Hamiltonian Graphs	
		Chromatic Number	**2**
		Spanning Trees,BFS and DFS	**4**

II- Year I - Semester	Name of the Course	L	T	P	C
PC2102	Data Structures	3	0	0	3

Course Objectives:

1. To impart the usage of linear list to students.
2. To help students understand the difference between dynamic memory using linked list.
3. To demonstrate the students about the operations Trees.
4. To make the student to understand various algorithms in graphs.
5. To make the students to learn the importance of hashing and sorting algorithms.

Unit-1: **10 hrs**

Algorithms and Linear Lists : Algorithmic complexity, performance and Analysis, Linear lists (Arrays) , Applications of Linear List : Searching and Sorting

Unit-2: **8 hrs**

Stacks and Queues, Linked Lists: Single Linked List, Double Linked List, Circular Linked List, Stack and Queues using Linked list

Unit-3: **10 hrs**

Trees: Binary Trees Operations, Tree traversal, Threaded Binary Trees, Binary Search Trees, Binary Heap

Unit-4: **10 hrs**

Graphs- Elementary Graph Operations, Graph Traversals, Minimum cost spanning tree Algorithms , Shortest paths algorithms.

Unit-5: **10 hrs**

Hashing and Pattern Matching: Concept Hashing, Hash Functions, Collision Resolution Techniques, Pattern Matching algorithms

Text Books

1. Data structures, Algorithms and Applications in Java, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in Java, Mark Allen Weiss, Pearson Education. Ltd, Second Edition

Reference Books

1. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, and J. D. Ullman, Pearson, 2002.
2. Introduction to Algorithms, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, MIT Press. 3rd Edition.
3. Classical Data Structures, 2nd Edition, DebasisSamanta, PHI

e- resources

1. Data Structures Visualizations : https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2. Code Archery Youtube Channel: https://www.youtube.com/playlist?list=PLrKBFf87Cy9CNZpzi3poq8BFWc0h4f0vL

Course Outcomes:

CO1: **understand** the implementation of linear lists**(Understand)**
CO2: **examine** static and dynamic data structures with suitable applications. **(Apply)**
CO3: **determine** trees applications. **(Apply)**
CO4: appreciate the importance and **significance** of graph algorithms in building and solving real world applications. **(Analyze)**
CO5: **understand** and implement algorithms for text processing.**(Understand)**

CO-PO mapping Table

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	1	-	-	-	-	-	-	-	-	-	2	2
C02	1	2	2	-	-	-	-	-	-	-	-	-	2	2
C03	1	-	2	2	-	-	-	-	-	-	-	-	2	2
C04	2	-	2	1	-	-	-	-	-	-	-	-	2	2
C05	1	2	1	2	-	-	-	-	-	-	-	-	2	2

Micro Syllabus of Data Structures and Algorithms

UNIT-I **10 Hours**

Algorithms and Linear Lists : Algorithmic complexity, performance and Analysis, Linear lists (Arrays) , Applications of Linear List : Searching and Sorting

Unit	Module	Micro content	# hrs
Algorithms	Algorithmic Complexity, performance and analysis	Introduction to algorithms	1
		Time complexity and space complexity Analyzing performance of algorithm Big Oh, Theta, small Oh notations	1
Linear Lists (Array)	Representation and Operations	Arrays, representation	1
	Searching in Linear	Linear Search	3

	List	Binary Search	
	Sorting	Insertion Sort, Merge Sort, Quick Sort, Radix Sort	4
Additional Topics		Evaluation of Postfix expression, Round Robin algorithm, Fibonacci Search	

UNIT II **16 Hours**

Stacks, Queues and Linked List : Stacks, Queues, Single Linked List, Double Linked List, Circular Linked List, Stack and Queues using Linked list.

Unit	Module	Micro content	# hrs
Stacks	Representation and Operations	Stacks : Representation using arrays Operations : push, pop, peek	2
Queues	Representation and Operations	Queue : Representation using arrays Operations : enqueue, dequeue, search	2
Linked List	Representation and Operations	Singly Linked List : Representation Operations: Insert at begin, Insert at end, Insert at position, Delete at begin, Delete at end, Delete at position, search	5
		Doubly Linked List: Representation Operations: Insert at begin, Insert at end, Insert at position, Delete at begin, Delete at end, Delete at position, search	3
		Circular Linked List: Representation Operations: Insertion, Deletion and search	2
		Stack using Linked list, Queue using Linked List	2
Additional Topics:		Huffman Coding, Generalized Linked List	

UNIT III **14 Hours**

Trees: Binary Trees Operations, Tree traversal, Threaded Binary Trees, Binary Search Trees, Priority Queues: Heap

Unit	Module	Micro content	# hrs
Trees	Introduction	Terminology: Node, Root, Leaf, InternalNode, Representation , Types of Binary Trees	2
	Binary Trees	Binary Trees: properties, representation, Traversals: Inorder, Preorder, Postorder Threaded Binary Trees	5
	Binary Search Trees	Representation, Operations: Insert, delete, search Skewed Trees	5
Priority Queues	Binary Heap: Representation and operations	Heap : Min Heap, Max Heap Operations: insert, delete, findMin, reheapify	2
Additional Topics:		Balanced Binary Search Trees	

UNIT IV **10 Hours**

Graphs- Elementary Graph Operations, Graph Traversals,

Minimum cost spanning tree Algorithms , Shortest paths algorithms

Unit	Module	Micro content	# hrs
Graphs	Introduction	Definition, Representation, Degree of graph, Connected Components, Biconnected Components	2
	Graph Traversal	Breadth First Search Traversal, Depth First Search Traversal	2
	Minimum cost spanning tree	Prims algorithm, Kruskals algorithm	3
	Shortest path and Transitive closure	Single Source shortest path algorithm: Dijkstra's algorithm, All pair Shortest Path algorithm: Floyd – Warshall, Transitive Closure	3
Additional Topics:		Directed Acyclic Graph, Bellman Ford Algorithm	

UNIT-V **10 Hours**

Hashing and Sorting : Concept Hashing, Hash Functions, Collision Resolution Techniques, Sorting algorithms

Unit	Module	Micro content	# hrs
Hashing	Collision Resolution using Hashing	Concept of Hashing, Hash Functions: Division Method, Folding Method, Mid Square Method Collision Resolution Techniques: Linear Probing, Quadratic Probing, Double Hashing, Separate Chaining	6
Pattern Matching	Algorithms	Brute Force, Boyer Moore Pattern Algorithm,	4
Additional Topics		Digital Search Trees	

II- Year I- Semester	Name of the Course	L	T	P	C
PC2103	Java Programming	3	0	0	3

Course Objectives:

1. To understand object oriented programming concepts, and apply them in solving problems.
2. To make the students to learn the principles of inheritance and polymorphism; and to demonstrate how they relate to the design of abstract classes; to introduce the implementation of packages and interfaces.
3. To make the students to learn the concepts of exception handling.
4. To make the students to learn the concepts of multithreading.
5. To make the students to develop GUI applications.

Unit-1: : Introduction to OOPS Concepts, Classes and Strings 10 Hrs

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements.

Classes: Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, arrays-One Dimensional and multi-dimensional arrays, Searching, Sorting.

Strings-Exploring the String class, String buffer class, Command-line arguments.

Unit – II: Inheritance, Interfaces, Packages 8 Hrs

Inheritance: Need of inheritance, types, super keyword, abstract classes, interfaces, compile time and runtime polymorphism, Packages.

Unit – III: Exception Handling and I/O Streams 10 Hrs

Exception Handling: Concepts of Exception handling, Built-in exceptions, creating own exception sub classes, Assertions.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, Object Serialization, exploring java.nio

Unit – IV: Multithreading 10 Hrs

Multithreading : Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, thread groups.

Unit – V: GUI Programming 10 Hrs

GUI Programming with Swing: Introduction, limitations of AWT, Various swing components & hierarchy.
Event Handling- event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

Text Books

.Java - The Complete Reference, Herbert Schildt, MC GRAW HILL Education, 9th Edition, 2016

Reference Books

1. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.

2. "Core Java", Nageswar Rao, Wiley Publishers.

3. "Thinking in Java", Bruce Eckel, Pearson Education

4. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.

Course Outcomes: By the end the of the course, the student will be able to

CO-1: Understand object-oriented programming concepts for problem solving.
CO-2: Build class hierarchy and packages for real world problems.
CO-3: Develop thread safe Java programs with appropriate Exception handling.
CO-4: Demonstrate multithreaded application programs through a language
CO-5: Design GUI applications using swings and multithreading.

CO-PO MAPPING MATRIX:

Mapping	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2
C01	-	2	1	1	-	-	-	-	-	-	-	-	2	1
C02	-	2	2	2	1	-	-	-	-	-	-	-	2	1
C03	-	2	2	2	1	-	-	-	-	-	-	-	2	2
C04	-	2	2	2	1	-	-	-	-	-	-	-	2	1
C05	-	2	2	2	2	-	-	-	-	-	-	-	2	1

Micro syllabus for Java Programming

Unit – I: Introduction to OOPS Concepts, Classes and Strings **12 Hrs**

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements.

Classes: Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, arrays-One Dimensional and multi-dimensional arrays, Searching, Sorting.

Strings-Exploring the String class, String buffer class, Command-line arguments.

Unit	Module	Micro content
Introduction to OOPS Concepts, Classes and Strings	OOPs	Need of Java, JVM, JDK
		Introduction to Object Oriented Programming
		OOPS Vs structured programming
		Java buzzwords, Sample programs
		Data types & operators
		Control statements
	Classes	Classes, Objects, Methods
		Constructors, this and static keywords
		Method and Constructor Overloading,
		Arrays, searching & sorting
	Strings	String class & methods, problems related
		String buffer & String tokenizer
		Command line arguments

Unit – II: Inheritance, Interfaces, Packages **12 Hrs**

Inheritance: Need of inheritance, types, super keyword, abstract classes, interfaces, compile time and runtime polymorphism, Packages.

Inheritance, Interface & Packages	Inheritance	Need for inheritance
		Types of inheritance
		Super keyword
		Abstract classes
		Calling super class with sub class
	Interface	Introduction
		Dynamic method despatch
		Compile time & runtime polymorphism
	Packages	Introduction, classpath
		Built-in packages
		User defined package,

Unit – III: Exception Handling and I/O Streams 12 Hrs

Exception Handling: Concepts of Exception handling, Built-in exceptions, creating own exception sub classes, Assertions.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, Object Serialization, exploring java.nio

Exceptions & I/o	Exception Handling	Introduction, Concepts of Exceptions - try, catch, throw & throws, finally
		Built-in exceptions

		exception hierarchy
		User defined exceptions
	Stream & I/O	Readers & Writers, Byte Stream, Random Access files, object serialization
		Exploring java.nio package
		Reading console Input and Writing Console Output
Unit – IV: Multithreading **10 Hrs** **Multithreading :** Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, thread groups.		
Multithreading	Multithreading	Introduction of Multitasking, Multitasking Vs Multithreading
		Process Vs Thread
		Thread life cycle
		Using Thread & Runnable Interfaces
		Creation of multiple threads
		Synchronization - Producer consumer problems, Banker problems
		Thread priorities
		Inter thread communication
		Daemon threads
		Thread groups
		All thread related methods
Unit – V: GUI Programming **14 Hrs** **GUI Programming with Swing:** Introduction, limitations of AWT, Various swing components & hierarchy. **Event Handling**- event delegation model, sources of event, Event Listeners, adapter classes, inner classes.		
Gui Programming	GUI with Swings	Introduction, AWT Vs Swings
		Components & hierarchy
	Event Handling	Event Delegation Model
		Sources of events
		Event Listeners
		Adapter Classes, Inner classes

II- Year I- Semester	DATABASE MANAGEMENT SYSTEM	L	T	P	C
PC2104		3	0	0	3

Course Objectives:

1. Study the basic concepts and importance of Database Management Systems
2. Learn and understand the conceptual design of database and information retrieval
3. Learn various commands and writing of queries for information retrieval
4. Understand the concepts of Database design
5. Study of internal storage and its access

Unit-I: Introduction **8 Hrs** Introduction to Database, Applications of Database, Purpose of Database, View of Data, Data Independence, Data Models, Users of Database, DBA, Query Processor, Storage Manager, Database Architecture
Unit-II: Conceptual Design & Relational Query Languages **10 Hrs** Conceptual Design of Database using ER Model, Notations, Types of attributes, Relation, Mapping Constraints, Features of ER Diagram, Weak Entity Set, Examples of Conceptual Design Relational Algebra: Selection, Projection, Set Operations, Rename, Cartesian-Product, Join, Outer Join, Examples **Relational Calculus:** Tuple Relational Calculus and Domain Relational Calculus, Safety Expressions
Unit-III: SQL & PL/SQL **10 Hrs** SQL Commands: DDL, DML, TCL, DCL Types of Constraints (Primary, Alternate, Not Null, Check, Foreign), Basic form of SQL query, joins, outer joins, set operations, group operations, various types of queries, PL/SQL (Cursor, Procedures, Functions, Packages, Triggers…)
Unit-IV: Database Design **10 Hrs** Database Design: Normalization, Purpose of Normalization, Functional Dependency, Closure, 1NF, 2NF, 3NF, BCNF, MVFD, 4NF, Join Dependency, 5NF Why NoSQL? Importance of NoSQL
Unit-V: Transaction, Data Recovery & Storage Management **10 Hrs** Transaction Management: ACID Properties of Transactions, Conflict & View serializability, Lock based protocols, Time Stamp based protocol, Thomas Write Rule, Validation Based Protocol, Deadlock detection, Deadlock avoidance, Deadlock prevention: wait-die and wound-wait **Recovery Management:** Types of failures, ideal storage, Log, Log records, log based recovery techniques, Shadow Paging, ARIES **File Organization & Indexing:** Types of File Organizations, Primary Indexing, Secondary Indexing, Multi-level Indexing, Hash Indexing, Tree Indexing

Text Books:
1. Data base System Concepts,5/e, Silberschatz, Korth, TMH 2. Introduction to Database Systems, CJ Date, Pearson
Reference Books:
1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, and TATA McGraw Hill 3rd Edition **2.** Fundamentals of Database Systems, ElmasriNavate Pearson Education

Micro Syllabus of Database Management Systems

UNIT - I : INTRODUCTION

Introduction to Database, Applications of Database, Purpose of Database, View of Data, Data Independence, Data Models, Users of Database, DBA, Query Processor, Storage Manager, Database Architecture

Unit	Module	Micro Content
UNIT I	Introduction to Database	Definitions of data, database and information
		History of data
		Importance of databases over file systems
		Applications of Database
		Purpose of Database
		View of Data
		Data Independence
		Data Models
		Users of Database
		DBA
		Query Processor
		Storage Manager
		Database Architecture

UNIT – II: Conceptual Design & Relational Query Languages

Conceptual Design of Database using ER Model, Notations, Types of attributes, Mapping Constraints, Features of ER Diagram, Weak Entity Set, Examples of Conceptual Design

Relational Algebra: Selection, Projection, Set Operations, Rename, Cartesian-Product, Join, Outer Join, Examples

Relational Calculus: Tuple Relational Calculus and Domain Relational Calculus, Safety Expressions

Unit	Module	Micro Content
UNIT II	Conceptual Design	ER Model
		Notations
		Types of attributes
		Mapping Constraints
		Features of ER Diagram
		Weak Entity Set
		Examples of Conceptual Design
	Relational Algebra	Selection

		Projection
		Set Operations
		Rename
		Cartesian-Product
		Join
		Outer Join
		Safety Expressions
	Relational Calculus	Tuple Relational Calculus
		Domain Relational Calculus
		Safety Expressions

UNIT – III: SQL & PL/SQL

SQL Commands: DDL, DML, TCL, DCL

Types of Constraints (Primary, Alternate, Not Null, Check, Foreign), Basic form of SQL query, joins, outer joins, set operations, group operations, various types of queries, PL/SQL (Cursor, Procedures, Functions, Packages, Triggers)

Unit	Module	Micro Content
UNIT III	SQL Commands	DDL
		DML
		TCL
		DCL
	Types of Constraints	Primary
		Alternate
		Not Null
		Check
		Foreign
	SQL Queries	Basic
		Joins
		Set operations
		Group operations
		Various types of queries
	PL/ SQL	Cursor
		Procedures
		Functions
		Packages
		Triggers

UNIT – IV: Database Design

Database Design: Normalization, Purpose of Normalization, Functional Dependency, Closure, 1NF, 2NF, 3NF, BCNF, MVFD, 4NF, Join Dependency, 5NF. Why NoSQL?, Importance of NoSQL

Unit	Module	Micro Content
UNIT IV	Database Design	Normalization
		Purpose of Normalization
		Functional Dependency

		Closure
		1NF
		2NF
		3NF
		BCNF
		MVFD
		4NF
		Join Dependency
		5NF
	NoSQL	Why NoSQL?
		Importance of NoSQL
		Overview of NoSQL tools

UNIT - V: Transaction, Data Recovery & Storage Management

Transaction Management: ACID Properties of Transactions, Conflict & View serializability, Lock based protocols (2PLP, Tree & Multiple Granularity), Time Stamp based protocol, Thomas Write Rule, Validation Based Protocol, Deadlock detection, Deadlock avoidance, Deadlock prevention: wait-die and wound-wait

Recovery Management: Types of failures, ideal storage, Log, Log records, log based recovery techniques, Shadow Paging, ARIES

File Organization & Indexing: Types of File Organizations, Primary Indexing, Secondary Indexing, Multi-level Indexing, Hash Indexing, Tree Indexing.

Unit	Module	Micro Content
UNIT V	Transaction Management	ACID Properties of Transactions
		Conflict & View serializability
		Lock based protocols (2PLP, Tree & Multiple Granularity)
		Time Stamp based protocol, Thomas Write Rule
		Validation Based Protocol
		Deadlock detection
		Deadlock avoidance
		Deadlock prevention: wait-die and wound-wait
	Recovery Management	Types of failures
		Ideal storage
		Log, Log records, log based recovery techniques
		Shadow Paging
		ARIES
	File Organization & Indexing	Types of File Organizations
		Primary Indexing
		Secondary Indexing
		Hash Indexing: Static and Dynamic
		Tree Indexing

Course Outcomes:

By the end the of the course, the student will be able to

CO1: To **understand** the basics of database systems and applications
CO2: To **construct** logical design of database and information retrieval
CO3: To **demonstrate** relational model practically (Structured Query Language)
CO4: To **demonstrate** and relate normalization for database design
CO5: To **outline** the necessity of transaction management, recovery management, file organization & indexing

CO-PO-PSO Mapping Matrix:

Mapping	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2
C01	2	--	--	--	--	--	3	--	--	--	--	--	1	--
C02	3	2	2	--	--	--	--	--	--	--	--	--	--	2
C03	3	2	1	--	3	--	--	--	--	--	--	--	2	3
C04	3	2	1	--	--	--	--	--	--	--	--	--	1	3
C05	2	--	--	--	--	--	--	--	--	--	--	--	1	--

II- Year I- Semester	Name of the Course	L	T	P	C
PC2101L	Data Structures Lab	0	0	3	1.5

Course Objectives:

CO1: Ability to apply computational thinking to a diverse set of problems.

CO2: Ability to adapt to new challenges and computational environments.

CO3: Proficiency in the design and implementation of algorithms.

List of experiments:

Prerequisites: Solve the following problems in Hackerrank

1. Time Conversion
2. Diagonal Difference
3. Stair case
4. Birthday Cake candles

UNIT I

1. Implement Binary Search using arrays
2. Implement Insertion Sort.
3. Implement Quick Sort
4. Implement Merge Sort
5. Implement Radix Sort

String Pairs

Anagram

UNIT II

6. Implement stack using arrays
7. Implement conversion of infix to postfix expression.
8. Implement queue using arrays.
9. Implement circular queue
10. Implement Singly Linked List
11. Implement Doubly Linked List
12. Implement Binary Heap Operations.

Minimize the Sum

Implement Expression Tree.

UNIT III

13. Implement Complete Binary Tree
14. Implement Binary Trees Traversal techniques (recursive and non-recursive)
15. Implement Binary Search Tree
16. Implement Binary Heap Operations.

UNIT IV

17. Implement Graph and its operations
18. Implement Breadth First Search
19. Implement Depth First Search
20. Implement Prims' Algorithm
21. Implement Kruskal's Algorithm

Implement Island Strikes.

Implement Pawn Moves.

UNIT V

22. Implement Linear Probing on a dictionary.
23. Implement Separate Chaining.
24. Implement Brute Force Pattern Matching.
25. Implement Boyer Moore Pattern Matching.

CO-PO-PSO Mapping Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSPO1	PSPO2
CO1	2	2	1										1	1
CO2	2		2	1										1
CO3		2	1	2									1	1

II- Year I- Semester	Name of the Course	L	T	P	C
PC2102L	Java Programming Lab	0	0	3	1.5

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using java collection frame work.
3. To write multithreaded programs.
4. To design GUI application using swing controls.
5. To introduce java compiler and eclipse platform
6. To impart hands on experience with java programming.

Note:

Mandatory to follow test driven development with Eclipse IDE empowered JUnit testing framework and code coverage plugin.

The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments

1. Create a class called Invoice that a hardware store might use to represent an invoice for an item sold at the store. An Invoice should include four pieces of information as instance variables-a part number (type String),a part description(type String),a quantity of the item being purchased (type int) and a price per item (double). Your class should have a constructor that initializes the four instance variables. Provide a set and a get method for each instance variable. In addition, provide a method named getInvoiceAmount() that calculates the invoice amount (i.e., multiplies the quantity by the price per item), then returns the amount as a double value. If the quantity is not positive, it should be set to 0. If the price per item is not positive, it should be set to 0.0. Write a test application named InvoiceTest that demonstrates class Invoice's capabilities. [CO1]

2. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, and type of EB connection (i.e. domestic or commercial). Compute the bill amount using the following tariff. [CO1]

   If the type of the EB connection is domestic, calculate the amount to be paid as follows:

   1. First 100 units - Rs. 1 per unit
   2. 101-200units - Rs. 2.50 per unit
   3. 201 -500 units - Rs. 4 per unit

4. >501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

5. First 100 units - Rs. 2 per unit
6. 101-200units - Rs. 4.50 per unit
7. 201 -500 units - Rs. 6 per unit
8. >501 units - Rs. 7 per unit

3. Create class SavingsAccount. Use a static variable annualInterestRate to store the annual interest rate for all account holders. Each object of the class contains a private instance variable savingsBalance indicating the amount the saver currently has ondeposit. Provide method calculateMonthlyInterest to calculate the monthly interest by multiplying the savingsBalance by annualInterestRate divided by 12 this interest should be added to savingsBalance. Provide a static method modifyInterestRate that sets the annualInterestRate to a new value.Write a program to test class SavingsAccount. Instantiate two savingsAccount objects, saver1 and saver2, with balances of $2000.00 and $3000.00, respectively. Set annualInterestRate to 4%, then calculate the monthly interest and print the new balances for both savers. Then set the annualInterest Rate to 5%, calculate the next month's interest and print the new balances for both savers. [CO1]
4. Create a class called Book to represent a book. A Book should include four pieces of information as instance variables-a book name, an ISBN number, an author name and a publisher. Your class should have a constructor that initializes the four instance variables. Provide a mutator method and accessor method (query method) for each instance variable. In addition, provide a method named getBookInfo that returns the description of the book as a String (the description should include all the information about the book). You should use this keyword in member methods and constructor. Write a test application named BookTest to create an array of object for 30 elements for class Book to demonstrate the class Book's capabilities. [CO1].
5. Write a JAVA program to search for an element in a given list of elements using binary search mechanism. [CO1]
6. Write a Java program that implements Merge sort algorithm for sorting and also shows the number of interchanges occurred for the given set of integers. [CO1]
7. Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random() [CO1].
8. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary. [CO1]

9. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.[CO2]
10. Develop a java application to implement currencyconverter(DollartoINR,EURO toINR,YentoINR and vice versa), distance converter (meter to KM, miles to KM and vice versa), timeconverter (hours to minutes, seconds and vice versa) using packages. [CO1]
11. Write a Java Program to Handle Arithmetic Exceptions and InputMisMatchExceptions. [CO1]
12. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and Fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates Fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both. [CO3].
13. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of thenumber. [CO3].

14. Write a Java program that correctly implements the producer – consumer problem using the concept of inter-thread communication. [CO3].

15. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file inbytes. [CO1].

16. Write a Java program to build a Calculator in Swings/ [CO4]

17. Write a Java program to implement JMenu to draw all basic shapes using Graphics. [CO4]

18.Write a Java program to implement JTable and JTree. [CO4]

19. Write a Java program to implement JTabbedPane. [CO4]

20. Write a Java Program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle and the result produced by the server is the area of the circle. [CO3]

Course Outcomes: at the end of the lab, the student will be able to

CO1: Develop programs for solving real world problems using java collection frame work.
CO2: Develop and apply multithreaded programs in network applications.
CO3: Develop GUI programs using swing controls in Java.

CO-PO mapping Table with justification

Mapping	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2
C01	2	2	2		2				2				2	2
C02	2	2	2		2				2				2	2
C03	2	2	2		2				2				2	2

II- Year I - Semester	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
PC2104L		0	0	3	1.5

Course Objectives:

1. To familiarize the participant with the distinctions of database environments towards an information-oriented framework
2. To give a good formal foundation on the relational model of data
3. To present SQL and procedural interfaces to SQL comprehensively

List of experiments:

SQL

1. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints **[CO1]**
2. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions. **[CO1]**
3. Queries using operators in SQL **[CO2]**
4. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update **[CO2]**
5. Queries using Group By, Order By, and Having Clauses **[CO2]**
6. Queries on Controlling Data: Commit, Rollback, and Save point **[CO2]**
7. Queries to Build Report in SQL *PLUS **[CO2]**
8. Queries on Joins and Correlated Sub-Queries **[CO2]**
9. Queries on Working with Index, Sequence, Synonym, Controlling Access, and Locking Rows for Update, Creating Password and Security features **[CO2]**

PL/SQL

1. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of Assignment Operation **[CO3]**
2. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL **[CO3]**
3. Write a PL/SQL block using SQL and Control Structures in PL/SQL **[CO3]**
4. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types **[CO3]**
5. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS **[CO4]**
6. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc. **[CO4]**
7. Demonstration of database connectivity **[CO4]**

Course Outcomes:

CO1: To create database for user (Creation of Database)
CO2: To solve various SQL queries for user defined schemas
CO3: To generalize PL/ SQL blocks
CO4: To illustrate the usage of user defined packages

CO-PO mapping Matrix:

Mapping	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2
C01	1	--	3	--	--	--	--	--	--	--	--	--	3	2
C02	3	2	1	1	--	--	--	--	--	--	--	--	1	3
C03	2	1	1	--	--	--	--	--	--	--	--	--	1	--
C04	2	--	--	--	--	--	--	--	--	--	--	--	1	--

II- Year I- Semester	Name of the Course	L	T	P	C
SOC2101	Advanced Python Programming	1	0	2	2

PRE-REQUISITES:

- Fundamentals of Python
- Problem solving skills

Course objectives: The student should be able to

1. Able to learn advanced concepts in Python
2. Able to use advanced packages like numpy, scipy, opencv in Python for building data processing & visualizing applications.
3. Able to process digital imaging applications

Unit-1: Python Fundamentals: Introduction to Python, Data Structures – List, Dictionaries, Sets and Tuples. **(6 hrs)**

Modules, Python Packages, Libraries: Modules - Creating modules, import statement, from Import statement, name spacing. Math Module: Constants, Power and logarithmic functions, Trigonometric functions. Numpy Library: Numpy import, Basic functions, Matrices Addition, Subtraction Multiplication, Transpose, Inverse, Eigen values and Eigenvectors using Numpy **(8hrs)**

Unit-2: Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages **(4hrs)**

Data Visualization – Matplotlib - Loading the library and importing the data, How Mat plot lib works?, modifying the appearance of a plot, Plotting multiple plots, Modifying the tick marks, Scatter plots, Bar plots. **(8hrs)**

Unit-3: File Handling – Introduction to Files, File modes, Reading, Writing data from files, Copy one file to another, deletion of files. Other file programs in Python. **(4hrs)**

Text Processing: Word, character and line counting, Frequency count. Usage of with() and split(). Reading and writing into CSV formats**.** **(8hrs)**

Unit-4: Image Processing - Installing Jupiter notebook. Image & Its properties. Image processing applications. Image I/O and display with Python, Reading, saving and displaying an image using Open CV - PyPI, matplotlib

Sample programs – Image statistics Croping, Converting images from RGB to Gray and resizing the image. **(12 hrs)**

Unit-5: Using Databases and SQL – Introduction to Database Concepts, usage of SQLite, Create, Insert & Retrieve data, Spidering twitter using a database. Sample Python codes **(8 hrs)**

Text books:

1. Python for Everybody: Exploring Data Using Python 3, Charles Severance
2. The Hitchiker's Guide to Python, O'Reilly publication

Reference books:

1. Hands-On Image Processing with Python, O'Reilly Publications
2. *Think Python,* Allen Downey, Green Tea Press

e- Resources & other digital material

1. https://nptel.ac.in/courses/117/105/117105079/
2. https://nptel.ac.in/courses/106/106/106106145/#
3. https://realpython.com/python-mysql/

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: Recall the usage of Python Concepts.

CO2: Use different Python packages for Data Visualization

CO3: Demonstrate File handling & text processing

CO4: Demonstrate applications that performs Image processing

CO5: Connect database with Python.

Text books:

1. Python for Everybody: Exploring Data Using Python 3, Charles Severance
2. The Hitchiker's Guide to Python, O'Reilly publication

Reference books:

1. Hands-On Image Processing with Python, O'Reilly Publications
2. *Think Python,* Allen Downey, Green Tea Press

Digital resources:

1. https://nptel.ac.in/courses/117/105/117105079/
2. https://nptel.ac.in/courses/106/106/106106145/#
3. https://realpython.com/python-mysql/

Course Outcomes:

CO1: Recall the usage of Python Concepts.
CO2: Use different Python packages for Data Visualization
CO3: Demonstrate File handling & text processing
CO4: Demonstrate applications that performs Image processing
CO5: Connect database with Python.

CO-PO mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1	1	1	2										
CO2	1	2	2	2										
CO3	1	2	2	2										
CO4	2	2	2	2										
CO5	1	2	2	1										

Micro-Syllabus for Advanced Python Programming

Python Fundamentals: Introduction to Python, Data Structures – List, Dictionaries, Sets and Tuples.
Modules, Python Packages, Libraries: Modules - Creating modules, import statement, from Import statement, name spacing. Math Module: Constants, Power and logarithmic functions, Trigonometric functions. Numpy Library: Numpy import, Basic functions, Matrices Addition, Subtraction Multiplication, Transpose, Inverse, Eigen values and Eigenvectors using Numpy

Unit No	Module	Micro content
I a	Python Fundamentals	Introduction to Python features, advantages and disadvantages, applications
		Lists - different types of problems using lists
		Tuples
		Dictionaries - converting lists into dictionaries and other problems
		sets
I b	Modules, Python Packages, Libraries	Module creation and import
		Math module and functions - basic math, statistical and logarithmic, trigonometric functions
		Numpy basic mathematical operations - matrix applications
		Eigen values and vectors

Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages
Data Visualization – Matplotlib - Loading the library and importing the data, How Mat plot lib works?, modifying the appearance of a plot, Plotting multiple plots, Modifying the tick marks, Scatter plots, Bar plots.

Unit No	Module	Micro content
I a.	Introduction to PIP	Installation process, commands
		Installation of various packages
		Using Python packages
II b.	Data Visualization	Loading and importing matplotlib
		Multiple plots - small applications
		Updating plot ticks, scatter plots - sample applications
		Bar plots sample applications

File Handling – Introduction to Files, File modes, Reading, Writing data from files, Copy one file to another, deletion of files. Other file programs in Python. **(4hrs)**

Text Processing: Word, character and line counting, Frequency count. Usage of with() and split(). Reading and writing into CSV formats**. (8hrs)**

Unit No	Module	Micro content
3a.	File Handling	Introduction to Files, File modes
		Reading and writing files - sample
		programs - copy, reverse, reading lines, reading words, deletion of files
		Updating a file
3b.	Text processing	Word, line, character count programs
		Frequency count
		Usage of with() and split()
		Reading different files like CSV
		Implement read, update, cells/rows/columns in a CSV file

Image Processing - Installing Jupiter notebook. Image & Its properties. Image processing applications. Image I/O and display with Python, Reading, saving and displaying an image using Open CV - PyPI, matplotlib

Unit No	Module	Micro content
IV	Image processing	• Introduction to images and their properties • Reading and writing images • Types of images • Display images using opencv • Usage of PyPI (methods for image processing) • Image enhancement operations • other simple image based programs

Using Databases and SQL – Introduction to Database Concepts, usage of SQLite, Create, Insert & Retrieve data, Spidering twitter using a database. Sample Python codes **(8 hrs)**

Unit No	Module	Micro content
V	**Database connectivity**	Database concepts - tables, rows and columns, primary keys, referential integrity
		Usage of SQlite
		DDL and DML commands
		Basic storage and retrieval operations on database
		Spidering twitter data and related python code modules

II- Year I- Semester	Name of the Course	L	T	P	C
MC2101	Essence of Indian Traditional Knowledge	2	0	0	0

Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003.
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection.
- To know the student traditional knowledge in different sector.

Unit-I: 10Hrs

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit the student will able to:

- Understand the traditional knowledge.
- Contrast and compare characteristics importance kinds of traditional knowledge.
- Analyse physical and social contexts of traditional knowledge.
- Evaluate social change on traditional knowledge.

Unit-II: **10Hrs**

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit the student will able to:

- Know the need of protecting traditional knowledge.
- Apply significance of TK protection.
- Analyse the value of TK in global economy.
- evaluate role of government

Unit-III: 10Hrs

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework of TK.
- Contrast and compare the ST and other traditional forest dwellers
- Analyse plant variant protections
- Evaluate farmers right act

Unit-IV: 7Hrs

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FOR A for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand TK and IPR
- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

Unit-V: 9Hrs

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit the student will able to:

- know TK in different sectors.
- apply TK in engineering.

- analyze TK in various sectors.
- evaluate food security and protection of TK in the country.

Reference Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

E-Resources:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. 2.http://nptel.ac.in/courses/121106003/

Course Outcomes: After completion of the course, students will be able to:

1. understand the concept of Traditional knowledge and its importance
2. know the need and importance of protecting traditional knowledge
3. know the various enactments related to the protection of traditional knowledge.
4. understand the concepts of Intellectual property to protect the traditional knowledge

***

II- Year II- Semester	Name of the Course	L	T	P	C
BS2201	Probability and Statistics	2	1	0	3

Course objectives:

1. To **Classify** the concepts of data science and its importance (L4) or (L2)
2. To **Interpret** the association of characteristics and through correlation and regression tools (L4)
3. To **Understand** the concepts of probability and their applications, **apply** discrete and continuous probability distributions (L3)
4. To **Design** the components of a classical hypothesis test (L6)
5. To **Infer** the statistical inferential methods based on small and large sampling tests (L4)

UNIT-I

Descriptive statistics and methods for data science: 10 hrs

Data science-Statistics Introduction-Population vs Sample-Collection of data-primary and secondary data-Types of variable: dependent and independent Categorical and Continuous variables-Data visualization-Measures of Central tendency-Measures of Variability (spread or variance)-Skewness Kurtosis.

UNIT-II

Correlation and Curve fitting: 10 hrs

Correlation- correlation coefficient-Rank correlation-Regression coefficient and properties-regression lines-Multiple regression-Method of least squares-Straight line-parabola-Exponential-Power curves.

UNIT-III

Probability and Distributions: 10 hrs

Probability-Conditional probability and Baye's theorem-Random variables-Discrete and Continuous random variables-Distribution function-Mathematical Expectation and Variance-Binomial, Poisson, Uniform and Normal distributions.

UNIT-IV

Sampling Theory: 10 hrs

Introduction–Population and samples-Sampling distribution of Means and Variance (definition only)-Central limit theorem (without proof)-Point and Interval estimations, Good estimator, Unbiased estimator, Efficiency estimator-Maximum error of estimate.

UNIT-V

Test of Hypothesis: 8 hrs

Introduction–Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors-Level of significance-One tail and two-tail tests-Tests concerning one mean, two means, and proportions using Z test, Tests concerning one mean, two means using t test, also chi-square and F tests use for small samples.

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1: **Classify** the concepts of data science and its importance (L4) or (L2) (**Understand, Analyze)**

CO2: **Interpret** the association of characteristics and through correlation and regression tools (L4) **Analyze**

CO3: **Understand** the concepts of probability and their applications, **apply** discrete and continuous probability distributions (L3) **Understand, Apply**

CO4: **Design** the components of a classical hypothesis test (L6) **Understand, Design, create**

CO5: **Infer** the statistical inferential methods based on small and large sampling tests (L4) **Understand, Analyze**

Text books:

1. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. **S. C. Gupta and V. K. Kapoor,** Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012

Reference books

1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
2. **Jay I. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Sheldon M. Ross,** Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. **Johannes Ledolter and Robert V. Hogg,** Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.
5. **T. K. V. Iyenger**, Probability and Statistics, S. Chand & Company Ltd, 2015.

e- Resources & other digital material

1. https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE (For Probability and Statistics)

2. https://www.youtube.com/watch?v=VVYLpmKRfQ8&list=PL6C92B335BD4238AB (For Probability and Statistics)
3. https://www.mathsisfun.com/data/standard-normal-distribution-table.html (Information about Normal distribution)
4. https://www.statisticshowto.com/tables/t-distribution-table/(Information about T- distribution)

Statistical Tables to be allowed in examinations:

1. Normal distribution table
2. T- distribution table

CO-PO mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2												
CO2	2	3												
CO3	2	2												
CO4	2	2												
CO5	2	3												

Micro-Syllabus of Probability and Statistics

UNIT-I:Descriptive statistics and methods for data science: 10 hrs

Data science-Statistics Introduction-Population vs Sample-Collection of data-primary and secondary data-Types of variable: dependent and independent Categorical and Continuous variables-Data visualization-Measures of Central tendency-Measures of Variability (spread or variance)-Skewness Kurtosis.

Unit	Module	Micro content	No of hrs
1a.Descriptive Statistics	Introduction-Population vs Sample	Collection of data-primary and secondary data	3
		Population	
		Sample	
	Types of variable	dependent and	2
		independent	
		Categorical	
		Continuous variables	
	Data visualization	-Data visualization	1
1b.methods for data science	Measures of Central tendency and Measures of Variability	Measures of Central tendency	2
		Measures of Variability	2
		Skewness Kurtosis.	

UNIT-II: Correlation and Curve fitting: 10 hrs

Correlation-correlation coefficient-Rank correlation-Regression coefficient and properties-regression lines-Multiple regression-Method of least squares-Straight line-parabola-Exponential-Power curves.

Unit	Module	Micro content	No of hrs
2.Correlation and Curve fitting	Correlation	correlation coefficient	4
		Rank correlation	
	Regression	Regression coefficient	4
		properties	
		regression lines	
		Multiple regression	
	Method of least squares	Straight line	4
		Parabola.	
		Exponential curves	
		Power curves.	

UNIT-III: Probability and Distributions: 12 hrs

Probability-Conditional probability and Baye's theorem- Random variables -Discrete and Continuous random variables-Distribution function-Mathematical Expectation and Variance-Binomial, Poisson, Uniform and Normal distributions.

Unit	Module	Micro content	No of hrs
3. Probability and Distributions	Probability	Conditional probability	2
		Baye's theorem	
	Random variables	Discrete Random variables	1
		Continuous Random variables	1
		Distribution function	1
		Mathematical Expectation and variance	1
	Distributions	Binomial distribution.	4
		Poisson distribution	
		Uniform distribution	
		Normal distribution	

UNIT-IV: Sampling Theory: 10 hrs

Introduction–Population and samples-Sampling distribution of Means and Variance (definition only)-Central limit theorem (without proof)-Point and Interval estimations, Good estimator, Unbiased estimator, Efficiency estimator-Maximum error of estimate.

Unit	Module	Micro content	No of hrs
4.Sampling Theory	Introduction	Population samples	1
		Central limit theorem (without proof	
	Sampling distributions	Sampling distribution of Means	4
		Sampling distribution of Variance	
	Estimation	Point estimations	5
		Interval estimation	
		Good estimator	
		Unbiased estimator	
		Efficiency estimator	
		Maximum error of estimate.	

UNIT-V: Test of Hypothesis: 14 hrs

Introduction–Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors-Level of significance-One tail and two-tail tests-Tests concerning one mean, two means, and proportions using Z test, Tests concerning one mean, two means using t test, also chi-square and F tests use for small samples.

Unit	Module	Micro content	No of hrs
5. Test of Hypothesis	Hypothesis	Null Hypothesis	**2**
		Alternative Hypothesis	
		Type I and Type II errors	
		Level of significance	
		One tail and two-tail tests	
	Test for large samples	Tests concerning one mean using Z test	**6**
		Tests concerning one two means using Z test.	
		Tests concerning proportions using Z test	
	Tests for small samples	Tests concerning one mean, two means using t test	**6**
		chi-square test	

		F test	

***

II- Year II- Semester	Name of the Course	L	T	P	C
ES2201	Computer Organization	3	0	0	3

Course Objectives:

1. To understand basic structures of computers and to understand various machine instructions.
2. To understand basic structures of computers and to understand various machine instructions.
3. To analyse ALU & I/O organization of a computer.
4. To understand various memory systems.
5. To analyse functionalities done by processing unit and also learn micro programmed control.

Unit – I: Basic Structure of a Computer and Machine Instructions. 8 Hrs

Introduction, History of Computer Generations, Functional unit, Basic Operational concepts, Bus structures, System Software, Performance. Number representation: Fixed Point and Floating Point representation. Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types

Unit – II: Addressing modes and types of Instructions 10 Hrs

Addressing Modes, Basic Input/output Operations, and role of Stacks and Queues in computer programming equation.

Component of Instructions: Logical Instructions, shift and Rotate Instructions. Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

Unit – III: **Basic building blocks for the ALU: 10 Hrs**

Adder, Subtractor, Shifter, Multiplication and division circuits. Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

Unit – IV: The Memory Systems 10 Hrs

Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Associative Memory, Cache Memories: Mapping Functions, INTERLEAVING, Secondary Storage: Magnetic Hard Disks, Optical Disks.

Unit – V: Processing unit **10 Hrs**

Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, Fetching a Word from Memory, Execution of Complete Instruction, Hardwired Control, MICRO PROGRAMMED CONTROL: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field.

Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization by William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003

Reference Books:

1. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.
2. Computer System Architecture by M Morris Mano, Prentice Hall of India, 2001

Course Outcomes: By the end the of the course, the student will be able to

CO-1: Able to **understand** basic structures of computers and to **understand** various machine Instructions.
CO-2: Able to **learn and use** the addressing modes and types of instructions.
CO-3: Able to analyze I/O organization of a computer.
CO-4: Able to **understand** various memory systems.
CO-5: Able to **analyze** functionalities done by processing unit and also learn micro programmed control.

CO-PO Mapping Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	2	-	2	-	-	-	-	-	-	-	-	-	-	2
CO3	-	2	2	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	2	1	-	-	-	-	-	-	2	2	2	2

Micro Syllabus of Computer Organization

UNIT I: Basic Structure of a Computer and Machine Instructions.

Unit	Module	Micro Content
UNIT I	Introduction	Introduction, History of Computer Generations, Functional unit
		Basic Operational concepts, Bus structures, System Software, Performance
	Number representation	Integer - unsigned, signed (sign magnitude, 1's complement, 2's complement);
		Characters - ASCII coding, other coding schemes;
		Real numbers - fixed and floating point, IEEE754 representation
	Instruction and Instruction Sequencing	Register Transfer Notation
		Assembly Language Notation
		Basic Instruction Types
UNIT – II: Addressing modes and types of Instructions		
Unit	**Module**	**Micro Content**
UNIT II	Addressing modes	Addressing Modes
		Basic Input/output Operations
		Role of Stacks and Queues in computer programming equation
	Component of Instructions	Logical Instructions
		Shift and Rotate Instructions.
	Type of Instructions	Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations
UNIT – III: Basic building blocks for the ALU		
Unit	**Module**	**Micro Content**
UNIT III	Basic Building blocks	Adder, Subtractor, Shifter, Multiplication and division circuits. Accessing I/O Devices
	Interrupts	Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory access
	Buses	Synchronous Bus, Asynchronous Bus, Interface Circuits
	Standard I/O Interface	Peripheral Component Interconnect (PCI) Bus, Universal Sefrial Bus (USB)
UNIT - IV - The Memory Systems		
Unit	**Module**	**Micro Content**
UNIT IV	Main Memory	Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, and Associative Memory.
	Cache Memories	Mapping Functions
		INTERLEAVING
	Secondary Storage	Magnetic Hard Disks, Optical Disks.

UNIT V - Processing unit		
Unit	**Module**	**Micro Content**
UNIT V	Fundamental Concepts	Register Transfers, Performing an Arithmetic or Logic Operation, Fetching a Word from Memory
		Execution of Complete Instruction, Hardwired Control
	Micro Programmed Control	Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field.

II- Year II- Semester	Name of the Course	L	T	P	C
PC2201	Operating Systems	3	0	0	3

Course Objectives:

1. Study the basic concepts and functions of operating system
2. Learn about Processes, Threads and Scheduling algorithms
3. Understand the principles of concurrency and Deadlocks
4. Learn various memory management schemes
5. Study I/O management and File systems

UNIT-I **10 Hours**

Introduction to Operating System Concepts: What Operating Systems do, Computer System Organization, Functions of Operating systems, Types of Operating Systems, Operating Systems Services, System calls, Types of System calls, Operating System Structures, Distributed Systems, Special purpose systems.

UNIT-II **10 Hours**

Process Management: Process concept, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Scheduling Criteria, Scheduling algorithms and their evaluation, Operations on Processes, Inter-process Communication.

Threads: Overview, User and Kernel threads, Multi-threading Models.

UNIT-III **10 Hours**

Concurrency: Process Synchronization, The Critical- Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, and Classic Problems of Synchronization.

Principles of deadlock: System Model, Deadlock Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

UNIT- IV **10 Hours**

Memory Management: Logical vs physical address space, Swapping, Contiguous Memory Allocation, Paging, Structures of the Page Table, Segmentation.

Virtual Memory Management: Virtual memory overview, Demand Paging, Page-Replacement & its algorithms, Allocation of Frames, Thrashing.

UNIT-V **8 Hours**

File system Interface: The concept of a file, Access Methods, Directory structure, files sharing, protection.

File System implementation: File system structure, Allocation methods, and Free-space management.

Mass-storage structure: overview of Mass-storage structure, Disk scheduling, Swap space management.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata McGraw Hill Education.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata McGraw-Hill Education

e-Resources

1. https://en.wikipedia.org/wiki/Operating_system
2. https://www.tutorialspoint.com/operating_system/

Course Outcomes: By the end the of the course, the student will be able to

CO-1: Understand the structure and functionalities of Operating System
CO-2: Demonstrate the concept of Process, Threads and CPU Scheduling Algorithms
CO-3: Use the principles of Concurrency to solve Synchronization problems
CO-4: Demonstrate various methods for handling Deadlocks
CO-5: Infer various Memory Management Techniques

CO-PO-Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	2	3	3	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	1	2	-	-	-	-	-	-	-	3	--
CO3	2	2	3	-	2	-	-	-	-	-	-	-	2	--
CO4	2	2	3	-	2	-	-	-	-	-	-	-	2	2
CO5	3	3	3	-	2	-	-	-	-	-	-	-	3	2

Micro Syllabus of Operating Systems

UNIT I : Introduction to Operating System Concepts: What Operating Systems do, Computer System Organization, Functions of Operating systems, Types of Operating Systems, Operating Systems Services, System calls, Types of System calls, Operating System Structures, Distributed Systems, Special purpose systems.		
Unit	**Module**	**Micro Content**
UNIT I	What Operating Systems do	User View, System View, Defining Operating Systems.
	Computer System Organization	Computer-system operation, Storage structure, i/o structure.
	Functions of Operating systems	Process Management, Memory Management, File Management, I/O Management, Protection, Security, Networking.
	Types of Operating Systems	Batch processing, Multiprogramming, Timesharing, Distributed, Real time, Multi user, Multi-tasking, Embedded, Mobile operating system.
	Operating Systems Services	User interface, Program execution, I/O operations, File system manipulation, Communication, Error Detection.
	System calls, Types of System calls	Process control, File management, Device management, Information maintenance, and Communication maintenance, Protection and security maintenance system calls.
	Operating System Structures	Simple Structure Approach, Layered Approach, Microkernel Approach, Modules Approach.
	Distributed Systems	About Distributed Systems.
	Special purpose systems	Real Time Embedded Systems, Multimedia Systems, And Handheld Systems.

UNIT - II **Process Management:** Process concept, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Scheduling Criteria, Scheduling algorithms and their evaluation, Operations on Processes, Inter-process Communication. **Threads:** Overview, User and Kernel threads, Multi-threading Models.		
Unit	**Module**	**Micro Content**
	Process concept	Define process, process in memory.
	Process State Diagram	Process states, diagram of process states.
	Process control block	Process state, process number, program counter, CPU registers, CPU switch from process to process, memory management information, accounting information, I/O status information.
	Process Scheduling	Introduction to process scheduler.
	Scheduling Queues	Job queue, ready queue, device queue, queueing diagram.
	Schedulers	Importance of scheduler, long term scheduler, short term scheduler, medium term scheduler, degree of

UNIT II		multiprogramming, i/o bound process, cpu-bound process, swapping.
	Scheduling Criteria	Throughput, Turnaround time, Waiting Time, Response time.
	Scheduling algorithms	First-Come First-Served (FCFS) Scheduling, Shortest-Job-First(SJF) Scheduling, Priority Scheduling, Round Robin(RR) Scheduling, Multiple-Level Queue Scheduling, Multilevel Feedback Queue Scheduling.
	Evaluation of Scheduling algorithms	Deterministic modelling, Queueing models, Simulations and Implementation.
	Operations on Processes	Process creation, Process termination.
	Inter-process Communication	Shared memory systems, Message passing systems.
	Threads: Overview	Definition of thread, single threaded process, multithreaded process, benefits.
	Multi-threading Models	User and Kernel threads, many-to-one model, one-to-one model, many-to-many model.

UNIT-III

Concurrency: Process Synchronization, The Critical- Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, and Classic Problems of Synchronization.

Principles of deadlock: System Model, Deadlock Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

Unit	Module	Micro Content
UNIT III	Process Synchronization	What is synchronization, why is it required, cooperating processes, race condition.
	Critical- Section Problem	Critical section, entry section, remainder section, mutual exclusion, progress, bounded waiting.
	Peterson's Solution	Software based solution to critical section between two processes.
	Synchronization Hardware	Locking, test and set instructions, mutual exclusion implementation with test and set, compare and swap instructions, mutual exclusion implementation with compare and swap.
	Semaphores	Semaphore usage, counting and binary semaphore, semaphore implementation, deadlock and starvation.
	Monitors	Structure of monitors, monitors vs semaphores, monitor usage, implementing a monitor using semaphores, dining-philosophers solution using monitors.
	Classic Problems of Synchronization	Bounded-buffer problem, reader-writer problem, dining-philosophers problem.
	Principles of deadlock: System Model	Deadlock definition, resources, request-use-release of resources.
	Deadlock Characterization	Necessary conditions for occurrence of deadlock, Resource allocation graph.
	Deadlock Prevention	Mutual exclusion, hold and wait, no-preemption, circular wait.

	Deadlock Detection	Graph algorithm, Banker's algorithm.
	Deadlock Avoidance	Safe state, Graph algorithm, Banker's algorithm.
	Recovery form Deadlock	Process termination, resource pre-emption.

UNIT- IV

Memory Management: Logical vs physical address space, Swapping, Contiguous Memory Allocation, Paging, Structures of the Page Table, Segmentation.

Virtual Memory Management: Virtual memory overview, Demand Paging, Page-Replacement & its algorithms, Allocation of Frames, Thrashing

Unit	Module	Micro Content
UNIT IV	Memory Management	Base register, limit register, protection with base and limit register.
	Logical vs physical address space	Logical address, memory address register, physical address, dynamic relocation using relocation register.
	Swapping	Swapping of two processes using a disk as backing store, swapping on mobile systems.
	Contiguous Memory Allocation	Memory protection, memory allocation, fragmentation.
	Paging	Basic method for implementing paging, paging hardware, TLB, protection, shared pages.
	Structure of the Page Table	Hierarchical paging, hashed page tables, inverted page tables.
	Segmentation	Basic method, segmentation hardware.
	Virtual memory overview	Virtual memory, virtual address space.
	Demand Paging	Demand paging technique, basic concepts, steps in handling page fault, locality of reference.
	Page-Replacement & its algorithms	Need for page replacement, page replacement techniques: FIFO, Optimal, LRU, LRU Approximation, Counting based.
	Allocation of Frames	Minimum number of frames, allocation algorithms: equal, proportional, global vs local allocation, non-uniform memory access,
	Thrashing	Cause of thrashing, working set model.

UNIT-V

File system Interface: The concept of a file, Access Methods, Directory structure, files sharing, protection.

File System implementation: File system structure, Allocation methods, and Free-space management.

Mass-storage structure: overview of Mass-storage structure, Disk scheduling, Swap space management.

Unit	Module	Micro Content
	File Concept	File - attributes, operations, types, structure.
	Access Methods	Sequential, Direct, other access methods.
	Directory structure	Typical file system organization, storage structure, single level directory, two-level, tree-structured, acyclic-graph, general graph directory.
	Files sharing	Multiple users, remote file system, Consistency

UNIT V		semantics.
	Protection	Types of access, access control.
	File system structure	File systems, basic file system, layered file system, file organization module, logical file system, FCB.
	Allocation methods	Contiguous, linked, indexed, efficiency of these methods.
	Free-space management	Free-space list, bit vector, linked list, grouping, counting.
	Overview of Mass-storage structure	Magnetic disks, solid state disks.
	Disk scheduling	FCFS, SSTF, SCAN,C-SCAN, LOOK,C-LOOK.
	Swap space management	Swap-space use, location

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II- Year I- Semester	Name of the Course	L	T	P	C
PC2202	Software Engineering	3	0	0	3

COURSE OBJECTIVES: The student should be able to

1. To understand the software life cycle models.
2. To understand the software requirements and SRS document.
3. To understand the importance of modeling and modeling languages.
4. To design and develop correct and robust software products.
5. To understand the quality control and how to ensure good quality software.

Unit-1: Introduction to Software Engineering: **10 Hrs**

Software, Software Classifications and Characteristics, Emergency of Software Engineering, What is Software Engineering? Software Engineering Challenges

Software Processes Process model, Elements and Characteristics of Process model, Process Classification, Phased Development Life Cycle, Software Development

Process Models: Prescriptive Process Models, Agile process models, and RUP process model

Unit-2: Project Management & Planning: **10 Hrs**

Project management essentials, Project success and failures, Project Life Cycle, Project team structure and organization, Software Configuration Management. Project planning activities, Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques, Staffing and Personnel Planning, Project Scheduling and Miscellaneous Plans.

Unit-3: Requirement Engineering: **8 Hrs**

Software Requirements, Requirement Engineering Process, Requirement Elicitation, Requirement Analysis (Structured Analysis, Object Oriented Analysis, Data Oriented Analysis and Prototyping Analysis), Requirements Specification, Requirement Validation, and Requirement Management.

Unit-4: Software Design: **10 Hrs**

Software Design Process, Characteristics of a Good Design**,** Design Principles, Modular Design (Coupling and Cohesion), Software Architecture, Design

Methodologies (Function Oriented Design and Object Oriented Design), Structured Design Methodology (SDM), Transaction Analysis and Logical Design;

Coding: Coding principles, Coding process, Code verification and documentations.

Unit-5: Software Testing: **10 Hrs**

Testing Fundamentals, Test Planning, Black Box Testing, White Box Testing, Levels of Testing, Debugging Approaches

Quality of Software: Quality Concept, Quality Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM), ISO 9000, Six Sigma.

Maintenance: Software Maintenance, Maintenance Process Models and Reengineering.

Text Books

1. Software Engineering: Concepts and Practices- Ugrasen Suman, Cengage Learning Publications.
2. Fundamentals of Software Engineering-Rajib Mall, PHI, New Delhi.

Reference Books

1. An Integrated Approach to S/w Engineering- Pankaj Jalote, Narosa Publishing House.
2. Software Engineering- Ian Sommerville, Pearson Education, New Delhi.
3. Software Engineering Concepts-Richard E. Fairly, Tata McGraw Hill Inc. New York.

e- resources

https://www.javatpoint.com/software-engineering-tutorial

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to

CO1: Define and develop s/w projects from requirement gathering to implementation.
CO2: Obtain knowledge about principles and practices of software engineering.
CO3: Focus on the fundamentals of modeling a software project.
CO4: Obtain knowledge about estimation and maintenance of software systems
CO5: Design test cases, schedules and perform testing for SQA

CO-PO MAPPING MATRIX:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	1	2	1	-	-	-	3	-	2	3	2	1	2	1
C02	-	2	3	1	2	2	2	-	1	2	1	-	3	1
C03	-	-	2	-	3	3	1	-	2	1	3	-	3	2
C04	1	3	2	2	2	2	3	-	-	2	2	-	3	1
C05	-	-	2	-	3	2		2	2	-	2	-	2	1

Micro Syllabus of Software Engineering

UNIT I: Introduction to Software Engineering: (14Hrs)
Software, Software Classifications and Characteristics, Emergency of Software Engineering, What is Software Engineering? Software Engineering Challenges
Software Processes Process model, Elements and Characteristics of Process model, Process Classification, Phased Development Life Cycle, Software Development
Process Models: Prescriptive Process Models, Agile process models, and RUP process model

Unit	Module	Micro Content
UNIT I	Software Engineering	Software Classifications, Characteristics
		Engineering Discipline
		Emergency Of Software Engineering
		What Is Software Engineering?
		Software Engineering Challenges
	Software Processes	Process Model
		Elements And Characteristics Of Process Model
		Process Classification
		Phased Development Life Cycle
		Software Development
	Process Models	Prescriptive Process Models
		Agile Process Models,
		RUP Process Model

UNIT – II: Project Management & Planning: (12Hrs)
Project management essentials, Project success and failures, Project Life Cycle, Project team structure and organization, Software Configuration Management. Project planning activities, Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques, Staffing and Personnel Planning, Project Scheduling and Miscellaneous Plans.

Unit	Module	Micro Content
UNIT II	Project Management Essentials	Project, People, Process, Product
	Project Success &Failures	Why Project Fails, Keys To Success
	Project Life Cycle	Project Vs Product Life Cycles
	Project Team Structure And Organization, S/W Configuration Management	Configuration Identification, Change Control
		Configuration Status Accounting, Auditing
	Project Planning And Estimation	Project Planning Activities
		Metrics And Measurements
		Project Size Estimation
		Effort Estimation Techniques
		Staffing And Personnel Planning
		Project Scheduling
		Miscellaneous Plans

UNIT –III :Requirement Engineering: (14 Hrs.)
Software Requirements, Requirement Engineering Process, Requirement Elicitation, Requirement Analysis (Structured Analysis, Object Oriented Analysis, Data Oriented Analysis and Prototyping Analysis), Requirements Specification, Requirement Validation, and Requirement Management.

Unit	Module	Micro Content
Unit III	Requirements Engineering	Software Requirements
		Requirement Engineering Process
		Requirement Elicitation
		Requirement Analysis
	Structured Analysis	Data Flow Diagrams, Dictionary
		Structured Analysis Method, Pros &Cons
	Data Oriented Analysis	ERM, Data Oriented Analysis Method
	Object Oriented Analysis	OO Method, Modeling
		Dynamic And Functional Modeling
	Prototyping Analysis	Throwaway Prototyping
		Evolutionary Prototyping
	Requirements Specification, Validation, And Management	SRS Characteristics And Components
		Structure And Methods
		Review And Reading

UNIT - IV :Software Design: (14 Hrs.)

Software Design Process, Characteristics of a Good Design**,** Design Principles, Modular Design (Coupling and Cohesion), Software Architecture, Design Methodologies (Function Oriented Design and Object Oriented Design), Structured Design Methodology (SDM), Transaction Analysis and Logical Design;

Coding: Coding principles, Coding process, Code verification and documentations.

Unit	Module	Micro Content
UNIT IV	Software Design Process	Software Design Process
	Characteristics Of A Good Design	Characteristics of a Good Design
	Design Principles	Abstraction and information hiding
		Functional decomposition and TD BU strategies
	Modular Design	coupling and cohesion
	Software Architecture	importance of SA and styles
		designs and documentation evaluation
	Design Methodologies	FO & OO designs
	Structured Design Methodology	DFD I/p process & O/p segments
		First level factoring
		additional factoring
	Transaction Analysis And Logical Design	PDL and algorithmic design
	Coding Principles & Process	Coding principles & process
	Verification And Documentation	Verification and documentation

UNIT V : Software Testing: (17Hrs)

Testing Fundamentals, Test Planning, Black Box Testing, White Box Testing, Levels of Testing, Debugging Approaches

Quality of Software: Quality Concept, Quality Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM), ISO 9000, Six Sigma.

Maintenance: Software Maintenance, Maintenance Process Models and Reengineering.

Unit	Module	Micro Content
UNIT V	Testing Fundamentals	Errors, Faults, Failures, Cost, Process, Role
	Planning	Case Design And Execution Stubs And Drivers
		Defect Tracking And Stats
	Black box testing	Ecp, Bva
		Cause Effect Graphing And Error Guessing
	White box testing	CF Based, Path Testing
		DF Base, Mutation Testing
	Levels of testing	Unit Integration System Acceptance
	Debugging approaches	Brute Force, Backtracking
		Breakpoint And Debugging By Induction
		Deduction And Testing
	Quality of software	Concept, Factors
	Verification and validation	Verification And Validation
	SQA	SQA Activities And Plan
	Quality standards	CMM, ISO 900, Six Sigma
	Maintenance	Maintenance Process Models
		Reengineering

II-Year-II Semester	DATA WAREHOUSING & DATA MINING	L	T	P	C
PC2203		3	0	0	3

Course Objectives:

1. Distinguishes the certainty of various classical approaches for mining data in warehouse.
2. Prepares students in identifying various problems and its corresponding approaches for mining data.
3. Outlines a student about merits and demerits of mining approaches contextually.

Course Outcomes:

At the end of the course student will be able to:

CO1: Infers about Data Warehousing & Data Mining. **(Understand)**

CO2: Demonstrates Pre-processing Techniques before Data Mining. **(Applying)**

CO3: Infers Classification & recite different approaches. **(Analyzing)**

CO4: Infers Association Analysis & recite different approaches. **(Analyzing)**

CO5: Infers Cluster Analysis & recite different approaches. **(Analyzing)**

UNIT - I **08 Hours**

Introduction: Data Warehousing: Architecture, OLAP vs OLTP, Data Cube and their operations. **Data Mining**: Patterns of data mining, issues in data mining, Statistical descriptions, data visualizations, similarity and dissimilarity measures of data.

UNIT - II **10 Hours**

Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT - III **10 Hours**

Classification: Basic concepts, General approach for solving a classification problem, Decision tree algorithm working and attribute selection measures, **Alternative techniques**: Bayes' Theorem, Naïve Bayesian classification Algorithm, Bayesian Belief networks.

UNIT - IV **10 Hours**

Association Analysis: Basic Concepts, Frequent item set generation, compact representation of frequent item sets and FP-Growth Algorithm.

UNIT - V **10 Hours**

Cluster Analysis: Basic Concepts, Different types of Clustering and cluster, **Algorithms:** K-means algorithm and their additional issues, Bisecting K-means, Agglomerative Hierarchical

Clustering Agorithm, DBSCAN Algorithm strengths and their weaknesses.

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

REFERENCE BOOKS:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining : VikramPudi and P. Radha Krishna, Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

e-RESOURCES:

1. https://www.saedsayad.com/data_mining_map.htm
2. https://nptel.ac.in/courses/106/105/106105174/
3. (NPTEL course by Prof.Pabitra Mitra)
   http://onlinecourses.nptel.ac.in/noc17_mg24/preview
4. (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran)
   http://www.saedsayad.com/data_mining_map.htm

Micro Syllabus of Data Warehousing & Data Mining

II B. Tech II Semester

UNIT I : Introduction: Data Warehousing, Data Mining		
Unit	**Module**	**Micro Content**
UNIT I	Data Warehousing	Introduction
		Architecture
		OLAP vs OLTP
		Data cube
		Data cube Operations
	Data Mining	Introduction
		Kinds and Patterns of Data Mining
		Issues of Data Mining
		Statistical Descriptions
		Data Visualizations
		Similarity and Dissimilarity

UNIT – II: Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

Unit	Module	Micro Content
UNIT II	Data Pre-processing	Data Cleaning: • Handling Missing values • Handling Noisy data
		Data Integration: • For nominal attribute • For numeric attribute
		Data Reduction: • Wavelet Transforms • PCS • Attribute subset selection • Numerosity reduction
		Data Transformation: • Strategies: smoothing, normalization etc • Normalization (Min Max, Z-score, Decimal Scaling) • Data Discretization

UNIT – III : Classification: Basic concepts, algorithms, alternative techniques

Unit	Module	Micro Content
UNIT III	Classification Analysis	Basic Concepts
		General Approach to solving a classification problem
		Decision Tree Induction
		Working of Decision Tree
		building a decision tree
		methods for expressing an attribute test conditions
		measures for selecting the best split
		Algorithm for decision tree induction
		Bayes' Theorem
		Naïve Bayesian Classification
		Bayesian Belief Networks

UNIT - IV : Association Analysis: Basic Concepts and Algorithms

Unit	Module	Micro Content
UNIT IV	Association Analysis	Problem Definition
		Frequent Item Set generation
		Rule generation

		compact representation of frequent item sets
		FP-Growth Algorithm
UNIT V : Cluster Analysis: Basic Concepts and Algorithms.		
Unit	**Module**	**Micro Content**
UNIT V	Cluster Analysis	Overview; Classification vs Clustering
		Different Types of Clustering
		Different Types of Clusters
		K-means
		K-Means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses
		Agglomerative Hierarchical Clustering
		Basic Agglomerative Hierarchical Clustering Algorithm
		DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

CO-PO-PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSPO1	PSPO2
CO1	2	3	--	1	--	2	--	2	--	--	--	--	1	--
CO2	3	1	--	--	--	--	--	--	--	--	--	--	--	3
CO3	--	3	1	1	--	3	--	--	--	--	--	--	--	3
CO4	--	3	1	1	--	3	--	--	--	--	--	--	--	3
CO5	--	3	1	1	--	3	--	--	--	--	--	--	--	3

II- Year II - Semester	OPERATING SYSTEMS LAB	L	T	P	C
PC2201L		0	0	3	1.5

Course Objectives:

1. Ability to apply computational thinking to a diverse set of problems.
2. Ability to analyze the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.
3. Proficiency in the design and implementation of algorithms.

LIST OF EXPERIMENTS

1. Simulate the following CPU scheduling algorithms [CO1]
a) FCFS
b) SJF (Premptive, Non Premptive)
c) Priority (Premptive, Non Premptive)
d) Round Robin

2. Simulate the following Process Synchronization techniques [CO1]
a) Bounded-Buffer problem
b) Readers-Writers problem
c) Dining philosophers problem using semaphores
d) Dining-Philosophers Solution using Monitors

4. Simulate Bankers Algorithm for [CO1]
a) Dead Lock Avoidance
b) Dead Lock Prevention

4. Simulate the following page replacement algorithms. [CO2]
a) FIFO
b) LRU
c) LFU
d) MFU

5. Simulate the following [CO2]
a) Multiprogramming with a fixed number of tasks (MFT)
b) Multiprogramming with a variable number of tasks (MVT)

6. Simulate the following File allocation strategies [CO3]

a) Contiguous
b) Linked
c) Indexed

7. Simulate the following disk-scheduling algorithms [CO3]
a) FCFS
b) SSTF
c) SCAN
d) C-SCAN
e) LOOK
f) C-LOOK

Course Outcomes:

At the end of the course student will be able to:

CO1: Examine various process management techniques like CPU scheduling, process synchronization and deadlocks. [K4, Analyze]
CO2: Prioritize various memory management techniques like page replacement algorithms. [K4, Analyze]
CO3: Analyse various storage management techniques like file allocation and disk scheduling. [K4, Analyze]

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO 1	2	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 2	2	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 3	2	2	2	-	-	-	-	-	-	-	-	1	2	1

II-Year-II Semester	SOFTWARE ENGINEERING LAB	L	T	P	C
PC2202L		0	0	3	1.5

The Software Engineering lab will facilitate the students to develop a preliminary yet practical understanding of software development process and tools

Course Objectives

- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes

1. To demonstrate requirement gathering techniques to create SRS for a defined problem.
2. To implement the cost, size, effort estimation techniques on a defined problem
3. To assess the risk for a defined problem by applying Risk Assessment strategies like RMMM.
4. To investigate a real-world problem using modern modelling tools.
5. To formulate test cases based on requirements and design
6. To conduct FTRs as a measure of communication between him and the other stakeholders of the project.

Experiments

Take any real time problem and do the following experiments:

1. Do the Requirement Analysis and Prepare SRS
2. Using COCOMO model estimate effort.
3. Calculate effort using FP oriented estimation model.
4. Analyze the Risk related to the project and prepare RMMM plan.
5. Develop Time-line chart and project table using PERT or CPM project scheduling methods.
6. Draw E-R diagrams, DFD, CFD and structured charts for the project.
7. Design of Test cases based on requirements and design.
8. Prepare FTR
9. Prepare Version control and change control for software configuration items

Reference Books:

1.Roger S.Pressman, Software engineering-A practitioner's Approach, McGraw-Hill International Edition, 6th edition, 2001.
2.IanSommerville, Software engineering, Pearson education Asia, 6th edition, 2000.

CO-PO-PSO Mapping Matrix:

CO/ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**P011**	**PO12**
CO.1	3	3	-	-	3	-	-	-	3	3	2	-
CO.2	3	3	-	-	-	-	-	-	3	3	3	-
CO.3	3	3	-	-	-	-	-	-	3	3	3	-
CO.4	3	3	3	3	-	-	-	-	3	3	3	-
CO.5	3	2	-	-	3	-	-	-	3	3	-	-
CO.6	-	-	-	-	-	-	-	-	3	3	3	-

II-Year-II Semester	Data Warehousing & Data Mining Lab	L	T	P	C
PC2203L		0	0	3	1.5

Course Objectives:

- Demonstrates various Data Mining Tasks.
- Relates students in differentiating Data Sets for analysis.
- Illustrates students in evaluating the methods contextually.

Course Outcomes:

At the end of the course student will be able to:

CO – 1 : Demonstrates Data Pre-processing Techniques.

CO – 2 : Demonstrates and Discovers Knowledge using Classification Methods

CO – 3 : Demonstrates and Discovers Knowledge using Association Methods

CO – 4 : Demonstrates and Discovers Knowledge using Clustering Methods

List of experiments:

1. Demonstration of preprocessing on dataset student.arff [CO1]
2. Demonstration of preprocessing on dataset labor.arff [CO1]
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm [CO3]
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm [CO3]
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm [CO2]
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm [CO2]
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm [CO2]
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm [CO2]
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means [CO4]
10. Demonstration of clustering rule process on dataset student.arff using simple k- means. [CO4]

CO-PO-PSO Mapping Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSPO1	PSPO2
CO1	--	3	1	1	--	3	--	--	--	--	--	--	--	3
CO2	--	3	1	1	--	3	--	--	--	--	--	--	--	3
CO3	--	3	1	1	--	3	--	--	--	--	--	--	--	3
CO4	--	3	1	1	--	3	--	--	--	--	--	--	--	3

II- Year II- Semester	Name of the Course	L	T	P	C
SOC2201L	R Programming Lab	0	0	3	1.5

Prerequisites: Basic mathematical background, basic knowledge in programming, fundamental knowledge of mathematical and statistical computations, simulations and data analysis and data science and modelling.

Learning Outcomes: After successful completion of the course, students should be able to

- Understand the basics in R programming in terms of constructs, control statements, functions, vectors,lists, etc.
- import, review, manipulate and summarize data-sets in R.
- Learn how to apply R programming for Data processing.
- Able to appreciate and apply the R programming from a statistical perspective.

Week1:

1. Write an R-Program to print Hello World .

2. Write an R-Program to take input from user.

3. Write a program to illustrate Variable assignment in R.

Week2:

1. Write a program to illustrate basic Arithmetic in R.

2. Write a program to illustrate data types in R .

Week3:

1. Write a program to illustrate creating and naming a vector in R (create vector using : operator, create vector using seq() function).

2. Write a program to create two vectors and perform different operations(+,-,*.etc.) on them and print the result.

3. Write a program to create two vectors and use the functions i)dim() ii)length( ) iii)is.numeric() iv)is.character() v)rbind() vi) cbind()

Week4:

1. Write a program to illustrate create a matrix and naming matrix in R .

2. Write a program to illustrate Add column and Add a Row in Matrix in R.

3. Write a program to illustrate Selection of elements in Matrixes in R .

4. Write a program to illustrate Performing Arithmetic of Matrices .

Week5:

1. Write a program to illustrate if-else-else if in R .

2. Write a Program to illustrate While and For loops in R .

3. Write a program to illustrate Compare and Matrices and Compare vectors .

4. Write a program to illustrate Logical & and Logical | operators in R.

Week6:

1. Write an R Program to Find the Factorial of a Number

2. Write an R Program to Find the Factors of a Number .

3. Write an R Program to Find the Fibonacci sequence Using Recursive Function.

Week7:

1.Write a program to print 1 to N numbers in reverse order using rev function in R.

2. Write a program to find cumulative sum 1:10 using cumsum function in R.

3. Write a program to compute log to base 10 of the sqrt of 50.

Week8:

1. Write a program to illustrate Functions in Quick sort implementation in R.
2. Write a program to illustrate Function inside function in R
3. Write a program to count the odd numbers in a vector of integers by defining function named oddcount().

Week9:

1. Write a program to illustrate List ? Why would you need a List .

2. Write a program to illustrate Adding more elements into a List .

Week10:

1. Write a program to illustrate Factors in R .

2. Case study of why you need use a Factor in R .

3. Write a program to illustrate Ordered Factors in R .

Week11:

1. Write a program to illustrate Data Frame Selection of elements in a Data frame. Create a data frame with the following fields

Name	Age	Height	Weight	Gender
Ramu	21	171	71	M
Arun	20	168	69	M
Rani	22	160	64	F
John	19	173	70	M

i)Find the Mean height of students and weight of students.
ii)Find the standard deviation of heights and weights of students
iii)Find the number of male and female students.

2. Write a program to illustrate Sorting a Data frame .

Week12:

1. Write a program to illustrate to create graphs and usage of plot() function in R .

2. Write a program to illustrate Customising and Saving to Graphs in R.

3. Write a program to illustrate some built in Mathematical Functions.

Course Outcomes: By the end of the Lab, the student able to

1. **Comprehend** the various concepts of a R language
2. **Develop** R Programming for Data Processing
3. **Design** and development of R problem solving skills.
4. **Apply** the R programming from a statistical perspective.

CO-POS MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	2	-	-	-	3		1	2		
CO2	2	3	3	2	2	-	-	-	1		2	2		
CO3	3	3	3	2	-	-	-	-	2		2	2		
CO4	2	2	2	2	2	-	-	-	2		2	2		