



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

(A State Government University)

B. Tech - 2024

**FIRST YEAR SYLLABUS
(GROUP A)**



SEMESTER 2

GROUP A

SEMESTER S2
MATHEMATICS FOR INFORMATION SCIENCE – 2
(Group A)

Course Code	GAMAT201	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Elementary matrix operations	Course Type	Theory

Course Objectives:

1. To provide a comprehensive understanding of linear algebra focusing on fundamental concepts and applications, and to develop necessary skills to effectively utilize linear algebra in advanced studies and professional practice.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Linear systems of equations, Solution by Gauss elimination, Row echelon form and rank of a matrix, Fundamental theorem for linear systems - homogeneous and non-homogeneous (without proof), Eigen values and Eigen vectors of matrices, Diagonalization of matrices. [Text 1: Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4]	9
2	Vector Spaces, Examples of vector space – R^n and $M_{m \times n}$ only, Subspaces, Examples as subspaces of R^n and $M_{m \times n}$, Linear combinations of vectors in a vector space, Spanning sets, Linear dependence and independence, Basis for a vector space, The dimension of vector space, Coordinate representation in R^n , Change of basis in R^n : Transition Matrix (without proof). [Text 2: Relevant topics from sections 4.2, 4.3, 4.4, 4.5, 4.7]	9

3	<p>Vector length and unit vector, Dot product and angle between two vectors, The Cauchy- Schwarz Inequality, Inner product, Examples as R^n and $M_{2 \times 2}$, Properties of inner products, Definitions of length, distance and angle, Orthogonal projections in inner product spaces, Orthogonal and orthonormal sets, Orthogonal and orthonormal basis, Gram-Schmidt orthonormalization process (without proof), The least squares problem, Orthogonal Subspaces, Solving the least square problems.</p> <p>[Text 2: Relevant topics from sections 5.1, 5.2, 5.3, 5.4]</p>	9
4	<p>Linear Transformations, Properties of linear transformations, Linear Transformation given by a matrix, Rotation in R^2, Projection in R^3, Kernel of a Linear Transformation and its basis, Range of a Linear Transformation and its basis, Rank and Nullity of a Linear Transformation, Sum of Rank and Nullity (without proof), Matrices for Linear Transformations.</p> <p>[Text 2: Relevant topics from sections 6.1, 6.2, 6.3]</p>	9

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Solve system of linear equations, to evaluate eigen values and eigen vectors of matrices and to diagonalize matrices.	K3
CO2	Understand the concepts of vector spaces and subspaces and to apply their properties.	K3
CO3	Describe inner product spaces and their properties, to apply orthonormalization process and to solve least square problems.	K3
CO4	Understand the concept of linear transformation and to apply its properties, to find the rank and nullity of a linear transformation and to find the matrices of linear transformations.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10 th edition, 2016
2	Elementary Linear Algebra	Ron Larson	Cengage Learning	8 th edition, 2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Mathematics for Machine Learning	Marc Peter Deisenroth, A. Aldo Faisal & Cheng SoonOng	Cambridge University Press	1 st edition, 2020
2	Linear algebra and learning from data	Gilbert Strang	Wellesley-Cambridge Press	1 st edition, 2019
3	Elementary Linear Algebra	Stephen Andrilli & David Hecker	Academic Press Inc.	4 th edition, 2010
4	Elementary Linear Algebra	Howard Anton, Chris Rorres	Wiley	11 th edition, 2019

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/111/107/111107164/
2	https://archive.nptel.ac.in/courses/111/107/111107164/
3	https://archive.nptel.ac.in/courses/111/107/111107164/
4	https://archive.nptel.ac.in/courses/111/107/111107164/

SEMESTER S1 /S2
PHYSICS FOR INFORMATION SCIENCE
(Common to Group A)

Course Code	GAPHT121	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory + Lab

Course Objectives:

1. To equip students with a strong foundation in the fundamentals of Physics, impart this knowledge within the context of Information Science disciplines, cultivate scientific attitudes and critical thinking skills, and enable students to integrate Physics concepts with their core Information Science programs.
2. To make the students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Electrical conductivity</p> <p>Classical free electron theory, Electrical conductivity in metals, Fermi Dirac distribution, Variation of Fermi function with temperature, Fermi Energy, Energy bands, Classification of materials into conductor, semiconductor and insulator.</p> <p>Superconductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Super conductors. BCS Theory, Applications of superconductors.</p>	9
2	<p>Quantum Mechanics</p> <p>Introduction, Concept of uncertainty and conjugate observables</p>	9

	(qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling (Qualitative)	
3	<p>Semiconductor Physics</p> <p>Intrinsic semiconductor, Derivation of density of electrons in conduction band and density of holes in valence band, Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative)</p> <p>Formation of p-n junction, Fermi level in semiconductors-intrinsic and extrinsic, Energy band diagram of p-n junction - Qualitative description of charge flow across a p-n junction - Forward and reverse biased p-n junctions, Diode equation (Derivation), I-V Characteristics of p-n junction</p>	9
4	<p>Semiconductor Devices</p> <p>Semiconductor devices- Rectifiers- Full wave and Half wave. Zener diode- VI characteristics, Tunnel diode-VI characteristics, Semiconductor Laser (Construction and working), Applications</p> <p>Photonic devices (Qualitative treatment only) - Photo detectors (Junction and PIN photodiodes), Solar cells- IV Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode, Applications</p>	9

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination-3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p align="center">(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p align="center">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain electrical conductivity and Superconductivity.	K2
CO2	Explain the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics.	K2
CO3	Apply the fundamentals of Semiconductor Physics in engineering.	K3
CO4	Describe the behaviour of semiconductor materials in semiconductor devices.	K2
CO5	Apply basic knowledge of principles and theories in physics to conduct experiments.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Physics	H K Malik and A K Singh	McGraw Hill	2 nd Edition, 2017
2	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill Publications	6 th Edition, 2003
3	A Textbook of Engineering Physics	MN Avadhanulu, P G Kshirsagar, TVS Arun murthy	S. Chand	11 th Edition, 2018
Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Semiconductor Devices Fundamentals	Robert F Pierret	Pearson Education	1995
2	Advanced Semiconductor Fundamental	Robert F Pierret	Pearson Education	2 nd Edition, 2002
3	Solid State Electronic Devices	Ben G Streetman and Sanjay Kumar Banerjee	Pearson Education 6/e	2010
4	Solid State Physics	S.O. Pillai	New age international publishers	10 th Edition, 2022
5	Introduction to Solid State Physics	Charles Kittel	Wiley India Edition	2019
6	Advanced Engineering Physics	Premlet B	Phasor Books	10 th Edition, 2017
7	A Text Book of Engineering Physics	I. Dominic and. A. Nahari,	Owl Books Publishers	Revised Edition, 2016

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://nptel.ac.in/courses/115103108
2	https://nptel.ac.in/courses/115101107 https://nptel.ac.in/courses/115102023
3	https://nptel.ac.in/courses/108106181
4	https://nptel.ac.in/courses/108108112

Continuous Assessment (10 Marks)

i. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

ii. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

iii. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

iv. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task

2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

Experiment List

(Minimum 10 Experiments)

Experiment No.	Experiment
1	Diode characteristics
2	Zener diode- V-I characteristics
3	Tunnel diode –V-I characteristics
4	Half wave rectifier
5	Full wave rectifier
6	Hall effect in semiconductors
7	Determination of band gap energy of a semiconductor
8	Characteristics of LED
9	Solar Cell- V-I and Intensity Characteristics
10	Laser – Determination of wavelength using diffraction grating
11	Laser- To measure the wavelength using a millimeter scale as a grating

12	Compare the variation of current with potential difference, for a metal, filament bulb and semiconductor diode.
13	Determination of dielectric constant
14	CRO -Measurement of frequency and amplitude of wave forms
15	Photo diode - V-I Characteristics
16	Numerical aperture of optical fiber

SEMESTER S1/S2
CHEMISTRY FOR INFORMATION SCIENCE AND ELECTRICAL SCIENCE

(Common to Group A & B)

Course Code	GXCYT122	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory + Lab

Course Objectives:

1. To equip students with a comprehensive understanding of chemistry concepts that are relevant to engineering applications.
2. To familiarize students with applied topics such as spectroscopy, electrochemistry, and instrumental methods.
3. To raise awareness among students about environmental issues, including climate change, pollution, and waste management, and their impact on the quality of life.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Electrochemistry and Corrosion Science (9 Hours)</p> <p>Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (Numerical problems)- Reference electrodes – SHE & Calomel electrode –Construction and Working - Electrochemical series - Applications – Glass Electrode & pH Measurement-Conductivity-Measurement using Digital conductivity meter. Li-ion battery & H₂-O₂ fuel cell (acid electrolyte only) construction and working.</p> <p>Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium) - Galvanic series - Corrosion control methods - Cathodic Protection - Sacrificial anodic protection and impressed current cathodic protection – Electroplating of copper - Electroless plating of copper.</p>	9

2	<p>Materials for Electronic Applications (9 Hrs)</p> <p>Nanomaterials - Classification based on Dimension & Materials- Synthesis – Sol gel & Chemical Reduction - Applications of nanomaterials – Carbon Nanotubes, Fullerenes, Graphene & Carbon Quantum Dots – structure, properties & application.</p> <p>Polymers - Fire Retardant Polymers- Halogenated & Non-halogenated polymers (Examples only)- Conducting Polymers-Classification- Polyaniline & Polypyrrole-synthesis, properties and applications.</p> <p>Organic electronic materials and devices- construction, working and applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSC)</p> <p>Materials used in Quantum computing Technology, Super capacitors, Spintronics</p>	9
3	<p>Molecular Spectroscopy and Analytical Techniques (9 Hours)</p> <p>Spectroscopy-Types of spectra- Molecular energy levels - Beer Lambert's law – Numerical problems - Electronic Spectroscopy – Principle, Types of electronic transitions –Role of conjugation in absorption maxima- Instrumentation-Applications – Vibrational spectroscopy – Principle- Number of vibrational modes - Vibrational modes of CO₂ and H₂O – Applications</p> <p>Thermal Analysis: Dielectric Thermal Analysis (DETA) of Polymers- Working and Application.</p> <p>Electron Microscopic Techniques: SEM - Principle, instrumentation and Applications.</p>	9
4	<p>Environmental Chemistry (9Hrs)</p> <p>Water characteristics - Hardness - Types of hardness- Temporary and Permanent - Disadvantages of hard water -Degree of hardness (Numericals) Water softening methods-Ion exchange process- Principle, procedure and advantages. Reverse osmosis – principle, process and advantages. – Water disinfection methods – chlorination-Break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- Definition & Significance.</p> <p>Waste Management: Sewage water treatment- Primary, Secondary and</p>	9

	Tertiary - Flow diagram -Trickling filter and UASB process. E Waste, Methods of disposal – recycle, recovery and reuse. Chemistry of climate change- Greenhouse Gases- Ozone Depletion-Sustainable Development- an introduction to Sustainable Development Goals.	
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Self-Study Topics (NOT TO BE INCLUDED FOR END SEMESTER EXAMINATION):

Construction, working and applications of Lead acid battery, Nickel cadmium battery and Nickel metal hydrid battery.

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Continuous Assessment	Internal Examination-1 (Written)	Internal Examination-2 (Written)	Internal Examination-3 (Lab Examination)	Total
5	10	10	10	5	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one fullquestion out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the Basic Concepts of Electrochemistry and Corrosion to explore the possible applications in various engineering fields	K2
CO2	Describe the use of various engineering materials in different industries	K2
CO3	Apply appropriate analytical techniques for the synthesis and characterization of various engineering materials.	K3
CO4	Outline various water treatment and waste management methods	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering Chemistry	B. L. Tembe, Kamaluddin, M. S.Krishnan	NPTEL Web-book	2018
2	Physical Chemistry	P. W. Atkins	Oxford University Press	International Edition- 2018
3	Instrumental Methods of Analysis	H. Willard, L. L.Merritt	CBS Publishers	7th Edition-2005
4	Engineering Chemistry	Jain & Jain	Dhanpath Rai Publishing Company	17 th Edition - 2015

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fundamentals of Molecular Spectroscopy	C. N. Banwell	McGraw-Hill	4 th edn., 1995
2	Principles of Physical Chemistry	B. R. Puri, L. R. Sharma, M. S. Pathania	Vishal Publishing Co	47th Edition, 2017
3	Introduction to Spectroscopy	Donald L. Pavia	Cengage Learning India Pvt. Ltd	2015
4	Polymer Chemistry: An Introduction	Raymond B. Seymour, Charles E. Carraher	Marcel Dekker Inc	4th Revised Edition, 1996
5	The Chemistry of Nanomaterials: Synthesis, Properties and Applications	Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham	Wiley-VCH Verlag GmbH & Co. KGaA	2014
6	Organic Electronics Materials and Devices	Shuichiro Ogawa	Springer Tokyo	2024
7	Principles and Applications of Thermal Analysis	Gabbot, P	Oxford: Blackwell Publishing	2008

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/104/106/104106137/ https://archive.nptel.ac.in/courses/113/105/113105102/ https://archive.nptel.ac.in/courses/113/104/113104082/ https://www.youtube.com/watch?v=BeSxFLvk1h0
2	https://archive.nptel.ac.in/courses/113/104/113104102/ https://archive.nptel.ac.in/courses/104/105/104105124/ https://archive.nptel.ac.in/courses/105/104/105104157/

Continuous Assessment (10 Marks)

Continuous assessment evaluations are conducted based on laboratory associated with the theory.

Mark distribution

1. Preparation and Pre-Lab Work (2 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (2 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (3 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (3 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for Lab Examination (5 Marks)

1. Procedure/Preliminary Work/Conduct of Experiments (2 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

2. Result (2 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.

3. Viva Voce (1 Marks)

- Proficiency in answering questions related to theoretical and practical aspects of the subject.

List of Experiments***Any 10 Experiments Mandatory**

Expt. Nos.	Experiment
1	Estimation of iron in iron ore
2	Estimation of copper in brass
3	Determination of cell constant and conductance of solutions
4	Calibration of pH meter and determination of pH of a solution
5	Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin
6	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution
7	Determination of molar absorptivity of a compound (KMnO_4 or any water-soluble food colorant)
8	Analysis of IR spectra
9	Identification of drugs using TLC
10	Estimation of total hardness of water-EDTA method
11	Estimation of dissolved oxygen by Winkler's method
12	Determination of calorific value using Bomb calorimeter
13	Determination of saponification value of a given vegetable oil
14	Determination of acid value of a given vegetable oil
15	Verification of Nernst equation for electrochemical cell.

SEMESTER S2
FOUNDATIONS OF COMPUTING: FROM HARDWARE
ESSENTIALS TO WEB DESIGN
(Common to Group A & B)

Course Code	GXEST203	CIE Marks	40
Teaching Hours/Week(L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To introduce the students to the fundamental building blocks of an IT infrastructure including the computing systems, its peripherals, Operating Systems and Networking.
2. To make the learners capable of developing and deploying simple and dynamic websites.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Computer Hardware – CPU, Memory - Memory hierarchy: registers, cache, RAM, virtual memory, Motherboard - Computer Peripherals - I/O devices, Storage devices- HDDs, SSDs, optical drives, I/O communication and device management, Interface cards – Buses – Firmware - Boot process	9
2	Binary representation of data and numbers, Integer Representation, Data storage units - bits, bytes, kilobytes, etc., ASCII and Unicode, CPU Architecture and Instruction Set: Basic CPU architecture - ALU, registers, control unit, Instruction format and assembly language (basics only) Fetch-execute cycle and instruction execution.	9
3	Computer System Software - Operating Systems, Basic commands in Linux / Windows, Shell scripting (bash). Computer Communications – LAN, MAN, WAN, Client/Server networks, Peer-to-Peer networks, Topologies. Basics of IP addresses, DHCP, NAT, Network Security (Desktop & Perimeter), DNS, VPN, Routers, Client-Server, Internet, WWW, Web servers.	9

4	Web Design (Basics of HTML, CSS, and JavaScript) – Understanding the web content delivery, Understanding HTML and XHTML Connections, Understanding Cascading Style Sheets, Understanding JavaScript	9
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Course Assessment Method
(CIE: 40 marks, ESE:60)

Continuous Internal Evaluation Marks (CIE):

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one fullquestion out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Identify the fundamental components and the working of an IT environment.	K2
CO2	Explain the data representations, CPU architectures, and the basic functioning of a computer.	K2
CO3	Explain the operating systems, computer network architecture, and necessary protocols used.	K2
CO4	Develop simple interactive web pages and validate the inputs.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Invitation to Computer Science	G.Michael Schneider, Judith Gersting	Cengage	2/e , 2020
2	The Architecture of Computer Hardware, Systems Software, & Networking: An Information Technology Approach	Irv Englander	Wiley	5/e, 2014
3	HTML, CSS, and JavaScript All in One, Sams Teach Yourself	Julie C. Meloni Jennifer Kyrnin	Pearson	1/e, 2020

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The Elements of Computing Systems, second edition: Building a Modern Computer from First Principles	Noam Nisan and Shimon Schocken	The MIT Press	2/e, 2021
2	Peter Norton's Introduction to Computers	Peter Notron	McGrawHill	6/e, 2010
3	Web Design with HTML, CSS, JavaScript and JQuery	Jon Duckett	Wiley	1/e, 2014

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://www.nand2tetris.org/
2	https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

SEMESTER S2**PROGRAMMING IN C****(Common to Group A & B)**

Course Code	GXEST204	CIE Marks	40
Teaching Hours/Week(L: T:P: R)	3:0:2:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To prepare learner to write versatile C programs for solving computational problems that they come across in their professional life.
2. To equip the learner to write efficient C programs using suitable language constructs to solve real world computational problems.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	C Fundamentals - Character Set, Constants, Identifiers, Keywords, Basic Data types, Variables, Operators and its precedence, Bit-wise operators, Expressions; Statements - Input and Output statements; Structure of a C program; Simple programs. Control Statements - if, if-else, nested if, switch, while, do-while, for, break & continue, nested loops.	9
2	Arrays - Single dimensional arrays, Defining an array, Array initialization, Accessing array elements; Enumerated data type; Type Definition; Two-dimensional arrays – Defining a two-dimensional array; Programs for matrix processing; Programs for sequential search; Bubble sort; Strings - Declaring a string variable, Reading and displaying strings, String related library functions – Programs for string matching.	9

3	Functions - Function definition, Function call, Function prototype, Parameter passing; Recursion; Passing array to function; Macros - Defining and calling macros; Command line Arguments. Structures - Defining a Structure variable, Accessing members, Array of structures, Passing structure to function; Union. Storage Class - Storage Classes associated with variables: automatic, static, external and register.	9
4	Pointers - Declaration, Operations on pointers, Passing pointer to a function, Accessing array elements using pointers, Processing strings using pointers, Pointer to pointer, Array of pointers, Pointer to function, Pointer to structure, Dynamic Memory Allocation. Files - Different types of files in C, Opening & Closing a file, Writing to and Reading from a file, Processing files, Library functions related to file – fseek(), ftell(), fread(), fwrite().	9

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Infer a computational problem and develop C programs from them using basic constructs of C language including the control statements.	K2
CO2	Develop C programs using arrays, matrices, and strings.	K3
CO3	Utilize functions to find solution to the computational problems by dividing it into a number of modules and abstract data types.	K3
CO4	Develop C programs using pointers for dynamic data handling.	K3
CO5	Use files in C to permanently store and manipulate data.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Programming with C	Byron S Gottfried	Mc Graw Hill	4/e, 2018
2	Problem Solving and Program Design in C	Jeri R. Hanly, Elliot B. Koffman	Pearson	8/e, 2016

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The C Programming Language	Brian W. Kernighan and Dennis Ritchie	Pearson	2/e, 2015
2	C The Complete Reference	Herbert Schildt	Mc Graw Hill	4/e, 2017
3	Let us C	Yashavant Kanetkar	BPB Publishers	19/e, 2022
4	Programming in ANSI C	E Balagurusamy	Mc Graw Hill	9/e, 2024

SEMESTER S2
ENGINEERING ENTREPRENEURSHIP AND IPR

(Common to all Branches)

Course Code	UCEST206	CIE Marks	60
Teaching Hours/Week (L: T:P: R)	2:1:0:0	ESE Marks	40
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Develop a framework for identifying, curating and validating engineering-based business ideas.
2. Learn essential tools for understanding product-market fit and customer needs.
3. Create a comprehensive business plan for a new venture.
4. Gain foundational knowledge of Intellectual Property Rights (IPR) and their importance for startups.
5. Develop skills for prototyping, stakeholder engagement, and team collaboration.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	<p>Introduction to Ideation, Innovation & Entrepreneurship</p> <ul style="list-style-type: none"> • What is Ideation? • Understanding Innovation • Frameworks for Innovation • The Entrepreneurial Mindset • Starting a Business, types formation statutory compliances. • Resources for Aspiring Entrepreneurs <p>Introduction to Intellectual Property Rights (IPR)</p> <ul style="list-style-type: none"> • Types of IPR: Patents, trademarks, copyrights, trade secrets <p>Strategies for protecting intellectual property based on the type of innovation</p>	9

	<ul style="list-style-type: none"> ● Role of IPR in securing funding and competitive advantage <p>Importance of building a strong team</p> <ul style="list-style-type: none"> ● Identifying roles ● Skill sets ● Team dynamics <p>Identifying Pain Points and problem statement</p> <ul style="list-style-type: none"> ● Idea Generation Techniques ● Developing and Refining Ideas ● Develop strategies for bringing your innovation to life 	
2	<p>Problem and solution canvas preparation</p> <ul style="list-style-type: none"> ● Orientation and canvas introduction ● Customer needs assessment ● Market segmentation ● Value proposition ● Competitive analysis ● Market entry strategy ● Market validation ● Regulatory and legal considerations <p>Customer profiling</p> <ul style="list-style-type: none"> ● Review of market research ● Customer segmentation ● Customer profiling ● Persona development ● Validation and feedback ● Prioritization and selection ● Communication and messaging <p>Competitor analysis</p> <ul style="list-style-type: none"> ● Identify competitors ● Competitor profiling ● SWOT analysis ● Market positioning ● Customer feedback and reviews 	9

	<ul style="list-style-type: none"> ● Pricing analysis ● Differentiation strategy ● Benchmarking and improvement 	
3	<p>Business plan preparation</p> <ul style="list-style-type: none"> ● Business plan framework ● Market analysis ● Product/ service description ● Marketing and sales strategy ● Operations plan ● Financial projections ● Risk management <p>Prototype development plan preparation</p> <ul style="list-style-type: none"> ● Prototype requirements analysis ● Technical specifications ● Development approach ● Development timeline ● Resource allocation ● Testing and quality assurance ● Iterative development and feedback loop ● Documentation and version control 	9
4	<p>Prototype development</p> <p>Stakeholder engagement strategies</p> <ul style="list-style-type: none"> ● Investors ● Partners ● Customers ● Advisors & Mentors 	9

Course Assessment Method
(CIE: 60 marks, ESE: 40 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Micro Project	Internal Ex-1	Internal Ex-2	Total
5	35	10	10	60

Micro project / Comprehensive Business Plan:

The course will be evaluated based on a comprehensive Business Plan Report submitted and prototype development evaluation at the end of the course. The report should integrate learnings and activities from each module, demonstrating a deep understanding of the concepts and your ability to apply them to a chosen engineering venture.

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 1 or 2 Questions from each module. Total of 8 Questions, each carrying 3 marks (6x2 =12 marks) 	<ul style="list-style-type: none"> 2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 9 marks. <p>(4x7 = 28 marks)</p>	40

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Gain foundational knowledge of Innovation and Entrepreneurship, Intellectual Property Rights (IPR) and their importance for startups.	K2
CO2	Develop a framework for identifying, curating and validating engineering-based business ideas.	K3
CO3	Learn essential tools for understanding product-market fit and customer needs.	K3
CO4	Create a comprehensive business plan for a new venture.	K6
CO5	Develop skills for prototyping, stakeholder engagement, and team collaboration.	K4

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

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

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The Engineering Handbook	Richard C.Dorf	CRC Press	
2	The Innovator's DNA	Clayton M. Christensen and Jeffrey H. Dyer	Harvard Business Review Press;	Revised edition (June 4, 2019)
3	Start with Why	SIMON SINEK	Portfolio	Reprint edition (December 27, 2011)
4	Business Model Generation	Alexander Osterwalder & Yves Pigneur	Wiley	2010
5	The Engineering Entrepreneur: A Practical Guide to Starting and Running a Successful Engineering Business in India	Saibal Gupta and Ashok Jhunjunwala	Sage Publications	2011
6	Innovation and Entrepreneurship for Engineers	Bharat Bhushan and Seema Bhushan	CRS Press	2016
7	Indian Patent Law	P. Narayanan	Eastern Book Company	2 nd edn/ 2020
8	The Law of Copyright and Designs	B.L. Wadehra	Universal Law	5 th edn/2010
9	Intellectual Property Rights (Including IPR in the Digital Age)	Prabuddha Ganguli	Tata McGraw-Hill Education	2001
10	The Startup India Manifesto: A Guide to the Indian Startup Ecosystem	Rashmi Bansal and Deepinder Goyal	Westland Publications	2020

SEMESTER S1/S2 HEALTH AND WELLNESS

(Common to all Groups)

Course Code	UCPWT127	CIE Marks	50
Teaching Hours/Week(L: T:P: R)	1:0:1:0	ESE Marks	0
Credits	1	Exam Hours	Nil
Prerequisites (if any)	None	Course Type	Theory and Practical

Course Objectives:

1. To provide essential knowledge on physical activity, health, and wellness.
2. To ensure students understand body systems, exercise principles, nutrition, mental health, and disease management.
3. To educate students on the benefits of yoga, the risks of substance abuse and basic first aid skills.
4. To equip students with the ability to lead healthier lifestyles.
5. To enable students to design effective and personalized exercise programs.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Human Body Systems related to Physical activity and its functions: Respiratory System - Cardiovascular System . Musculoskeletal System and the Major Muscle groups of the HumanBody. Quantifying Physical Activity Energy Expenditure and Metabolicequivalent of task (MET) Exercise Continuum: Light-intensity physical activity, Moderate -intensity physical activity, Vigorous -intensity physical activity. Defining Physical Activity, Aerobic Physical Activity, Anaerobic	4

	<p>Physical Activity, Exercise and Health-Related Physical Fitness.</p> <p>FITT principle to design an Exercise programme</p> <p>Components of Health-related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.</p>	
2	<p>Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health.</p> <p>Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports</p> <p>Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet Carbohydrate & the Glycemic Index</p> <p>Animal & Plant - based Proteins and their Effects on Human Health</p> <p>Dietary Fats & their Effects on Human Health</p> <p>Essential Vitamins and Minerals</p>	2
3	<p>Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - Cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis , flat foot, Knock knee)</p> <p>Meaning, Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga</p> <p>Understanding on substance abuse and addiction - Psychoactive substances & its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.</p>	4

4	First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider First aid measures for: - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain & Strain)	2
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Additional Topics

- Need and Importance of Physical Education and its relevance in interdisciplinary context. Understanding of the Endocrine System
- Developing a fitness profile
- Healthy foods habits for prevention and progression of Lifestyle Diseases. Processed foods and unhealthy eating habits.
- Depression - Anxiety - Stress
- Different ways of carrying an injured person. Usage of Automated external defibrillator

Course Assessment Method(CIE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Case Study/Micro project/Presentation	Activity evaluation	Total
10	20	20	50

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the different human body systems and describe various types of physical activities along with methods to measure and quantify these activities.	K2
CO2	Explain how to maintain or improve health and wellness through psychological practices, dietary habits, and sports activities.	K2
CO3	Discuss about common hypokinetic disorders and musculoskeletal disorders, and describe the importance of leading a healthy lifestyle through the practice of yoga and abstaining from addictive substances.	K2
CO4	Explain the basics of first aid and describe common sports injuries	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				2		3		3	3	2		2
CO2				2		3		2	2			2
CO3				0		3		3				2
CO4				2		3						2

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Foundations of Nutrition	Bhavana Sabarwal	Common wealth Publishers	1999
2	Anatomy and physiology in health and illness.	Ross and Wilson	Waugh, A., & Grant, A.	2022

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Fit to be Well Essential Concept	Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S.	Jones & Bartlett Learning.	2018
2	Introduction to physical education, fitness, and sport.	Siedentop, D., & Van der Mars, H.	Human kinetics.	2022
3	Substance Use Disorders. Manual for Physicians.	Lal, R., & Ambekar, A	National Drug Dependence Treatment Centre, New Delhi	2005
4	The exercise health connection-how to reduce your risk of disease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health	1998
5	ACSM's resource manual for guidelines for exercise testing and prescription.	Lippincott Williams & Wilkins.	American College of Sports Medicine.	2012
6	Exercise Physiology: energy, nutrition and human performance.	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams & Wilkins	2010

Continuous Internal Evaluation Marks (CIE): for the Health and wellness course

Students will be evaluated as follows.

Title	Method of Evaluation
Attendance	Students must attend at least 75% of both theory and practical classes. They will receive 10 marks based on their class attendance. Students who do not meet the minimum attendance requirement for a course, as specified in the B. Tech regulations, will not be eligible to proceed to the next criteria.
Assignment / Presentation	Assignments will be given to students to assess their understanding of the subjects taught. Students will be required to make presentations on the subjects taught in class, and their understanding of the subjects will be assessed. Based on the Assignments and Presentations the students will be awarded marks out of 20

Activity Evaluation	<p>The Assignment / Presentation faculty handling the class will use the tests from the Fitness Protocols and Guidelines for ages 18+ to 65 years, as set forth by FIT India. Measurements will be taken for all the tests of the FIT India Fitness Protocol and the evaluation will be based on the benchmark score received for the following tests:</p> <ol style="list-style-type: none"> 1. V Sit Reach Test 2. Partial Curl Up - 30 seconds 3. Push Ups (Male) and Modified Push Up (Female) 4. Two (2) Km Run/Walk <p>Students who achieve a total benchmark score of 8 across the aforementioned 4 tests will be awarded pass marks for activity evaluation. Students who score better will be awarded a maximum mark of 20.</p>
Activity Evaluation - Special Circumstances	<p>Physically challenged and medically unfit students can opt for an objective test to demonstrate their knowledge of the subjects taught. Based on their performance in the objective test, they will be awarded marks out of 20.</p>
Activity Evaluation - Special Considerations NCC	<p>Students who enrolled themselves in the NCC during the course period (between the start and end dates of the program) and attended 5 college level parades will be awarded pass marks for activity evaluation. Students who attend more parades will be eligible for a maximum mark of 20 based on their parade attendance.</p>

Tests to evaluated as per Criterion - 2 and Benchmark Scores

V Sit Reach Test

How to Perform:

1. The subject removes their shoes and sits on the floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 8-12" apart.
2. The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.

3. With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping the fingers on baseline and feet flexed.
4. After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
5. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

Infrastructure/Equipment Required:

1. A tape for marking the ground, marker pen, and ruler.
2. With the tape mark a straight line two feet long on the floor as the baseline, and a measurement line perpendicular to the midpoint of the baseline extending two feet on each side.
3. Use the marker pen to indicate every centimeter and millimeter along the measurement line. The point where the baseline and the measuring line intersect is the zero point.

Scoring: The score is recorded in centimeters and millimeters as the distance reached by the hand, which is the difference between the zero point (where the baseline and measuring line intersect) and the final position.

Scoring for V Sit Reach Test for Males

Level	Benchmark Score	Measurement (cm)
1	2	<11
2	4	12-13
3	6	14-17
4	7	18-19
5	8	20-21
6	9	22
7	10	>22

Scoring for V Sit Reach Test for Females

Level	Benchmark Score	Measurement (cm)
1	2	<14
2	4	15-16
3	6	17-19
4	7	20-21
5	8	22
6	9	23
7	10	>23

Partial Curl Up - 30 seconds**How to Perform:**

1. The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.
2. The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least 6 inches above/along the ground towards the parallel strip).
3. The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

Infrastructure/Equipment Required:

Flat clean cushioned surface with two parallel strips (6 inches apart), Stopwatch

Scoring: Record the maximum number of Curl ups in a certain time period 30 seconds.

Scoring for Partial Curl Up - 30 seconds Test for Males

Level	Benchmark Score	Numbers
1	2	<25
2	4	25-30
3	6	31-34
4	7	35-38
5	8	39-43
6	9	44-49
7	10	>49

Scoring for Partial Curl Up - 30 seconds Test for Females

Level	Benchmark Score	Numbers
1	2	<18
2	4	18-24
3	6	25-28
4	7	29-32
5	8	33-36
6	9	37-43
7	10	>43

Push Ups for Male/Modified Push Ups for Female

How to Perform:

1. A standard push up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
2. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended.
3. This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.
4. For Female: push-up technique is with the knees resting on the ground.

Infrastructure/Equipment Required:

Flat clean cushioned surface/Gym mat

Scoring: Record number of correctly completed pushups.

Scoring for Push Ups for Male

Level	Benchmark Score	Numbers
1	2	<4
2	4	04- 10
3	6	11 -18
4	7	19-34
5	8	35-46
6	9	47-56
7	10	>56

Scoring for Modified Push Ups for Female

Level	Benchmark Score	Numbers
1	2	0-1
2	4	2 - 5
3	6	6 -10
4	7	11 - 20
5	8	21-27
6	9	27-35
7	10	>35

2 Km Run/Walk

How to Perform:

1. Participants are instructed to run or walk 2 kms in the fastest possible pace.
2. The participants begin on signal (Starting point)- “ready, start”. As they cross the finish line, elapsed time should be announced to the participants.
3. Walking is permitted but the objective is to cover the distance in the shortest possible time.

Infrastructure/Equipment Required:

Stopwatch, whistle, marker cone, lime powder, measuring tape, 200 or 400 m with 1.22 m (minimum 1 m) width preferably on a flat and even playground with a marking of starting and finish line. You can also use any application on your mobile phone that tells you the distance.

Scoring: Time taken for completion (Run or Walk) in min, sec.

Scoring for 2Km Run/walk for Male

Level	Benchmark Score	Minutes: Seconds
1	2	> 11:50
2	4	10:42
3	6	09:44
4	7	08:59
5	8	08:33
6	9	07:37
7	10	>07:37

Scoring for 2Km Run/walk for Female

Level	Benchmark Score	Minutes: Seconds
1	2	>13:47
2	4	12:51
3	6	12:00
4	7	11:34
5	8	10:42
6	9	09:45
7	10	>09:45

SEMESTER - S1/S2
LIFE SKILLS AND PROFESSIONAL COMMUNICATION

(Common to all Branches)

Course Code	UCHUT128	CIE Marks	100
Teaching Hours/Week (L: T:P: R)	2:0:1:0	ESE Marks	0
Credits	1	Exam Hours	-
Prerequisites (if any)	None	Course Type	Activity-based learning

Course objectives:

1. To foster self-awareness and personal growth, enhance communication and interpersonal connection skills, promote effective participation in groups and teams, develop critical thinking, problem-solving, and decision-making skills, and cultivate the ability to exercise emotional intelligence.
2. To equip students with the necessary skills to listen, read, write & speak, to comprehend and successfully convey any idea, technical or otherwise
3. To equip students to build their profile in line with the professional requirements and standards.

Continuous Internal Evaluation Marks (CIE):

- Continuous internal evaluation is based on the individual and group activities as detailed in the activity table given below.
- The students should be grouped into groups of size 4 to 6 at the beginning of the semester. They should use online collaboration tools for group activities, report/presentation making and work management.
- Activities are to be distributed between 3 class hours (2L+1P) and 3.5 Self-study hours.
- Marks given against each activity should be awarded fully if the students successfully complete the activity.
- Students should maintain a portfolio file with all the reports and other textual materials generated from the activities. Students should also keep a journal related to the activities undertaken.

- Portfolio and journal are mandatory requirements for passing the course, in addition to the minimum marks required.
- The portfolio and journal should be carried forward and displayed during the 7th Semester Seminar course as a part of the experience sharing regarding the skills developed through the HMC courses and Mini project course.
- Self-reflection questionnaire shall be given at the beginning of the semester, in between and at the end of the semester based on the guidelines in the manual of the course.

Sl. No.	Activity	Class room (L) / Self Study (SS)	Week of completion	Group / Individual (G/I)	Marks	Skills	CO
1.1	Group formation and self-introduction among the group members	L	1	G	-	<ul style="list-style-type: none">• Connecting with group members• Time management - Gantt Chart	
1.2	Familiarizing the activities and preparation of the time plan for the activities	L	1	G	-		
1.3	Preparation of Gantt chart based on the time plan	SS	1	G	2		
2.1	Take an online personality development test, self reflect and report	SS	1	I	2	<ul style="list-style-type: none">• Self-awareness Writing	CO1
2.2	Role-storming exercise 1: Students assume 2 different roles given below and write about their <ul style="list-style-type: none">• Strengths,• Areas for improvement,• Concerns,• Areas in which he/she hesitates to take advice,• Goals/Expectations, from the point of view of the following assumed roles <ul style="list-style-type: none">i) their parent/guardian/mentorii) their friend/sibling/cousin	L	1	I	2	<ul style="list-style-type: none">• Goal setting - Identification of skills and setting goal• Self-awareness• Discussion in groups• Group work- Compiling of ideas• Mind mapping	CO1
2.3	Role-storming exercise 2: Students assume the role of their teacher and write about the <ul style="list-style-type: none">• Skills required as a B.Tech graduate• Attitudes, habits, approaches required	SS	1	I	2		CO1

	and activities to be practised during their B.Tech years, in order to achieve the set goals						
2.4	Discuss the skills identified through role storming exercise by each one within their own group and improvise the list of skills	L	1	G	2		CO1
2.5	Prepare a mind map based on the role-storming exercise and exhibit/present it in class	SS	2	G	2		CO1
3	Prepare a presentation on instances of empathy they have observed in their own life or in other's life	L	2 to 4	I	2	● Empathy	CO2
4.1	Each student connects and networks with a minimum of 3 professionals from industry/public sector organizations/other agencies/NGOs /academia (atleast 1 through LinkedIn)	SS	3	I	2	● Workplace awareness ● Listening ● Communication - interacting with people	
4.2	Interact with them to understand their workplace details including ● workplace skills required ● their work experience ● activities they have done to enhance their employability during their B.Tech years ● suggestions on the different activities to be done during B.Tech years Prepare a documentation of this	SS	3	I	4	● Networking through various media including LinkedIn ● Discussion in groups ● Report preparation ● Creativity Goal setting - Preparation of action plan	CO2
4.3	Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals Prepare the Minutes of the discussions	SS	3	G	2		CO2
4.4	Report preparation based on the discussions	SS	4	G	3		CO4
4.5	Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions	L	5	G	4		CO3
4.6	Identify their own goal and prepare an action plan for their undergraduate	SS	5	I	2		CO1

	journey to achieve the goal						
5.1	Select a real-life problem that requires a technical solution and list the study materials needed	L	6	G	2		CO3
5.2	Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource)	SS	6	I	2		CO4
5.3	Use any online tech forum to gather ideas for solving the problem chosen	SS	6	G	2		CO5
5.4	Arrive at a possible solution using six thinking hat exercise	L	7	G	3		CO3
5.5	Prepare a report based on the problem-solving experience	SS	7	G	2		CO4
6.1	Linkedin profile creation	SS	1	I	2	Profile-building	CO6
6.2	Resume preparation	SS	8	I	2		CO6
6.3	Self introduction video	SS	8	I	3		CO6
7	Prepare a presentation on instances of demonstration of emotional intelligence	SS	9	I	2	Emotional intelligence	CO2
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	SS	10	G	3	Diversity	CO2, CO5
9	Take online Interview skills development sessions like robotic interviews; self-reflect and report	SS	10	I	2	• Interview skills	CO6
10	Take an online listening test, self reflect and report	SS	11	I	2	Listening skills	CO6
11.1	Activities to improve English vocabulary of students	L	8	I/G	4	<ul style="list-style-type: none"> English vocabulary English language skills Writing Presentation Group work Self-reflection 	CO4
11.2	Activities to help students identify errors in English language usage	L	9	I/G	2		CO4
11.3	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	L	10	I/G	2		CO4
11.4	Write a self-reflection report on the improvement in English language communication through this course	SS	12	I	2		CO4
11.5	Presentation by groups on the						CO4, CO5

	experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared	L	11 to 12	G	2		
12.1	Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies	SS	12	G	4	<ul style="list-style-type: none"> • Audio-visual presentations creations with the use of technology tools • Effective use of social media platforms • Profile building 	CO2, CO4, CO5
12.2	Upload the video content to podcasting platforms or YouTube	SS	12	G	1		CO5
12.3	Add the link of the podcast in their LinkedIn profile	SS	12	G	1		CO5

Table 2. Lab hour Activities (P): 24 Marks

Sl No	Activity	Marks	Skill	CO
1	<p>Hands-on sessions on day-to-day engineering skills and a self-reflection report on the experience gained:</p> <ol style="list-style-type: none"> 1. Drilling practice using electric hand drilling machines. 2. Cutting of MS rod and flat using electric hand cutters. 3. Filing, finishing and smoothening using electrically operated hand grinders. 4. MS rod cutting using Hack saw by holding the work in bench wise. 5. Study and handling different types of measuring instruments. 6. Welding of MS, SS work pieces. 7. Pipe bending practice (PVC and GI). 8. Water tap fitting. 9. Water taps rubber seal changing practice. 10. Union and valves connection practice in pipes. 11. Foot valve fitting practice. 12. Water pump seal and bearing changing practice. 	24	Basic practical engineering skills	3
2	Language Lab sessions	-	Language Skills	4

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Develop the ability to know & understand oneself, show confidence in one's potential & capabilities, set goals and develop plans to accomplish tasks	K5
CO2	Develop the ability to communicate and connect with others, participate in groups/teams, empathise, respect diversity, be responsible and understand the need to exercise emotional intelligence	K5
CO3	Develop thinking skills, problem-solving and decision-making skills	K5
CO4	Develop listening, reading, writing & speaking skills, ability to comprehend & successfully convey any idea, and ability to analyze, interpret & effectively summarize textual, audio & visual content	K6
CO5	Develop the ability to create effective presentations through audio-visual mediums with the use of technology tools and initiate effective use of social media platforms & tech forums for content delivery and discussions	K6
CO6	Initiate profile-building exercises in line with the professional requirements, and start networking with professionals/academicians	K6

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										1		3
CO2					1			3		3		3
CO3		1	1		1					1		1
CO4					1					1		2
CO5					1	1				1		2
CO6					1					1		

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Life Skills & Personality Development	Maithry Shinde et.al.	Cambridge University Press	First Edition, 2022
2	Emotional Intelligence: Why it can matter more than IQ	Daniel Goleman	Bloomsbury, Publishing PLC	25th Anniversary Edition December 2020
3	Think Faster, Talk Smarter: How to speak successfully when you are put on the spot	Matt Abrahams	Macmillan Business	September 2023
4	Deep Work: Rules for focused success in a distracted world	Cal Newport	PIATKUS	January 2016
5	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2nd Edition 2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Life Skills for Engineers	Remesh S., Vishnu R.G.	Ridhima Publications	First Edition, 2016
2	Soft Skills & Employability Skills	Sabina Pillai and Agna Fernandez	Cambridge University Press	First Edition, 2018
3	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education	2nd Edition 2017
4	English Grammar in Use	Raymond Murphy,	Cambridge University Press India PVT LTD	5th Edition 2023
5	Guide to writing as an Engineer	David F. Beer and David McMurrey	John Willey. New York	2004

SEMESTER S2

IT WORKSHOP

(Common to Group A&B)

Course Code	GXESL208	CIE Marks	50
Teaching Hours/Week(L: T:P: R)	0:0:2:0	ESE Marks	50
Credits	1	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

1. To provide a basic understanding about computer hardware, software, and computer network.
2. To familiarize the learner with the web development process using HTML, CSS, and Javascript.

Details of Experiments

Expt. No	Experiment (Minimum 10 Experiments)
1	Practice Computer Hardware – Familiarization CPU Box, Motherboard, CPU & Chip-set, Interface cards, Card slots, Hard disk, Cables, SMPS, NIC, Various ports, etc. Computer Peripherals - I/O Devices. Storage devices, Interface cards – Buses – Firmware
2	Familiarization of Boot process
3	Familiarizing installation of Linux and Windows operating systems
4	Familiarizing basic Unix/Linux commands - ls, mkdir, cp, mv, grep, rmdir, chmod, useradd, passwd, history, dmesg, cpuinfo, uname, du, time, write, fdisk
5	Familiarizing networking hardware - RJ45, UTP, fibre, switch, NIC, router, Wireless Access Point (WAP), modem
6	Familiarizing basic networking commands - ifconfig, ping, traceroute, nslookup, ssh, scp, telnet, ftp
7	View network traffic using Wireshark/Packet tracer

8	Familiarizing the steps how to configure and establishing a network connecting
9	Shell programming in Linux(bash)
10	Create a web page and deploy on a local web server.
11	Use Javascript to validate forms.
12	Create an image slider using HTML, CSS, and JavaScript. Allow users to navigate between images using previous and next buttons.
13	Familiarisation of LaTeX - Basic only
14	Familiarisation of Development Environments - Visual studio code, Sublime Text, Atom
15	Introducing Repositories - Git / Bitbucket

Course Assessment Method
(CIE: 50 Marks, ESE: 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record. (Continuous Assessment)	Internal Exam	Total
5	25	20	50

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Mandatory requirements for ESE:

- Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.

Course Outcomes (COs)

At the end of the course the student will be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Experiment with the fundamental hardware components of a computer and how to interface them with software systems.	K3
CO2	Make use of the command line of Linux operating system and shell programming.	K3
CO3	Experiment with the data network communication scenarios using Wireshark.	K3
CO4	Develop basic websites using HTML, CSS & JavaScript and manage the versions.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table

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

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), : No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Invitation to Computer Science	G. Michael Schneider, Judith Gersting	Cengage	2/e, 2020
2	LINUX for Developers: Jumpstart Your Linux Programming Skills	William Rothwell	Pearson	1/e, 2018
3	HTML, CSS, and JavaScript -All in One, Sams Teach Yourself	Julie C. Meloni Jennifer Kyrnin	Pearson	1/e, 2018

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	The Architecture of Computer Hardware, Systems Software, & Networking: An Information Technology Approach	Irv Englander	Wiley	5/e, 2014
2	Mastering Git : Attain expert level proficiency with Git for enhanced productivity and efficient collaboration	Jakub Narębski	Packt	1/e, 2016
3	Web Design with HTML, CSS, JavaScript, and JQuery.	Jon Duckett	Wiley	1/e, 2014

Video Links (NPTEL, SWAYAM...)	
Sl. No.	Link ID
1	https://overthewire.org/wargames/bandit/
2	https://www.w3schools.com/

Continuous Assessment (25 Marks)

1. Preparation and Pre-Lab Work (7 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (7 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (6 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (5 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

PROGRAMME CORE 1

SEMESTER S2
DISCRETE MATHEMATICS
(Common to all Computer Science and its allied branches)

Course Code	PCCST205	CIE Marks	40
Teaching Hours/Week(L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To equip students with the ability to analyze and solve problems using discrete mathematical techniques.
2. To give a deeper understanding of mathematical logic, set theory, and proof techniques such as direct proofs, proof by contradiction, and mathematical induction.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Sets, Functions, and Relations Sets and Subsets, Venn Diagrams, Set Operations, Set Identities, Generalized Unions and Intersections, The Principle of Inclusion-Exclusion (Basic and Generalized versions), and applications. Function definition, Injections, Surjections and Bijections, Inverse Functions, and Compositions of Functions, Cardinality of Sets, Cantor diagonalization argument Relations and Their Properties, Composition of relations, n-ary Relations, Representing Relations Using Matrices, Equivalence Relations, Equivalence Classes, Partial Orderings, Hasse Diagrams, Maximal and Minimal Elements, Lattices	11

2	Mathematical logic and proofs Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs, Methods of Proving Theorems - Direct proof, Indirect proof (Proof by Contraposition), Proof by Contradiction, Proof by counter examples, The Pigeonhole Principle.	11
3	Induction and Recurrences Mathematical Induction, Weak and Strong induction Recursive (Inductive) definitions and recurrence relations, Modeling with Recurrence Relations, Solving Linear Recurrence Relations (homogeneous and nonhomogeneous), Generating Functions, Using Generating Functions to Solve Recurrence Relations.	11
4	Group theory Groups - Definition, Examples, and Elementary Properties, Abelian group, Permutation group, Subgroup, Homomorphisms, Isomorphisms, and Cyclic Groups, Cosets and Lagrange's Theorem	11

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one fullquestion out of two questions.

Part A	Part B	Total
<ul style="list-style-type: none"> Questions from each module. Total of 8 Questions, each carrying 3 marks <p>(8x3 =24marks)</p>	<ul style="list-style-type: none"> Each question carries 9 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p>(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic	K3
CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion.	K3
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science.	K2
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science	K3
CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients	K3
CO6	Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups.	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3								2
CO2	3	3	3	3								2
CO3	3	3	3	3								2
CO4	3	3	3	3								2
CO5	3	3	3	3								2
CO6	3	3	3	3								2

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Discrete Mathematics and its Applications	Kenneth H. Rosen, Kamala Krithivasan	McGraw Hill	8/e, 2021

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Schaum's Outline of Discrete Mathematics	Marc Lipson, Seymour Lipschutz	McGraw-Hill	3/e, 2021
2	Discrete Mathematics	Kenneth A. Ross, Charles R.B. Wright	Pearson	5/e, 2012

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://nptelvideos.com/lecture.php?id=6033
2	https://nptelvideos.com/lecture.php?id=6024
3	https://nptelvideos.com/lecture.php?id=6051
4	https://nptelvideos.com/lecture.php?id=6058

SEMESTER S2
DISCRETE MATHEMATICAL STRUCTURES
(INFORMATION TECHNOLOGY)

Course Code	PCITT205	CIE Marks	40
Teaching Hours/Week(L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	A sound background in higher secondary school Mathematics	Course Type	Theory

Course Objectives:

1. Students will be able to understand and apply mathematical notations and concepts essential for computing.
2. Students can develop and utilize mathematical reasoning and proof strategies to enhance their analytical thinking and creative problem-solving skills.

SYLLABUS

Module No.	Syllabus Description	Contact Hours (44 Hrs)
1	<p>Introduction to Logic: Propositional Logic, Truth tables, Conditional propositions and Logical Equivalence, The laws of Logic, The Principle of Duality, Resolution proofs.</p> <p>Predicates and Quantifiers: Universal quantifier and Existential quantifier, Negation of Quantifiers, The Rule of Universal Specification, The Rule of Universal Generalizations. The implications of Quantifiers.</p>	11
2	<p>Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations, The Binomial Theorem (without proof), Combinations with Repetition, Pigeon Hole Principle, Principle of Inclusion and Exclusion (without proof), Derangements.</p>	11

3	Relations, Functions and Algebraic Structures: Sets, Relations, Functions, Equivalence Relations, Posets and Lattices, HasseDiagrams, Complimented and Distributive lattices, Structured sets for binary operations, Semigroups, Monoids, Groups, Rings, Fields.	12
4	Generating Function: Definitions and Examples, Calculation Techniques, Exponential Generating Function. Recurrence Relations: First-order linear recurrence relations with constant coefficients – homogeneous, non-homogeneous Solution. Second-order linear recurrence relations with constant coefficients, homogeneous, non-homogeneous Solution.	10

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE):

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions		
Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply logical reasoning and formal methods to construct and verify logical arguments and proofs involving propositions, truth tables, logical equivalence, and quantifiers.	K3
CO2	Apply fundamental counting principles, including permutations, combinations, and the pigeonhole principle, to solve problems related to combinatorial analysis and discrete structures.	K3
CO3	Describe the concepts of sets, relations, and functions, and recognize the properties and structures of algebraic systems such as lattices, semigroups, monoids, groups, rings, and fields.	K2
CO4	Explain the concepts of sets, relations, functions, algebraic structures such as groups and fields, and the methods for solving first and second-order linear recurrence relations using generating functions and other techniques.	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

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

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Discrete and Combinatorial Mathematics: An Applied Introduction	Ralph P. Grimaldi, B. V. Ramana	Pearson	5 th Edition, 2007.
2	Discrete Mathematics with Graph Theory and Combinatorics.	T Veerarajan	Tata McGraw Hill	1 st Edition, 2007

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Discrete Mathematics and its Applications	K. H. Rosen	McGraw Hill	7 th Edition, 2012
2	Discrete Mathematical Structures	D. S. Chandrasekharaiah	PRISM Books	4 th Edition, 2012
3	Discrete Mathematical Structures with Application to Computer Science	J. P. Tremblay and R. Manohar	Tata McGraw Hill	2 nd Edition, 2002
4	Discrete Mathematics for Computer Scientists & Mathematicians	Joe L. Mott, Abraham Kandel and Theodore P. Baker	Pearson Education	2nd Edition, 2015

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://nptel.ac.in/courses/106106094
2	https://nptel.ac.in/courses/106103205
3	https://nptel.ac.in/courses/106106094
4	https://nptel.ac.in/courses/106103205