Curriculum & Syllabus
Under Autonomy

B.Tech Computer Science Engineering (Cyber Security)

(Effective from 2023-24 admission batch)

Department: CSE *Curriculum Structure & Syllabus (Effective from2023-24 admission batch)*

		1stYear1stSemester							
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	SCI	Multidisciplinary	YCS 1001	Basic Electronics	3	0	0	3	3
2	SCI	Minor	YMT1001	Engineering Mathematics–I	3	1	0	4	4
3	ENGG	Major	YCS 1002	Programming for Problem Solving	3	1	0	4	4
4	HUM	Ability Enhancement Course	YED1001	Professional Communication	2	0	0	2	2
5	HUM	Common value added course	YBT1003	Environmental Science	1	1	0	2	1
B.PRACTICAL									
6	HUM	Skill Enhancement	YCS1101	Basic Electronics Laboratory	0	0	3	3	1.5
7	ENGG	Skill Enhancement	YCS1103	Workshop & Manufacturing Practices Laboratory	0	0	3	3	1.5
8	ENGG	Major	YCS 1102	Programming for Problem Solving Laboratory	0	0	3	3	1.5
9	HUM	Ability Enhancement Course	YED1101	Professional Communication Laboratory	0	0	2	3	1.5
C.MANDATORYACTIVITIES/COURSES(Non-CGPA)									
11	MC	Mandatory Course	YCS1502	Seminar/Group Discussion	0	0	0	0	1
12.	MC	Mandatory Course	YCS1501	Universal Human Value	0	0	0	0	1
13.	MC	Mandatory Course	YCS1503	SkillX	0	0	0	0	1
Total of Theory, Practical and Mandatory Activities /Courses								26	20

***HUM: Humanities ;ENGG: Engineering;SCI:Science;PRJ:Project;MC:*MandatoryActivities/Courses**

1st Year 2nd Semester									
Sl. No.	**BroadCategory**	**Category**	**Course Code**	**CourseTitle**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	ENGG	Major	YCS 2001	Data Structures	3	1	0	4	4
2	SCI	Multidisciplinary	YPH 2001	Engineering Physics	3	0	0	3	3
3	SCI	Multidisciplinary	YMT2001	Engineering Mathematics –II	3	0	0	3	3
4	ENGG	Minor	YCS2002	Basic Electrical Engineering	3	0	0	3	3
5	HUM	Common value added course	YED2001	Indian Knowledge System	1	1	0	2	1
B.PRACTICAL									
7	ENGG	Major	YCS2101	Data Structures Laboratory	0	0	3	3	1.5
8	SCI	Skill Enhancement	YPH2101	Engineering Physics Laboratory	0	0	3	3	1.5
9	ENGG	Minor	YCS2102	Basic Electrical Engineering Laboratory	0	0	3	3	1.5
10	ENGG	Skill Enhancement	YCS2301	Engineering Graphics &Design Laboratory	0	0	3	3	1.5
10	SCI	Ability Enhancement	YCS2503/ JSC2503	Life Skills / Communicative English Proficiency	0	0	1	1	1
C.MANDATORYACTIVITIES/COURSES(Non-CGPA)									
11	HUM	Ability Enhancement Course	YCS2502	Group Discussion	1	0	0	1	1
12	MC	Mandatory Course	YCS2501	NSS/Physical Activities /Meditation &Yoga/Photography	0	0	3	2	1
13	MC	Mandatory Course	YCS2504	SkillX	0	0	0	0	1
TotalofTheory,PracticalandMandatoryActivities/Courses								31	21

2nd Year 3rd Semester									
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	SCI	Minor	YMT 3001	Probability and Statistics	3	0	0	3	3
2	ENGG	Minor	YCS 3001	Digital Logic and Electronics	3	0	0	3	3
3	ENGG	Major	YCS 3002	Computer Organization and Architecture	3	0	0	3	3
4	ENGG	Major	YCS 3003	Design and Analysis of Algorithms	3	0	0	3	3
B.PRACTICAL									
5	ENGG	Minor	YCS 3101	Digital Logic and Electronics Laboratory	0	0	3	3	1.5
6	ENGG	Skill Enhancement Course	YCS 3104	IT Workshop Laboratory (SciLab/MATLAB/C++)	0	1	3	3	3
7	ENGG	Major	YCS 3102	Computer Organization and Architecture Laboratory	0	0	3	3	1.5
8	ENGG	Major	YCS 3103	Design and Analysis of Algorithms Laboratory	0	0	3	3	1.5
C.MANDATORYACTIVITIES/COURSES(Non-CGPA)									
9	HUM	Ability Enhancement Course	YCS3501	Technical Seminar Presentation	1	0	0	1	1
10	MC	Mandatory Course	YBB3501	Disaster management	0	0	3	3	1
11	MC	Mandatory Course	YCS3502	SkillX	0	0	0	0	1
Total of Theory, Practical and Mandatory Activities / Courses								28	19.5

2ndYear4th Semester									
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	ENGG	Minor	YCS4005	Discrete Mathematics	3	0	0	3	3
2	ENGG	Major	YCS 4001	Operating Systems	3	0	0	3	3
3	ENGG	Major	YCS 4002	Formal Language and Automata Theory	3	0	0	3	3
4	ENGG	Minor	YCS 4003	Object Oriented Programming using Java	3	0	0	3	3
5	HUM	Ability Enhancement Course	YBB4001	Principles of Management	2	0	0	2	2
B.PRACTICAL									
6	ENGG	Major	YCS 4101	Operating Systems Laboratory	0	0	3	3	1.5
7	ENGG	Minor	YCS 4102	Numerical Methods Laboratory	0	0	3	3	1.5
8	ENGG	Major	YCS 4103	Object Oriented Programming using Java Laboratory	0	0	3	3	1.5
9	ENGG	Major	YCS 4104	Programming Using Python Laboratory	0	0	3	3	1.5
C.MANDATORYACTIVITIES/COURSES (Non-CGPA)									
10	HUM	Ability Enhancement Course	YCS4501	Soft Skill& Aptitude	1	0	0	1	1
11	MC	Mandatory Course	YED4501	Foreign Language	0	0	0	3	1
12	MC	Mandatory Course	YCS4502	SkillX	0	0	0	0	1
TotalofTheory,PracticalandMandatoryActivities /Courses								30	20

3rdYear5thSemester									
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	ENGG	Major	YCS5001	Artificial Intelligence	3	0	0	3	3
2	ENGG	Major	YCS5002	Database Management Systems	3	0	0	3	3
3	ENGG	Major	YCS5003	Computer Networks	3	0	0	3	3
4	ENGG	Major	YCS5004D YCS5004B YCS5004F	Ethical Hacking Cryptography and Network Security Web Development Tools	3	0	0	3	3
5	HUM	Minor	YED5001	Economics for Engineers	2	0	0	2	2
B.PRACTICAL									
6	ENGG	Major	YCS5101	Artificial Intelligence Laboratory	0	0	3	3	1.5
7	ENGG	Major	YCS5102	Database Management Systems Laboratory	0	0	3	3	1.5
8	ENGG	Major	YCS5103	Computer Networks Laboratory	0	0	3	3	1.5
9	PRJ	Skill Enhancement	YCS5201	Internship	0	0	2	2	1.5
C.MANDATORYACTIVITIES/COURSES (Non-CGPA)									
10	MC	Mandatory Course	YCS5501	Behavioral and Interpersonal skills	3	0	0	3	1
11	MC	Mandatory Course	YCS5502	SkillX	0	0	0	0	1
Total of Theory, Practical and Mandatory Activities /Courses								28	20

3rdYear6thSemester									
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	ENGG	Major	YCS6002	Software Engineering	3	0	0	3	3
2	ENGG	Major	YCS 6007	Steganography and Authentication	3	0	0	3	3
3	ENGG	Major	YCS 6008	Digital / Computer Forensics	3	0	0	3	3
4	ENGG	Major	YCS6004C YCS6004G YCS6004H	Cloud Computing Security Analysis and Reporting Mobile Operating System and Security	3	0	0	3	3
5	ENGG	Minor	YLB6001	Cyber Law and Ethics	3	0	0	0	3
B.PRACTICAL									
6	ENGG	Major	YCS 6102	Software Engineering Laboratory	0	0	3	3	1.5
7	ENGG	Major	YCS6107	Steganography and Authentication Laboratory	0	0	3	3	1.5
8	ENGG	Major	YCS 6108	Digital / Computer Forensics Laboratory	0	0	3	3	1.5
C.MANDATORYACTIVITIES/COURSES(Non-CGPA)									
9	MC	Mandatory Course	YCS6501	Innovation, Entrepreneurship & IPR	3	0	0	3	1
10	MC	Mandatory Course	YCS6502	SkillX	0	0	0	0	1
TotalofTheory,PracticalandMandatoryActivities /Courses								24	19.5

4thYear7thSemester									
Sl. No.	**Broad Category**	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
					L	**T**	**P**	**Total**	
A.THEORY									
1	ENGG	Major	YCS 7006	Digital Forensic	3	0	0	3	3
2	ENGG	Major	YCS 7002 L YCS 7002 M YCS 7002 N	Network Security & Web Security Digital Devices Security , Tools and Technologies for Cyber Security Advanced Operating Systems	3	0	0	3	3
3	ENGG	Major	YCS 7004K YCS 7003 H YCS 7003 L	Block chain Technology & Crypto currency Ad-Hoc and Sensor Networks Cyber Attacks and Counter Measures: User Perspective	3	0	0	3	3
4	ENGG	Major	YCS 7004D YCS 7004E YCS 7004F	Advanced Algorithm Neural Networks and Deep Learning Optimization Techniques	3	0	0	3	3
5	HUM	Minor	YBB7001	Human Resource Development and Organizational Behavior	2	0	0	2	2
B.PRACTICAL									
5	ENGG	Major	YCS 7101	Digital Forensic Laboratory	0	0	3	3	1.5
6	ENGG	Major	YCS 7102 I YCS 7102 J YCS 7102 K	Network Security & Web Security Laboratory Digital Devices Security , Tools and Technologies for Cyber Security Laboratory Advanced Operating Systems Laboratory	0	0	3	3	1.5
7	ENGG	Major	YCS 7201	Project I	0	0	3	3	3
C.MANDATORY ACTIVITIES/COURSES(Non-CGPA)									
8	MC	Mandatory Course	YCS7501	Constitution of India	3	0	0	3	1
9	MC	Mandatory Course	YCS7502	SkillX	0	0	0	0	1

Total of Theory, Practical and Mandatory Activities/Courses	29	20

4thYear8thSemester

Sl.No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
A.THEORY									
1	ENGG	Major	YCS 8001IK YCS 8001L YCS 8001M	Cyberspace and Its Governance Cyber Risk Management Cloud Infrastructure and Services	3	1	0	3	4
2	ENGG	Major	YCS 8002 J YCS 8002 K YCS 8002 L	VLSI Bio-informatics Robotics	3	1	0	3	4
3	ENGG	Minor	YCS 8003 A YCS 8003 B YCS 8003 C	Introduction to IoT Image Processing Optimization Techniques	3	0	0	3	3
B.PRACTICAL									
4	PRJ	Skill Enhancement	YCS 8201	Major Project-II	0	0	12	12	6
5	PRJ	Internship	YCS 8202	Grand Viva	0	0	3	0	3
C.MANDATORYACTIVITIES/COURSES									
6	MC	Mandatory Course	YED 8501	Essence of Indian Knowledge Tradition	0	0	3	3	1
7	MC	Mandatory Course	YCS8502	Skillx	0	0	0	0	1
Total of Theory, Practical and Mandatory Activities/Courses								33	20

Total Credit = 160

Semester1Curriculum and Syllabus

Course Code	YCS1001			
Course Title	Basic Electronics			
Category	SCI Multi Displ			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

In this course, students will learn about the fundamental behavior and principle of operations of various electronic devices and circuits. At the end of the course, students will be able to design useful electronic subsystems like rectifiers, amplifiers, etc.

Course Outcome:

CO1: To understand and remember the principle of operation of semiconductor devices.
CO2: To understand and analyze the operations of P-N junction diodes, bipolar and field-effect transistors, and solve design problems.
CO3: To understand and remember the principle of working of operational amplifiers and demonstrate its various applications.
CO4: Design and analyze electronic circuits incorporating semiconductor devices and operational amplifiers to meet specified requirements.
CO5: Troubleshoot and optimize electronic circuits using diagnostic tools and techniques.

Course Content:

Module 1: Fundamentals of Semiconductor [6L]

- Conductors, Insulators, and Semiconductors
- Energy band diagrams
- Fermi Dirac function, Fermi level
- Intrinsic and Extrinsic (p-type and n-type) semiconductors
- Drift and Diffusion current
- Mass action law
- Conductivity in semiconductor
- Einstein relationship in semiconductor
- Numerical problems

Module 2: P-N Junction Diode and its Applications [8L]

- P-N junction diode, Characteristics, and parameters
- Diode equation, V-I characteristics
- P-N junction breakdown: conditions, avalanche, and zener breakdown
- Zener diode and characteristics
- Diode half-wave and full-wave rectifiers (centre tapped and bridge) circuits and operation, ripple factor, efficiency, reduction of ac ripples using filter circuit (Qualitative analysis)
- Design of diode clipper and clamper circuit
- Application of Zener diode in regulator circuit
- Numerical problems

Module 3: Bipolar Junction Transistor [6L]

- BJT operation: PNP and NPN transistors
- Transfer characteristics, Current conduction mechanism
- Common Emitter, Common Base, Common Collector configurations and Static characteristics
- Junction biasing condition for active, saturation, and cut-off modes
- DC load line and Quiescent point
- BJT biasing, BJT as an amplifier
- Numerical problems

Module 4: Field Effect Transistor [6L]

- Classification of field-effect transistors: JFET, MOSFET
- Operating principle of JFET
- Drain and Transfer characteristics of JFET (n-channel and p-channel)
- CS, CG, CD configurations
- Relation between JFET parameters
- FET as an amplifier
- E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel)
- Numerical Problems

Module 5: Feedback and Operational Amplifier [8L]

- Concept of feedback: Positive and Negative feedback, Gain with feedback, Feedback topologies
- Operational Amplifier: Ideal characteristics, Non-ideal characteristics of op-amp – offset voltages, bias current, offset current, slew rate, CMRR, and bandwidth
- Inverting and Non-inverting amplifier
- Concept of virtual ground and virtual short
- Applications of op-amp: Adder, Differential Amplifier, Differentiator, Integrator
- Numerical problems

Module 6: Electronic Instruments and Measurements [2L]

- Basics of measurement
- Cathode-Ray Oscilloscope and Digital-Storage Oscilloscope
- Measurement of voltage, frequency, and phase
- Signal generators and analytical instruments

Text/Reference Books:

1. D. Chattopadhyay and P. C. Rakshit, "Electronics Fundamentals and Applications", New Age International Publishers
2. J. Millman, C. Halkias, and C. D. Parikh, "Integrated Electronics", McGraw-Hill Education
3. D. A. Bell, "Electronic Devices and Circuits", Oxford University Press
4. D. P. Kothari and I. J. Nagrath, "Basic Electronics", McGraw-Hill Education
5. J. D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YMT1001			
Course Title	Engineering Mathematics I			
Category	SCI Minor			
LTP & Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	48			
Pre-requisites	None			

Learning Objectives :

In this course the students will learn about the basic knowledge of matrix algebra, function of several variable sand Improper integral. At the end of the course, the students will be able to solve engineering problems.

Course Outcome:

CO1: Recall the distinctive characteristics of matrix algebra and calculus.

CO2: Understand the theoretical concept of vector space and apply to address problems.

CO3: Understand concept of definite and improper integral and apply to address problems in their disciplines

CO4: Understand the concept of functions of several variables and apply to address problems in their disciplines

CO5: Apply matrix algebra, vector spaces, definite and improper integrals, and functions of several variables to solve engineering problems, demonstrating a comprehensive understanding of the mathematical concepts and their practical applications.

Course Content:

Module 1: Matrix Algebra [11L]

Matrix Algebra: Inverse and rank of a matrix; Orthogonal matrix and its properties, trace of a matrix, Consistency and inconsistency of linear systems of equations, Solution of linear system of equation by Gauss elimination, matrix inverse method. Eigenvalues and eigenvectors; Cayley-Hamilton Theorem, Diagonalization of a matrix.

Module 2: Vector Spaces [15L]

Vector Spaces: Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map. Inner product spaces, Gram-Schmidt orthogonalization.

Module 3: Definite and Improper Integral [6L]

Definite and Improper Integral: Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.

Module 4: Calculus [6L]
Calculus: Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 5: Function of Several Variables [10L]

Function of Several Variables: Function of several variables, Concept of limit, continuity and differentiability; Partial derivatives, Total derivative and its application; Chain rules, Derivatives of implicit functions Euler's theorem on homogeneous function, Jacobian, Maxima and minima of functions of two variables, Method of Lagrange multipliers.

Text / Reference Books:

1. E. Kreyszig, "Advanced Engineering Mathematics (9th Ed)", John Wiley & Sons, 2006.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
4. B. S. Grewal, "Higher Engineering Mathematics (36th Ed)", Khanna Publishers, 2010.
5. N. P. Bali and M. Goyal, "A textbook of Engineering Mathematics", Laxmi Publications, Reprint, 2008.

PO-CO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 1002			
Course Title	Programming for Problem Solving			
Category	ENGG Major			
LTP & Credits	L	T	P	Credit
	3	1	0	4
Total Contact Hours	48			
Pre-requisites	None			

Learning Objective:

Algorithmic skill is a fundamental skill in modern times, and this course provides the students with the foundations of computational problem solving. The course emphasizes on principles and methods rather than on systems and tools.

Course Outcome:

CO1: Understand the basic model of computation
CO2: Apply algorithmic thinking to understand, and solve problems
CO3: Design and implement algorithms for a given problem
CO4: Implement algorithms using a high-level programming language
CO5: Analyze and evaluate algorithms for efficiency and correctness

Course Content:

Module 1: Introduction to Computation [8L]
Model of computation, stored-program concept, hardware and software. Number rep- resentation: basic concepts, decimal and binary.

Module 2: Problem Solving and Algorithmic Thinking [8L]
Overview - problem definition, logical reasoning. Flowcharts - symbols used, examples. Algorithm - definition, practical examples, properties, representation, algorithms vs programs. Elementary concepts about time complexity.

Module 3: Algorithmic Thinking [10L]
Constituents of Algorithms-Sequence, Selection and Repetition, input-output. Computation - expressions, logic. Problem Understanding and Analysis -problem definition, input-output, variables, name binding. Types of Functions- user defined functions, Standard Functions, Parameter Passing techniques, Recursive functions, Data organization: lists, arrays, etc.,
algorithms to programs.

Module 4: Problem Solving with Algorithms [10L]
Examples and case studies, sorting and searching, statistical calculations. Numerical methods- solution of equations, root finding, solution of differential equations, integration.

Text/Reference Books:

1. D.D. Riley and K. A. Hunt, \Computational Thinking for the Modern Problem Solver", CRC Press.
2. P. F. Luccio, \Computational Thinking: First Algorithms, then Code" Springer.
3. S. S. Sastry, \Introductory Methods of Numerical Analysis" Prentice-Hall of India.
4. R. G. Dromey, \How to Solve it by Computer" Prentice-Hall.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YBT1003			
Course Title	Environmental Science			
Category	HUM, Common value added course			
LTP & Credits	L	T	P	Credits
	1	1	0	1
Total Contact Hours	24			
Pre-requisites	None/ If Any			

Learning Objective:

Students will be able to understand the natural environment and its relationships with human activities and able to apply the fundamental knowledge of science and engineering to assess environmental and health risk, to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues and to solve scientific problem-solving related to air, water, noise & land pollution.

Course Outcome:

CO1: To understand the natural environment and its relationships with human activities.

CO2: To apply the fundamental knowledge of science and engineering to assess environmental and health risk.

CO3: To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.

CO4: Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

CO5: Demonstrate an understanding of the ethical and societal implications of environmental issues and propose sustainable solutions to mitigate environmental degradation, emphasizing the importance of conservation and preservation of natural resources.

Course Content:

Module1: Introduction [5L]

Introduction to environment and ecology. Components of the environment, environmental degradation, natural cycles of environment.

Module2: Ecology [2L]

Elements of Ecology, Ecological balance, Cause & Effects of afforestation and deforestation.

Module 3: Air Pollution and Control [5L]

Atmospheric composition, Segments of atmosphere climate, weather. Atmospheric Stability, Sources and effect so fair pollutants, primary and secondary pollutants. Criteria Pollutants:PM10, Source, Effect, Control.5 CO, NOx, Source, Effect, Control. Sox, Source, Effect, Control. Lead, Ozone, Source, Effect, Control. Greenhouse effect, Control Measures. Depletion of ozone layer, Effects of UV exposer, Control Measures.

Module 4: Water Pollution and Control [7L]

Hydrosphere, natural water resources and reserves. Pollutants: their origin and effects. COD and BOD test, NBOD and CBOD. River / lake / ground water pollution. Control Measures of water pollution. Drinking water and waste water treatment.

Module 5: Land Pollution [3L]

Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes) their origin and effects. Collection and disposal of solid waste, recycling and treatment methods.

Module 6: Noise Pollution [2L]

Sources, effects, standards and control converters, Gray code to binary converters, Encoder.

Text/Reference Books:

1. A. K. Dey, “Environmental Chemistry”, New Age international
2. G.M. Masters, “Environmental Engineering”, Prentice Hall India

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YED 1001				
Course Title	Professional Communication				
Category	HUM, Ability Enhancement Course				
LTP & Credits	L	T	P	Credits	
	2	0	0	2	
Total Contact Hours	24				
Pre requisites	None				

Learning Objective:
In this course, the students will develop communicative competence in English so as to make the industry-ready, with special emphasis on knowledge in grammar and English writing.

Course Outcome:
CO1: To learn how to employ communication skills in the workplace
CO2: To understand and learn about the use of the different elements of English
CO3: To develop requisite skills for effective reading and comprehension of texts
CO4: To learn how to compose formal, written communication
CO5: To enhance listening skills for effective communication.

Course Content:
Module 1: Communication in a Globalized World [4L]
Introduction; meaning of communication; five stages of communication; formal and informal communication; verbal and non-verbal communication; role of body language in communication; barriers to effective communication; prejudice and lack of sensitivity in communication; gender/culture neutrality.

Module 2: Functional Grammar [8L]
Articles and prepositions. Direct and indirect verbs, subject-verb agreement. Tense and voice, sentences: simple, complex and compound; direct and indirect speech.

Module 3: Reading Comprehension [6L]
Reading purposes and skills: skimming, scanning and intensive reading, reading comprehension: fictional and non-fictional prose, one-word substitution and sentence making.

1. "Where the Mind is without Fear" by Rabindranath Tagore
2. "Out of Business" by R.K. Narayan

Module 4: Writing Skills [6L]
Paragraph, formal letters, emails, job applications, order and complaint letter, importance of punctuation in writing.

Text/Reference Books:
1. Wren and Martin (Revised by N. D. V. Prasada Rao), "High School English Grammar and Composition", S. Chand Publishing.
2. S. A. Beebe and T. P. Mottet, "Business and Professional Communication – Principles and Skills and Leadership" Pearson Education.
3. Sethi and B. Adhikari, "Business Communication" Tata McGraw-Hill.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS1101			
Course Title	Basic Electronics Laboratory			
Category	ENGG Skill Enhancement			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

1. To prepare the students to have a basic knowledge of active and passive components.
2. To develop the ability to measure signals using a multimeter, CRO.
3. To understand the characteristics of proper biasing for BJT and FET.
4. To encourage the development of circuits using diodes, transistors, FETs, and OPAMPs.

Course Outcome:

CO1: To study and evaluate the characteristics of basic electronic components (Diode, BJT, FET).
CO2: To demonstrate the working of CRO, Function Generator, Digital Multimeter, and D.C. power supply.
CO3: To sketch the V-I characteristics of p-n junction diode, Zener diode, BJT.
CO4: To construct the rectifier circuit using diode and Inverting, Non-inverting amplifiers Circuit using Op-Amp.
CO5: To determine the characteristics parameters of Op-Amp.

Course Content:

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT). [3 days]
2. Familiarization with measuring and testing equipment like Digital Multimeter, CRO, Signal generator, and Power Supply. [2 days]
3. Study of V-I characteristics of Junction diode. [1 day]
4. Study of V-I characteristics of Zener diode. [1 day]
5. Study of Half wave and Full wave rectifier. [2 days]

6. Study of V-I characteristics of BJT. [1 day]
7. Study of an operational amplifier chip and analyze its functionality. [2 days]
8. Design of non-inverting and inverting amplifier using operational amplifier. [2 days]
9. Design of adder, differential amplifier using operational amplifier. [2 days]
10. Verification of the truth table of basic logic gates using IC. [1 day]
11. Innovative Experiment. [1 day]

Text/Reference Books:

1. J. Millman, C. Halkias, and C. D. Parikh, "Integrated Electronics", McGraw-Hill Education.
2. D. A. Bell, "Electronic Devices and Circuits", Oxford University Press.
3. D. P. Kothari and I. J. Nagrath, "Basic Electronics", McGraw-Hill Education.
4. J. D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	1	2	2	1	2	2	-	2
CO2	3	2	1	2	2	-	-	1	2	2	1	2	3	3	3
CO3	3	3	1	1	2	-	-	1	2	1	1	2	3	3	3
CO4	3	3	3	2	2	1	1	1	3	2	2	3	3	3	3
CO5	3	2	1	1	-	-	-	-	1	1	1	2	2	-	2

Course Code	YCS 1103			
Course Title	Workshop/Manufacturing Practices Laboratory			
Category	ENGG Skill Enhancement			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	Physics & Mathematics (10+2 Level)			

Course Outcomes:

After successful completion of this course, learners will be able to:

CO1: Identify and operate various hand tools related to a variety of manufacturing operations.
CO2: Safely fabricate simple components with their own hands.
CO3: Gain practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO4: Produce small devices of their interest for project or research purposes.
CO5: Apply safety standards and regulations in workshop environments to ensure the well-being of oneself and others.

Course Content:

(i) Theoretical discussion & videos: 3P

1. Manufacturing Methods - casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Carpentry
4. Welding (arc welding & gas welding), brazing
5. Electrical & Electronics
6. Metal casting
7. CNC machining, Additive manufacturing
8. Plastic molding & Glass Cutting

(ii) Workshop Practice:

Module 1 - Machine shop 6P Typical jobs that may be made in this practice module: i. To make a pin from a mild steel rod in a lathe. ii. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Module 2 - Fitting shop 6P Typical jobs that may be made in this practice module: i. To make a Gauge from MS plate.

Module 3 - Carpentry 6P Typical jobs that may be made in this practice module: i. To make wooden joints and/or a pattern or like.

Module 4 - Welding shop (Arc welding 3P + gas welding 3P) 3P Typical jobs that may be made in this practice module: i. ARC WELDING (3P): To join two thick (approx 5mm) MS plates by manual metal arc welding. ii. GAS WELDING (3P): To join two thin mild steel plates or sheets by gas welding.

Module 5 - Electrical & Electronics 3P House wiring, soft soldering

Module 6 – Smithy 3P Typical jobs that may be made in this practice module: R21 B. Tech (ME) i. A simple job of making a square rod from a round bar or similar. For further study (Optional)

Module 7 - Casting 3P Typical jobs that may be made in this practice module: i. One/ two green sand molds to prepare, and a casting be demonstrated.

Module 8 - Plastic molding & Glass Cutting 3P Typical jobs that may be made in this practice module: i. For plastic molding, making at least one simple plastic component should be made. ii. At least one sample shape on glass should be made using laser cutting machine. Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K., and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Reference Books:

1. Gowri P., Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
3. Kalpakjian S. and Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
4. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern.
5. Principles of Metal Cutting/Principles of Machine Tools by G.C. Sen and A. Bhattacharya, New Central Book Agency, Kolkata.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course code	YCS1102			
Course Title	Programming for Problem solving Laboratory			
Category	ENGG Major			
LTP & Credits	L	T	P	Credit
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	Basic Understanding of Computer			

Learning Objective:

The course is oriented to those who want to advance structured and procedural programming understanding and to improve C programming skills. The major objective is to provide students with an understanding of code organization and functional hierarchical decomposition using complex data types.

Course Outcomes:

CO1: Learn and understand the DOS system commands and familiarize with C programming environment.

CO2: Learn and translate the algorithms into simple programs and understand the flowchart design and test.

CO3: Understand and implement conditional branching, iteration and recursion.

CO4: Apply and analyse various C programs with Arrays, Pointers, Structures, Union along with functions.

CO5: Apply programming to solve matrix addition and multiplication problems and understand the file handling.

Course Content:

Suggestive List of Experiments:

1. Familiarization with basic DOS commands and programming design with the help of Flowcharts Using Raptor. [1 day]
2. Familiarization with C programming environment, Variable types and type Conversions, Simple Computational problems using arithmetic expressions. [1 day]
3. Branching and logical expressions, Problems involving if-then-else structures. [1 day]
4. Loops, while and for loops, Iterative problems e.g., sum of series, patterns print. [2 days]
5. 1D Arrays: searching, sorting, 1D Array manipulation, 2D arrays and Strings, Matrix problems, String operations. [2 days]
6. Functions, call by value, Simple functions implementations, function recursion. [2 days]
7. Pointers, structures and dynamic memory allocation, Union. [2 days]
8. File handling, file reading, writing, copying etc. [1 day]

Text/Reference Books:

1. B. W. Kerninghan& D. M. Ritchie, "The C Programming Language (16th Ed.)", PHI/Pearson Education.
2. Y. Kanetkar, "Let us C (15th Ed.)", BPB Publication.
3. E. Balagurusamy, "Programming in ANSI C (15th Ed.)", Tata-McGraw Hill.
4. K. R. Venugopal& S. R. Prasad, "Mastering C (7th Ed.)", Tata-McGraw Hill.
5. R. Thareja, "Introduction to C Programming (4th Ed.)", Oxford University Press.

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YED 1101			
Course Title	Professional communication Laboratory			
LTP & Credits	L	T	P	Credits
	0	0	2	1.5
Total Contact Hours	24			
Pre-requisites	None			

Learning Objective:

In this laboratory course, students will be exposed to the need for English in the workplace and equipped with good language skills, communication skills, and soft skills.

Course Outcome:

CO1: Apply different skills of technical communication in English.

CO2: Use correct pronunciation when speaking English.

CO3: Use appropriate techniques for effective and active listening.

CO4: Learn to express ideas clearly and coherently in professional settings.

CO5: Demonstrate effective verbal and non-verbal communication skills in various professional scenarios, including presentations, meetings, and interviews

Course Content:

Suggestive List of Experiments:

1. Learn about phonetics and pronunciation guide (Introduction of phonetics and phonetic table, tongue and lip movements for vowels and consonants, monophthongs/diphthongs, voiced/unvoiced, aspirated/unaspirated, minimal pairs, syllables, stress, and intonation). [4 Days]
2. Training on listening and comprehension (Active listening and its techniques, academic listening versus business listening, listening activities: answering questions, form filling, summarizing news bulletin, presentation, video clip, lecture, story). [6 Days]
3. Training on speaking skills (Basic parameters of speaking, fluency-focused activities: JAM, conversational role plays, speaking using a picture, group discussions, and personal interviews). [6 Days]
4. Laboratory project work (Making a 5-minute animation video with voiceover OR making a 10-minute documentary film). [8 Days]

Text/ Reference Books:

1. P. Ladefoged, “A Course in Phonetics”, Harcourt Brace Jovanovich College Publishers.
2. J. Sullivan, “Simply Said: Communicating Better at Work and Beyond”, Wiley.
3. N. Leonardo, “Active Listening Techniques: 30 Practical Tools to Hone your Communication Skills”, Rockridge Press.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Semester 2 Curriculum and Syllabus

Course Code	YCS2001			
Course Title	Data Structures			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	48			
Pre-requisites	Basic Programming			

Learning Objective:

In this course, students will be taught about the significance of non-linear data structures with respect to the access and organization of data, various algorithmic approaches to write programs to solve problems in different engineering domains by using different data structures, merits and demerits of altered algorithms in terms of time-complexity.

Course Outcome:

CO1: To differentiate how the choices of data structure and algorithm methods impact the performance of a program.
CO2: To solve problems based on different data structures and also write programs.
CO3: To identify appropriate data structure and algorithmic methods in solving a problem.
CO4: To discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.
CO5: To compare and contrast the benefits of dynamic and static data structures implementations.

Course Content:

Module 1: Introduction of Data Structure [12L]

- Concepts of data structures, Abstract Data Type.
- Algorithms and programs, basic idea of pseudo-code, Properties of an algorithm.
- Algorithm efficiency and analysis, time and space analysis of algorithms – Order notations.
- Array: Different representations – row major, column major.
- Sparse matrix − its implementation and usage, Array representation of polynomials.
- Linked List: Singly linked list – operations, Doubly linked list – operations.
- Circular linked list – operations, Linked list representation of polynomial and applications.

Module 2: Linear Data Structure [10L]

- Stack and its implementations (using array and linked list).
- Applications (Infix, Prefix, and Postfix with their conversions, Postfix Evaluation).
- Queues, circular queue, de-queue.
- Implementation of queue- linear and circular (using array and linked list).
- Recursion: Principles of recursion - use of stack, tail recursion. Applications - The Tower of Hanoi, Eight-queen problem.

Module 3: Nonlinear Data Structure [18L]

- Trees: Basic terminologies, forest, tree representation (using array and linked list).
- Binary trees - binary tree traversal (pre-, in-, post- order).
- Threaded binary tree – operations.

- Binary search tree- operations (creation, insertion, deletion, searching).
- Concept of Max-Heap and Min-Heap (creation, deletion).
- Height balanced binary tree – AVL tree (insertion, deletion with examples only).
- Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge).
- Minimal spanning tree – Prim's algorithm, Kruskal's algorithm (basic idea of greedy methods).

Module 4: Searching and Sorting [8L]

- Sorting Algorithms: Bubble sort, Insertion sort, Selection sort – with the notion of complexity.
- Quick sort, Merge sort – with complexity, Radix sort – with complexity.
- Searching: Sequential search, Binary search, Interpolation Search– with complexity.
- Hashing: Hashing functions, Collision resolution techniques.

Text/Reference Books:

1. E. Horowitz, S. Sahni and S. Anderson-Freed, "Fundamentals of Data Structures of C", Universities Press.
2. S. Lipschutz, "Data Structures", Tata McGraw Hill Education (India) Private Limited.
3. A. M. Tanenbaum, "Data Structures in C", Pearson.
4. R. Thareja, "Data Structures Using C", Oxford.
5. A.K. Rath, A. K. Jagadev, "Data Structure Using C", Scitech Publications.
6. T. H. Coreman, "Introduction to Algorithms", MIT Press.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YPH2001			
Course Title	Engineering Physics			
Category	SCI , Multidisciplinary			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

The objective of the course is to provide students with a sufficient understanding of physics' foundational ideas and their potential applications. Understanding the fundamentals of physics will enable engineers to better comprehend the instruments and methods employed in the field and lay the groundwork for introducing novel ideas. It can also raise awareness of the crucial part that engineering and science play in the creation of new technologies. Additionally, it provides the required exposure to the practical aspects, which is a vital component of studying the sciences.

Course Outcome:

CO1: To understand and remember the basic principles of Classical Mechanics, Relativistic Mechanics, Quantum Mechanics, Statistical Mechanics, and microscopic phenomena.

CO2: To understand the working principles of laser, optical fiber, and holography amplifier and analyze their various applications to enhance knowledge in modern optics.

CO3: To learn the basic principles of electromagnetic induction, dielectric properties, and magnetic properties of materials.

CO4: To understand and apply knowledge in new technologies.

CO5: To apply the principles of physics to solve engineering problems and analyze real-world phenomena.

Course Content:

Module 1: Mechanics [8L]

- Representation of vector, scalar, and vector fields, partial derivative of vector, gradient of scalar field, divergence, and curl of vector field.
- Friction, conservation laws, rigid body, moment of inertia, acceleration of rigid body, Mass-energy Equivalence Concept of photon.

Module 2: Quantum Theory [8L]

- Blackbody Radiation spectrum, Wein's law, Rayleigh–Jeans law, Quantum theory of radiation, Wave mechanics, wave-particle duality, De Broglie waves, Bohr's quantization rules, Phase and group velocities, Davission-Germer Experiment, Heisenberg Uncertainty Principle, Wave function and its significance, Schrodinger's wave equation.

Module 3: Laser, Fiber Optics [6L]

- Spontaneous and stimulated emission of radiation, Population inversion, Einstein's coefficients, Basic components of laser system, Construction and working of Ruby laser, He-Ne lasers, Laser Applications. Basic ideas of Fiber optics.

Module 4: Statistical Mechanics and Applications [6L]

- Introduction to Statistical mechanics, Concept of energy levels and energy states. Classical limits of quantum statistics, Concept of Fermi level. Fermi level in metals, Fermi level for intrinsic and

extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p-type, n-type).

Module 5: Electromagnetic Induction [3L]

- Magnetic flux, Faraday's law of electromagnetic induction, electromotive force, Ampere's circuital law, Maxwell's equation.

Module 6: Dielectrics [3L]

- Types of dielectric, relation between dielectric constant and electric susceptibility, polarizability, Clausius-Mossotti Equation, application of dielectric materials.

Module 7: Magnetic Properties of Materials [2L]

- Magnetic flux density, magnetic permeability, magnetic susceptibility, classification of magnetic materials, diamagnetic materials, paramagnetic materials, Curie law.

Text/Reference Books:

1. Beiser, "Concepts of Modern Physics", McGraw Hill India.
2. D.K. Bhattacharya and P. Tandon, "Engineering Physics", Oxford India.
3. Lal and N. Subramanyam, "A Textbook Of Optics", S. Chand & Co.
4. Dominic I. and A. Nahari, "A TextBook of Engineering Physics", Owl Book Publishers.
5. E. Hecht, "Optics", Pearson Education.
6. N. Mehta, "Applied Physics for Engineers", PHI Ltd.
7. J.C Palais, "Fiber Optic Communications", Pearson Education.
8. K. Pandey and S. Chathurvedi, "Engineering Physics", Cengage Learning.
9. J. Philip, "A textbook of Engineering Physics", Educational Publishers.
10. B. Premlet, "Engineering Physics", McGraw Hill India..

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YMT2001			
Course Title	Mathematics II			
Category	SCI , Multidisciplinary			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective(s):

In this course the students will learn about the basic knowledge of double and triple integration, ordinary differential equation and laplace transform. At the end of the course, the students will be able to solve engineering problems.

Course Outcomes:

CO1: To use mathematical tools to evaluate multiple integrals and vector integrals.
CO2: To apply effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
CO3: To understand the properties of Laplace Transform to evaluate multiple integrals and their usage
CO4: To understand the concept of Laplace transform to solve ordinary differential equations.
CO5: Apply mathematical concepts and techniques to analyze and solve engineering problems involving double and triple integration, ordinary differential equations, and Laplace transforms, demonstrating proficiency in mathematical modeling and problem-solving skills.

Course Content:

Module 1: Multivariable Calculus (Integration): [8L]

Double integration, Change of order of integration in double integrals, Triple integrals, vector line integrals, scalar surface integrals, vector surface integrals,Gauss divergence theorem and Stokes' theorem.

Module 2: First Order Ordinary Differential Equations: [10L]

Solution of first order and first-degree ODE: Exact ODE, Rules for finding Integrating factors, Linear ODE, Bernoulli's equation, Solution of first order and higher degree ODE: solvable for, solvable for solvable for and Clairaut's equation

Module 3: Second Order Ordinary Differential Equations: [8L]

Solution of second order ODE with constant coefficients: C.F. & P.I., Method of variation of parameters, Cauchy-Euler equations,

Module 4: Laplace Transform: [10L]

Definition and existence of LT, LT of elementary functions, First and second shifting properties,

Change of scale property, LT of $t\,f(t)$, LT of $\frac{f(t)}{t}$, LT of derivatives of f (t), LT of $\int f(t)dt$, Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties, Convolution theorem (statement only) and its application to the evaluation of inverse LT.

Text /Reference Books:

1. E. Kreyszig, "Advanced Engineering Mathematics(9th Ed)", John Wiley & Sons.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill New Delhi.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill.
4. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers.
5. N. P. Bali and M. Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS2002			
Course Title	Basic Electrical Engineering			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

In this course, students will learn about the fundamentals of electrical circuits, focusing on both DC and AC circuits, transformers, and rotating machines.

Course Outcome:

CO1: Understand and remember the working principles of basic electrical circuits, power distribution, and safety measures.
CO2: Analyze the functioning of DC and AC circuits.
CO3: Understand and remember the basic principles of transformers and rotating machines.
CO4: Analyze and evaluate the performance of electrical circuits, transformers, and rotating machines through laboratory experiments and simulations.
CO5: Design basic electrical circuits and systems, considering safety, efficiency, and economic factors.

Course Content:

Module 1: DC Circuits Fundamentals [9L]

- Electric circuits: Linear circuit, Non-linear circuit, Bilateral circuit, Unilateral circuit, Dependent source, Node, Branch, Active and Passive elements, Kirchhoff's laws, Source equivalence and conversion.
- Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

Module 2: AC Circuits Fundamentals [9L]

- Sinusoidal quantities: Average and RMS values, Peak factor, Form factor, Phase and Phase difference, Concept of phasor diagram, V-I relationship in R, L, C circuits, R-L-C circuits in series and parallel with phasor diagrams, Impedance and Admittance, Impedance triangle and Power triangle, Power factor.
- Three-phase balanced circuits, Concept of three-phase power measurement.

Module 3: Single-Phase Transformer [5L]

- Single-phase transformer: Idea on constructional parts, Classifications, Working principle. Numerical on EMF equation, Phasor diagram.

Module 4: Electrical Rotating Machines [8L]

- DC Machines: Constructional features, Classifications, Working principle of Generator and Motor. Simple Numerical on voltage equation.
- Three-phase Induction Motor: Basic concept of Three Phase circuit and Production of Rotating Magnetic Field, Working principle of Three Phase Induction Motor and Torque-Speed Characteristics (concept only).

Module 5: Electrical Installations [5L]

- Power generation to distribution through overhead lines and underground cables with single-line diagram. Earthing of electrical equipment, Basic accessories: MCB, MCCB, ELCB, SFU, Megger.

Text/Reference Books:

1. D.P. Kothari and I.J. Nagrath, "Basic Electrical Engineering", Tata-McGrawHill.
2. V. Mittle and A. Mittal, "Basic Electrical Engineering", Tata-McGrawHill.
3. E. Hughes, "Electrical and Electronics Technology", PHI/Pearson Education.
4. C.L. Wadhwa, "Basic Electrical Engineering", Pearson Education.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YED2001			
Course Title	Indian Knowledge System			
Category	HUM, Common value added course			
LTP & Credits	L	T	P	Credits
	1	1	0	1
Total Contact Hours	24 hrs			
Pre-requisites	None			

Learning Objective(s):

To facilitate students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of the knowledge system. To make students understand traditional knowledge and analyze it and apply it to their day-to-day life.

Course Outcomes:

CO1: Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2: Appreciate the need and importance of protecting traditional knowledge.
CO3: Recognize the relevance of Traditional knowledge in different domains.
CO4: Establish the significance of Indian Knowledge systems in the contemporary world.
CO5: Evaluate the impact of Indian Knowledge Systems on global perspectives.

Course Content:

Module 1: Introduction to Indian Knowledge Systems (IKS): [6L] Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge.

Module 2: Traditional Knowledge in Humanities and Sciences: [7L] Linguistics, Number and measurements-Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.

Module 3: Traditional Knowledge in Professional domain: [7L] Town planning and architecture- Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.

Text / Reference Books:

1. Introduction to Indian Knowledge System - concepts and applications, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-9391818-21-0
2. Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230
3. Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS2101			
Course Title	Data Structures Laboratory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	Fundamentals of Programming			

Learning Objective:

In this course, students will learn about implementing different algorithmic approaches in C programs using non-linear and linear data structures to solve problems in various engineering domains.

Course Outcome:

CO1: Choose appropriate data structures for specified problem definitions.
CO2: Compare operations such as searching, insertion, deletion, and traversing mechanisms on various data structures.
CO3: Explain practical applications of data structures.
CO4: Analyze how to store, manipulate, and arrange data efficiently.
CO5: Implement various data structures using arrays and linked lists.

Course Content:

1. Experiments on Arrays [1 day]
    - Addition and Multiplication of Arrays
    - Implementation of Sparse Matrices
2. Experiments on Abstract Data Types [2 days]
    - Implementation of stack using Array
    - Applications of stack: infix to postfix conversion, expression evaluation

3. Experiments on Linked List [2 days]
    - Implementation of linked lists and its operations: insertion, deletion, and reverse
    - Implementation of stacks and queues using linked lists
    - Polynomial addition and polynomial multiplication
4. Experiments on Searching and Sorting [2 days]
    - Searching: Linear Search, Binary Search
    - Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, and Heap Sort
5. Experiments on Non-linear Data Structures [2 days]
    - Traversals of binary tree, Binary Search Tree (BST), Threaded binary tree
    - Height-balanced binary tree: AVL tree (insertion, deletion)
    - B-Trees: insertion, deletion
6. Experiments on Hashing [1 day]
    - Implementation of Hash tables and its operations: searching, inserting, and deleting, handling collisions
7. Innovative Experiments [2 days]
    - Case study of solving complex problems from various engineering domains using suitable data structures (e.g., mesh analysis in electrical circuits, event-driven simulation, etc.).

Text/Reference Books:

1. C. E. Balagurusamy, "Data Structures using C", McGraw Hill.
2. E. Horowitz, S. Sahni, and S. Anderson-freed, "Fundamentals of Data Structures of C", Universities Press.
3. A. K. Sharma, "Data Structures using C", Pearson.
4. R. Thareja, "Data Structures using C", Oxford University Press.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YPH2101			
Course Title	Engineering Physics Laboratory			
Category	SCI, Skill Enhancement			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

The objective of this course is to revise the basic concepts of physics through a standard set of experiments to correlate them with the corresponding theory.

Course Outcomes:

CO1: To discover an idea of different measurements and errors.
CO2: To understand and apply basic laws of physics and experiments.
CO3: To practice and generate experimental skills in different areas of physics and applications.
CO4: To analyze experimental data using appropriate statistical methods and tools to draw meaningful conclusions and make predictions.
CO5: To communicate experimental procedures, observations, and results effectively through written reports and oral presentations.

Course Content:

Suggestive List of Experiments:

1. General idea about Measurements and Errors: i) Error estimation using Slide calipers/Screw-gauge/traveling microscope for one experiment. ii) Proportional error calculation using Carey Foster Bridge. [2 days]
2. Determination of wavelength of light by Newton's ring method. [1 day]
3. Determination of wavelength of light by Laser diffraction method. [1 day]
4. Determination of Planck's constant using photoelectric cell. [1 day]
5. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment. [2 days]
6. Determination of Stefan's constant. [1 day]
7. Determination of bandgap of a semiconductor. [1 day]
8. Study of dispersive power of material of a prism. [1 day]
9. Measurement of nodal and antinodal points along transmission wire and measurement of wavelength. [1 day]
10. Determination of wavelength of light by Fresnel's bi-prism method. [1 day]

Text/Reference Books:

1. B.L. Flint and H.T. Worsnop, "Advanced Practical Physics for Students", Asia Publishing House.
2. M. Nelson and J.M. Ogborn, "Advanced Level Physics Practicals", Heinemann Educational Publishers.

3. S. Panigrahi and B. Mallick, “Engineering Practical Physics”, Cengage Learning.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS2102			
Course Title	Basic Electrical Engineering Laboratory			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

In this course, students will learn about the basic electrical components, machinery, instruments, and safety measures.

Course Outcomes:

CO1: Identify and apply common electrical equipment and instruments.
CO2: Develop electric networks using various components and analyze the circuit behavior.
CO3: Apply and analyze the basic characteristics of transformers and electrical machines.
CO4: Demonstrate an understanding of the characteristics and operation of different types of electrical machines.
CO5: Analyze and interpret data from electrical experiments, draw conclusions, and make recommendations based on the findings.

Course Content:

List of Experiments:

1. Basic safety precautions – Earthing, Introduction to measuring instruments – Voltmeter, Ammeter, Multimeter, Wattmeter, Real-life Resistor, Capacitor, Inductor.
2. Verification of Thevenin's and Norton's Theorem.
3. Verification of Superposition and Maximum Power Transfer Theorem.
4. Characteristics of Fluorescent, Tungsten, and Carbon filament lamps.
5. Study of R-L-C series circuit.
6. Three-phase Power measurement with two wattmeter methods.

7. Demonstration of cut-out sections of machines: DC Machine (commutator-brush arrangement), Induction Machine (squirrel cage rotor).
8. Measurement of primary and secondary voltage and current of a single-phase transformer – Open Circuit and Short Circuit Test.
9. Starting, Reversing, and speed control of DC shunt motor.
10. Torque-Speed characteristics of DC Machine.
11. Torque-Speed characteristics of Three-phase Induction Motor.
12. Test on a single-phase Energy Meter.
13. Innovative experiments.

Text/Reference Books:

1. D.P. Kothari and I.J. Nagrath, "Basic Electrical Engineering," Tata-McGraw Hill.
2. V. Mittle and A. Mittal, "Basic Electrical Engineering," Tata-McGraw Hill.
3. E. Hughes, "Electrical and Electronics Technology," Pearson.
4. C.L. Wadhwa, "Basic Electrical Engineering," Pearson Education.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS2301			
Course Title	Engineering Graphics & Design Laboratory			
Category	ENGG, Skill Enhancement			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
TotalContact Hours	36			
Pre-requisites	None/IfAny			

Learning Objective:

The learning objectives of engineering graphics typically include developing skills and knowledge related to the visualization, interpretation, and communication of engineering designs.

Course Outcomes (COs):

After attending the course, students would:

CO1: Get introduced to Engineering Graphics and visual aspects of design.
CO2: Know and use common drafting tools with the knowledge of drafting standards.
CO3: Able to apply computer-aided drafting techniques to represent line, surface, or solid models in different engineering viewpoints.
CO4: Able to produce part models; carry out assembly operations and show the working procedure of a designed project work using animation.
CO5: Demonstrate proficiency in using computer-aided design (CAD) software to create and modify engineering drawings, including 2D and 3D models, with an understanding of industry standards and practices.

Course Content:

List of Drawings:

- Traditional Engineering Graphics: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Modules:

Module 1: Introduction to Engineering Drawing

- Principles of Engineering Graphics and their significance.
- Usage of Drawing instruments.
- Lines, lettering, Dimensioning.
- Scales – Plain, Diagonal, and Vernier Scales.

Module 2: Geometrical Construction and Curves

- Construction of polygons, Parabola, Hyperbola, Ellipse, Cycloid, Archimedean Spiral, and Involute (square & circle).

Module 3: Projection of Points, Lines, Surfaces

- Orthographic projection - 1st and 3rd angle projection.
- Projection of lines and surfaces – Hexagon.

Module 4: Projection of Solids

- Cube, Pyramid, Prism, Cylinder, Cone.

Module 5: Drawing Isometric view from Orthogonal / Sectional views of Simple Solid Objects

- Principles of Orthographic Projections.
- Conventions.
- Projections of Points and lines inclined to both planes.

- Auxiliary Views.
- Isometric Views of lines, Planes, Simple, and compound Solids.
- Conversion of Isometric Views to Orthographic Views and Vice-versa.

Module 6: Sections and Sectional Views of Right Angular Solids

- Full and half-sectional views of solids.

Module 7: Development Of Surfaces

- Prism, Cylinder, Cone.

Module 8: Computer-Aided Drafting (Using AutoCAD and/or similar softwares)

- Introduction: Cartesian and Polar coordinate system, Absolute and Relative coordinates.
- Basic editing commands: Line, Point, Trace, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline.
- Editing methods.
- Basic object selection methods, Window and crossing window, Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror.
- Display commands: Zoom, Pan, Redraw, Regenerate.
- Simple dimensioning and text.
- Simple exercises.

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.
2. K. Venugopal, Engineering Drawing + AutoCAD, New Age International publishers.

Reference Books:

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House.
2. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
4. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publishers.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS2503			
Course Title	LIFE SKILLS			
Category				
LTP & Credits	**L**	**T**	**P**	Credits
	0	0	1	1
Total Contact Hours	30			
Pre-requisites	None			

Learning Objective:

Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes. Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at. This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underlie personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

Course Outcomes:

After the completion of the course, the student will be able to:

- **CO1:** Define and identify different life skills required in personal and professional life.
- **CO2:** Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
- **CO3:** Explain the basic mechanics of effective communication and demonstrate these through presentations.
- **CO4:** Take part in group discussions for goal-setting, decision-making, and problem-solving, and work effectively in teams to achieve common goals.
- **CO5:** Use appropriate thinking and problem-solving techniques to solve new problems.

Course Content:

Module 1:[6L]

Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, Problem solving, Effective communication, Interpersonal relationships, Coping with stress, Coping with emotion.
Life Skills for Professionals: Positive thinking, Right attitude, Attention to detail, Having the big picture, Learning skills, Research skills, Perseverance, Setting goals and achieving them, Helping others, Leadership, Motivation, Self-motivation, and motivating others, Personality development, IQ, EQ, and SQ.

Module 2:[7L]

Self-awareness: Definition, need for self-awareness; Coping with stress and emotions, Human values, tools and techniques of SA: Questionnaires, journaling, reflective questions, meditation, mindfulness, psychometric tests, feedback.

Stress Management: Stress, reasons and effects, identifying stress, stress diaries, the four A's of stress management, techniques, Approaches: action-oriented, emotion-oriented, acceptance-oriented, resilience, Gratitude Training.

Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method and relaxation techniques.

Morals, Values, and Ethics: Integrity, Civic Virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Time management, Co-operation, Commitment, Empathy, Self-confidence, Character, Spirituality, Avoiding procrastination, Sense of engineering ethics.

Module 3:[5L]

21st Century Skills: Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left Brain & Right Brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

Steps in Problem Solving: Problem Solving Techniques, Six Thinking Hats, Mind Mapping, Forced Connections, Analytical Thinking, Numeric, symbolic, and graphic reasoning. Scientific temperament and Logical thinking.

Module 4:[6L]

Group and Team Dynamics: Introduction to Groups: Composition, formation, cycle, thinking, clarifying expectations, problem solving, consensus, dynamics techniques, Group vs Team, Team dynamics, Virtual teams. Managing team performance and managing conflicts, Entrepreneurship

Case Studies: Students analyze real-world case studies to apply life skills concepts to practical problems.

Module 5:[6L]

Leadership: Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, turnaround leadership, managing diverse stakeholders, crisis management. Types of leadership, traits, styles, VUCA leadership, levels of leadership, transactional vs. transformational leaders, leadership grid, effective leaders.

Self-Assessment Quizzes: Students complete self-assessment quizzes to reflect on their strengths, weaknesses, values, and goals.

. **Text Books**

1. BarunK.Mitra,“Personality Development & Soft Skills”, Oxford Publishers, Third impression,2017.

Reference Books:

1. ShivKhera,“You Can Win”, MacmillanBooks,NewYork,2003.
2. ICT Academy of Kerala,"Life Skills for Engineers ", McGraw-Hill Education (India) Private Ltd.,2016.
3. Caruso, D. R. and Salovey P, “The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership”,JohnWiley & Sons, 2004.
4. Kalyana, “Soft Skill for Managers”; First Edition;Wiley Publishing Ltd,2015.
5. Larry James,“The First Book of Life Skills”; FirstEdition,EmbassyBooks,2016.

CO-PO Mapping:

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

Semester 3 Curriculum and Syllabus

Course Code	YMT3001			
Course Title	Probability and Statistics			
Category	SCI,Minor			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

In this course, students will learn about the basic knowledge of probability and statistics. At the end of the course, the students will be able to solve different real-life problems in the field of artificial intelligence, data science, etc.

Course Outcome:

CO1: To explain and demonstrate the distinctive characteristics of probability distribution.
CO2: To analyze the probability of real-world uncertain phenomena by identifying probability distribution that fits the phenomena.
CO3: To explain and demonstrate the distinctive characteristics of statistics.
CO4: To apply and analyze the uses and limitations of statistical analysis.
CO5: Apply probability and statistical concepts to solve problems in artificial intelligence, data science, and other relevant fields.

Course Content:

Module 1: Basic Probability [3L]
Sample space and events,probability,axioms of probability, some elementary theorems, conditional probability, Baye's Theorem.

Module 2: Random Variable and Distribution [12L]
Discrete and continuous random variable, Probability density function and probability mass function for single variable only, Distribution function and its properties, Definitions of Expectation and Variance, properties and examples, Some important discrete distribution: Binomial and Poisson distribution and related problems. Some important continuous distribution: Normal, uniform and Exponential distributions and related problems.

Module 3: Basic Statistics [9L]
Measures of central tendency, Measure of dispersion, Measure of skewness and kurtosis, Correlation, regression and rank correlation.

Module 4: Applied Statistics [12L]
Curve fitting by the method of least squares: fitting of straight lines, second-degree parabolas and more general curves. Sampling, Testing of hypothesis: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Small samples Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text/Reference Books:

1. E.Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons.
2. B.S.Grewal, “Higher Engineering Mathematics”, Khanna Publishers.
3. N.G.Das, “Statistical Methods (Combined Volume)”, Tata-McGrawHill.
4. R.GargandC.Prasad, “Advanced Engineering Mathematics”, Khanna Publishers.
5. S.Ross, “A First Course in Probability”, Pearson Education India.
6. W.Feller, “An Introduction to Probability Theory and its Applications, Vol.1”, Wiley.
7. J.E.FreundandR.E.Walpole, “Mathematical Statistics”, Prentice Hall.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3

Course Code	YCS3001			
course Title	Digital Logic and Electronics			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:
In this course, students will learn about the representation of numbers in a computer system and how digital circuits can be designed using logic gates and flip-flops. They will also learn about the process of digital-to-analog and analog-to-digital conversions. After completing this course, students will be in a better position to understand the basic operation of a computer system and how various functional blocks can be implemented.

Course Outcome:

CO1: Explain the binary number system and its importance in digital circuit design.
CO2: Classify and analyze various ways of minimizing switching functions.
CO3: Understand the process of designing combinational logic circuits.
CO4: Understand the process of designing sequential logic circuit modules.
CO5: Understand and remember the process of analog-to-digital and digital-to-analog conversion.

Course Content:

Module 1: Number Systems and Binary Codes [7L]

- Introduction to number systems: decimal, binary, octal, hexadecimal.
- Conversion from one number system to another.

- Signed number representation: sign-magnitude, 1's complement, and 2's complement.
- Addition and subtraction of numbers.
- Binary codes: BCD, excess-3 code, gray code.
- Introduction to floating-point representation and its importance in representing real numbers in digital systems.

Module 2: Logic Families and Minimization of Switching Functions [10L]

- Logic gates and their functionalities.
- Logic families: TTL, nMOS, CMOS, pass transistor logic.
- Realization of gates.
- Boolean algebra, truth tables, and switching functions.
- Minimization of completely and incompletely specified switching functions: Karnaugh Map and Quine-McCuskey methods.
- Explanation of buffer and tri-state buffer operations and their applications in digital circuits.
- Introduction to HDL and its importance in describing digital circuits for synthesis and simulation.

Module 3: Combinational Logic Circuits [9L]

- Realization of Boolean functions using NAND/NOR gates.
- Half-adder, full-adder, and ripple-carry adder/subtractor.
- Decoders, Encoders, and Multiplexers: applications in logic design.
- Adder-Subtractor Circuits: Detailed explanation of adder-subtractor circuits and their applications in arithmetic operations.
- Comparator Circuits: Introduction to comparator circuits and their use in comparing binary numbers.

Module 4: Sequential Logic Circuits [9L]

- Clocks, flip-flops, and latches.
- Types of flip-flops: SR, D, JK, T; Edge-triggered and master-slave flip-flops.
- State table and state diagram, state minimization, synthesis of finite state machines (FSMs).

Module 5: Counters and Registers [6L]

- Synchronous and asynchronous counters, up/down counters.
- Applications of counters.
- Registers: parallel-in parallel-out and shift registers, linear feedback shift register (LFSR).
- Applications of registers in datapaths.

Module 6: D/A and A/D Conversion Techniques [7L]

- Digital-to-analog converters: principle of operation, weighted resistor and resistive ladder D/A converters.
- Analog-to-digital converters: resolution and accuracy.
- Types of A/D converters: flash type, counter type, successive-approximation type.
- Sigma-Delta ADCs: Introduction to sigma-delta analog-to-digital converters and their advantages in achieving high resolution.
- Successive Approximation Register (SAR) ADCs: Detailed explanation of successive approximation register ADCs and their operation principles.
-

Text/Reference Books:

1. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory (3rd Ed.)", Cambridge University Press.
2. M. Morris Mano, "Digital Design (3rd Ed.)", Pearson.
3. G. De Micheli, "Synthesis and Optimization of Digital Circuits", Tata-McGraw-Hill

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS3002				
Course Title	Computer Organization and Architecture				
Category	ENGG, Major				
LTP & Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	36				
Pre-requisites	a)Digital Circuits and Logic Design				

Learning Objective:

In this course, students will learn about the evolution of computer systems and development in computer organization and architecture. Special emphasis will be placed on the various functional units of a computer system and how instructions are executed. By the end of the course, students will have a better understanding of how programs are executed in a computer system.

Course Outcomes:

CO1: Explain the process of instruction execution.

CO2: Analyze and design the control unit of a computer system.

CO3: Analyze and design adder, multiplier, and division units.

CO4: Analyze and design memory subsystems.

CO5: Explain and classify various input/output data transfer techniques.

Course Content:

Module 1: Evolution of Computer System [4L]

- Introduction to computing system
- Computer organization and architecture
- Basic functional units of a computer
- Evolution of computers

- Stored-program concept
- Von Neumann and Harvard models

Module 2: Basic Operation of Computer [7L]

- Instruction Set Architecture
- CPU registers
- Instruction format and encoding
- Addressing modes
- Instruction set
- Instruction types
- Instruction decoding and execution
- Basic instruction cycle
- Reduced Instruction Set Computer (RISC)
- Complex Instruction Set Computer (CISC)
- Case study: MIPS Instruction set, MIPS assembly language programming
- Pipelining: Basic concepts, pipeline hazards, techniques to overcome hazards (e.g., forwarding, stalling, branch prediction)
- Case study: Pipeline stages and operation in a modern processor (e.g., Intel or AMD processors)

Module 3: Processor Unit Design [7L]

- Register transfer operations
- Internal single and multi-bus architecture
- Design of control unit: hardwired control unit design, microprogrammed control unit design, concept of control word and control store
- Horizontal, vertical, and diagonal microprogrammed control unit design

Module 4: Arithmetic Unit Design [6L]

- Adder and subtractor
- Shift-and-add multiplication
- Signed multiplication: Booth's algorithm, integer division, restoring and non-restoring division

- Floating-point representation: IEEE floating point format, floating-point arithmetic
- Superscalar and out-of-order execution: Concepts and advantages
- Speculative execution: Purpose and implementation in modern processors

Module 5: Memory Unit Design [7L]

- Basic memory types: Random Access Memory (RAM), Read Only Memory (ROM), Static RAM, Dynamic RAM
- Memory hierarchy
- Cache memory: mapping techniques, memory interleaving
- Virtual memory: Concepts, benefits, implementation (e.g., page tables, TLB)
- Memory management techniques: Fragmentation, compaction, techniques to reduce fragmentation (e.g., buddy system)

Module 6: Input Output Organization [5L]

- I/O mapped I/O and Memory mapped I/O
- Synchronous and Asynchronous serial data communication
- Secondary memory: disk, flash memory
- I/O Data transfer techniques: Programmed I/O, Interrupt-driven I/O, Direct Memory Access (DMA)

Text/Reference Books:

1. C. Hamacher, Z. Vranesic, and S. Zaky, “Computer Organization (5th Ed.)”, Tata-McGraw-Hill.
2. W. Stallings, “Computer Organization and Architecture (6th Ed.)”, Prentice Hall of India.
3. D. A. Patterson, and J. L. Hennessy, “Computer Organization and Design – The Hardware/Software Interface”, Morgan Kaufmann.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS3003			
Course Title	Design and Analysis of Algorithms			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			

Learning Objective: The course will cover topics such as algorithm complexity concepts and diverse algorithmic designs, including divide and conquer, dynamic programming, and greedy algorithms. It will also include important search and sorting algorithms, graphs, and basic approaches to optimization.

Course Outcome:

1. To understand the concepts of time and space complexity, worst case, average case, and best case complexities, and the big-O notation.
2. To apply design principles and concepts to algorithm design.
3. To understand and analyze the mathematical foundation in the analysis of algorithms.
4. To explain and classify different algorithmic design strategies.
5. To analyze the efficiency of algorithms using time and space complexity theory.

Course Content:

1. Complexity Analysis [7L]
    - Time and space complexity
    - Different asymptotic notations and their mathematical significance
    - Solving recurrences: substitution method, recurrence tree method, Master Theorem
2. Divide and Conquer [9L]
    - Basic concept
    - Examples: binary search, merge sort, quick sort and their complexity (all three cases)
    - Heap sort and its complexity
    - Karatsuba algorithm
    - Introduction to randomized algorithms and their application in divide and conquer
    - Lower Bound Theory: Comparison trees, Oracle and adversary argument, State space method

3. Dynamic Programming [14L]
    - Basic concepts
    - Matrix chain manipulation
    - Strassen's algorithm
    - Longest common subsequence
    - All-pair shortest paths (Floyd Warshall)
    - Single-source shortest path (Dijkstra, Bellman-Ford)
    - 0/1 Knapsack problem
    - Traveling Salesman problem
    - Greedy Method: Basic concept
    - Examples: fractional Knapsack problem, job sequencing with deadlines
    - Minimum cost spanning tree using Prim's and Kruskal's method
    - Huffman encoding and decoding
    - Advanced dynamic programming techniques (e.g., memoization, tabulation)
    - Backtracking: Basic concept
    - Examples: n-queens problem, graph coloring problem
    - Disjoint Set Manipulation: Set manipulation algorithm like UNION-FIND, union by rank
4. String Matching Problem [10L]
    - Different techniques: Naive algorithm, string matching using finite automata, and Knuth, Morris, Pratt (KMP) algorithm with their complexities
    - Rabin-Karp algorithm for string matching with a rolling hash function
    - Boyer-Moore algorithm for string searching with a heuristic to skip comparisons
    - Amortized Analysis and Network Flow: Aggregate, Accounting, and Potential Method
    - Ford Fulkerson algorithm
    - Max-Flow Min-Cut
5. Notion of NP-Completeness [8L]
    - NP class, NP-hard class, NP-complete class, their interrelationship
    - Reductions and Polynomial time Reducibility
    - Satisfiability problem (3-SAT and 2-SAT)
    - Cook-Levin's theorem
    - Clique decision problem
    - Vertex Cover problem
    - Additional small important topics in existing modules

Text/Reference Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, “Introduction to Algorithms”, MIT Press.
2. E. Horowitz and S. Sahni, “Fundamentals of Computer Algorithms”, Universities Press.
3. K. Mehlhorn and P. Sanders, “Data Structures and Algorithms”, Springer.
4. A. Aho, J. Hopcroft, and J. Ullman, “Design and Analysis of Computer Algorithms”, Addison-Wesley.
5. D.E. Knuth, “The Art of Computer Programming (Vol.3)”, Addison-Wesley.

. CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS3101			
course Title	Digital Logic and Electronics Laboratory			
Category	ENGG, Minor			
LTP &Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:
In this laboratory course, students will conduct hands-on sessions for the design and implementation of combinational and sequential digital circuit modules, as well as interfacing LED and 7-segment display units.

Course Outcome:

CO1: To understand and test the functionalities of basic gates.
CO2: To understand Boolean functions using various combinational circuit modules (like gates, multiplexer, decoder, etc.).
CO3: To understand and verify the functions of flip-flops and other sequential circuit elements (like counter, register, etc.).
CO4: To understand and analyze complex digital systems and verify the functionality.
CO5: To design a data path consisting of an ALU, registers, and multiplexers, and then design the control path to compute the Greatest Common Divisor (GCD) of two numbers.

Course Content:

1. Design a basic inverter using transistors, obtain the transfer characteristics, and measure the propagation delay. Repeat the experiment using an inverter chip.

2. Given a Boolean function, minimize it and realize the function using NAND gates. Using a 555 timer, design a rectangular waveform generator of a given frequency.
3. Design a full-adder using basic gates. Cascade two such full-adders to realize a 2-bit adder. Connect LEDs to observe the outputs and verify the functionality.
4. Verify the functionality of multiplexer and decoder chips. Implement a 4-variable Boolean function using an 8-to-1 multiplexer.
5. Implement RS and JK master-slave flip-flops using NAND gates and verify their functionalities. Verify the functionality of a J-K flip-flop chip.
6. Using JK or D flip-flops, design a 4-bit shift register and verify the functionality. Modify the designs to make it into (a) a ring counter, (b) Johnson counter and verify the functionality.
7. Design a 3-bit synchronous counter that counts in some arbitrary count sequence. Apply a square wave at the clock input and analyze the waveforms observed.
8. Design a 2-digit BCD counter and display the count value on 7-segment display units.
9. Design an 8-bit modulo-N counter for some arbitrary value of N. Connect a D/A converter at the output of the counter and observe the output waveform. Analyze the operation for various values of N. Use the circuit to display the transfer characteristic of a NOT gate on the oscilloscope.
10. Design a data path consisting of an ALU, registers, and multiplexers. Hence design the control path to compute the GCD of two numbers.

Text/Reference Books:

1. Z. Kohavi and N. K. Jha, “Switching and Finite Automata Theory (3rd Ed.)”, Cambridge University Press.
2. M. Morris Mano, “Digital Design (3rd Ed.)”.
3. G. De Micheli, “Synthesis and Optimization of Digital Circuits”, Tata-McGraw-Hill.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 3104			
Course Title	IT Workshop Lab(SciLab/MATLAB/C++)			
Category	ENGG, Skill Enhancement Course			
LTP & Credits	L	T	P	Credits
	0	0	3	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

The purpose of this course is to learn and practice basic programming concepts, skills needed for basic problem solving, and applications—plots and built-in statistical and set operations, all using MATLAB as the vehicle. MATLAB is a powerful software package that has built-in functions to accomplish a diverse range of tasks, from mathematical operations to three-dimensional imaging. Additionally, MATLAB has a complete set of programming constructs that allow users to customize programs to their own specifications.

Course Outcome:

CO1: To impart knowledge to the students using MATLAB software that enhances programming knowledge in Research and Development.

CO2: To introduce the MATLAB technical computing environment for the analysis and visualization of data to understand and predict future scenarios.

CO3: To introduce students to the use of a high-level programming language, MATLAB, for solving scientific and engineering problems.

CO4: Reinforce a structured, top-down approach to formulate and solve problems.

CO5: Introduce common approaches, structures, and conventions for creating and evaluating computer programs, primarily in a procedural paradigm.

Course Content:

1. Basic Commands:
    - Clear Command: Removes all variables from the workspace.
    - Clc Command: Clears the command window and homes the cursor.
    - Help Command: Displays help about a topic if it exists.
    - Lookfor Command: Provides help by searching through all the first lines of MATLAB help topics and returning those that contain a keyword you specify.
    - Edit Command: Enables you to edit (open) any M-file in the Editor Window. This command does not open built-in functions like sqrt. See also the type Command.
    - More command: More on enables paging of the output in the MATLAB command window, and more off disables paging of the output in the MATLAB command window.
2. Create/Initialize Matrix:
    - Separate the elements of a row with blanks or commas, use semicolons to indicate the end of each row, and surround the entire list of elements with square brackets.
3. Matrix Operations:
    - Display the result of addition, subtraction, and multiplication operations on matrices.
4. Colon Operator:
    - Create and display vectors using the colon operator along with spacing, perform possible arithmetic operations, and validate the result.
5. Zero and Unit Matrix:
    - Create and display zero and unit matrices of the required size.
6. Matrix Manipulations:
    - Find and display the inverse and transpose of a given matrix, find the largest element in each vector of the matrix, and store it at n+1 positions of each row or vector. Also, find the

maximum element of the matrix at n+1, m+1 positions, where n and m are the sizes of the given matrix.

7. Display Results of Various Commands/Functions:
    - Diag(), prod(), median(), sort(), det(), tril(), and triu().
8. Built-in Functions:
    - Write a program to display the result of various built-in functions like abs(), atan(), ceil(), log(), rem(), sqrt(), rand(), randn(), and mod().
9. Plotting:
    - Plot a graph of y versus x, where x values range from zero to 2*pi, and y values are the sine of x.
10. Graph Labeling:
    - Display the graph with proper labeling using xlabel, ylabel, and title commands.
11. Plotting Sinc Function:
    - Plot the Sinc function, where Sinc(x) = sin(x) / x, and $-2\pi \leq x \leq 2\pi$.
12. M-File Program:
    - Write a program in an M-File to read a 3x3 Matrix, then display the diagonal of the matrix.
13. String Manipulation:
    - Write a program to read a string, then replace each character in the string with its following character in ASCII code.
14. Control Structures:
    - Programs using control structure statements. For example, display all prime numbers between two given input values.
15. Image Processing:
    - Write a program to read an image and display the resulting image of the following commands: imresize() and imhist().

Text/Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing MATLAB, Pearson Education Inc., 2004.
2. Stormy Attaway, MATLAB: A Practical Introduction to Programming and Problem Solving, Butterworth-Heinemann Publisher, 2013.
3. MathWorks Book by Cleve Moler
4. MATLAB Getting Started Guide

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 3102			
Course Title	Computer Organization and Architecture Laboratory			
Category	ENGG , Major			
LTP & Credits	L	T	P	Credits
	3	0	0	1.5
Total Contact Hours	36			
Pre-requisites	Digital Circuits Laboratory			

Learning Objective:

In this laboratory course, students will conduct experiments using a MIPS instruction set simulator. They will also learn how to model various hardware blocks using the hardware description language Verilog. They shall be designing various functional units like adder, multiplier, processor, etc., using Verilog.

Course Outcome:

CO1: To understand how to write assembly language programs in MIPS.

CO2: To design various combinational and sequential circuits using Verilog.

CO3: To design and analyze various CPU functional units using Verilog.

CO4: To apply a pipelined processor using Verilog.

CO5: To implement and simulate the MIPS 5-stage pipeline in Verilog, utilizing a subset of 16 instructions, and validate the design by composing a comprehensive test bench with sample machine language programs stored in a memory module.

Course Content:

1. Familiarization with MIPS assembly language programming using an instruction set simulator like QtSPIM.
    - Reading and displaying an arbitrary string and an integer.
    - Storing numbers sequentially in memory and finding the minimum, maximum, and sum.
    - Sorting a set of numbers stored in memory. [2 days]
2. Familiarization of function calls with MIPS assembly language programming.
    - Writing a function to compute the factorial of a given number.
    - Writing a function to compute the GCD of two numbers.
    - Writing a function to compute the N-th Fibonacci number. [2 days]
3. Familiarization with a Verilog simulator like iVerilog and writing simple combinational and sequential modules using behavioral and structural modeling with Verilog.
    - Writing a module to implement an arbitrary Boolean function (e.g., F=A'BC+C'D).
    - Writing a module to implement a full adder and hence a 4-bit ripple carry adder.
    - Writing a module to implement a D flip-flop and hence a 4-bit shift register.
    - Writing a module to implement an 8-bit up-down counter with asynchronous clear. [2 days]
4. Writing Verilog modules to implement functional blocks used in computer organization.
    - Writing a module to implement a 16-bit arithmetic and logic unit with 8 functions.
    - Writing a module to implement read/write operations in a 1024x16 memory system. [2 days]
5. Implementing the MIPS 5-stage pipeline in Verilog, using a subset of 16 instructions. The design has to be tested by writing a test bench containing sample machine language programs stored in a memory module. [4 days]

Text/Reference Books:

1. qtSPIM simulator, http://spimsimulator.sourceforge.net/
2. MIPS overview, https://tams.informatik.uni-hamburg.de/applets/hades/webdemos/mips.html
3. M. M. Mano and M. D. Ciletti, "Digital Design: with an Introduction to Verilog HDL (5th Ed.)", Pearson Education.
4. J. Bhasker, "Verilog HDL Synthesis: A Practical Primer", B.S. Publications.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS3103			
Course Title	Design and Analysis of Algorithms Laboratory			
Category	ENGG , Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	a)Programming Practices I			

Learning Objective:

The course aims to provide strategies (divide and conquer, dynamic programming, greedy method) to solve problems in computer science effectively. Using these paradigms, the course will demonstrate innovative and effective approaches to solving specific problems. Rigorous proof of algorithm validity will be emphasized.

Course Outcome:

CO1: To prove the correctness and analyze the running time of basic algorithms.

CO2: To design algorithms using dynamic programming, greedy method, backtracking, branch and bound strategy, and to describe algorithms that employ these strategies.

CO3: To compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem.

CO4:To identify and analyze criteria and specifications appropriate to new problems.

CO5:To apply algorithmic design techniques to solve real-world scheduling and routing problems, demonstrating proficiency in graph coloring, backtracking, and optimization approaches.

Course Content:

1. Experiments on Divide and Conquer Approach:
    - Binary Search (Recursive & Iterative)

- Merge Sort, Heap Sort, Quick Sort
- Find Maximum and Minimum element from an array of integers Duration: 2 days

2. Experiments on Dynamic Programming:
    - Minimum number of scalar multiplications needed for chain of matrix
    - All pair of shortest paths for a graph
    - Single-source shortest path for a graph (Dijkstra, Bellman-Ford)
    - Longest common subsequence problem Duration: 2 days
3. Experiments on Backtracking:
    - The n-Queens problem
    - Graph Coloring problem Duration: 2 days
4. Experiments on Greedy Methods:
    - Knapsack problem
    - Job sequencing with deadlines
    - Minimum cost spanning tree by Prim's and Kruskal's algorithm Duration: 2 days
5. Innovative Experiments:
    - Take the university timetable for all departments. Write a computer program to find all conflicts within the timetable using graph coloring approach. Provide a solution using Backtracking. Compute the distance and find the stoppages every classmate of yours cover to reach the institute. Then assume their speeds based on their travelling modes. Compute each student's minimum time to reach the institute premises. Duration: 2 days

Text/Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to Algorithms", MIT Press.
2. E. Horowitz and S. Shani, "Fundamentals of Computer Algorithms", Universities Press.
3. K. Mehlhorn and P. Sanders, "Data Structures and Algorithms", Springer.

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CO-POMapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Semester 4 Curriculum and Syllabus

Course Code	YCS4005			
Course Title	Discrete Mathematics			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

In this course, the students will learn about the mathematical foundations of computer science. The specific topics that would be covered include propositional calculus and proof techniques, set theory and other derived algebraic structures, recurrence relations, and the theory of graphs. The course will be very helpful for the students as it acts as a prerequisite for various next-level courses like algorithms, automata theory, artificial intelligence, etc.

Course Outcome:

CO1: To explain the distinctive characteristics of propositional logic and its applications.
CO2: To demonstrate the applications of various proof techniques.
CO3: To explain the basic concepts of sets, relations, functions, and various algebraic structures.
CO4: To understand the concept of recurrence relations and methods of solution.
CO5: To explain and analyze the concept of graphs and various graph algorithms.

Course Content:

Module 1: Propositional Logic [6L]

- Introduction to Propositional Calculus: Propositions, Logical Connectives, Conjunc- tion, Disjunction, Negation.
- Conditional Connectives, Implication, Converse, Contra- positive, Inverse, Bi-conditional statements, Logical Equivalence, Tautology.
- Conjunctive and disjunctive normal forms.
- Universal and existential quantifiers and their negations.

Module 2: Proof Techniques [6L]

- Forward proof, proof by contradiction, contrapositive proofs, proof by mathematical induction, proof of necessity and sufficiency.
- Weak Induction and Strong Induction.

Module 3: Sets, Relations and Functions [8L]

- Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations.
- Finite and infinite set, countable and uncountable sets.
- Algebraic structures with one binary operation: semigroups, monoids, and groups.
- Algebraic structures with two binary operations: rings and fields.
- Power Sets, Cardinality of Finite and Infinite Sets.

Module 4: Recurrence Relations [6L]

- Recurrence relations: Formulation of different counting problems in terms of recurrence

relations.

- Solution of recurrence relations with constant coefficients by (i) iterative method, (ii) characteristic roots method, (iii) generating functions method.
- Pigeonhole principle.

Module 5: Introduction to Graphs [10L]

- Graphs and their basic properties: digraphs, weighted graph, connected and disconnected graph, bipartite graph, complement of a graph, regular graph, complete graph, walk, path, circuit, Euler graph, cutset, cutvertices, adjacency and incidence matrices of a graph, isomorphism.
- Graph coloring problem, planar graphs, trees.
- Hamiltonian Graphs, Dijkstra's Algorithm.

Text/Reference Books:

1. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill.
2. J-P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill Education.
3. S.K. Chakraborty and B.K. Sarkar, "Discrete Mathematics", Oxford University Press.
4. R. Graham, D.E. Knuth, and O. Patashnik, "Concrete Mathematics: A Foundation for Computer Science", Addison-Wesley.
5. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice-Hall.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4001			
Course Title	Operating Systems			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	Data Structures and Algorithms			

Learning Objective:

In this course, students will learn about the role of an operating system as the interface between application programs and computer hardware. They will understand how the operating system manages various computer resources, which is essential for handling large software projects

effectively.

Course Outcomes:

CO1: To explain the role of an operating system and how it acts as an interface between hardware and software.
CO2: To contrast the concepts of processes and threads, and how they are scheduled.
CO3: To demonstrate the use of various synchronization tools in solving the critical section problem.
CO4: To explain and classify various memory management techniques, including virtual memory.
CO5: To apply the knowledge of data structures to explain how file systems can be implemented on secondary storage.

Course Content:

Module 1: Introduction to Operating Systems [4L]

- Functionalities of an operating system – hardware/software interface.
- Evolution of operating systems – batch, multi-programmed, time-sharing, real-time, distributed.
- Simultaneous Peripheral Operations On-Line (SPOOL).
- Protection and Security – user/supervisory mode, privileged instructions, system calls (invoking OS services).

Module 2: Processes and Threads [7L]

- Processes – basic concept, process control block (PCB), process state transition diagram.
- Process scheduling – independent and cooperating processes, inter-process communication using shared memory and message passing. Case studies from Unix/Linux.
- Threads – lightweight process concept, benefits of threads, user and kernel-level threads, using thread library in Unix/Linux.
- CPU Scheduling – scheduling criteria, preemptive and non-preemptive scheduling. Scheduling algorithms – FCFS, SJF, SRTF, RR, priority, multi-level feedback queue.

Module 3: Process Synchronization and Deadlocks [7L]

- Classical problems of process synchronization – producer-consumer, reader-writer, dining philosopher, etc.
- Critical section problem – illustration, software solutions, solution using synchronization hardware: test-and-set (TST) and SWAP instructions.
- Semaphores – definition, binary and counting semaphores, implementation of semaphores, minimizing busy waiting. Case studies from Unix/Linux.
- Deadlocks – deadlock characterization, methods of handling deadlock, deadlock prevention versus deadlock avoidance, Banker's algorithm.

Module 4: Memory Management [8L]

- Logical versus physical address space, swapping, contiguous memory allocation, memory protection using fence registers.
- Paging – basic concept, performance analysis, translation look-aside buffer (TLB). Segmentation.
- Virtual memory – separation of logical and physical address space, demand paging, locality of reference. Page replacement algorithms – FCFS, LRU, Optimal, Belady's anomaly. Thrashing, working set model.
- Page table structure and its optimization techniques. Segmentation with paging (combined scheme). Memory protection and access control mechanisms. Shared memory and memory-mapped files.
- Case studies on memory management in modern operating systems (e.g., Windows, macOS, Linux).

Module 5: Device and File Management [7L]

- Disk structure – cylinders, tracks, and sectors.
- Disk scheduling algorithms – FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.
- File system – file concept, access methods, directory and file system structure, allocation methods (contiguous, linked, indexed), free space management. Case study for Unix/Linux.
- Disk management optimizations (e.g., track skewing, clustering, buffering), RAID levels and their implications for performance and fault tolerance.
- File system reliability and recovery mechanisms (e.g., journaling, shadowing), Network file systems and distributed file systems (e.g., NFS, AFS, CIFS).
- Case studies on file systems used in cloud computing and distributed systems.

Module 6: Miscellaneous Topics [3L]

- Brief overview of real-time and distributed operating systems, mobile operating systems.

Text/Reference Books:

1. A. Silberschatz, P. B. Galvin, and G. Gagne, "Operating System Concepts", Wiley Asia.
2. D. M. Dhamdhere, "Operating Systems: A Concept-Based Approach", Tata McGraw-Hill.
3. M. Bach, "Design of the Unix Operating System", Prentice-Hall of India.
4. W. Stallings, "Operating Systems: Internals and Design Principles", Prentice-Hall of India.
5. C. Crowley, "Operating System: A Design-Oriented Approach", Irwin Publishing.
6. G. J. Nutt, "Operating Systems: A Modern Perspective", Addison-Wesley.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4002			
Course Title	Formal Language and Automata Theory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	Discrete Mathematics Programming and Data Structures			

Learning Objective:

In this course, students will learn the theory of computation, including formal language classes and their relationships, techniques to prove or disprove theorems in automata theory using its properties, and approaches to determine the decidability and intractability of computational problems. At the end of the course, students will be able to analyze complex problems and automata to find solutions.

Course Outcome:

CO1: Explain the basic properties of formal languages and grammars.

CO2: Understand the tools for recognizing different formal languages.

CO3: Differentiate between regular, context-free, and recursively enumerable languages.

CO4: Apply the theory of computation and computational models, including decidability and intractability.

CO5: Analyze complex problems and automata to find solutions using the theory of computation and computational models, including decidability and intractability.

Course Content:

1. Module 1: Introduction to Finite Automata [10L]
    - Finite Automata, Alphabets, Strings, Languages
    - Regular Languages, Deterministic Finite Automata (DFA)
    - Nondeterministic Finite Automata (NFA)
    - Equivalence of NFA and DFA
    - Minimization of Finite Automata
    - Myhill-Nerode Theorem
    - FA with output: Moore and Mealy machine
2. Module 2: Properties of Regular Expression [7L]
    - Operators of regular expression and their precedence
    - Algebraic laws for Regular expressions
    - Kleen’s Theorem
    - Regular expression to FA
    - Non-Regular Languages
    - Pumping Lemma for regular Languages

3. Module 3: Language & Grammar Formalism [9L]
    - Grammars, Regular grammars
    - Context-Free Grammar
    - Derivation, Derivation trees
    - Ambiguity in Grammar
    - Simplification of CFGs
    - Normal forms for CFGs - CNF and GNF
4. Module 4: PushDown Automata [4L]
    - PDA Description and definition
    - Acceptance by Final state, Acceptance by empty stack
    - Deterministic PDA
    - Equivalence of PDA and CFG
5. Module 5: Turing Machines and Decidability [6L]
    - Basic model, Definition and representation
    - Language acceptance by TM
    - Church's Thesis
    - Recursive and recursively enumerable languages
    - Halting problem
    - Introduction to Undecidability

Text/Reference Books:

1. J. D. Ullman, J. Hopcroft and R. Motwani, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 2007
2. P. Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett Learning, 2012
3. K. L. P. Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall India, 2008
4. M. Sipser, "Introduction to Theory of Computation", Thomson Course Technology, 2006
5. J. C. Martin, "Introduction to Languages and Theory of Computations", McGraw Hill, 2011

6. E. A. Rich, Automata, "Computability and Complexity", Pearson Education, Inc., 2019

7. D. Kozen, "Automata and Computability", Springer, 1997

8. H. R. Lewis and C. H. Papadimitriou, "Elements of the Theory of Computation", Prentice Hall of India Private Ltd., 1998

9. Z. Kohavi and N. K. Jha, "Switching and Finite Automata Theory", Cambridge University Press, 2010

10. D. I. A. Cohen, "Introduction to Computer Theory", John Wiley & Sons, Inc., 1986

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4003			
Course Title	Object Oriented Programming using Java			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a) Fundamentals of Programming b) Object Oriented Programming			

Learning Objective:

The course aims to provide a comprehensive understanding of Java programming with a focus on object-oriented concepts. Students will learn the fundamentals of Java, including data types, variables, control statements, and arrays. They will also gain knowledge of OOP principles such as encapsulation, inheritance, polymorphism, and abstraction. Additionally, the course covers advanced topics like exception handling, multithreading, and GUI programming in Java.

Course Outcome:

CO1: Explain the process of interaction between objects, classes, and methods.

CO2: Acquire a basic knowledge of Object Orientation with different properties.

CO3: Analyze various string handling functions with various I/O operations.

CO4: Discuss basic code reusability features with respect to Inheritance, package, and Interface.

CO5: Implement Exception handling, Multithreading, and Applet (Web program in Java) programming concepts in Java.

Course Content:

Module 1: Java Basics (8 Hours)

- JVM architecture
- Data types, variables, and operators
- Control statements
- Arrays
- Exception handling
- Java Collections Framework (List, Set, Map, ArrayList, LinkedList, HashSet, HashMap)

Module 2: Object-Oriented Programming (7 Hours)

- Encapsulation
- Class fundamentals
- Object & Object reference
- Constructors
- Access control
- Nested methods
- Abstract Class & Interfaces
- Enumerations
- Packages
- Reflection

Module 3: Inheritance and Polymorphism (9 Hours)

- Types of inheritance
- Member access rules
- Usage of this and Super keyword

- Method Overloading and Overriding
- Abstract classes
- Dynamic method dispatch
- Packages and Interfaces
- I/O Streams

Module 4: Exception Handling and Multithreading (6 Hours)

- Exception types
- Try, Catch, Throw, Throws, Finally
- Thread basics
- Thread Life-Cycle
- Synchronizing Threads
- Inter Communication of Threads
- Critical Factor in Thread
- Deadlock

Module 5: GUI Programming and Applet (6 Hours)

- Applet vs. Application
- Applet Lifecycle
- GUI Programming basics
- AWT Components
- Swing Components
- Java Utilities (java.util Package)

Text/Reference Books:

1. "Java: The Complete Reference" by H. Schildt and C. Dann
2. "Programming With Java: A Primer" by E. Balagurusamy
3. "Thinking in JAVA" by B. Eckel
4. "Database Programming with JDBC and JAVA" by G. Reese

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YBB4001			
Course Title	Principles of Management			
Category	HUM, Ability Enhancement Course			
LTP & Credits	L	T	P	Credits
	2	0	0	2
Total Contact Hours	24			
Pre-requisites	None			

Learning Objective:

In this course, students will learn about the fundamental principles of management used in the industry and different organizations. They will study various fields of management and related theories, applying them practically to enhance their management skills. By the end of the course, students will understand and interpret the knowledge and skills necessary to work as effective managers.

Course Outcomes:

CO1: To familiarize students with the origins of management principles and compare them with modern trends in management theories.

CO2: To understand the essential functions of management along with theories framed by management experts in the business field.

CO3: To explain the managerial process and related functions that facilitate change.

CO4: To understand the relationship between various levels of management in a business organization and the process of achieving objectives.

CO5: To explain the importance of feedback control in the management process, along with relevant theories, and to apply proper management principles in modern business practices to solve problems.

Course Content:

Module 1: Management [4L]

- Definition, Nature, Importance, and Evolution of Management
- Contributions of Fayol, Taylor, Hawthorne, Maslow
- Management as an Art or Science?
- Functions of a Manager (Duties and Responsibilities)
- Ethics in Management

Module 2: Planning and Control [4L]

- Planning (Steps, Types, and Barriers)
- McKinsey Approach, SWOT Analysis
- Operational and Strategic Planning
- Controlling (Concept, Relationship with Planning, Process, Dimensions)
- Management by Objectives (MBO)

Module 3: Decision Making and Organizing [4L]

- Decision Making Process
- Certainty and Uncertainty in Decisions
- Brainstorming
- Process of Organizing
- Authority and Responsibility
- Delegation and Empowerment
- Centralization and Decentralization
- Departmentation

Module 4: Staffing [4L]

- Manpower Planning
- Job Design
- Selection and Recruitment
- Training and Development
- Performance Appraisal

Module 5: Leadership and Communication [3L]

- Role of Leadership
- Theories of Leadership
- Qualities of a Good Leader
- Development of Leadership
- Communication Process and Types
- Electronic Media

Module 6: Group Dynamics [2L]

- Group Concept
- Stages of Group Formation
- Types of Groups

Module 7: Recent Trends in Management [3L]

- Social Responsibility in Management
- Changes in Management
- Total Quality Management (TQM)
- Stress Management
- International and Global Management
- Crisis Management

Text/Reference Books:

1. H. Cortes, D. S. Bright, and E. Hartman, "Principles of Management".
2. R. B. Rudani, "Principles of Management".
3. M. Gupta, "Principles of Management".
4. L. M. Prasad, "Principles and Practice of Management".

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4101			
Course Title	Operating Systems Laboratory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	Data Structures and Algorithms			

Learning Objective:

In this laboratory course, students will carry out various software assignments on Unix/Linux shell

programming and system calls. Additionally, assignments for simulating important OS modules like CPU scheduling, file system, etc., shall be carried out.

Course Outcome:

CO1: To learn how to write shell scripts.
CO2: To learn how to use Unix/Linux system calls and to design a shell program.
CO3: To analyze the performance of CPU scheduling algorithms through simulation.
CO4: To learn how to use multi-threaded programming.
CO5: To design and implement one OS module like memory management, file system, etc.

Course Content:

Suggestive List of Experiments:

1. Write shell scripts using "bash" shell scripting language for simple system administration tasks, text search and replacement, directory and file manipulation, simple numeric computations, etc.
2. Write programs in C for familiarization with the Unix/Linux system calls fork, exec, wait, exit, dup, pipe, shared memory, etc.
3. Write a command-line interpreter (shell) program using the Unix/Linux system calls with the facilities for: (a) running executable programs, (b) running a program in the background, (c) input and output redirection, (d) command piping.
4. Implementation of various CPU scheduling algorithms in C and compare their performances.
5. Write programs using the "pthread" library with multiple threads and use semaphores for mutual exclusion.
6. Design and implement a Unix-like memory-resident file system using the concept of inodes. OR Implementation of memory management system supporting virtual memory, and analyze the performance.

Text/Reference Books:

1. A. Silberschatz, P. B. Galvin, and G. Gagne, "Operating System Concepts," Wiley Asia.
2. D. M. Dhamdhere, "Operating Systems: A Concept-Based Approach," Tata McGraw-Hill.
3. M. Bach, "Design of the Unix Operating System," Prentice-Hall of India.

CO-POMapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4102

Course Title	Numerical Methods Laboratory			
Category	ENGG,Minor			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	C programming			

Learning Objective:

- To provide an overview of numerical techniques applicable to engineering problems.
- To offer insight into the implementation of these techniques.
- To build confidence in tackling numerical solutions.
- To understand the underlying physics behind numerical methods.
- To aid in method selection by understanding how methods work and their limitations.

Course Outcomes:

CO1: Demonstrate proficiency in using computer programming tools for engineering calculations.
CO2: Construct simple computer algorithms using a programming tool.
CO3: Apply simple numerical methods to solve engineering-related mathematical problems.
CO4: Appreciate the limitations and applicability of numerical methods.
CO5: Utilize computer-based numerical methods for solving engineering problems.

Course Content:

Unit I: Solution for Systems of Non-linear Equations
- Roots of non-linear equations using Bisection Method.
- Roots of non-linear equations using Regula Falsi or False Position Method.
- Roots of non-linear equations using Newton-Raphson Method.

Unit II: Solution for Systems of Linear Algebraic Equations
- System of linear equations using Gauss-Elimination Method.
- System of linear equations using Gauss-Seidal Iteration Method.
- System of linear equations using Gauss-Jordan Method.

Unit III: Numerical Integration
- Numerical integration using Trapezoidal Rule.
- Numerical integration using Simpson's Rules.

Unit IV: Solution of Interpolation Polynomial
- Solution using Newton Forward Difference Interpolation Polynomial Function.
- Solution using Newton Backward Difference Interpolation Polynomial Function.
- Solution using Lagrange's Interpolation Polynomial Function.

Unit V: Numerical Solution of Ordinary Differential Equations
- Numerical solution of ordinary differential equations by Euler's Method.
- Numerical solution of ordinary differential equations by Runge-Kutta Method of 4th Order.
- Numerical solution of ordinary differential equations by Taylor Series Method.

Text/Reference Books:

1. "Introductory Methods of Numerical Analysis" by S.S. Sastry.
2. "Numerical Methods for Scientific and Engineering Computation" by Mahinder Kumar Jain.
3. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale.

4. "Numerical Recipes: Art of Scientific Computing" by W.H. Press, B.P. Flannery, et al.
5. "Numerical Methods" by E. Balagurusamy.
6. "Numerical Methods using MATLAB" by J. M. Mathews and K. Fink.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4103			
Course Title	Object Oriented Programming Using Java Laboratory			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	a)Programming Practices I			

Learning Objective:
The learning objective of this course is to provide students with practical experience in implementing object-oriented programming concepts using Java. Through hands-on exercises and projects, students will learn to design and develop Java applications using classes, inheritance, interfaces, packages, exception handling, file handling, multithreading, and event-driven programming. The course aims to enhance students' understanding and proficiency in Java programming, enabling them to solve real-world problems using object-oriented principles.

Course Outcome:

CO1: Implement and demonstrate an understanding of basic object-oriented programming principles such as classes, objects, inheritance, and polymorphism in Java.
CO2: Design and develop Java applications using interfaces, packages, exception handling, and file handling to solve programming problems.
CO3: Develop multithreaded Java applications to achieve concurrent execution of tasks and improve program efficiency.
CO4: Apply event-driven programming concepts in Java to create interactive graphical user interfaces (GUIs) for applications.
CO5: Work on a mini project that integrates various Java programming concepts learned throughout the course to solve a real-world problem.

Course Content:

1. Electricity Bill Generation using Classes [1 day]
2. Currency Converter, Distance Converter, and Time Converter Implementation using Packages [1 day]
3. Pay Slip Generation using Inheritance [1 day]
4. Stack ADT Implementation using Multiple Inheritance (Interface) [1 day]
5. String Operations using ArrayList [1 day]
6. Abstract Class Implementation [1 day]
7. User-Defined Exception Handling Implementation [1 day]
8. File Handling [1 day]
9. Multithreading Implementation [1 day]
10. Generic Function Implementation [1 day]
11. Calculator Design Using Event-Driven Programming [1 day]
12. Mini Project [1 day]

Text/Reference Books:

1. H. Schildt and C. Dann, "Java: The Complete Reference", McGraw-Hill Education.
2. E. Balagurusamy, "Programming With Java: A Primer", Tata McGraw-Hill.
3. B. Eckel, "Thinking in JAVA", Prentice Hall.
4. G. Reese, "Database Programming with JDBC and JAVA", O'Reilly Media, Inc.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS4102			
Course Title	Programming Using Python			
Category	Professional Core			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	a) Fundamentals of Programming b) Basic Problem Solving			

Learning Objective:
In this practical course, students will learn Python programming basics and paradigms, including looping, control statements, and string manipulations. They will become familiar with various modules, packages, and Python libraries used for various applications, such as machine learning and deep learning.

Course Outcome:

CO1: Understand and explain the basic principles of Python programming language and object-oriented concepts.

CO2: Define and demonstrate the use of built-in data structures along with the help of condition checking and looping structures.

CO3: Understand and apply various applications of different modules and packages in Python.

CO4: Learn to handle exceptions and files in Python.

CO5: Apply Python programming concepts to develop a computer game for teaching data structures like stacks and queues, enhancing visualization and understanding of abstract concepts through game-based learning.

Course Content:

1. History, Features, Setting up path, working with Python, Basic Syntax, Variable and Data Types, Operator. [1 day]

2. Conditional Statements: If, If-else, Nested if-else, Looping, For, While, Nested loops, Control Statements: Break, Continue, Pass. [1 day]

3. String Manipulation: Accessing Strings, Basic Operations, String slices, Function and Methods. Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods. [2 days]

4. Tuple: Introduction, Accessing tuples, Operations, Working, Functions, and Methods. Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Properties. [2 days]

5. Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables. [1 day]

6. Modules: Importing module, Math module, Random module, Packages, Composition, Input-Output Printing on screen, Reading data from the keyboard, Opening and closing file, Reading and writing files, Functions. [2 days]

7. Exception and File Handling: Exception, Exception Handling, Except clause, Try & finally clause, User-Defined Exceptions. [1 day]

8. Case study on using a computer game for teaching data structures on stacks and queues. The computer game is developed to help students visualize the data structures and data access operations on stacks and queues. This game-based learning is engaging, fun, and, more importantly, abstract concepts in data structures can be visualized and learned through game-playing. [2 days]

Text/Reference Books:

1. T.R. Padmanabhan, "Programming with Python (1st Ed.)", Springer.
2. R. Thareja, "Python Programming: using Problem Solving Approach (1st Ed.)", Oxford University Press.
3. W. McKinney, "Python Data Analysis (2nd Ed.)", O'Reilly.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Semester 5 Curriculum and Syllabus

Course Code	YCS 5001			
Course Title	Artificial Intelligence			
Category	ENGG , Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a)Design and Analysis of Algorithms			

Learning Objective:

In this course, students will learn the basic concepts, theories, and techniques of artificial intelligence, enabling them to understand and apply AI algorithms in various fields of Computer Engineering.

Course Outcome:

CO1: Explain the basic concept of Artificial Intelligence and its applications.
CO2: Classify and analyze various AI tools and techniques.
CO3: Learn and evaluate various AI algorithms.
CO4: Apply the basic understanding of artificial intelligence in real-world applications.
CO5: Evaluate and assess the performance, effectiveness, and ethical implications of artificial intelligence systems in various real-world applications.

Course Content:

Module 1: Introduction to Artificial Intelligence (AI) [7L]

Overview: Foundations, scope, problems, and approaches of AI. Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents.

Module 2: AI Techniques [7L]

Artificial Intelligence programming techniques, Problem-solving through Search: forward and backward, state-space, blind, heuristic, problem-reduction, A*, AO*, min-max, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications.

Module 3: Planning and Representation in AI [8L]

Planning: planning as search, partial order planning, construction and use of planning graphs. Representing and Reasoning with Uncertain Knowledge: probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, sample applications.

Module 4: Decision Making [8L]

Decision-Making: basics of utility theory, decision theory, sequential decision problems, elementary game theory, sample applications.

Module 5: Knowledge Acquisition [6L]

Machine Learning and Knowledge Acquisition: learning from memorization, examples, explanation, and exploration. Learning nearest neighbor, naive Bayes, and decision tree classifiers, Q-learning for learning action policies, applications.

Text/Reference Books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach," Prentice Hall.
2. N. J. Nilsson, "Artificial Intelligence: A New Synthesis," Morgan-Kaufmann, 1998.
3. J. Pearl, "Heuristics: Intelligent Search Strategies for Computer Problem Solving," Addison-Wesley Publishing Company.
4. B. A. Heule, M. Van Maaren, and H. Walsh, "The Handbook of Satisfiability," IOS Press.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5002			
Course Title	Database Management System			
Category	ENGG ,Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a)Data Structures and Algorithms			

Learning Objective:

In this course, students will learn about data models, conceptualize and depict a database system, design systems using E-R diagrams, learn SQL and relational database design, understand internal storage structures using different file and indexing techniques, and grasp the concepts of transaction processing, concurrency control techniques, and recovery procedures.

Course Outcome:

CO1: Apply E-R diagrams for an application.
CO2: Explain the creation of the normalized relational database model.
CO3: Analyze real-world queries to generate reports.
CO4: Determine whether a transaction satisfies the ACID properties.
CO5: Create and maintain an organization's database.

Course Content:

Module 1: Introduction [3L]

- Concept and overview of DBMS, data models.
- Database languages, database administrator, database users.
- Three-schema architecture of DBMS.

Module 2: Entity-Relationship and Relational Database Model [9L]

- Basic concepts, design issues.
- Mapping constraints, keys, entity-relationship diagram.
- Weak entity sets, extended E-R features.
- Case study on E-R model.
- Structure of relational databases, relational algebra.
- Relational calculus, extended relational algebra operations.
- Views, modifications of the database.

Module 3: SQL and Integrity Constraints [6L]

- Concept of DDL, DML, DCL.
- Basic structure, set operations, aggregate functions.
- Null values, domain constraints, referential integrity constraints.
- Assertions, views, nested sub-queries.
- Database security application development using SQL, stored procedures, and triggers.

Module 4: Relational Database Design [6L]

- Functional dependency, different anomalies in designing a database.
- Normalization using functional dependencies, decomposition, Boyce-Codd Normal Form, 3NF.
- Normalization using multi-valued dependencies, 4NF, 5NF.
- Case study.

Module 5: Internals of RDBMS [6L]

- Physical data structures.
- Query optimization: join algorithm, statistics, and cost-based optimization.
- Transaction processing, concurrency control, and recovery management.
- Transaction model properties, state serializability.
- Lock-based protocols, two-phase locking, deadlock handling.

Module 6: File Organization & Index Structures [6L]

- File and record concept, placing file records on disk.
- Fixed and variable-sized records.
- Types of single-level index (primary, secondary, clustering).

- Multilevel indices, dynamic multilevel indices using B-tree and B+ tree.

Text/ Reference Books:

1. R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", Addison Wesley Publishing.
2. C. J. Date, "Introduction to Database Management", Vol. I, II, III, AddisonWesley.
3. J. D. Ullman, "Principles of Database Systems", Galgottia Publication.
4. G. Jim and R. Address, "Transaction Processing: Concepts and Techniques", Morgan Kaufmann.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 5003			
Course Title	Computer Networks			
Category	ENGG ,Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a) Computer Organization and Architecture b)Operating Systems			

Learning Objective:

In this course, students will learn about the fundamental concepts of computer networking, with a detailed understanding of the TCP/IP protocol suite that drives the Internet. Various important network applications shall be discussed, providing students with a comprehensive understanding of how data flows through a real network and the various issues involved.

Course Outcome:

CO1: Explain the fundamental concepts of data communication.

CO2: Illustrate how the various protocols at the data link layer level work.

CO3: Explain the functionalities of the various protocols at the network and transport layer level.

CO4: Demonstrate how various internetworking devices can be used to connect different networks together.

CO5: Learn about various network applications with a particular emphasis on security.

Course Content:

Module 1: Introduction to Data Communication Techniques [5L]

- Data communication concepts, analog and digital signal transmission.
- Layered Network architecture–the OSI model.
- Transmission media (guided and unguided) and data transmission techniques (analog and digital).
- Signal encoding techniques – NRZ, NRZI, AMI, Manchester, Differential Manchester, etc.
- Circuit switching and packet switching, virtual circuits, and datagrams.

Module 2: Data Link Layer [7L]

- Framing and flow-control techniques.
- Stop-and-wait and sliding-window protocols for frame transmission, performance analysis.
- Error control techniques–checksum and CRC, stop-and-wait ARQ, Go-back-N, selective reject protocols.
- Multiple-access protocols: ALOHA, CSMA and CSMA/CD.
- IEEE 802.x Ethernet standard, switched Ethernet, Fast Ethernet, Gigabit Ethernet.
- Wireless LAN protocols and standards.

Module 3: Network Layer [8L]

- TCP/IP protocol suite, internetworking concepts.
- Internet Protocol (IP), IP addressing and routing, IP fragmentation and reassembly.
- IP subnets and masks–variable length subnet masks, classless inter-domain routing.
- Miscellaneous protocols–ARP and RARP, ICMP, BOOTP and DHCP.
- IPv6–basic differences from IPv4.

Module 4: Transport Layer [4L]

- Process-to-process delivery, TCP and UDP.
- TCP connection establishment and termination.
- Flow and congestion control in TCP–window advertisement, leaky-bucket and token-bucket algorithms.

Module 5: Internetworking Concepts [6L]

- Internetworking devices repeaters, hubs, bridges and routers.
- Interconnecting LANs using bridges, frame forwarding and address learning.
- Routing algorithms–shortest-path algorithm, distance vector algorithm, link state algorithm.
- RIP OSPF and BGP algorithms.

Module 6: Network Applications [6L]

- Client-server concept.
- Introduction to DNS, SMTP, SNMP, FTP, TELNET and HTTP.
- Firewalls, Network Address Translator (NAT), Proxy Server, etc.
- Basic concepts of Cryptography–symmetric and asymmetric key crypto systems, Cryptographic hash functions.

- Digital signature, PGP, HTTPS.

Text/Reference Books:

1. W. Stallings, "Data and Computer Communication (5thEd.)", PHI/Pearson Education.
2. B. A. Forouzan, "Data Communication and Networking (3rdEd.)", Tata-McGraw-Hill.
3. W. R. Stevens, "UNIX Network Programming (3rdEd.), Prentice-Hall, Addision-Wesley.
4. A. Tanenbaum, "Computer Networks (4thEd.), PHI/ Pearson Education.
5. W. Stallings, "Cryptography and Network Security: Principles and Practice(4thEd.)", PHI/Pearson Education.

CO-PO Mapping:

Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5004D			
Course Title	Ethical Hacking			
Category	ENGG,Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	Computer Programming, Web Programming, Computer Networks			

Learning Objective:

Introduces the concepts of Ethical Hacking and gives the students the opportunity to Learn about different tools and techniques in Ethical hacking and security and practically apply some of the tools.

Course Outcome:

CO1: Understand the fundamental principles underlying malware, hardware, and software vulnerabilities, including their origins and mechanisms of exploitation.
CO2: Understand the core concepts related to malware, hardware and software vulnerabilities and their causes
CO3: Understand ethics behind hacking and vulnerability disclosure
CO4: Appreciate the Cyber Laws and impact of hacking
CO5: Exploit the vulnerabilities related to computer system and networks using

Course Content:

Module 1: [6L]

Introduction to Ethical Disclosure: Ethics of Ethical Hacking, Ethical Hacking and the legal system, Proper and Ethical Disclosure Cousins of the Compiler

Module 2: [7L]

Penetration Testing and Tools: Using Metasploit, Using Back Track Live CD Linux Distribution

Module 3: [7L]

Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDAPro, Advanced Reverse Engineering

Module 4: [9L]

Client-side browser exploits, Exploiting Windows Access Control Model for Local Elevation Privilege, Intelligent Fuzzing with Sulley, From Vulnerability toExploit

Module 5: [4L]

Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware

Module 6: [3L]

Case study of vulnerability of cloud platforms and mobile platforms & devices

Text/Reference Books:

1. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical Hackers' Handbook, TMH Edition
2. Jon Erickson, Hacking: The Art of Exploitation, SPD

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5004E			
Course Title	Cryptography and Network Security			
Category	ENGG , Major			
LTP & Credits	**L**	**T**	**P**	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a) Data Structures and Algorithms b) Operating Systems c) Discrete Structures			

Learning Objective:

In this course, students will learn about various cryptographic techniques essential for understanding how secure information systems can be built. The course will discuss various security applications as case studies, helping students strengthen their basic knowledge in cybersecurity.

Course Outcome:

CO1: Explain the basic concept of cryptography and its applications in network security.

CO2: Learn and analyze various private-key cryptography algorithms.

CO3: Learn and analyze various public-key cryptography algorithms.

CO4: Explain various cryptographic hash functions and their applications in network security.

CO5: Demonstrate how the basic concepts of cryptography can be used to develop practical security applications.

Course Content:

Module 1: Introduction to Cryptography and Block Ciphers [4L]

- Introduction to security attacks, services, and mechanisms.
- Conventional encryption models: private-key and public-key cryptography.
- Classical encryption techniques: substitution and transposition ciphers.

Module 2: Private-key Cryptography [7L]

- Block Cipher: Feistel structure, Shannon's theory of confusion and diffusion, DES, triple-DES, AES.
- Linear and differential cryptanalysis: basic concepts.
- Key distribution problem.
- Stream Cipher: basic concept, realization based on linear feedback shift register.

Module 3: Mathematical Background [7L]

- Modular arithmetic, Fermat's and Euler's theorem, gcd, primality testing.
- Euclid's algorithm, Chinese remainder theorem.
- Intractable problems: integer factorization problem, modular square root problem, discrete logarithm problem.

Module 4: Public-key Cryptography [6L]

- RSA algorithm, security of RSA, key management.

- Diffie-Hellman key exchange algorithm.
- Elliptic curve cryptography: basic concepts.

Module 5: Cryptographic Hash Functions and Authentication [5L]

- Properties of hash functions: MD5 message digest algorithm, secure hash algorithm (SHA-1).
- Digital signatures: authentication protocols, various approaches, digital signature standard (DSS).

Module 6: Network Security [7L]

- Authentication applications: Kerberos, X.509 directory authentication service.
- Electronic mail security: pretty good privacy (PGP), S/MIME.
- Certification: public-key infrastructure.
- Secure socket layer (SSL), transport layer security, secure HTTP (HTTPS), and other secure protocols on the Internet.
- System security: viruses, worms, and malware, firewall systems.

Text/Reference Books:

1. W. Stallings, "Cryptography and Network Security: Principles and Practices", Prentice-Hall of India.
2. J. Menezes, P.C. van Oorschot, and S.A. Vanstone, "Handbook of Applied Cryptography", CRC Press.
3. D. Stinson, "Cryptography: Theory and Practice", CRC Press.
4. C. Kaufman, R. Perlman, and M. Speciner, "Network Security", Pearson Education.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5004F			
Course Title	Web Development Tools			
Category	ENGG, Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a. Mathematical Foundation b. Programming Languages			

Learning Objectives:

The course content should be taught and implemented with the aim to develop different types of skills so that developing professional web sites includes a gamut of many kindsof technologies and tools involving GUI, animations, Content management, database, blogs etc. For designing and publishing web documents creating user interfaces, animation and informative reports are basic requirement of the software industry today

Course Outcome:

CO1: Create interactive website using various tools.

CO2: Illustrate the basics of WWW (World Wide Web) and different Web Browsers.

CO3: Use Gmail account and Google Apps.

CO4: Create wordpress based user interface and website

CO5: Create small scale animations

Course Content:

Module 1: .NET architecture and Programming [8L]

Components of the .NET Architecture MS .NET Runtime, Managed / Unmanaged Code, Intermediate Language, Common Type System, MS .NET Base Class Library (BCL), Assemblies, Metadata, and Modules, Just In Time Compilation, Garbage• Collection. Introduction to C# .Net language, C# Program Console Application• Development, Compiling and Executing, Defining a Class, Declaring the Main () Method, Organizing Libraries with Namespaces, Using the using Keyword, Adding Comments. C# Data Types, Value Types-Primitive Data Types, Reference Types.•

Module 2: C# Controls structure , Properties, Delegates & Exception Handling [8L]

C# Control Structures -Using the if Statement, Using the if- else Statement, Using the switch case Statement, C# looping controls and jumping statements: Using the for Statement, Using the while Statement, Using the do while Statement, Using the break Statement, Using the continue Statement, Using the return Statement, Using the goto Statement. C# Properties – Using Properties- Get Accessor, Set Accessor.• Delegates in C# - Single Cast, Multicast Delegates.• Exception Handling in C# -Using the try Block, Using the catch Block,• Using the finally Block, Using the throw Statement.

Module 3: Inheritance, interface and generics [6L]

Inheritance, in C#. Interfaces in C#.• Structures in C#• Operator Overloading in C#, Using Generics in C#•

Module 4: Threading , file handling, C# controls. [8L]

Multithreading -Getting started with threads, managing thread lifetimes, destroying threads, scheduling threads, communicating data to a thread. File I/O with streams - Stream classes file stream, streamreader and• streamwriter, string readers and writers file system classes directory and directoryinfo, file and fileinfo, parsing paths

Module 5: Working with Wordpres [6L]

Use Wordpress for creating Web pages including themes, posts and menus

Use Wordpress for Adding media, links and plugins to web pages

Text/Reference Books:

1. Beginning C#, Wrox Publication.
2. Professional C#, Wrox Publication.Boudreau, Denis. The Inclusive Speaker: How to Truly Connect With All of Your Audience Without Leaving Anyone Behind, Prominence Publishing, 2023.
3. Burgstahle, Sheryl. Creating Inclusive Learning Opportunities in Higher Education, Harvard Education Press, 2020.
4. Burgstahle, Sheryl. Universal Design in Higher Education: From Principles to Practice, Harvard Education Press, 2008.
5. Byrne-HaberByrne, Sheri. Giving a Damn About Accessibility, UX Collective (PDF download, SoundCloud audio), 2021

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	-	-	2	-	-	-	0	0	3	0	0	0	1	0	0
CO2	2	2	-	-	-	-	0	0	0	0	0	0	1	2	0
CO3	2	-	1	-	3	-	0	0	1	0	0	0	2	0	0
CO4	2	2	-	2	-	1	0	0	1	0	0	0	0	0	0
CO5	1	2	-	-	-	-	0	0	2	0	0	0	1	0	0

Course Code	YED5001			
Course Title	Economics for Engineers			
Category	HUM,Minor			
LTP & Credits	**L**	**T**	**P**	Credits
	2	0	0	2
Total Contact Hours	24			
Pre-requisites	None			

Learning Objective:

In this course, students will learn about managerial economics, basics of accounting, and financial management. By the end of the course, students will be able to make different managerial decisions in terms of economics, solve financial statements, and make different financing decisions for businesses and at a personal level.

Course Outcome:

CO1: Apply appropriate engineering economics analysis methods for problem-solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.

CO2: Evaluate the cost-effectiveness of individual engineering projects using the learned methods and draw inferences for investment decisions.

CO3: Compare the life cycle cost of multiple projects using the learned methods and make a quantitative decision between alternate facilities and/or systems.

CO4: Evaluate the profit of a firm, carry out break-even analysis, and employ this tool to make production decisions.

CO5: Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

Course Content:

Module 1: Introduction [3L]

- Managerial Economics
- Relationship with other disciplines
- Firms: Types, Objectives, and goals
- Managerial Decisions-Decision Analysis

Module 2: Demand and Supply Analysis [5L]

- Demand: Types, determinants, function, elasticity, forecasting
- Supply: Determinants, function, elasticity

Module 3: Cost Analysis [5L]

- Elements of costs
- Marginal cost, Marginal Revenue
- Sunk cost, Opportunity cost
- Break-even analysis–PV ratio

Module 4: Elementary Economic Analysis [4L]

- Inflation: Meaning, types, causes, measures to control
- National Income: Definition, Concepts, Method of measuring

Module 5: Financial Accounting [5L]

- Concepts and Definition of Accounting
- Journal, Ledger, Trial Balance
- Trading A/C, Profit & Loss A /C, Balance Sheet

Module 6: Investment Decision [2L]

- Time value of money: Interest - Simple and compound, nominal and effective rate of interest
- Cash flow diagrams
- Principles of economic equivalence
- Evaluation of engineering projects: Present worth, Future worth, Annual worth, Internal rate of return, Cost-benefit analysis for public projects

Text/Reference Books:

1. B. Riggs and S.U. Randhwa, "Engineering Economics", McGraw Hill Education India.
2. D. Vengedasalam and K. Madhavan, "Principles of Economics", Oxford University Press.
3. W.G. Sullivan, E.M. Wicks, and C.P. Koelling, "Engineering Economy", Pearson.

4. R.P. Seelvan, "Engineering Economics", Prentice-Hall of India.
5. H.L. Ahuja, "Principles of Micro Economics", S. Chand & Company Ltd.
6. S.P. Gupta, "Macro Economics", Tata McGraw Hill.
7. K.K. Dewett, "Modern Economic Theory", S.Chand & Company Ltd.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5101			
Course Title	Artificial Intelligence Laboratory			
Category	ENGG ,Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	a) Data Structures and Algorithms b) Database Management System c) Programming Practices II			

Learning Objective:

In this course, students will learn the basic principles, techniques, and applications of Artificial Intelligence and Machine Learning for problem-solving, inference, perception, knowledge representation, and puzzles design.

Course Outcomes:

CO1: Explain the working principles of PROLOG/LISP and apply LIST structure of PROLOG.

CO2: Apply reasoning and inference principles to real-world problems and design programs to solve various puzzles.

CO3: Design simple algorithms for data classification in Python/R and test them with benchmark datasets.

CO4: Design simple algorithms for data clustering in Python/R and test them with benchmark datasets.

CO5: Analyze and evaluate algorithms for estimation/prediction using regression.

Course Content:

Suggestive List of Experiments:

In this laboratory, students will be familiarized with PROLOG/LISP language. The experiments are structured

into four modules.

1. Module 1 (4 days):
    - Introduction to PROLOG facts & rules using a simple family tree.
    - Explanation of how goals are given in PROLOG and simple queries on the family tree.
    - Formation of recursive definitions and how PROLOG executes goals.
    - Implementation of Graph Search algorithms like DFS, BFS.
    - Implementation of well-known puzzles like the 8-queens problem, Towers-of-Hanoi problem, etc.
2. Module 2 (4 days):
    - Implementation of Classifiers: KNN, Naive Bayes Classifier, Decision Tree, SVM, Perceptron, Multi-Layer Perceptron, Random Forest, etc., on Python/R platform and test them on benchmark datasets.
    - Familiarization with ML Tools: Excel, WEKA, R, Python for classification.
3. Module 3 (3 days):
    - Implementation of data clustering algorithms: K-Means, DBSCAN, Hierarchical (AGNES/DIVISIVE), etc., on Python/R platform and test them on benchmark datasets.
    - Familiarization with ML Tools: Excel, WEKA, R, Python for clustering.
4. Module 4 (1 day):
    - Implementation of Regression (single and Multiple Variables) linear and non-linear, Logistic regression for prediction tasks.

Text/Reference Books:

1. I. Bratko, "Prolog programming for artificial intelligence", Pearson Education.
2. S. Kaushi, "Logic and Prolog Programming", New Age International Publishers.
3. B. Lantz, "Machine learning with R", PACKT Publishing.
4. C. M. Andreas and S. Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly Media.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5102			
Course Title	Database Management System Laboratory			
Category	ENGG ,Major			
LTP & Credits	**L**	**T**	**P**	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	a)Digital Circuits Laboratory			

Learning Objective:

This course aims to enable students to learn about data models, conceptualize and depict a database system, understand the fundamental concepts of SQL queries, design a database with the necessary attributes, and learn the methodology of accessing, modifying, and updating data and information from relational databases. Additionally, students will learn database design, designing user interfaces, and how to connect with databases.

Course Outcome:

CO1: To understand the basic concepts regarding databases and SQL queries.

CO2: To explain the concepts of PL/SQL.

CO3: To differentiate between DBMS and advanced DBMS.

CO4: To analyze database system concepts and apply normalization to the database.

CO5: To apply and create different transaction processing and concurrency control applications.

Course Content:

1. Experiments on fundamentals of database systems:
    - Creating a Database
    - Creating a Table
    - Specifying Relational Data Types
    - Specifying Constraints
    - Creating Indexes (Duration: 2 days)
2. Experiments on database Tables and Record handling:
    - INSERT statement
    - Use of SELECT and INSERT together
    - DELETE, UPDATE, TRUNCATE statements
    - DROP, ALTER statements (Duration: 2 days)
3. Experiments on retrieving data from the database:
    - The SELECT statement

- Use of the WHERE clause
- Use of the Logical Operators in the WHERE clause
- Use of IN, BETWEEN, LIKE, ORDER BY, GROUP BY, and HAVING Clause
- Use of the Aggregate Functions
- Combining tables using JOINS
- Sub-queries (Duration: 3 days)

4. Experiments on Miscellaneous Database Management:
    - Creating Views
    - Creating Column Aliases
    - Creating Database Users
    - Use of GRANT and REVOKE (Duration: 1 day)
5. Experiments on PL/SQL:
    - Use of decision-making statements
    - Different loop structures to solve simple programs (e.g., sum of few numbers, pattern prints, etc.)
    - Inserting values into tables, reading data from a table
    - Basic working with CURSORS (Duration: 1 day)
6. Innovative Experiments:
    - Case study of handling complex databases (e.g., College Management System, Hospital Management System, Library Management System, Payroll Management System, etc.) (Duration: 3 days)

Text/Reference Books:

1. H.F. Korth and A. Silberschatz, “Database System Concepts”, McGraw Hill.
2. E. Ramez and S. Navathe, “Fundamentals of Database Systems”, Benjamin Cummings Publishing Company.
3. C.J. Date, “Introduction to Database Management”, Vol. I, II, III, Addison Wesley.
4. G. Jim and R. Address, “Transaction Processing: Concepts and Techniques”, Moragan Kaufmann.
5. J.D. Ullman, “Principles of Database Systems”, Galgottia Publication.
6. I. Bayross, “SQL, PL/SQL the Programming Language of Oracle”, BPB Publications.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS5103			
Course Title	Computer Networks Laboratory			
Category	ENGG ,Major			
LTP& Credits	**L**	**T**	**P**	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	c. Operating Systems Laboratory d. Computer Organization and Architecture Laboratory			

Learning Objective:

In this laboratory course, students will learn network programming using the socket API system calls and analyze packets flowing over the network. Additionally, they will simulate several algorithms at the data link and network layers and analyze the results.

Course Outcome:

CO1: To learn how to use socket API system calls for network programming.

CO2: To learn how to capture network packets and analyze them.

CO3: To analyze various algorithms at the data link and network layers through simulation.

CO4: To understand and apply error detection and correction techniques in network communication.

CO5: To design and implement simple network protocols.

Course Content:

Suggestive List of Experiments:

1. Familiarization with Berkeley socket interface system calls in C, and writing programs to communicate between two machines using both connection-oriented (TCP) and connectionless (UDP) protocols. [3 days]
2. Write programs in C to simulate the stop-and-wait and sliding-window protocols, and carry out performance analyses both in the absence of errors and also in the presence of errors. [2 days]
3. Familiarization with a packet capturing and analysis tool (like Wireshark), and analyze packets as captured under various data transfer scenarios over the network. [2 days]
4. Write a program in C to simulate a router for filtering packets (make the specification of the problem as realistic as possible). [3 days]
5. Write programs to implement the distance vector algorithm for building up the routing tables in a network of routers. [2 days]

Text/Reference Books:

1. W. Stallings, "Data and Computer Communication (5th Ed.)", PHI/Pearson Education.
2. B. A. Forouzan, "Data Communication and Networking (3rd Ed.)", Tata-McGraw-Hill.
3. W. R. Stevens, "UNIX Network Programming (3rd Ed.)", Prentice-Hall, Addison-Wesley.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Semester 6 Curriculum and Syllabus

Course Code	YCS 6002			
Course Title	Software Engineering			
Category	Major ENGG			
LTP & Credits	**L**	**T**	**P**	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

The students will be able to comprehend the various software process models. To understand the types of software requirements and SRS document. To know the different software design and architectural styles. To learn the software testing approaches and metrics used in software development. To know about quality control and risk management.

Course Outcome:

CO1: To compare and select a process model for a business system.
CO2: To identify and specify the requirements for the development of an application.
CO3: To develop and maintain efficient, reliable and cost effective software solutions.
CO4: To critically think and evaluate assumptions and arguments of the client.
CO5: To understand the importance of software maintenance and the techniques involved in maintaining software systems.

Course Content:

Module 1: [9L]

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, Process patterns, process assessment. Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process, Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools

Module 2: [8L]

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements Engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioral models, Data models, Object models, structured methods. UML Diagrams.

Module 3: [7L]

Design Engineering: Design process and Design quality, Design concepts, the design model. Creating

an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design. Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution. Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation

Module 4: [6L]

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. Metrics for Process and Projects: Software Measurement, Metrics for software quality.

Module 5: [6L]

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan. Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, The Capability Maturity Model Integration (CMMI), Software reliability, The ISO 9000 quality standards.

Text/Reference Books:

1. Software Engineering A practitioner's Approach, Roger S Pressman, 6th edition. McGraw Hill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson education.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
4. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
5. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
6. Software Engineering1: Abstraction and modelling, Diner Bjorner, Springer International edition, 2006.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 6007			
Course Title	Steganography and Authentication			
Category	ENGG,Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

The course about the watermarking models and message coding.To learn about watermark security and authentication.To learn about steganography. Perceptual models

Course Outcome:

CO1: Know the History and importance of watermarking and steganography
CO2: Analyze Applications and properties of watermarking and steganography.
CO3: Demonstrate Models and algorithms of watermarking.
CO4: Possess the passion for acquiring knowledge and skill in preserving authentication of Information.
CO5: Identify theoretic foundations of steganography and steganalysis.

Course Content:

Module 1: Introduction to Steganography and Digital Image Fundamentals [8L]

Definitions and Terminology: Understanding cover media, secret message, stego media, embedding algorithm, and extraction algorithm. History and Applications: Overview of the history and modern uses in copyright control, secure communication, and medical imaging. Digital Image Basics: Image representation (grayscale, RGB color models), pixels, and color channels. Comparison: Distinguishing between steganography and cryptography. Performance Metrics: Key evaluation criteria, including imperceptibility (PSNR, SSIM), capacity (bpp).

Module 2: Spatial domain steganography [7L]

Least Significant Bit (LSB) Substitution/Embedding, Pixel Value Differencing (PVD) Huffman coding, Adaptive Huffman coding, Arithmetic coding, Shannon Fano coding, Dictionary techniques-.

Module 3: Frequency domain techniques [10L]

Frequency domain techniques- FFT, Discrete Wavelet Transform – Haar wavelet, Discrete Cosine Transform and JPEG2000. Deep Learning (CNN, GAN) approaches for modern adaptive techniques.

Module 4: [7L]

Watermark security & authentication: Security requirements – Watermark security, cryptography – Attacks – Exact authentication – Selective authentication – Localization.

Module 5: Steganalysis [4L]

Principles and Approaches**,** Histogram analysis, Chi-Square attacks, Familiarization with steganalysis tools.

Text/Reference Books:

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, "Digital Watermarking and Steganography", Margan Kaufmann Publishers, New York, 2008.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 6004E			
Course Title	Digital / Computer Forensics			
Category	ENGG,Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

It includes people, processes and IT systems by applying a risk management process. It can help small, medium and large businesses in any sector keep information assets secure. The ISO 27000 family of standards helps organizations keep information assets secure. Using this family of standards will help your organization manage the security of assets such as financial information, intellectual property, employee details or information entrusted to you by third parties.

Course Outcome:

CO1: Understand the difference between Security Metrics and Audits.
CO2: Knowledge on Vulnerability Management
CO3: Know the Information Security Audit Tasks, Reports and Post Auditing Actions.
CO4: Understand Information Security Assessments
CO5: Know an engineering specialization to the solution of complex engineering problems

Course Content:

Module 1: [6L]

COMPUTER FORENSICS: Standard Procedure; Incident Verification; System identification; Recovery of Erased and damaged data; Disk imaging and preservation; Data encryption and compression; Automated search techniques; Forensic software

Module 2: [8L]

NETWORK FORENSICS AND INTERNET FORENSICS: Tracking network traffic; Reviewing Network Logs; Tools, Performing Live Acquisitions, Order of volatility; Standard Procedure; Internet & World Wide Web threats (Email, Chat-rooms, Search Engines; Hacking & illegal access, Obscene and indecent transmission, Extortion & threats) ; Domain Name Ownership Investigation; Reconstructing Past Internet Activities and Events; Email Forensics: E-mail Analysis; Email Forensics: Email Headers and Spoofing; Email Forensics: Laws against Email Crime; Messenger Forensics: AOL, Yahoo, MSN, and Chats; Browser Forensics: Analyzing Cache and Temporary Internet Files; Browser Forensics: Cookie Storage and Analysis; Browser Forensics: Web Browsing Activity Reconstruction

Module 3: [7L]

FORENSIC INVESTIGATION AND EVIDENCE PRESENTATION, LEGAL ASPECTS OF DIGITAL FORENSICS: Authorization to collect the evidence; Acquisition of evidence; Authentication of the evidence; Analysis of the evidence; Reporting on the findings; Testimony; Laws & regulations –

Information Technology Act ; Giving evidence in court

Module 4: [8L]

MOBILE FORENSICS & STEGANOGRAPHY:NCollecting and Analyzing Cell Phone, PDA, Blackberry, iPhone, iPod, iPad,and MP3 Evidence; Analyzing CD, DVD, Tape Drives, USB, Flash Memory, and other

Storage Devices; Digital Camera Forensics ; Reconstructing Users Activities; Recovering and Reconstructing Deleted Data; Steganography Tools and Tricks; Data Hiding; Data Recovery

Module 5: [7L]

MALWARE ANALYSIS: Analyzing Live Windows System for Malware; Analyzing Live Linux System for Malware; Analyzing Physical and Process Memory Dumps for Malware; Discovering and Extracting Malware from Windows Systems; Discovering and Extracting Malware from Linux Systems; Rootkits and Rootkit Detection and Recovery; Reverse Engineering Tools and Techniques

Text/Reference Books:

1. Internet Security: Cryptographic Principles, Algorithms and Protocols by Man Young Rhee
2. Computer Forensics and Investigations by Nelson, Phillips, Enfinger, and Steuart
3. The Third Edition of Internet Cryptography" by Richard E.Smith
4. Computer Forensics by John R.Vacca
5. The Third Edition of Computer Forensics and Cyber Crime: An Introduction by Marjie T.Britz
6. Digital Forensics and Cyber Crime by Joshua I James and Frank Breitinger
7. Fundamentals of Digital Forensics: Theory, Methods, and Real-Life Applications by Joakim Kävrestad

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS6004C			
Course Title	Cloud Computing			
Category	ENGG,Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a) Computer Networks b) Operating Systems			

Learning Objective:

To provide students a sound foundation of cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real-life scenarios. To enable students to explore some important cloud computing-driven commercial systems and applications.

Course Outcome:

CO1: To explain the Cloud architecture, different services, and deployment models.

CO2: To learn the concepts of abstraction and different types of virtualization.

CO3: To identify and explain different cloud offerings with their usage, namely Azure, Google Apps, Amazon Web Services.

CO4: To explain the underlying concepts of cloud management and security and illustrate the use of Service-Oriented Architecture (SOA).

CO5: To analyze and compare different cloud computing providers and services, evaluating their performance, cost-effectiveness, and suitability for specific use cases.

Course Content:

Module 1: Definition of Cloud Computing and its Basics [8L]

- Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public, Private, Hybrid, and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing.
- Cloud Architecture: A brief introduction to Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients.
- Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos.
- PaaS – Basic concept, tools, and development environment with examples.
- SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platforms.
- Identity as a Service (IDaaS).
- Compliance as a Service (CaaS).

Module 2: Use of Platforms in Cloud Computing [8L]

- Concepts of Abstraction and Virtualization.
- Virtualization technologies: Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D).
- Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of the use of load balancing.
- Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF).
- Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance.

Module 3: Use of various Web Services [7L]

- Concepts of Platform as a Service: Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com).
- Application development Use of PaaS Application frameworks.

- Use of Google Web Services: Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service.
- Use of Amazon Web Services: Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service.
- Use of Microsoft Cloud Services: Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services.

Module 4: Cloud Infrastructure [6L]

- Types of services required in implementation – Consulting, Configuration, Customization, and Support.
- Cloud Management: An overview of the features of network management systems and a brief introduction of related products from large cloud vendors.
- Monitoring of an entire cloud computing deployment stack – an overview with mention of some products.
- Lifecycle management of cloud services (six stages of lifecycle).
- Concepts of Cloud Security: Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards).

Module 5: Concepts of Services and Applications [7L]

- Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs.
- Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs.
- Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services.

Text/Reference Books:

1. B. Sosinsky, "Cloud Computing Bible (1st Ed.)", Wiley.
2. R. Buyya, C. Vecchiola, S. T. Selvi, "Mastering Cloud Computing (2nd Ed.)", McGraw Hill Education.
3. A.T. Velte, "Cloud computing: A practical approach (3rd Ed.)", Tata McGraw Hill.
4. C. Miller, "Cloud Computing (4th Ed.)", PHI/Pearson Education.
5. K. Saurabh, "Cloud Computing (2nd Ed.)", Wiley.

CO-PO Mapping:

ourse Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 6004G			
Course Title	Security Analysis and Reporting			
Category	ENGG,Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

It includes people, processes and IT systems by applying a risk management process. It can help small, medium and large businesses in any sector keep information assets secure. The ISO 27000 family of standards helps organizations keep information assets secure. Using this family of standards will help your organization manage the security of assets such as financial information, intellectual property, employee details or information entrusted to you by third parties.

Course Outcome:

CO1: Understand the difference between Security Metrics and Audits.
CO2: Knowledge on Vulnerability Management
CO3: Know the Information Security Audit Tasks, Reports and Post Auditing Actions.
CO4: Understand Information Security Assessments
CO5: Know an engineering specialization to the solution of complex engineering problems

Course Content:

Module 1: [8L]

Information Security Performance Metrics and Audit: Security Metrics and Reporting, Common Issues and Variances of Performance Metrics, Introduction to Security Audit, Servers and Storage devices, Infrastructure and Networks, Communication Routes, Information Security Methodologies (Black-box, White-box, Greybox), Phases of Information Security Audit and Strategies, Ethics of an Information Security Auditor etc. Maintain Healthy, Safe & Secure Working environment (NOS 9003)

Module 2: **[8L]**

Information Security Audit Tasks, Reports and Post Auditing Actions: Pre-audit checklist, Information Gathering, Vulnerability Analysis, External Security Audit, Internal Network Security Audit, Firewall Security Audit, IDS Security Auditing, Social Engineering Security Auditing, Web Application Security Auditing, Information Security Audit Deliverables & Writing Report, Result Analysis, Post Auditing Actions, Report Retention etc. Provide Data/Information in Standard formats (NOS 9004)

Module 3: **[7L]**

Vulnerability Management: Information Security Vulnerabilities – Threats and Vulnerabilities, Human-based Social Engineering, Computer-based Social Engineering, Social Media Countermeasures, Vulnerability Management – Vulnerability Scanning, Testing, Threat management, Remediation etc.

Module 4: **[7L]**

Information Security Assessments: Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions &Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

Module 5: **[6L]**

Configuration Reviews: Introduction to Configuration Management, Configuration Management Requirements-PlanControl, Development of configuration Control Policies, Testing Configuration Management etc

Text/Reference Books:

1. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K.Gavrilenko, and A.Michajlowski
2. “The Art of Computer Virus Research and Defense by Peter Szor.”
3. https://www.sans.org/readingroom/whitepapers/threats/implementing-vulnerability-management-process-34180
4. http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.pdf

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 6004H			
Course Title	Mobile Operating System and Security			
Category	ENGG,Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

It includes people, processes and IT systems by applying a risk management process. It can help small, medium and large businesses in any sector keep information assets secure. The ISO 27000 family of standards helps organizations keep information assets secure. Using this family of standards will help your organization manage the security of assets such as financial information, intellectual property, employee details or information entrusted to you by third parties.

Course Outcome:

CO1: Ccompare the similarities, differences and benefits of the current mobile operating systems
CO2: Explain the functionalities of remote operations and security essential of mobile devices
CO3: Analyze the latest trends and application in building Mobile OS
CO4: Understand Information Security Assessments
CO5: Demonstrate the native applications required to build using mobile OS

Course Content:

Module 1: **[8L]**

Introduction: Introduction to different operating system platforms, Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques Windows Server, Windows Desktop, Linux servers, Android, Apple iOS.

Module 2: **[10L]**

Installation of software operating system and configuration, identification and obtaining installation media as well as suitable hardware, installing software. Introduction, Type of Mobile OS Android OS (Google Inc.), Bada (Samsung Electronics),BlackBerry OS (Research In Motion),iPhone OS / iOS (Apple),MeeGo OS (Nokia and Intel) Palm OS (Garnet OS),Windows Mobile (Windows Phone 7)

Module 3: **[6L]**

End-to-end testing of operating systems (Windows, Linux), test remote management, login management, connectivity to network resources. Issues facing Mobile devices, Securing mobile application development, Android Securable IPC Mechanism, Android Security Model, Intents, Activities, Services, Android Security tools

Module 4: **[6L]**

Various operating systems applications (IOS, Safari, Maps, App Store, Windows, Command Prompt, Linux, Terminal, Android; Chrome, Maps, Play Store.), Introduction to Cross Platform development

Module 5: **[6L]**

Security principles of operating systems, virtual servers and cloud services, user access control, malware protection, patch management.

CASE STUDIES
Case study of Android as Mobile OS

Text/Reference Books:

1. GerardusBlokdyk, Mobile Operating System a Complete Guide, 5STARCooks publication
2. Reto Meier, Professional Android 4 Application Development, Wrox Publication
3. Books Llc (Google online Books), Mobile Phone Operating System: General Books LLCInstallation of Android studio.
4. Charlie Miller, Dion Blazakis, Dino DaiZovi, Stefan Esser, Vincenzo Iozzo, iOS Hacker's Handbook, Wiley publication

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YLB6001				
Course Title	Cyber Law and Ethics				
Category	ENGG,Minor				
LTP & Credits	L	T	P	Credits	
	3	0	0	3	
Total Contact Hours	36				
Pre-requisites	None/if any				

Learning Objective:

Cyber law provides a framework for protecting individuals and organizations from cyber threats, ensuring the privacy and security of digital transactions, and establishing guidelines for ethical and legal conduct in cyberspace.

Course Outcome:

CO1: Understand the evolution of computer technology and the emergence of cyberspace, including the legal and technological significance of domain names and the Internet as a tool for global access.

CO2: Analyze the Information Technology Act, 2000, its amendments, limitations, and provisions related to digital signatures, cryptographic algorithms, electronic records, and certifying authorities.

CO3: Evaluate cyber laws and related legislation, including patent law, trademark law, copyright, and their implications for software, domain names, electronic databases, and civil and criminal procedures.

CO4: Examine electronic business and legal issues, including the evolution of e-commerce, paperless contracts, e-commerce models (B2B, B2C), e-security, taxation, electronic payments, supply chain, and emerging trends.

CO5: Discuss the importance of cyber ethics, the need for cyber regulations, and ethical issues in information society, artificial intelligence, and blockchain technologies.

Course Content:

Module 1: Introduction to Cyber Law [7L]

Evolution of computer technology, emergence of cyberspace. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Webspace, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

Module 2: Information Technology Act [7L]

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

Module 3: Cyber Law and Related Legislation [8L]

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic DataBase and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution, Online Dispute Resolution (ODR).

Module 4: Electronic Business and Legal Issues [7L]

Evolution and development in E-commerce, paper vs paperless contracts E-Commerce models-B2B, B2C, E-security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

Module 5: Cyber Ethics [7L]

The Importance of Cyber Law, Significance of Cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Blockchain Ethics.

Text/Reference Books:

1. Cyber Laws: Intellectual property & E-Commerce, Security-Kumar K, Dominant Publisher
2. Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3. Information Security policy & Implementation Issues, NIIT, PHI
4. Computers, Internet and New Technology Laws, Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur.
5. Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi,
6. Cyber Law, Jonthan Rosenoer, Springer, New York, (1997).

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS6102			
Course Title	Software Engineering Laboratory			
Category	ENGG Major			
LTP &Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	a)Object Oriented Programming Laboratory			

Learning Objective:

In this course students can build a fully functional, interactive, layered, distributed, database- backed software system from the ground-up as part of a small,agile,development team in a laboratory setting, become acquainted with historical and modern software methodologies. It also help to understand the phases of software projects and practice the activities of each phase, Practice clean coding, taking part in project management and become a dept at such skills as distributed version control, unit testing,

integration testing, build management, and deployment.

Course Outcome:

CO1: To construct, elicit and specify software requirements through a productive working relationship with various stakeholders of the project

CO2: To design applicable solutions in one or more application domains using software engineering approaches with case studies

CO3: To develop the test cases from the design and effectively apply relevant standards and perform testing, and quality management and practice

CO4: To construct modern engineering architecture for software project management, time management and software reuse, and an ability to engage in life-long learning

CO5: To understand the importance of software maintenance and the techniques involved in maintaining software systems.

Suggestive List of Experiments:

1. Write down the problem statement for a suggested system of relevance. [1day]
2. Do Feasibility study along with requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system [1 day]
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart. [1day]
   To perform the user's view analysis for the suggested system: Use case diagram. [1day]
4. To draw the structural view diagram for the system: Class diagram, object diagram. [1day]
   To draw the behavioral view diagram: State-chart diagram, Activity diagram. [1day]
5. To perform the behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram, timing diagram, component diagram, State diagram. [1day]
   To perform the implementation view diagram: Component diagram for the system. [1day]
   To perform the environmental view diagram : Deployment diagram for the system. [1day]
6. To perform various testing using the testing tool unit testing, integration testing for a Sample code of the suggested system. [1day]
7. Perform Estimation of effort using FP Estimation for chosen system with other matrices. [1day]
8. To prepare time line chart/Gantt Chart/PERT Chart for selected software project. [1day]

Software required: MS Project, MS Visio, Docker

Text/Reference Books:

1. R.S. Pressman, "Software Engineering: A Practitioner's Approach", Tata McGraw Hill.

2. P. Jalote, "Software Engineering", Wiley India.
3. R.Mall," Software Engineering ",Prentice-Hall of India

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 6107			
Course Title	Steganography and Authentication Laboratory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

The purpose of this course is to introduce the basic concept and methodologies for digital image processing. Also some methods of steganalysis will be discussed. Steganography, Steganalysis, Discrete Cosine Transformation (DCT), Ipv4 header, IP datagram fragmentation. The objective of steganography is to hide a secret message within a cover-media in such a way that others cannot discern the presence of the hidden message.

Course Outcome:

CO1: To implement basic and advanced image processing algorithms
CO2: To learn about compression and coding schemes.
CO3: Programming for different operations on image
CO4: Programming related to image operations.
CO5: Explain the design process to the problem of hiding a message in a digital image

Course Content:

List of Experiments:

Do the following exercises for any two projects given in the list of sample projects or any other Projects:

1 Hide Documents Using Steganography.
2. Hiding Documents within an Image
3. Display of gray scale images.
4. Histogram Equalization
5. Performing 2-D DFT and DCT.
6. Display of colour images
7. DWT of images
8. Segmentation using watershed transform

Text/Reference Books:

1 Rafael.C,Gonzalez, Richard E Woods, "Digital Image Processing",3rdEdition, Pearson India, 2013..
2. Jain A.K, "Fundamentals of Digital Image Processing", 4th Edition, Prentice hall of India, 2004..
3.. B.Chanda, D. DuttaMajumder, "Digital Image Processing and Analysis", 2ndEdition, Phi learning, 2011

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 6108			
Course Title	Digital / Computer Forensics Laboratory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices. Understand how to examine digital evidences such as the data acquisition, identification analysis.

Course Outcome:

CO1: To demonstrate procedure for identification, preservation and acquisition of digital evidence.
CO2: To demonstrate techniques and tools used in digital forensic for operating system and malware protection.
CO3: To demonstrate tools for mobile forensic and browser email forensic.
CO4: To explore scenario based crime forensic investigation..
CO5: Explain the design process to the problem of forensic science

Course Content:

List of Experiments:

1 Analysis of forensic image using open source tools : FTK Imager, Autopsy.
2. Explore forensic tools in Kali Linux for acquiring, analyzing and duplicating data: dd, dcfldd.
3. Performing penetration testing using Metasploit: Kali Linux.
4. Performing RAM forensic to analyze memory images to traces of an attack: Capturing RAM using DumpIT Tool and volatility tool.
5. Network forensic using Network Minor
6. Windows recycle bin forensic
7. USB device forensic: USB Detective
8. Email Analysis

Text/Reference Books:

1 Nina Godbole and SunitBelapore; "Cyber Security: Understanding CyberCrimes, Computer Forensics and Legal Perspectives", Wiley Publications,2011.
2 Bill Nelson, Amelia Phillips and Christopher Steuart; "Guide to ComputerForensics and Investigations" – 3rd Edition, Cengage, 2010 BBS.
3.. Shon Harris; "All in One CISSP Guide, Exam Guide Sixth Edition",McGraw Hill, 2013.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Semester 7 Curriculum and Syllabus

Course Code	YCS7003B/7006			
Course Title	Soft Computing			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

The main objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing. .Upon completion of this course, the student should be able to get an idea on: Artificial Intelligence, Various types of production systems, characteristics of production systems. Neural Networks, architecture, functions and various algorithms involved. Fuzzy Logic, Various fuzzy systems and their functions. Genetic algorithms, its applications and advances.

Course Outcome:

At the end of the course the student should be able to

CO1: To learn about soft computing techniques and their applications
CO2: To analyze various neural network architectures
CO3: To understand perceptron and counter propagation networks
CO4: To Define the fuzzy systems
CO5: To analyze the genetic algorithms and their applications

Course Content:

Module 1: Introduction [6L]

- Introduction to soft computing
- Introduction to fuzzy sets and fuzzy logic systems
- Introduction to biological and artificial neural networks
- Introduction to Genetic Algorithm

Module 2 : Fuzzy Sets and Fuzzy Logic Systems [9L]

- Classical Sets and Fuzzy Sets and Fuzzy relations
- Operations on Classical sets, properties of classical sets
- Fuzzy set operations, properties of fuzzy sets, cardinality
- Membership functions, standard forms, boundaries, fuzzification methods
- Fuzzy to Crisp conversions, Lambda Cuts, Defuzzification methods
- Classical Logic and Fuzzy Logic, Approximate reasoning, Fuzzy Implication
- Fuzzy Rule based Systems, Linguistic Hedges, Fuzzy Rule based system, Fuzzy Inference System, Mamdani Fuzzy Models, Sugeno Fuzzy Models
- Applications of Fuzzy Logic in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems, Weather forecasting

Module 3: Neural Network [9L]

- Introduction to Neural Networks
- Biological Neurons and Artificial neural network
- Model of artificial neuron
- Learning Methods: Hebbian, competitive, Boltzmann etc.
- Neural Network models: Perceptron, Adaline, Madeline networks, single layer network
- Back propagation and multi-layer networks
- Competitive learning networks: Kohonen self-organizing networks, Hebbian learning, Hopfield Networks
- Neuro-Fuzzy modeling
- Applications of Neural Networks in Pattern Recognition and classification

Module 4 : Genetic Algorithms [7L]

- Simple GA, crossover, mutation
- Multi-objective Genetic Algorithm (MOGA)
- Applications of Genetic Algorithm in search and optimization, GA based clustering Algorithm, Image processing, pattern Recognition

Module 5: Other Soft Computing techniques [5L]

- Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO)

Text/Reference Books:

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Principles of Soft Computing, S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 7002 L			
Course Title	Network Security & Web Security			
Category	ENGG, Major			
LTP & Credits	**L**	**T**	**P**	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

Network security is an essential aspect of cybersecurity that protects network data and resources from attackers. Network security has three main objectives: to prevent unauthorized access, to detect and stop cyberattacks, and to ensure secure access for authorized users.

Course Outcome:

At the end of the course the student should be able to

CO1: To Understand and discover security vulnerabilities in browser side security threats

CO2: To Understand and discover vulnerabilities in server side security threats

CO3: To Understand and discover mitigation techniques to reduce the risk of cyber-attacks on web applications

CO4: To Understand and discover security vulnerabilities in Networked Systems, Protocols, the Internet

CO5: To Understand and discover security vulnerabilities in Wireless LAN and defense mechanisms against such vulnerabilities

Course Content:

Module 1: Introduction [8L]

Introduction to Network Security, Web Security, Threat Surfaces, Threat Landscape

Module 2: Network Security [14L]

Security Issues in TCP/IP – TCP, DNS, Routing (Topics such as basic problems of security in

TCP/IP, IPsec, BGP Security, DNS Cache poisoning etc)
DNSSec, IPSEC, S-BGP
Threat Models, Denial of Service Attacks, and DOS-proof network architecture
Wireless-LAN Security – WEP, WPA, WPA2 and WPA3
Network Defense tools – Firewalls, Intrusion Detection, Filtering
Threat Modeling, Attack Surfaces, and other comprehensive approaches to network design for security

Module 3: Web Security [14L]

Security architecture of World Wide Web, Security Architecture of Web Servers, and Web Clients, Client-side attacks and defenses,Server-side attacks and defenses
Web Application Security – Cross Site Scripting Attacks, Cross Site Request Forgery, SQL Injection Attacks
Content Security Policies (CSP) in web
Session Management and User Authentication, Session Integrity
Https, SSL/TLS

Text/Reference Books:

1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Principles of Soft Computing, S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7002M			
Course Title	Fog Computing			
Category	ENGG Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None/If Any			

Learning Objective:
This syllabus covers the fundamental aspects, architectures, programming models, data management, communication protocols, applications, challenges, and future directions in the field of Fog Computing.

Course Outcome:
CO1: A comprehensive understanding of Fog Computing principles, architectures, and components, including its comparison with Cloud Computing and Edge Computing.
CO2: Identify and evaluate the hardware and software requirements for Fog Computing infrastructure, including virtualization techniques and networking setups.
CO3: Design and implement effective task offloading strategies, resource management techniques, and load balancing algorithms for Fog Computing environments.
CO4: The necessary programming skills and knowledge of middleware and APIs to develop applications tailored for Fog Computing platforms.
CO5: Manage data effectively in Fog Computing systems, including storage, retrieval, processing, analytics, replication, consistency, security, and privacy considerations.

Course Content:

Module 1: Introduction to Fog Computing [5L]
- Overview of Fog Computing
- Comparison with Cloud Computing and Edge Computing
- Motivation and Applications of Fog Computing
- Architecture and Components of Fog Computing

Module 2: Fog Computing Infrastructure[5L]
- Hardware Requirements for Fog Computing
- Software Requirements and Platforms
- Virtualization Techniques in Fog Computing
- Networking Infrastructure for Fog Computing

Module 3: Fog Computing Models[4L]
- Task Offloading Strategies
- Resource Management and Allocation
- Load Balancing Techniques in Fog Computing
- Security and Privacy Considerations

Module 4: Programming Models for Fog Computing [4L]
- Fog Programming Paradigms
- Developing Applications for Fog Computing
- Middleware and APIs for Fog Computing
- Case Studies and Examples

Module 5: Data Management in Fog Computing [6L]
- Data Storage and Retrieval in Fog Computing
- Data Processing and Analytics at the Edge
- Data Replication and Consistency Models
- Data Security and Privacy in Fog Computing

Module 6: Communication Protocols in Fog Computing[4L]
- Communication Models in Fog Computing
- IoT Protocols and Standards
- Fog-to-Cloud Communication Protocols
- QoS and Reliability in Fog Communication

Module 7: Fog Computing Applications[4L]
- Smart Cities and Urban Computing
- Industrial IoT and Industry 4.0
- Healthcare Applications of Fog Computing
- Transportation and Logistics Applications

Module 8: Challenges and Future Directions[4L]

- Scalability and Performance Challenges
- Interoperability and Standardization
- Energy Efficiency in Fog Computing
- Emerging Trends and Future Directions in Fog Computing

Text/References Books:

1. "Fog Computing: Concepts, Frameworks and Applications" by Rajkumar Buyya, Amir Vahid Dastjerdi, and Satish Narayana Srirama.
2. "Fog Computing: A Practical Guide to Container Orchestration and Microservices in Fog Environments" by K.K. Singh, Yogesh Raheja, and Arun Sharma
3. "Fog Computing in the Internet of Things: Intelligence at the Edge" by Zaigham Mahmood and Rajkumar Buyya.
4. "Fog Computing: Principles, Architectures, and Applications" by Moussa Ayyash and Majd F. Sakr

CO/PO mapping:

Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 7002 N			
Course Title	Advanced Operating Systems			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems) Hardware and software features that support these systems.

Course Outcome:

CO1: Understand the design approaches of advanced operating systems

CO2: Analyze the design issues of distributed operating systems.

CO3: Evaluate design issues of multi processor operating systems.

CO4: Identify the requirements Distributed File System and Distributed Shared Memory.

CO5: Formulate the solutions to schedule the real time applications

Course Content:

Module 1: [8L]

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

Module 2:[8L]

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token – Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

Module 3:[7L]

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

Module 4:[7L]

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

Module 5:[6L]

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration
Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

Text/Reference Books:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001

2. 1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7004K			
Course Title	Block chain Technology & Crypto currency			
Category	ENGG, Major			
LTP& Credits	L	T	P	Credits
	3		0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objectives:

Blockchain is an emerging technology platform for developing decentralized applications and data storage, extending beyond its role as the technology underlying crypto currencies. The basic tenet of this platform is to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. Public blockchain platforms allow us to guarantee these properties with overwhelming probabilities even when untrusted users are participants of distributed applications with the ability to transact on the platform. Although blockchain technology has become popularly known because of its use in implementing cryptocurrencies such as Bitcoin, Ethereum, etc.

Course Outcomes:

CO 1: Describe the basic concepts and technology used for blockchain.

CO 2: Describe the primitives of distributed computing and cryptography related to blockchain.

CO 3: Illustrate the concepts of Bitcoin and their usage.

CO 4: Implement Ethereum blockchain contracts.

CO 5: Apply security features in blockchain technologies.

Course Contents:

Module 1: Introduction [6L]

- Need for Distributed Record Keeping.
- Modeling faults and adversaries.

- Byzantine Generals problem.
- Consensus algorithms and their scalability problems.
- Why Nakamoto Came up with Blockchain-based cryptocurrency?
- Technologies Borrowed in Blockchain – hash pointers, consensus, Byzantine fault-tolerant distributed computing, digital cash, etc.

Module 2: Basic Distributed Computing [4L]

- Atomic Broadcast, Consensus, Byzantine Models of fault tolerance.

Module 3: Basic Crypto primitives [6L]

- Hash functions, Puzzle-friendly Hash, Collision-resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems.

Module 4: Blockchain 1.0 [9L]

- Bitcoin blockchain, the challenges, and solutions.
- Proof of work, Proof of stake, alternatives to Bitcoin consensus.
- Bitcoin scripting language and their use.

Module 5: Blockchain 2.0 [9L]

- Ethereum and Smart Contracts.
- The Turing Completeness of Smart Contract Languages and verification challenges.
- Using smart contracts to enforce legal contracts.
- Comparing Bitcoin scripting vs. Ethereum Smart Contracts.

Module 5: Blockchain 3.0 [6L]

- Hyperledger Fabric, the plug and play platform, and mechanisms in permissioned blockchain.

Module 6: Privacy, Security issues in Blockchain [8L]

- Pseudo-anonymity vs. anonymity.
- Zcash and Zk-SNARKS for anonymity preservation.
- Attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks.
- Advent of Algorand and Sharding-based consensus algorithms to prevent these.

Text / Reference Books: Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7003H			
Course Title	Ad Hoc And Sensor Networks			
Category	ENGG,Major			
LTP& Credits	L	T	P	Credits
	3		0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objectives:

- Understand the concept of ad hoc networks and their characteristics.
- Explain the architecture and routing algorithms for wireless sensor networks.
- Identify the challenges and solutions in implementing ad hoc and sensor networks.
- Implement routing algorithms based on network and user requirements.
- Familiarize with physical and MAC layer protocols and their issues.
- Demonstrate knowledge of transport layer and security issues in ad hoc and sensor networks.
- Develop basic modules using the operating systems used in wireless sensor networks.

Course Outcomes:

- CO1: Construct ad hoc networks and wireless sensor networks.
- CO2: Implement suitable routing algorithms based on network and user requirements.
- CO3: Identify appropriate physical and MAC layer protocols and their issues.
- CO4: Demonstrate knowledge of transport layer and security issues in ad hoc and sensor networks.
- CO5: Be familiar with the operating systems used in wireless sensor networks and build basic modules.

Course Contents:

1. Module 1: Introduction [7L]
    - Characteristics of MANETs
    - Application and challenges of MANETs
    - Topology-based vs position-based approaches
    - Topology-based routing protocols

- Position-based routing protocols
- Other routing protocols

2. Module 2: Data Transmission in MANETs [6L]
    - Broadcast storm multicasting
    - Geocasting
    - TCP protocol overview
    - TCP and MANETs
    - Solutions for TCP over Ad Hoc
3. Module 3: Basics of Wireless Sensors [8L]
    - Introduction to wireless sensors and applications
    - Design issues and energy consumption
    - Clustering of sensors
    - Applications of wireless sensor networks
    - Data retrieval in sensor networks
4. Module 4: Security and Sensor Network Platforms [7L]
    - Security in ad hoc wireless networks
    - Key management and secure routing cooperation in MANETs
    - Intrusion detection systems
    - Sensor network hardware and programming challenges
    - Node-level software platforms
5. Module 5: Operating Systems and Simulators [6L]
    - Operating system: TinyOS
    - Imperative language: nesC
    - Dataflow style language: TinyGALS
    - Node-level simulators: ns-2 and its sensor networks extension, TOSSIM

Text / Reference Books:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004.

2. Holger Karl, Andreas Willig, “Protocol and Architecture for Wireless Sensor Networks”, John Wiley publication, Jan 2006.

3. Ad Hoc and Sensor Networks, Carlos Corderio, Dharma P. Aggarwal, World Scientific Publication/ Cambridge University Press, March 2006.

4. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000.

5. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kaufmann publishers, 2005,rp2000

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7003L			
Course Title	Cyber Attacks and Counter Measures: User Perspective			
Category	ENGG Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	Data structures			

Learning Objectives:
The Cyber Security Defense and Countermeasures course prepares students to defend enterprise networks and protect enterprise data assets from Web-based and internal attacks using techniques such as system hardening, encryption, policy enforcement, and software/hardware intrusion detection systems.

Course Outcomes:

CO1: Evaluate techniques to improve network security defense against regional and international threats CO2: Analyze a network for vulnerabilities to common cyber based attacks.

CO3: Summarize encryption techniques for securing enterprise data.
CO4: Recommend a strategy to protect digital assets from virus, malware, and other cyber-attacks.
CO5: Demonstrate an ability to analyze organizational networks and provide sound recommendations to protect digital assets from virus, malware, and other cyber-attacks.

Course Contents:

Module 1: [4L]

CYBER ATTACKS, TYPES OF ATTACKS MOTIVATION Introduction, Cyber-attack, Types of cyber-attack or threats.

Module 2: [6L]

ASSET, THREAT AND RISK MANAGMENT Introduction to asset, Identification of assets, Information assets, Software assets, Physical assets, Services, Accountability of assets, Assets valuation, Preparing a schema for classification, Implementation of the classification schema, vulnerability and threats, Types of threat, Risk management, Quantitative risk assessment, Advantages of quantitative risk assessments, Disadvantages of quantitative risk assessments, Qualitative risk assessment, Advantages of qualitative risk assessments, Disadvantages of qualitative risk assessments.

Module 3: [4L]

ORAGANIZATION SECURITY & FRAMEWORKS Introduction to information security framework, Advantage of Information Security framework, Standards, Best Practices and Frameworks, ISO, COSO, COBIT (IT Governance Framework), POLICIES, STANDARDS, BASELINES, GUIDELINES AND PROCEDURES, Security Policy.

Module 4: [8L]

SECURITY CONTROLS SECURITY BASICS, Physical Controls, Technical Controls, Administrative Controls, Physical security, protection on the inside, Partitioning and protecting network boundaries with firewalls, USER ACCESS CONTROLS, Why Access Controls are required, What are Access Control Models, Discretionary Access Control (DAC), Mandatory Access Control (MAC), Role Based Access Control (RBAC), Authentication, User password Authentication, Windows user based authentication, Directory based authentication, Certificate based authentication, Smart card based authentication, Biometrics, Grid based Authentication, Knowledge-based authentication, Machine Authentication, One time Password (OTP), Access Control Framework (ACF), Access Control Techniques and Technologies, Rule Based Access control, Menu Based Access Control, Access Control List, Content Based Access Control, Access control Markup Language (XACML), Security Assertion Markup Language (SAML), TRAINING AND AWARENESS, Types of Training, Classroom-Style Training, Security Awareness Website, Helpful Hints, Visual Aids, Promotions, Training Topics, Physical Security, Desktop Security, Wireless Networks and Security, Password Security, Phishing, Hoaxes, Malware, Viruses, Worms, Trojans, Spyware and Adware.

Module 5: [8L]

Introduction, Technical security controls, Preventive Technical Controls, Access Control Software, Antivirus Software, Library Control Systems, Passwords Smart Cards, Encryption, Dial-Up Access Control and Callback Systems, Detective Technical Controls, Audit Trails, Intrusion Detection Systems, Corrective Technical Controls, OS Upgrade, Backup Data restoral, Vulnerability Mitigation, PROTECTION FROM MALICIOUS ATTACKS, NETWORKS AND COMMUNICAITON, Data Communication, Characteristics of Data Communication, Components of Data Communication, Data Representation, Data Flow, Simplex, Half Duplex, Full Duplex, COMPUTER NETWORK, Categories of Network, Protocol, Elements of a Protocol, External Services, Policy on Use of External Services, CLOUD COMPUTING, Cloud Computing Models, Understanding Public and Private Clouds, Public Cloud, Private Cloud, Hybrid Cloud, Cloud Computing Benefits, Cloud Computing Challenges, IT Infrastructure.

Module 6: [6L]

AUTHENTICATION AND PASSWORD SECURITY: INTRODUCTION, AUTHENTICATION, Definition of Authentication, Definition of Electronic Authentication, Authentication vs. Authorization, Types of

Authentication Factors, Multi Factor and Two Factor Authentication, AUTHENTICATOIN METHODS AND PROTOCOLS, Kerberos, Secure Sockets Layer(SSL), Microsoft NTLM, Password Authentication Protocol, Challenge-Handshake Authentication Protocol(CHAP), Microsoft Challenge Handshake Authentication Protocol(MS-CHAP), Extensible Authentication Protocol, Remote Authentication Dial-In User Service (RADIUS), Certificates, Security Tokens, Selecting a Strong Password, Bad Password Combinations, Tips for a Strong Password.

Text/Reference Books:

1. Thomas, T. W., Tabassum, M., Chu, B., & Lipford, H. (2018). Security during application development: an application security expert perspective. 2018 CHI Conference on Human Factors in Computing Systems, 1–12. https://doi.org/10.1145/3173574.3173836"
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress.
3. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7004D			
Course Title	Advanced Algorithms			
Category	ENGG,Major			
LTP& Credits	**L**	**T**	**P**	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	Data structures			

Learning Objectives:
Introduce students to the advanced methods of designing and analyzing algorithms. The student should be able to choose appropriate algorithms and use them for specific problems. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems. Students should be able to understand different classes of problems concerning their computation difficulties. To introduce the students to recent developments in the area of algorithmic design.

Course Outcomes:
CO1: Analyze the complexity/performance of different algorithms.
CO2: Determine the appropriate data structure for solving a particular set of problems.
CO3: Categorize different problems into various classes according to their complexity.
CO4: Students should have an insight into recent activities in the field of advanced data structures.
CO5: Apply advanced algorithms to solve real-world problems effectively.

Course Contents:

Module 1: Sorting: Review of various sorting algorithms, topological sorting. Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search, and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis. [6L]

Module 2: Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path. [8L]

Module 3: Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm. Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition. [8L]

Module 4: Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Discrete Fourier Transform (DFT). [8L]

Module 5: Linear Programming: Geometry of the feasibility region and Simplex algorithm. NP-completeness: Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest: Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number. [6L]

Text/Reference Books:

4. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
5. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
6. "Algorithm Design" by Kleinberg and Tardos.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7004E			
Course Title	Neural Networks and Deep Learning			
Category	Major ENGG			
LTP & Credits	**L**	**T**	**P**	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

Neural networks enable computers to make intelligent decisions with minimal human intervention by learning and modeling complex, nonlinear relationships between input and output data. Deep learning encompasses a wide range of highly effective techniques in machine learning. The course aims to familiarize students with

this area and provide them with the knowledge to apply these techniques to solve real-world problems.

Course Outcome:

- CO1: Understand the mathematics behind the functioning of artificial neural networks.
- CO2: Analyze datasets to design neural network-based solutions.
- CO3: Design and implement deep learning models for signal/image processing applications.
- CO4: Design and deploy simple TensorFlow-based deep learning solutions for classification problems.
- CO5: Apply deep learning techniques to solve complex real-world problems.

Course Content:

Module 1: Introduction (4L)

- Various paradigms of learning problems.
- Perspectives and issues in deep learning framework.
- Review of fundamental learning techniques.

Module 2: Feed Forward Neural Network (6L)

- Artificial Neural Network.
- Activation functions.
- Multi-layer neural network.
- Cardinality, operations, and properties of fuzzy relations.

Module 3: Training Neural Network (6L)

- Risk minimization.
- Loss function.
- Backpropagation.
- Regularization.
- Model selection and optimization.

Module 4: Conditional Random Fields (8L)

- Linear chain.
- Partition function.
- Markov network.
- Belief propagation.
- Training CRFs.
- Hidden Markov Model.
- Entropy.

Module 5: Deep Learning (6L)

- Deep Feed Forward network.
- Regularizations.

- Training deep models.
- Dropouts.
- Convolution Neural Network.
- Recurrent Neural Network.
- Deep Belief Network.

Module 6: Deep Learning Research (6L)

- Object recognition.
- Sparse coding.
- Computer vision.
- Natural language.

Text/Reference Books:

1. Goodfellow, I., Bengio, Y., and Courville, A. "Deep Learning," MIT Press, 2016.
2. Bishop, C. M. "Pattern Recognition and Machine Learning," Springer, 2006.
3. Yegnanarayana, B. "Artificial Neural Networks," PHI Learning Pvt. Ltd, 2009.
4. Golub, G. H., and Van Loan, C. F. "Matrix Computations," JHU Press, 2013.
5. Kumar, Satish. "Neural Networks: A Classroom Approach," Tata McGraw-Hill Education, 2004.
6. Chopra, Rajiv. "Deep Learning," Khanna Publishing House, 2018.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7004F			
Course Title	Learning Optimization Technique			
Category	Major ENGG			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites				

Learning Objectives:

- Introduce optimization techniques using both linear and non-linear programming, with a focus on convex optimization while covering some techniques for non-convex function optimization.

- Provide students with a solid foundation in mathematical preliminaries, enabling them to frame engineering minima maxima problems in the framework of optimization problems.

Course Outcome:

CO1: Understand the mathematical preliminaries required for optimization techniques, including linear algebra, matrices, vector spaces, eigen analysis, probability theory, and multivariable calculus.

CO2: Apply linear programming techniques, including the simplex method, duality, and Karmarkar's method, to solve optimization problems.

CO3: Apply unconstrained optimization methods, such as conjugate direction and quasi-Newton methods, gradient-based methods, and one-dimensional search methods, to solve optimization problems.

CO4: Apply constrained optimization techniques, including Lagrange theorem, FONC, SONC, and SOSC conditions, to solve optimization problems with constraints.

CO5: Understand and apply projection methods, KKT conditions, and models for non-linear constrained optimization problems.

Course Content:

Module 1: Mathematical Preliminaries [8 L]

- Linear algebra and matrices
- Vector spaces
- Eigen analysis
- Elements of probability theory
- Elementary multivariable calculus

Module 2: Linear Programming (6 Lectures)

- Simplex method
- Introduction to linear programming model
- Duality
- Karmarkar's method

Module 3: Unconstrained Optimization (6 Lectures)

- Conjugate direction and quasi-Newton methods
- Gradient-based methods
- One-dimensional search methods

Module 4: Constrained Optimization (8 Lectures)

- Lagrange theorem
- FONC, SONC, and SOSC conditions

Module 5: Non-linear Constrained Optimization (8 Lectures)

- Projection methods
- KKT conditions
- Non-linear constrained optimization models

- Non-linear problems

Text/Reference Books:

1. An Introduction to Optimization by Edwin P K Chong, Stainslaw Zak
2. Nonlinear Programming by Dimitri Bertsekas

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YBB7001			
Course Title	Human Resource Development and Organizational Behavior			
Category	Minor HUM			
LTP & Credits	**L**	**T**	**P**	Credits
	2	0	0	1
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

To provide students with an understanding of the basic principles of organizational behavior, equipping them with managerial skills and the necessary knowledge in human resource management.

Course Outcome:

CO1: Define and explain the basic concepts of organizational behavior and motivation.
CO2: Explain essential concepts of organizational conflicts, conflict resolution through negotiation, change management, and organizational development.
CO3: Familiarize students with various aspects of HR, enabling them to deal effectively with people resourcing, talent management, and HR functions in an organization.
CO4: Understand the concepts of HRD, its role, and importance in the success of an organization.
CO5: Develop an understanding of compensation management and industrial relations.

Course Content:

Module 1: Introduction to Organizational Behavior (8L)

- Meaning and scope of organizational behavior
- Challenges and Opportunities
- Foundations of Individual behavior

- Motivation Theories (Maslow, ERG, Douglas McGregor two-factor theory)
- Group dynamics
- Leadership styles

Module 2: Organizational Conflict and Change Management (7L)

- Causes and consequences of organizational conflict
- Conflict and negotiation
- Organizational change
- Change management process
- Resistance to change
- Flexibility and crisis management
- Organizational Development: Concept and significance

Module 3: Human Resource Management (6L)

- Meaning, definition, and functions of HRM
- Job Analysis and Job Design
- Human Resource Planning
- Recruitment and Selection
- Sources of Recruitment
- Selection process, Placement, and Induction

Module 4: Human Resource Development (7L)

- Concepts of Human Resource Development
- Training and Development
- Methods of training
- Importance of Performance Appraisal
- Traditional and modern methods of performance appraisal
- Job Evaluation
- Methods of Job Evaluation
- Wage and Salary Administration

Module 5: Compensation Management and Industrial Relations (8L)

- Concepts and Principles of Compensation
- Influencing Factors
- Emerging Trends in Compensation
- Methods of Payment
- Incentives and Rewards
- Managing Industrial Relations

- Emerging trends and practices in human resource management

Text/Reference Books:

1. K. Aswathappa, Organizational Behaviour, 12th edition, Himalaya, 2016
2. Edwin B. Flippo, Personnel Management, 6th edition, TMH, 2013
3. P. Subba Rao, Management & Organizational Behavior, 2nd edition, Himalaya, 2014
4. C.B. Mamoria& VSP Rao, Personnel Management, 20th edition, Himalaya, 2015
5. Stephen P. Robins, Organisational Behaviour, 11th edition, PHI Learning / Pearson Education, 2008

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 7101			
Course Title	Soft Computing Laboratory			
Category	ENGG, Major			
LTP& Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

Aims to provide comprehensive understanding of soft computing approaches for AI problemsolving. Develops in depth knowledge on concepts related to different types of neural networks.Provides in depth knowledge on concepts related to Fuzzy logic, membership value assignment and reasoning with fuzzy quantities.Helps to understand the development of Fuzzy Inference systems and Fuzzy expert systems.Introduces the concepts related to Genetic algorithms for learning from examples.

Course Outcomes:

CO1: Implement neural networks to solve real world problems
CO2: Choose appropriate pre-trained model to solve real time problem
CO3: Parameter tuning using Genetic algorithms
CO4: Write genetic algorithms for learning the hyper parameters for data classification.
CO5: Implement Fuzzy Inference

Course Content:

Software Packages required*:*

Open source tools for building neural network models, fuzzy logic and genetic algorithms

List of Experiments:

1. Build an Artificial Neural Network by implementing the Back propagation algorithm and testthe same using appropriate data sets.
2. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
3. Design a neural network for classifying movie reviews (Binary Classification) using IMDBdataset.
4. Design a neural Network for classifying news wires (Multi class classification) using Reutersdataset.
5. Design a neural network for predicting house prices using Boston Housing Price dataset.
6. Implement fuzzy inference for image segmentation.
7. Implement the house price prediction problem with fuzzy reasoning
8. Implement the Fuzzy C-Means algorithm for clustering
9. Implement the basic concepts of genetic algorithms for learning
10. Implement genetic algorithms for hyper parameter tuning in neural networks for classifyingIMDB dataset.

Text/Reference Books:

1. Ivan Gridin, "Learning Gentic Algorithms with Python", BPB publishers, 2021

2. Rajasekaran and Pai, "Neural Networks, Fuzzy Logic and Evolutionary Algorithms:Synthesis and Applications, PHI, 2017

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7102I			
Course Title	Network Security & Web Security Laboratory			
Category	ENGG, Major			
LTP & Credits	**L**	**T**	**P**	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

Fog computing allows innovative solutions, particularly those requiring low latency and mobility. Such new applications can have diverse QoS needs, necessitating the use of fog management methods to deal with this heterogeneity efficiently.

Course Outcome:

CO1: Ability to implement inter process communication between two processes.

CO2: Ability to design and solve synchronization problems.

CO3: Ability to simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.

CO4: To comprehend how an operating system virtualizes CPU and memory

CO5: To discuss various scheduling and swapping policies. learn basic concurrent programming in C and assembly code

Course Content:

List of Experiments:

1. Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher iv) Vigenere cipher
2. Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Writing a Self-Propagating XSS Worm
6. Implement the Attack using HTTP GET request.
7. Attack in HTTP POST request.
8. Implement SQL Injection Attack on SELECT Statements.
9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
11. Defeating Malware i) Building Trojans ii) Rootkit Hunter
12. IP Attack, IP Fragmentation attack, IP teardrop attack

Text/Reference Books:

1. Build Your Own Security Lab, Michael Gregg, Wiley India
1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7102J			
Course Title	Fog Computing Laboratory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	0	0	3	1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

This course gives an overview of Fog Computing and its architecture, challenges and applications in different contexts.

Course Outcome:

CO1: To extend the students' knowledge of fog computing & edge computing

CO2: To enhance their expertise in area of wearable computing enjoinment
CO3: To carry out real life application of fog computing
CO4: To Explore Fog on security, multimedia and smart data.

CO5: To understand the architecture and its components and working of components and its performance

Course Content:

List of Experiments:

1. To implement simple data collection using IoT devices.
2. To Understand, implement and compare communication protocols used in IoT like MQTT, CoAP

3. To Set up edge devices and servers.
4. To develop an edge computing application for a specific industry (e.g., healthcare, manufacturing)
5. To implement analytics and decision-making processes at the edge.
6. To explore security concerns in IoT and edge computing.
7. To implement encryption and authentication for secure IoT communication.
8. To implement and IoT setup to send the data on the cloud
9. To integrate IoT, Edge computing and Cloud computing.

Text/Reference Books:

1. Internet of Things by Surya Durbha and Jyoti Joglekar by Oxford University Press, 2021.
2. Sensors, Cloud and Fog: The Enabling Technologies for th Internet of Things by Sudip Misra, Subhadeep Sarkar and Subarna Chatterjee by CRC Press, 2019.
3. Industry 4.0: The Industrial Internet of Things by Alasdair Gilchrist by Apress, 2023.
4. IoT and Edge Computing for Architects by Perry Lea, Second edition, by Packt, 2020.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS7102K			
Course Title	Advanced Operating Systems Laboratory			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	0	0		1.5
Total Contact Hours	36			
Pre-requisites	None			

Learning Objective:

Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management. Advanced operating system topics include multi-tasking, synchronization mechanisms, distributed system architecture, client–server models, distributed mutual exclusion and concurrency control, agreement protocols, load balancing, failure recovery, fault tolerance, cryptography, and multiprocessor operating systems.

Course Outcome:

CO1: Ability to implement inter process communication between two processes.

CO2: Ability to design and solve synchronization problems.

CO3: Ability to simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.

CO4: To comprehend how an operating system virtualizes CPU and memory

CO5: To discuss various scheduling and swapping policies. learn basic concurrent programming in C and assembly code

Course Content:

List of Experiments:

a. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
b. Write programs using the I/O System calls of UNIX operating system (open, read, write, etc.).
c. Write C programs to simulate UNIX commands like ls, grep, etc.
d. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
e. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
f. Develop application using Inter-Process Communication (using shared memory, pipes or message queues).
g. Implement the Producer-Consumer problem using semaphores (using UNIX system calls)
h. Implement Memory management schemes like paging and segmentation.
i. Implement Memory management schemes like First fit, Best fit and Worst fit.
j. Implement any file allocation techniques (Contiguous, Linked or Indexed)

Text/Reference Books:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001
2. 1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Semester 8 Curriculum and Syllabus

Course Code	YCS 8001K			
Course Title	Cyberspace and Its Governance			
Category	ENGG Major			
LTP& Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	Data structures			

Learning Objectives:

Cyber security governance is a comprehensive cybersecurity strategy that integrates with organizational operations and prevents the interruption of activities due to cyber threats or attacks.

Course Outcomes:

CO1: Make Learner Conversant With The Social And Intellectual Property Issues Emerging From 'Cyberspace.

CO2: Explore The Legal And Policy Developments In Various Countries To Regulate Cyberspace;

CO3: Develop The Understanding Of Relationship Between Commerce And Cyberspace;
CO4: Give Learners In Depth Knowledge Of Information Technology Act And Legal Frame Work Of Right To Privacy, Data Security And Data Protection.
CO5: Make Study On Various Case Studies On Real Time Crimes.

Course Contents:

Module 1: [8L]

Cyberspace – An Overview of the Concept Inherent Characteristics of Cyberspace. Forms of Cyberspace Regulations. Cyberspace Regulatory Theory of Lawrence Lessig

Module 2: [6L]

Outline of Legislative Framework for Cyber Law History and Emergence of Cyber Law. Outreach and Impact of Cyber Law. Major Amendments in Various Statutes

Module 3: [6L]

Establishment of Personal Jurisdiction in Cyberspace Overview of Tests and Interactivity. Jurisdictional Approaches of Online Contract. Basis of Jurisdiction and Indian Approach.

Module 4: [8L]

Indian Constitution and Freedom of Expression Examination of Rights Under Indian Laws. The Legislative Responses in Cyberspace. National Sovereignty And Freedom Of Expression.

Module 5: [8L]

Governance Corporate, IT, Security
Cyber Compliance
Cyber Security Framework Introduction : Information Security Program; Introducting Policies, Standards, Procedures and Guidelines; Introduction to International Standards; Introduction to Information Security Management Systems (ISMS) - ISO 27000.
Privacy in the Digital Age
Security Policies and Procedures

Text/Reference Books:

1 .K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security",1 st Edition, Dominant Publisher,2011.

2. Rodney D. Ryder, " Guide To Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.

3. Information Security policy &implementation Issues, NIIT, PHI.

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS8001L			
Course Title	Cyber Risk Management			
Category	ENGG Major			
LTP& Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	36			
Pre-requisites				

Learning Objectives:

A cybersecurity risk assessment is a process that helps organizations determine key business objectives and then identify the appropriate IT assets required to realize their objectives. It involves the identification of cyber attacks that may negatively impact these IT assets.

Course Outcomes:

CO1: Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation
CO2: Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools
CO3: Comprehend and execute risk management processes, risk treatment methods, and key risk and performance indicators
CO4: Design and develop a security architecture for an organization.
CO5: Design operational and strategic cyber security strategies and policies.

Course Contents:

Module 1: [10L]

- Cybersecurity Risk Frameworks
- Industry
- Regulatory
- Enterprise

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Module 2: [10L]

- Cyber Scenarion Analysis

- Threat Actors
- Security Operations
- Event Categories
- Loss Calculation

Module 3: [8L]

- Technology Controls
- Roles and Responsibilities
- Governance Processes

Module 4: [8L]

- Cybersecurity Risk Metrics
- Key Cyber Risk Indicators
- Cybersecurity Risk Appetite and Tolerance

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Text/Reference Books:

1. JohnVeiga, Gary McGraw,"Building Secure Software: How to Avoid Security Problems the Right Way", Addison-Wesley Professional Computing Series, 2001

2. A.Refsdal, B. Solhaug, K. Stolen, " Cyber-Risk Management", Springer, 2015/Latest Edition.

3. E. Wheeler, "Security Risk Management", O'Reilly, 2011/Latest Edition

4. R. Bentham, "Cyber Risk Management: Practical Strategies to Protect your Organization from Cyber Threats", Kogan Page, 2018/Latest Edition

5. C.J. Hodson, "Cyber Risk Management: Prioritize Threats, Identify Vulnerabilities and Apply Controls", Kogan Page, 2019/Latest Edition.

. CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS8001M			
Course Title	Cloud Infrastructure and Services			
Category	ENGG Major			
LTP& Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	36			
Pre-requisites				

Learning Objectives:

The course presents a top-down view of cloud computing, from applications and administration to programming, infrastructure, billing and security. The topics include: overview of cloud computing, cloud systems, Load balancing in AWS, distributed storage systems, virtualization, security in AWS, and management services and Billing. Students will study state-of-the-art solutions for cloud computing developed by Amazon. Students will also apply what they learn in one programming assignments and one project executed over Amazon Web Services.

Course Outcomes:

CO1: To explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO2: To apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost by Load balancing approach
CO3: To discuss system virtualization and outline its role in enabling the cloud computing system model

CO4: To analyze various cloud programming models and apply them to solve problems on the cloud.
.
CO5: To understand security and compliances for AWS.

Course Contents:

Module 1: [4L]

Introduction to Cloud Technologies
Introduction to the Cloud Computing, History of cloud computing, Cloud service options, Cloud Deployment models, Business concerns in the cloud.

Module 2: [4L]

Virtualization and Cloud Platforms
Exploring virtualization, Load balancing, Hypervisors, Machine imaging, Cloud marketplace overview, Comparison of Cloud providers.

Module 3: [3L]

Introduction to AWS
AWS history, AWS Infrastructure, AWS services, AWS ecosystem

Module 4: [5L]

Programming, management console and storage on AWS
Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Glacier - Content delivery platforms.

Module 5: [5L]

AWS identity services, security and compliance
Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities.

Module 6: [6L]

AWS computing and marketplace
Elastic cloud compute - Introduction to servers, Imaging computers
Auto scaling, Elastic load balancing, Cataloging the marketplace, AMIs, Selling on the marketplace

Module 7: [3L]

AWS networking and databases
Virtual private clouds, Cloud models, Private DNS servers (Route 53), Relational database service – DynamoDB, ElastiCache, Redshift.

Module 8: [6L]

Other AWS services and management services
Analytics services, Application services, Cloud security, CloudWatch, CloudFormation, CloudTrail, OpsWorks.
AWS billing and Dealing with disaster
Managing costs, Utilization and tracking, Bottom line impact, Geographic and other concerns, Failure plans, Examining logs.

Text/Reference Books:

1. Cloud Computing Bible. Barrie Sosinsky. John Wiley & Sons. ISBN-13: 978-0470903568.
2. Amazon Web Services For Dummies. Bernard Golden. For Dummies. ISBN-13: 978-1118571835
3. Rajkumar Buyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition
4. Amazon Security overview whitepaper- https://aws.amazon.com/whitepapers
5. IAM Getting started Guide http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html
6. Amazon.com Mashups by Francis Shanahan, Wrox, Wiley Publishing Inc., ISBN-13: 978-0470097779, ISBN-10: 0470097779
7. Amazon Web Services in Action by Michael Wittig and Andreas Wittig, Dreamtech Press, ISBN: 9789351198758

CO-PO Mapping

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS8002J			
Course Title	VLSI			
Category	ENGG, Major			
LTP & Credits	**L**	**T**	**P**	Credits
	3	1	0	4
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

This is an introductory course which covers basic theories and techniques of digital VLSI design in

CMOS technology. In this course, we will study the fundamental concepts and structures of designing digital VLSI systems include CMOS devices and circuits, standard CMOS fabrication processes, CMOS design rules, static and dynamic logic structures, interconnect analysis, CMOS chip layout, simulation and testing, low power techniques, design tools and methodologies, VLSI architecture.

Course Outcome:

CO1: Students gain the knowledge about MOSFET / CMOS operation and CMOS Process flow
CO2: Students gain the knowledge of transistor sizing, logical effort and combinational logic.
CO3: Students learn the design concepts with sequential logic
CO4: Students learn the issues related with the static timing analysis and clock distribution
CO5: Students become aware of concepts of memory design and interconnect delay

Course Content:

Module 1: [7L]

Introduction to VLSI Design, Levels of abstraction and the complexity of design, Challenges of VLSI design: power, timing, area, noise, testability, reliability and yield; CAD tools: simulation, layout, synthesis and test.

Module 2: [10L]

MOS modeling, MOS device models, Short-channel effects and velocity saturation, Scaling of MOS circuits; The CMOS inverter, VTC, Switching behavior, Noise margins and power dissipation; Static and dynamic CMOS combinational logic gate, Transistor sizing in static CMOS, logical effort , Passtransistor logic, sizing issues , Domino logic gates , estimating load capacitance , Simple delay models (RC) for CMOS gates , Power consumption;

Module 3: [10L]

Layout design, Design rules, Stick diagrams; Standard-cell layout, Chip layout and floor planning, Array layout; Data path units, Adders, Shifters, Multipliers; Control logic strategies, PLAs , Multilevel logic, Synthesis and place and route; Latches and clocking, Flip-flops, Set-up and hold tests, Static and dynamic latch and flip-flop, clock distribution, clock synthesis and synchronization using PLLs.

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Module 4: [9L]

MOS memories, Register, SRAM , DRAM; Global interconnect modeling, Capacitance, resistance and inductance of interconnect; Signal and power-supply integrity issues, Electromigration, RC interconnect modeling Driving large capacitive load, reducing RC delays; Verilog HDL

Text/Reference Books:

1. J. M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits: A Design Perspective, Second Edition, Pearson/PH, 2003.
2. J. P. Uyemura, Introduction to VLSI Circuits and Systems, Wiley, 2001.
3. W.Wolf, Modern VLSI Design: Systems on Chip Design, Third Edition, Pearson/PH, 2002.
4.R. L. Geiger, P. E. Allen and N. R. Strader, VLSI Design Techniques for Analog and Digital Circuits, McGraw-Hill, 1990.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS8002K			
Course Title	Bioinformatics			
Category	ENGG, Major			
LTP & Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

To provide a national bio-information network designed to bridge the inter-disciplinary gaps in biotechnology information. b. To establish link among scientists in organizations involved in R & D and manufacturing activities in biotechnology. c. To build up information resources, prepare database on biotechnology and to develop relevant information handling tools and techniques.

Course Outcome:

CO1: Infer the biological problems using appropriate in silico approaches
CO2: Select the suitable tools or servers to solve the specific biological issue and curate

experimental data.

CO3: Perform and analyze database and similarity search sequence alignment.

CO4: Construct and analyze phylogenetic trees

CO5: Use appropriate tools and packages to analyze varied range of biological problems.

Course Content:

Module 1: [5L]

Introduction to strings, edit distance strings, string similarity, elementary commands and protocols, Scope of Bioinformatics.

Module 2: [7L]

Sequence Databases And Their Use Introduction to databases, database search, algorithms issues in database search, sequence database search, parametric sequence alignments, sub optimal alignments, dynamic programming global and local alignment gaps, multiple alignment, common multiple alignment methods. FASTA and BLAST. Amino acid substitution matrices PAM and BLOSSOM.

Module 3: [6L]

Evolutionary Trees And Phylogeny : Ultrasonic trees, parsimony, ultrametric problem, perfect phylogeny, phylogenetic alignment, connection between multiple alignment and tree constructions.

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Module 4: [7L]

Protein Classification And Structure Visualization : Overview of the protein structure, protein structure visualization, visualization tools and databases, protein structure alignment, protein classification approaches, tools for plotting Protein - ligand interaction.

Module 5: [6L]

Protein Structure Prediction : Protein identification and characterization, primary structure analysis and prediction, secondary structure analysis and prediction, Ab initio method for protein prediction, protein function prediction.

Module 6: [5L]

Applications Of Bioinformatics: DNA mapping and sequencing, gene predictions, molecular predictions with DNA strings, role of bioinformatics in drug design

Text/Reference Books:

1. David W. Mount. 2005. Bioinformatics: Sequence and Genome analysis, Cold Spring Harbor Laboratory Press.
2. Jones, N.C. and Pevzner, P. A. 2004. An Introduction to Bioinformatics Algorithms. The MIT Press

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS8002L			
Course Title	Robotics			
Category	Major ENGG			
LTP & Credits	L	T	P	Credits
	3	1	0	4
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

To study the kinematics, drive systems and programming of robots. To study the basics of robot laws and transmission systems. To familiarize students with the concepts and techniques of robot manipulator, its kinematics. To familiarize students with the various Programming and Machine Vision application in robots. To build confidence among students to evaluate, choose and incorporate robots in engineering systems.

Course Outcome:

CO1:Interpret the features of robots and technology involved in the control
CO2:Apply the basic engineering knowledge and laws for the design of robotics.
CO3:Explain the basic concepts like various configurations, classification and parts of end effectors compare various end effectors and grippers and tools and sensors used in robots
CO4:Explain the concept of kinematics, degeneracy, dexterity and trajectory planning..

CO5:Demonstrate the image processing and image analysis techniques by machine vision system.

Course Content:

Module 1: [6L]

Fundamentals Of Robot : Robot – Definition – Robot Anatomy – Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions – Need for Robots – Different Applications..

Module 2: [8L]

Robot Kinematics Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices.

Module 3: [8L]

Robot Drive Systems And End Effectors Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All These Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, internal grippers and external grippers, selection and design considerations of a gripper
.

Module 4: [7L]

Sensors In Robotics Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual serving and navigation.

Module 5: [7L]

Programming And Applications Of Robot Teach pendant programming, lead through

programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields

Text/Reference Books:

1. Ganesh.S.Hedge,"A textbook of Industrial Robotics", Lakshmi Publications, 2006.
2. Mikell.P.Groover , "Industrial Robotics – Technology, Programming and applications" McGraw Hill 2ND edition 2012.
3. Fu K.S. Gonalz R.C. and ice C.S.G."Robotics Control, Sensing, Vision and Intelligence", McGraw Hill book co. 2007.
4. YoramKoren, "Robotics for Engineers", McGraw Hill Book, Co., 2002.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 8003A			
Course Title	Introduction to Iot			
Category	ENGG, Minor			
LTP & Credits	L	T	P	Credits
	3	0	0	3
Total Contact Hours	36			
Pre-requisites	a) Probability and Statistics b) Design and Analysis of Algorithms			

Learning Objective:

The main objective of image processing is to transform an image into digital form and perform certain operations on it in order to obtain specific models or to extract useful information from the image.

Course Outcome:

CO1: Upon successfully completing the course, the students should:

CO2: Have an appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression.

CO3: Be able to implement basic image processing algorithms in MATLAB.

CO4: Have the skill base necessary to further explore advanced topics of Digital Image Processing.

CO5: Be in a position to make a positive professional contribution in the field of Digital Image Processing.

Course Content:

Module 1: [7L]

Digital image fundamentals & Image Transforms: Digital Image fundamentals, Sampling and quantization, Relationship between pixels. Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Discrete Wavelet Transform.

Module 2: [9L]

Image enhancement (spatial domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, gray level Transformation, local or neighborhood operation, median filter, spatial domain high-pass filtering. Image enhancement (Frequency domain): Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass(smoothing) and High Pass (sharpening) filters in Frequency Domain

Module 3: [6L]

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration.

Module 4: [7L]

Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region-oriented segmentation Morphological Image Processing: Dilation and Erosion, Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.

Module 5: [7L]

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error-Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text/ Reference Books:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing - S Jayaraman, S. Essakkirajan, T. Veerakumar-TMH, 2010
3. Digital Image Processing and analysis-human and computer vision application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
4. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
5. Fundamentals of Digital Image Processing - A.K. Jain, PHI, 1989
6. Digital Image Processing and computer Vision - Somka, Halavac, Boyle - Cengage learning (Indian edition) 2008,
7. Digital Image Processing using Matlab, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson Education.
8. Introduction to Image Processing & Analysis - John C. Russ, J. Christian Russ, CRC Press, 2010
9. Digital Image Processing with MATLAB & Labview - Vipula Singh Elsevier

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 8003B				
Course Title	Image Processing				
Category	ENGG, Minor				
LTP & Credits	**L**	**T**	**P**	Credits	
	3	0	0	3	
Total Contact Hours	36				
Pre-requisites	Probability and Statistics Design and Analysis of Algorithms				

Learning Objective:

The main objective of image processing is to transform an image into digital form and perform certain operations on it in order to obtain specific models or to extract useful information from the image.

Course Outcome:

CO1: Upon successfully completing the course, the students should:

CO2: Have an appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression.

CO3: Be able to implement basic image processing algorithms in MATLAB.

CO4: Have the skill base necessary to further explore advanced topics of Digital Image Processing.

CO5: Be in a position to make a positive professional contribution in the field of Digital Image Processing.

Course Content:

Module 1: [6L]

Digital image fundamentals & Image Transforms: Digital Image fundamentals, Sampling and quantization, Relationship between pixels. Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Discrete Wavelet Transform.

Module 2: [10L]

Image enhancement (spatial domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, gray level Transformation, local or neighborhood operation, median filter, spatial domain high-pass filtering. Image enhancement (Frequency domain): Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass(smoothing) and High Pass (sharpening) filters in Frequency Domain

Module 3: [5L]

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration.

Module 4: [8L]

Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region-oriented segmentation Morphological Image Processing: Dilation and Erosion, Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.

Module 5: [7L]

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error-Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text/ Reference Books:

10. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
11. Digital Image Processing - S Jayaraman, S. Essakkirajan, T. Veerakumar-TMH, 2010
12. Digital Image Processing and analysis-human and computer vision application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
13. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
14. Fundamentals of Digital Image Processing - A.K. Jain, PHI, 1989
15. Digital Image Processing and computer Vision - Somka, Halavac, Boyle - Cengage learning (Indian edition) 2008,
16. Digital Image Processing using Matlab, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson Education.
17. Introduction to Image Processing & Analysis - John C. Russ, J. Christian Russ, CRC Press, 2010
18. Digital Image Processing with MATLAB & Labview - Vipula Singh Elsevier

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YCS 8003C				
Course Title	Cyber Law& Cyber Crime Investigation				
Category	ENGG, Minor				
LTP & Credits	**L**	**T**	**P**	Credits	
	3	0	0	3	
Total Contact Hours	36				
Pre-requisites	Cyber Security				

Learning Objective:

Cyber law, also known as internet law or digital law, signifies the legal regulations and frameworks governing digital activities. It covers a large range of issues, including online communication, e-commerce, digital privacy, and the prevention and prosecution of cybercrimes.

Course Outcome:

CO1: Understand the fundamentals of cybercrime and issues.

CO2: Understand different investigation tools for cybercrime..

CO3: Understand basics of Forensic Technology and Practices

CO4: Analyze different laws, ethics and evidence handling procedures.

CO5: Develop The Understanding Of Relationship Between Commerce And Cyberspace

Course Content:

Module 1: [6L]

Introduction: Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

Module 2: [8L]

Cyber Crime Issues: Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

Module 3: [7L]

Investigation: Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail

Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking..

Module 4: [8L]

Digital Forensics: Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

Module 5: [7L]

Laws and Acts: Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC, Electronic Communication Privacy ACT, Legal Policies..

Text/ Reference Books:

1. 1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. 2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006. Digital Image Processing and analysis-human and computer vision application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
3. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
4. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
5. "Understanding Forensics in IT ", NIIT Ltd, 2005.Digital Image Processing using Matlab, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson Education.

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3

Course Code	YED8501			
Course Title	Essence of Indian Knowledge Tradition			
Category	MC			
LTP & Credits	L	T	P	Credits
	3	0	0	1
Total Contact Hours	36			
Pre-requisites				

Learning Objective:

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

Course Outcome:

CO1: Understand the concept of Traditional knowledge and its importance.
CO2: Know the need and importance of protecting traditional knowledge
CO3: Know the various enactments related to the protection of traditional knowledge.
CO4: Understand the concepts of Intellectual property to protect the traditional knowledge.
CO5: Understand the traditional knowledge in different sectors.

Course Content:

Module 1: [8L]

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.

Module 2: [6L]

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

Module 3: [6L]

Legal framework and Traditional Knowledge (10 Lectures) 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.

Module 4: [8L]

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 FORA for increasing protection of Indian Traditional Knowledge.

Module 5: [8L]

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.

Text/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

CO-PO Mapping:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3	1	1	2	3	2	0	0	3	0	0	3	0	0	3
CO2	2	2	1	1	1	1	0	0	0	0	0	3	0	0	0
CO3	1	3	1	2	2	1	0	0	1	0	0	3	0	0	3
CO4	2	2	2	1	1	1	0	0	1	0	0	3	0	0	3
CO5	2	1	1	1	2	2	0	0	2	0	0	3	0	0	3