w.e.f. 2020-21

VR20

B. Tech.

COMPUTER SCIENCE AND ENGINEERING

(B.Tech 1st, 2nd and 3rd Year Syllabus)

Department of Computer Science and Engineering

(B. Tech. CSE Programme Accredited by NBA)

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2015 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A' Grade, Affiliated to JNTUK, Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

INSTITUTE VISION

To nurture excellence in various fields of engineering by imparting timeless core values to the learners and to mould the institution into a centre of academic excellence and advanced research.

INSTITUTE MISSION

To impart high quality technical education in order to mould the learners into globally competitive technocrats who are professionally deft, intellectually adept and socially responsible. The institution strives to make the learners inculcate and imbibe pragmatic perception and pro-active nature so as to enable them to acquire a vision for exploration and an insight for advanced enquiry.

DEPARTMENT VISION

The department vision is clearly defined and is in line with the college's vision. The vision of the department is:

"To evolve as a centre of academic excellence and advanced research in Computer Science and Engineering discipline."

DEPARTMENT MISSION

This mission of the Department is concise and supports the College's mission. The mission of the Computer Science and Engineering Department is:

"To inculcate students with profound understanding of fundamentals related to discipline, attitudes, skills, and their application in solving real world problems, with an inclination towards societal issues and research."

Program Educational Objectives(UG)

We have program educational objectives for our Computer Science and Engineering Program. Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Our Computer Science and Engineering program objectives are:

I. The graduates of the Program will have solid foundation in the principles and practices of computer science, including mathematics, science and basic engineering.

II. The graduates of the Program will have skills to function as members of multi-disciplinary teams and to communicate effectively using modern tools.

III. The graduates of the Program will be prepared for their careers in the software industry or pursue higher studies and continue to develop their professional knowledge.

IV. The graduates of the program will practice the profession with ethics, integrity, leadership and social responsibility.

PROGRAM OUTCOMES

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural,societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the lim itations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal andcultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmentalcontexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society atlarge, such as, being able to comprehend and write effective reports and design

documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and managementprinciples and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinaryenvironments.

PO12: Lifelong learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learningin the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Develop software applications/solutions as per the needs of Industry and society

PSO2: Adopt new and fast emerging technologies in computer science and engineering.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTION FOR FOUR YEAR UG PROGRAMME [VR20]

SEMESTER I CONTACT HOURS: 26

S.No	Course Code	Course Category	Course Name	L	T	P	Credits
1.	20BS1101	Basic Science	Matrices and Differential Calculus	3	0	0	**3**
2.	20BS1102A	Basic Science	Applied Physics (CSE/IT)	3	0	0	**3**
3.	20ES1103	Engineering Science	Programming for Problem Solving	3	0	0	**3**
4.	20ES1104	Engineering Science	Basics of Electrical Engineering	3	0	0	**3**
5.	20HS1105	Humanities and Social Science	Technical English and Communication Skills	2	0	0	**2**
6.	20BS1151A	Basic Science	Engineering Physics Laboratory	0	0	3	**1.5**
7.	20ES1152	Engineering Science	Programming for Problem Solving Laboratory	0	0	3	**1.5**
8.	20HS1153	Humanities and Social Science	Technical English and Communication Skills Laboratory	0	0	3	**1.5**
9.	20ES1154	Engineering Science	Computing and Peripherals Laboratory	0	0	2	**1**
10.	20MC1106	Mandatory Course	Technology and Society	1	0	0	**-**
			Total	**15**	**0**	**11**	**19.5**
11.	20MC1107	Mandatory Course	Induction Program				**-**

SEMESTER II CONTACT HOURS: 27

S.No	Course Code	Course Category	Course Name	L	T	P	Credits
1.	20BS2101	Basic Science	Laplace Transforms and Integral Calculus	3	0	0	**3**
2.	20BS2102	Basic Science	Engineering Chemistry	3	0	0	**3**
3.	20ES2103A	Engineering Science	Object Oriented Programming using Python	3	0	0	**3**
4.	20ES2104A	Engineering Science	Basic Electronics Engineering	3	0	0	**3**
5.	20ES2105	Engineering Science	Engineering Graphics	1	0	4	**3**
6.	20BS2151B	Basic Science	Engineering Chemistry Laboratory	0	0	3	**1.5**
7.	20ES2152A	Engineering Science	Object Oriented Programming using Python Laboratory	0	0	3	**1.5**
8.	20ES2153	Engineering Science	Engineering Workshop	0	0	3	**1.5**
9.	20MC2106	Mandatory Course	Professional Ethics and Practice	1	0	0	**-**
			Total	**14**	**0**	**13**	**19.5**

SEMESTER III **CONTACT HOURS: 28**

S.No	*Course Code*	*Course Category*	*Course Name*	*L*	*T*	*P*	*Credits*
1.	20BS3101A	Basic Science	Discrete Mathematics	3	0	0	**3**
2.	20ES3102	Engineering Science	Java Programming	3	0	0	**3**
3.	20CS3303	Program Core	Operating Systems	3	0	0	**3**
4.	20CS3304	Program Core	Digital logic and Computer Design	3	0	0	**3**
5.	20CS3305	Program Core	Data Structures	3	0	0	**3**
6.	20ES3151	Engineering Science lab	Java Programming Laboratory	0	0	3	**1.5**
7.	20CS3352	Program Core Lab 1	Digital logic Design Laboratory	0	0	3	**1.5**
8.	20CS3353	Program Core Lab 2	Data Structures Laboratory	0	0	3	**1.5**
9.	20TP3106	**Soft Skills – 1**	Logic and Reasoning	0	0	2	**1**
10.	20MC3107A	Mandatory Course (AICTE suggested)	Environmental Studies	2	0	0	**-**
			Total	**17**	**0**	**11**	**20.5**

SEMESTER IV **CONTACT HOURS: 31**

S.No	*Course Code*	*Course Category*	*Course Name*	*L*	*T*	*P*	*Credits*
1.	20BS4101	Basic Science	Probability and Statistics	3	0	0	**3**
2.	20CS4302	Program Core	Advanced Data Structures and Algorithms	3	0	0	**3**
3.	20CS4303	Program Core	Computer Organization and Microprocessor	3	0	0	**3**
4.	20CS4304	Program Core	Computer Networks	3	0	0	**3**
5.	20HS4105	Humanities and Social Sciences	Universal Human Values	3	0	0	**3**
6.	20CS4351	Program Core Lab1	Advanced Data Structures and Algorithms Laboratory	0	0	3	**1.5**
7.	20CS4352	Program Core Lab 2	Microprocessor Laboratory	0	0	3	**1.5**
8.	20CS4353	Program Core Lab 3	Computer Networks Laboratory	0	0	3	**1.5**
9.	20TP4106	**Soft Skills – 2**	English for Professionals	0	0	2	**1**
10	20CS4607	**Skill Oriented Course -1**	Industry Standard coding practice-1	1	0	2	**2**
11	20MC4108B	Mandatory Course (AICTE suggested)	Indian Constitution	2	0	0	**-**
			Total	**18**	**0**	**13**	**22.5**
Summer Internship 6 weeks (Mandatory) during summer vacation (EPICS)							
Honors/Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				**4**	**0**	**0**	**4**

SEMESTER V **CONTACT HOURS: 33**

S.No	*Course Code*	*Course Category*	*Course Name*	*L*	*T*	*P*	*Credits*
1	20CS5301	Program Core	Database Management Systems	3	0	0	3
2	20CS5302	Program Core	Advanced Java Programming	3	0	0	3
3	20HS5103	Humanities and Social Sciences	Engineering Economics and Management	2	0	0	2
4	20CS5404	Program Elective 1	Program Elective 1	3	0	0	3
5	20CS5205	Open Elective1	Open Elective1	2	0	2	3
6	20CS5351	Program Core Lab 1	Database Management SystemsLaboratory	0	0	3	1.5
7	20CS5352	Program Core Lab 2	Advanced Java Programming Laboratory	0	0	3	1.5
8	20HS5153	Humanities and Social Sciences	English Communication Skills Laboratory	0	0	2	1
9	20TP5106	**Soft Skills – 3**	Personality Development	0	0	2	1
10	20CS5354	Internship / Project (6 weeks)	EPICS	0	0	3	1.5
11	20CS5607	**Skill Oriented course -2**	Industry Standard Coding Practice - II	1	0	2	2
12	20MC5108A	Humanities Elective (AICTE suggested)	Biology for Engineers	2	0	0	-
			Total	**16**	**0**	**17**	**22.5**
Honors/Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				**4**	**0**	**0**	**4**

SEMESTER VI **CONTACT HOURS: 30**

S.No	*Course Code*	*Course Category*	*Course Name*	*L*	*T*	*P*	*Credits*
1	20CS6301	Program Core	Machine Learning	3	0	0	3
2	20CS6302	Program Core	Cryptography and Network Security	3	0	0	3
3	20CS6303	Program Core	Software Engineering Principles	2	0	0	2
4	20CS6404	Program Elective 2	Program Elective 2	3	0	0	3
5	20CS6205	Open Elective 2	Open Elective 2	2	0	2	3
6	20CS6351	Program Core Lab 1	Machine Learning Laboratory	0	0	3	1.5
7	20CS6352	Program Core Lab 2	Cryptography and Network Security Laboratory	0	0	3	1.5
8	20CS6353	Program Core lab 3	Software Engineering Principles Laboratory	0	0	3	1.5
9	20TP6106	**Soft Skills –4**	Quantitative Aptitude	0	0	2	1
10	20CS6554	Internship / Project	Mini Project – I	0	0	2	1
11	20MC6107B	Mandatory Course (AICTE suggested)	Innovation, IPR & Entrepreneurship	2	0	0	0
			Total	**15**	**0**	**15**	**20.5**
Industrial/Research Internship six weeks (Mandatory) during summer vacation							
Honors/Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				**4**	**0**	**0**	**4**

SEMESTER VII **CONTACT HOURS: 29**

S. No	*Course Code*	*Course Category*	*Course Name*	*L*	*T*	*P*	*Credits*
1	20CS7301	Program Core	Automata & Compiler Design	3	0	0	3
2	20CS7402	Program Elective 3	Program Elective 3	3	0	0	3
3	20CS7403	Program Elective 4	Program Elective 4	3	0	0	3
4	20CS7404	Program Elective 5	Program Elective 5	3	0	0	3
5	20CS7205	Open Elective 3	Open Elective 3	2	0	2	3
6	20CS7206	Open Elective 4	Open Elective 4	2	0	2	3
7	20CS7607	**Advanced Skill Course**	Corporate Readiness Skills	1	0	2	2
8	20CS7551	Internship / Project	Mini Project - II	0	0	3	1.5
9	20CS7552	Internship / Project	Industrial / Research Internship	0	0	3	1.5
			Total	**17**	**0**	**12**	**23**
Honors/Minor Courses (the hours distribution can be 4-0-0, 3-0-2 or 3-1-0 also)				**4**	**0**	**0**	**4**

Note: Open Elective Courses 3 and 4 are self-learning. Students may opt from any MOOCs platform. They have to submit the certificate before the last instruction day of VII semester. Course selection for MOOCs is subject to approval by the Head of the Department.

SEMESTER VIII **CONTACT HOURS: 24**

S.No	*Course Code*	*Course Category*	*Course Name*	*L*	*T*	*P*	*Credits*
1	20CS8551	Internship / Project**	Major Project and Internship (6 Months)	0	0	24	12
			Total	**0**	**0**	**24**	**12**

** The student should undergo internship and simultaneously he/she should work on a project with well-defined objectives. At the end of the semester the student should submit an internship completion certificate and a project report.

** If any of our associated company comes forward to offer an emerging course that will be offered as an industry offered course in V, VI or VII semesters under program elective with the approval of BoS. This is incorporated to enhance student skills and Employability in cutting edge technologies.

LIST OF PROGRAM ELECTIVES

Streams:

- **Artificial Intelligence & Machine Learning (AI/ML)**
- **Data Science**
- **IoT& Cloud (IoT &C)**
- **Cyber Security & Blockchain (CSBC)**
- **Augmented Reality & Virtual Reality Game Tech (AR&VR)**
- **Computer Networks(CN)**
- **Others**
- **Industry offered Courses (IOC)**

SEMESTER V (Program Elective 1)

S.No	Course Code	Stream	*Course Name*	L	T	P	Credits
1.	20CS5404A	AI/ML& Data Science	Applied Computational Statistics	**3**	**0**	**0**	**3**
2.	20CS5404B	IoT& C	Principles of Cloud Computing	**3**	**0**	**0**	**3**
3.	20CS5404C	CSBC	Information Security and Risk Management	**3**	**0**	**0**	**3**
4.	20CS5404D	AR & VR	Programming for Games	**3**	**0**	**0**	**3**
5.	20CS5404E	CN	Network Programming	**3**	**0**	**0**	**3**
6.	20CS5404F	Others	Object Oriented Analysis and Design	**3**	**0**	**0**	**3**
7.	20CS5404G	IOC	Industry offered course	**3**	**0**	**0**	**3**

SEMESTER VI (Program Elective II)

S.No	Course Code	Stream	*Course Name*	L	T	P	Credits
1.	20CS6404A	AI/ML	Artificial Intelligence	**3**	**0**	**0**	**3**
2.	20CS6404B	Data Science	Programming For Data Science	**3**	**0**	**0**	**3**
3.	20CS6404C	IoT& C	Internet of Things	**3**	**0**	**0**	**3**
4.	20CS6404D	CSBC	Multimedia Security and Forensics	**3**	**0**	**0**	**3**
5.	20CS6404E	AR & VR	Advanced Programming for Games	**3**	**0**	**0**	**3**
6.	20CS6404F	CN	Software Defined Networks	**3**	**0**	**0**	**3**
7.	20CS6404G	Others	Text Analytics & Natural Language Processing	**3**	**0**	**0**	**3**
8.	20CS6404H	IOC	Industry offered course	**3**	**0**	**0**	**3**

LIST OF OPEN ELECTIVES

SEMESTER V (OE I)

S.No	Course Code	Course	*Course Name*	L	T	P	Credits
1.	20CS5205A	Open Elective I	Web Programming	2	0	2	3
2.	20CS5205B	Open Elective I	LINUX	2	0	2	3
3.	20CS5205C	Open Elective I	Fundamentals of Data Structures ***For the students of Non CSE/IT branches only**	2	0	2	3
4.	20CS5205D	Open Elective I	Data Mining & Data warehousing	2	0	2	3

SEMESTER VI (OE II)

S.No	Course Code	Course	*Course Name*	L	T	P	Credits
1.	20CS6205A	Open Elective II	Mobile Application Development	2	0	2	3
2.	20CS6205B	Open Elective II	No SQL Databases	2	0	2	3
3.	20CS6205C	Open Elective II	Embedded Systems	2	0	2	3
4.	20CS6205D	Open Elective II	Introduction to Artificial Intelligence & Machine Learning * **For the students of Non CSE/IT branches only**	2	0	2	3

HONOR DEGREE IN COMPUTER SCIENCE & ENGINEERING

Semester 4 (2-2)

S.No	Course Code	Stream	*Course Name*	L	T	P	Credits
1	20CSH4801A	AI and ML	Advanced Python Programming	3	1	0	4
2	20CSH4801A	Data Science	Advanced Python Programming	3	1	0	4
3	20CSH4801B	IoT & Cloud	Fundamentals of IoT & Cloud	3	1	0	4
4	20CSH4801C	CSBC	Information Security	3	1	0	4
5	20CSH4801D	AR&VR	Game Design & Asset Creation	3	1	0	4
6	20CSH4801E	Full Stack	Frontend Technologies	3	1	0	4

Semester 5 (3-1)

S.No	Course Code	Stream	*Course Name*	L	T	P	Credits
1	20CSH5801A	AI and ML	Soft Computing Techniques	3	1	0	4
2	20CSH5801B	Data Science	High Dimensional Data Analysis	3	1	0	4
3	20CSH5801C	IoT & Cloud	Programming for IoT	3	1	0	4
4	20CSH5801D	CSBC	Pattern Recognition Techniques in Cyber Crime	3	1	0	4
5	20CSH5801E	AR&VR	VR Development	3	1	0	4
6	20CSH5801F	Full Stack	Mean Technologies	3	1	0	4

Semester 6 (3-2)

S.No	Course Code	Stream	*Course Name*	L	T	P	Credits
1	20CSH6801A	AI and ML	Artificial Neural networks	3	1	0	4
2	20CSH6801B	Data Science	Video Analytics	3	1	0	4
3	20CSH6801C	IoT & Cloud	Cloud Application Development& Deployment	3	1	0	4
4	20CSH6801D	CSBC	Intrusion Detection Systems and Firewall	3	1	0	4
5	20CSH6801E	AR&VR	XR Studio	3	1	0	4
6	20CSH6801F	Full Stack	Secured Backend Technologies	3	1	0	4

MINOR DEGREE IN COMPUTER SCIENCE AND ENGINEERING

(For non CSE/IT Students)

S. No	*Course Code*	*Course Name*	*Offered in Sem*	*L*	*T*	*P*	*Credits*
1	20CSM4701	Data Structures and Algorithms	IV	3	1	0	4
2	20CSM5702	Relational Database Systems	V	3	1	0	4
3	20CSM6703	Computer Organization and Architecture	VI	3	1	0	4

SEMESTER – I

20BS1101
MATRICES AND DIFFERENTIAL CALCULUS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Fundamentals of Matrices, Fundamentals of Calculus, Integration, Differentiation.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Determine Eigen values, Eigen vectors of a matrix.
CO2	Estimate Maxima and Minima of Multivariable functions.
CO3	Solve the Linear differential equations with constant coefficients.
CO4	Solve the Linear differential equations with variable coefficients.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2			1							
CO2	3	2			1							
CO3	3	2			1							
CO4	3	2			1							

COURSE CONTENT

UNIT I

Matrices: Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen values an Eigen vectors, Properties of Eigen values, Finding Inverse and Powers of a Matrix by Cayley-Hamilto Theorem. Reduction to Diagonal form, Reduction of Quadratic form to Canonical form, Nature of a Quadrati form, Complex matrices.

UNIT II

Differential Calculus: Fundamental Theorems-Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy' Mean Value Theorem and Taylor's Theorem, Expansions of functions-Maclaurin's Series and Taylor's Series. **Application**: Curvature, Radius of Curvature**.**
Functions of two or more Variables: Taylor's Theorem for Function of two Variables, Maxima and Minim of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.

UNIT III

Differential Equations of First Order:Exact Differential Equations, Equations Reducible to Exact Equations. **Applications:** Orthogonal Trajectories, Newton's Law of Cooling.
Linear Differential Equations of Higher Order: Definitions, Operator D, Rules for Finding the Complementary Function, Inverse Operator, Rules for finding Particular Integral, Working Procedure to Solve the Equation.

UNIT IV

Method of Variation of Parameters, Method of Undetermined Coefficients, Equations Reducible to Linear Equations with Constant Coefficients: Cauchy's Homogeneous Linear Equation, Legendre's Linear Equation, Linear Dependence of Solutions, Simultaneous Linear Equations with Constant Coefficients.
Application: L-C-R Circuits.

TEXT BOOK

1. B.S.Grewal , Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2019.

REFERENCE BOOKS

[1].Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.

[2].B.V.Ramana, Higher Engineering Mathematics, Tata MC Graw Hill, 1st Edition, 2007.
[3].N.P.Bali, Dr.Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 9th Edition, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)

[2]. nptel.ac.in/courses/122104017

[3]. nptel.ac.in/courses/111105035

[4]. Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/Loughborough%20website/

20BS1102A
APPLIED PHYSICS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	10 + 2 level Physics	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the importance of quantum mechanics.
CO2	Analyse and understand various types of lasers and their applications.
CO3	Elaborate different types of optical fibers and understand the concept of Superconductivity
CO4	Understand the fabrication of nanomaterials and carbon Nanotubes.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											
CO2	3		2									
CO3	3		1									
CO4	3				2							

COURSE CONTENT

Unit-I : Quantum Mechanics

Quantum Mechanics: Dual nature of light, Matter waves and Debroglie's hypothesis, Davisson-Germer's experiment,G. P. Thomson experiment, Heisenberg's uncertainty principle and its applications (Non existence of electron in nucleus, Finite width of spectral lines), One dimensional time independent and time dependent Schrödinger's wave equations, physical significance of wave function, Particle in a box (One dimension).

Unit-II :Lasers

Lasers: Introduction, Characteristics of laser, Basic Principles of lasers (absorption, spontaneous emission,stimulated emission), Requirements of lasers (pumping, population inversion, cavity resonance), Einstein's coefficients, different types of lasers: solid-state lasers (Ruby, Neodymium), gas lasers (He-Ne, CO_2), Semiconductor laser, applications of lasers in science, engineering and medicine.

Unit- III : Fibre Optics and Superconductivity

Fibre Optics: Introduction, Fundamentals of optic fibre, Propagation of light through optical fiber, Types of

optical fibers, Numerical aperture, Fractional Refractive Index change, Fiber optics in communication and it advantages.

Superconductivity: Introduction, Critical parameters, Flux quantization, Meissner effect, Types of Superconductors, BCS theory, Cooper pairs, London's equation- penetration depth, high temperature super conductors, Applications of superconductors.

TEXT BOOKS

[1]. M.N. Avadhanulu & P.G. Kshirsagar, Engineering Physics, S. Chand publications, Revised Edition, 2014
[2]. P.K. Palanisamy, "Applied Physics", Scitech Publications(INDIA) Pvt. Ltd., Fifth Print, 2008.

REFERENCE BOOKS

[1]. B. K. Pandey and S. Chaturvedi, 'Engineering Physics' Cengage Learning', Delhi, 2012.
[2]. O. Svelto, Principles of Lasers, 5th Edition, Springer, London, 2010
[3]. M.R. Srinivasan, "Engineering Physics", New age international publishers, First Edition, 2011.
[4]. Gaur and Gupta, Engineering Physics, Dhanpatrai publishers,8th edition 2008.

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/
2. https://ocw.mit.edu/resources/res-6-005-understanding-lasers-and-fiberoptics-spring-2008/laser-fundamentals-i/
3. http://nptel.ac.in/courses/112106198/19
4. https://www.peterindia.net/NanoTechnologyResources.html

20ES1103
PROGRAMMING FOR PROBLEM SOLVING

Course Category:	Engineering Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	--	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the different types of problem solving approaches
CO2	Apply the selections, loops, arrays, and string concepts in C to solve problems.
CO3	Apply functions and pointer concepts in C to solve problems.
CO4	Solve problems using enum, structures, unions, and file handling functions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1												
CO2		2	3										2	
CO3		2	3										3	
CO4		2	3										3	

COURSE CONTENT

UNIT I

Introduction to computer-based problem solving: Requirement of problem solving by computers, problem definition Use of examples for problem solving, similarities between problems, Problem solving strategies, steps involved i problem solving.

Program design and implementation issues: programs and algorithms, top-down design and step-wise refinemen construction of loops-basic programming constructs, Implementation, programming environment.

Algorithms for problem solving: Exchanging values of two variables, Summation of a set of numbers, decimal t binary base conversion, reversing the digit of an integer, to find greatest common divisor (GCD) of two numbers, t verify whether an integer is prime or not, organize a given set of numbers in ascending order, find the square root of a integer, factorial of a given number, generate the Fibonacci sequence for n terms, evaluate sin(x) as sum of series, to fin the value of the power of a number raised by another integer, reverse order elements of an array, find largest number i an array, print elements of upper triangular matrix, multiplication of two matrices, to compute to roots of a quadrati equation $ax^2+bx+c=0$.

UNIT II

Introduction to the C Language: Background of C program, Identifiers, Types, Variables, Constants Memory Layout, Input/Output, Programming Examples.

Structure of a C Program: Logical Data and Operators, Expressions, Precedence and Associatively Evaluating Expressions, Type Conversion, Statements, Storage Class.

Selection: Two-way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of a Loop Loops In C, Loop Examples, Recursion, The Calculator Program.

Arrays: Array Concepts in C, Inter-Function Communication, Array Applications, Two Dimensional Arrays Multidimensional Arrays.

UNIT III

Strings: String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String- Data Conversion.

Functions: Functions in C, User Defined Functions, Call by Value, Call Value Reference, Inter FunctionCommunication, Standard Functions, Scope.

Pointers: Introduction to Pointer, Pointers for Inter-Function Communications, Pointers to Pointers Compatibility, Lvalue and Rvlaue.

Pointer Applications: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function Memory Allocations Functions, Array of Pointers.

UNIT IV

Enumerations: The Type Definition(Typedef), Enumerated Types: Declaring an Enumerated Type Operations on Enumerated Types, Enumeration Type Conversion, Initializing Enumerated Constants Anonymous Enumeration: Constants, Input/Output Operators.

Structures: Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures through Pointers.

Unions: Referencing Unions, Initializers, Unions and Structures, Internet Address, Programming Applications.

File Handling: Files, Streams, Standard Library Input/Output Functions, Formatting Input/output Functions and Character Input/Output Functions, Command-Line Arguments.

TEXT BOOKS

[1]. Programming and Problem Solving Through "C" Language By HarshaPriya, R. Ranjeet · Firewall media 2006

[2]. Behrouz A. Forouzan and Richard F. Gilberg, “Computer Science A Structured Programming Approach Using C”, CENGAGE Learning, Third Edition

REFERENCE BOOKS

[1]. Anil B. Chaudhuri, “Flowchart and Algorithm Basics: The Art of Programming”, Mercury Learning & Information, 2020.

[2]. R.G. Dromey, “How to Solve it By Computer”, Prentice-Hall International Series in Computer Science,1982.

[3]. YashwantKanetkar , “Let us C” , BPB Publications, 16th Edition 2017.

[4]. Kernighan and Ritchie,“The C programming language”, The (Ansi C Version), PHI, second edition.

[5]. Paul J. Dietel and Harvey M. Deitel, “C: How to Program”, Prentice Hall, 8th edition (Jan 19 ,2021).

[6]. K.R.Venugopal, Sundeep R. Prasad, “Mastering C”, McGraw Hill, 2nd Edition, 2015.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Computer Science and Engineering - Noc:problem Solving Through Programming in C. [online] https://nptel.ac.in/courses/106/105/106105171/

[2] Computer Science and Engineering - Noc:introduction To Programming in C. [online] https://nptel.ac.in/courses/106/104/106104128/

[3] C For Everyone: Structured Programming. [online]https://www.coursera.org/learn/c-structured programming

[4] Advanced C Programming CourseTim Academy-Jason Fedin. [online] https://www.udemy.com/course/advanced-c-programming-course/

20ES1104
BASICS OF ELECTRICAL ENGINEERING

Course Category:	Engineering Sciences	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	--	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Analyze Electric Circuit fundamentals.
CO2	Understand the basic concepts of Alternating Quantities and MagneticCircuits.
CO3	Analyze the basic concepts of Electric Machines
CO4	Understand Measuring Instruments & Solar Photo Voltaic Systemconcepts

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3			2								1	
CO2	3	3											1	
CO3	2	2			2								1	
CO4	2	2											1	

COURSE CONTENT

UNIT - I

Introduction to Electrical Engineering: Electric Current, Electromotive force,Electric power and energy, Basic circuit components- Resistors-Inductors-Capacitors. Electromagnetic Phenomenon and Related Laws, Kirchhoff's laws.

Network Analysis: Network sources-Ideal independent voltage source, Idealindependent current source, Dependent sources, Practical voltage and current sources, Source conversion, Voltage and Current division rule, series and parallel connection of R, L and C, Star-Delta or, Delta- Star transformation. Mesh andNodal Analysis (with independent sources only).

UNIT – II

Alternating Quantities: Introduction, Generation of a.c. voltages, Waveforms and Basic Definitions, Relationship between frequency, speed and number ofpoles, Root Mean Square and Average values of alternating current and voltages,Form Factor and Peak Factor, Phasor representation of alternating quantities.

Magnetic Circuits: Introduction, Magnetic Circuits, Magnetic Field Strength (H),Magneto motive Force, Permeability, Reluctance, Analogy between Electric andMagnetic Circuits, Magnetic potential drop,

Magnetic circuit computations, Selfand Mutual Inductance, Energy in Linear Magnetic Systems

(Derivation for pure inductor).

UNIT - III

DC Machines: Introduction, Construction of dc machines, Armature Windings,Generation of dc voltage and torque production in a dc machine,Operation of a dc machine as a generator, Operation of dc machine as a motor.

Induction Motors: Introduction, Constructional features of three-phase induction motors, Principle of operation of three-phase induction motor- Slip and rotor frequency, Voltage and current equations and equivalent circuit of an induction motor.

UNIT - IV

Measuring Instruments: Introduction, Classification of instruments, Operating Principles, Essential features of measuring instruments, Ammeters and Voltmeters,Measurement of power.

Solar photovoltaic Systems: Solar cell fundamentals, characteristics,classification, module, panel and array construction, Maximizing the solar PVoutput and load matching, Maximum Power Point Tracker Basic Algorithm and Flowchart, PV system components, solar PV systems and solar PV applications.

TEXT BOOKS

[1] T.K. Nagasarkar and M.S. Sukhja, “Basic Electric Engineering”, 2nd ed.,Oxford University press 2011.

REFERENCE BOOKS

[1] B.H.Khan, ”Non Conventional Energy Resources”, 2nd ed., Mc.Graw HillEducation PvtLtd.,New Delhi,2013.
[2] AshfaqHussain, HaroonAshfaq, “ Fundamentals of Electric Engineering” 4th ed., DhanpatRai& Co, 2014.
[3] I.J.Nagarath and Kothari, “Theoy and Problems of Basic Electric Engineering”, 2nd ed., PHI Pvt. Ltd., 2016.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. http://nptel.ac.in/courses/108108076/

20HS1105
TECHNICAL ENGLISH AND COMMUNICATION SKILLS

Course Category:	Institutional Core	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:	Basic understanding of the language skills viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Develop administrative and professional compilations with felicity of expression
CO2	Demonstrate Proficiency in advanced reading and context oriented writing
CO3	Apply the elements of functional English with sustained understanding for authentic use of language in any given academic and/or professional environment
CO4	Execute tasks in Technical communication with competence

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1						2				3		
CO2						2			2	3		
CO3						2			2	3		
CO4										3		

COURSE CONTENT

UNIT I

Professional Writing Skills:-

- **Professional Letters**:
  Business, Complaint and Transmittal – Purpose, Style and format with special reference to Block Format and Modified Block Format
- **Paragraph and Essay Writing**:
  Linkers , Descriptive and Analytical with illustrations
- **Effective writing Practice**-
  Appropriateness. Brevity, clarity, cogency and coherence with guided and semi-controlled compilations including the use of Idiomatic expressions

UNIT II

Reading comprehension and Discourse development Skills

- **Analytical and critical reading** - critical, creative and lateral thinking- language and thinking – thinking process

and language development.

- **Effective reading Strategies** - Skimming, Scanning, Eye span, fixation, taming Regression, and Issues and Challenges of Vocalization and sub-vocalization.
- **Context-oriented Dialogue/ Argument writing** - Extending Invitation, Reciprocation, Acceptance, Concurrence, Disagreeing without being disagreeable- Discourse/dialogue Development and identification of inconsistencies in pre-prepared dialogues

UNIT III

Vocabulary and Functional English

- **Vocabulary for Competitive examinations** (A list of 500 High frequency words) Synonyms, Antonyms, Matching Homonyms, Homophones and nearer words along with Root words
- **Verbal analogies**(Single Unit) – Synonym Relation, Antonym relation, Object- Operator relation, Object-Obstacle/obstruction relation, Sequence Relation, Place-Monument Relation, Science- area of activity relation, Profession- Tool relation, Gender relation, Diminutive relation, etc
- **Functional Grammar** with special reference to Tense, Concord, Articles, pronoun-referent, Prepositions, use of Gerund ,Parallelism, etc (A Representative collection of 100 sentences)

UNIT IV

Technical Communication skills:

- **Technical Proposal writing**- Characteristics, Proposal Superstructure, Checklist , Formal Proposal
- **Technical Vocabulary**- Basic explanations and Description
- **Technical Report writing**- Informational Reports and Feasibility Report- Types, Components, Style and Formats

TEXT BOOKS

[1] Martin Cutts, Oxford guide to Plain English, 7th Impression, Oxford University Press, 2011
[2] M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.
[3] John Langan, College Writing Skills, McGraw Hill, IX Edition, 2014.
[4] Eclectic Learning materials offered by the Department

REFERENCE BOOKS

[1] Randolph Quirk, Use of English, Longman, I Edition (1968) Reprinted 2004.
[2] Thomson A.J & A.V, Martinet, Practical English Grammar, III Edition, Oxford University Press,2001
[3] V.Sethi and P.V. Dhamija, A Course in Phonetics and Spoken English, II Edition, PHI, 2006

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.britishcouncil.org/english
[2] www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online
[3] https://www.uni-marburg.de/sprachenzentrum/selbstlernzentrum/.../apps_for_esl.pdf

20MC1106
TECHNOLOGY AND SOCIETY

Course Category:	Institutional Core	**Credits:**	--
Course Type:	Mandatory Learning	**Lecture -Tutorial-Practice:**	1 - 0 - 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100 -- 100

COURSE OUTCOMES

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

CO1	Understand the origins of technology and its role in the history of human progress.
CO2	Know the Industrial Revolution and its impact on Society
CO3	Interpret the developments in various fields of technology till Twentieth Century.
CO4	Distinguish the impacts of Technology on the Environment and achievements of great scientists.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3							1				
CO2	3				2		1					
CO3	3							1				
CO4	3				2		1					

COURSE CONTENT

UNIT – I **(4 lectures)**

Introduction: Origins of technology, The Agriculture revolution, Technological contributions of ancient civilizations- Mesopotamians, Egyptians, Greeks, Romans, Indians and Chinese.

UNIT – II **(4 lectures)**

Industrial revolution: The social and political background, The technical background, Steam: The power behind the Indistrial Revolution, The revolution in Textile Industry, The Imapact of Indutrial Revolution on Society.

UNIT – III **(4 lectures)**

The Flowering of modern technology: Manufacturing Technologies, Prime Movers, Internal Combustion Engines, Production of Metals and Alloys, The Birth of Electrical Technology, Twentieth Century: The Flowering of modern technology like information technology and biotechnology, and its implications on

society.

UNIT – IV **(4 lectures)**

Technology, Science and Society: Impact of technology on society, The Impacts of Technology on the environment, Sustainable development.

Achievements of famous scientists:

(**World**): Einestein, Newton, Faraday, Graham Bell, Edison, S.Hawking.

(**India**): CV Raman, S.Chandrasekhar, Aryabhatta, Homi J Bhabha, Vikram Sarabhai, APJ Abdulkalam, S.Ramanujan, M.Visweswarayya.

TEXT BOOKS

[1] Dr. R.V.G Menon, "Technology and Society", Pearson Education, 2011

REFERENCE BOOKS

[1] Quan-Haase, A., " Technology and Society: Inequality, Power, and Social Networks", Oxford University Press, 2013.

20BS1151A
ENGINEERING PHYSICS LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Use function generator, spectrometer and travelling microscope in various experiments
CO2	Test optical components using principles of interference and diffraction of light
CO3	Determinethe V-I characteristicsof solar cell and photo celland appreciate the accuracy in measurements

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1				3								
CO2				3								
CO3	2			3								

COURSE CONTENT

1. Photo cell-Study of V-I Characteristics, determination of work function
2. Newton's Rings-Radius of curvature of plano convex lens.
3. Compound pendulum-Measurement of 'g'
4. LCR circuit- Study of Resonance
5. AC Sonometer –Verification of vibrating laws
6. Solar cell–Determination of Fill Factor
7. Diffraction grating-Wavelength of laser light
8. Optical fiber-Study of attenuation and propagation characteristics
9. Diffraction grating-Measurement of wavelength of mercury source
10. Hall effect –Hall coefficient measurement
11. Figure of merit of a galvanometer
12. Variation of magnetic field along the axis of current-carrying circular coil

TEXT BOOKS

[1] Madhusudhan Rao, "Engineering Physics Lab Manual", Isted., Scitech Publications, 2015
[2] Ramarao Sri, ChoudaryNityanand and Prasad Daruka, "Lab Manual of Engineering Physics"., Vth ed., Excell Books, 2010

E-RESOURCES

[1] http://plato.stanford.edu/entries/physics-experiment
[2] http://www.physicsclassroom.com/The-Laboratory
[3] http://facstaff.cbu.edu/~jvarrian/physlabs.html

VIRTUAL LAB REFERENCES

[1] http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1
[2] http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1
[3] http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

20ES1152
PROGRAMMING FOR PROBLEM SOLVING LABORATORY

Course Category:	Engineering Science	**Credits:**	1.5
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	---	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Implement the use of programming constructs in a structural programming language.
CO2	Apply the selections, loops, arrays, and string concepts in C to solve problems.
CO3	Apply functions, pointer, and Enum concepts in C to solve problems.
CO4	Solve problems using structures, Unions, and file handling functions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1		3											
CO2		1	3										1	
CO3		1	3										3	
CO4		1	3										3	

COURSE CONTENT

WEEK – 1 : Introduction to C Programming

a) The Structure of C Program with a sample program.
b) Use identifiers, data types, format specifiers, constants, and variables declaration and initialization to write simple C programs.
c) Write simple C programs using preprocessor commands and simple I/O statements.

WEEK – 2 : Data Types and Variable Declarations

a) Use void, integral and floating point data types in different scenarios to write programs.
b) Use various primitive data types for performing different mathematical operations.
c) Programs to perform mathematical operations using various operators in C

WEEK – 3 : Selection – Making Decisions

a) Write programs using the if...else selection statements.
b) Use nested if...else statement to solve problems that need multi-level selection making decisions.

c) Write programs that use switch...case and else...if multi way statements to select one out of several options.

WEEK – 4 : Looping Constructs and Their Applications

a) To have a clear idea on loop initialization, validation and updation.
b) Write programs using the while, for, or do...while loops.
c) To understand the logic and adopt best looping construct for different kinds of problems.
d) Design and develop programs based on Iterative loops using While, Do While, For, Nested For.

WEEK – 5 : Unconditional Control Transfer Statements

a) Write programs using of (break, and continue) unconditional control transfer statements.
b) Use the goto statement to transfer the control from one part to another part of a program and the use of return statement to end the execution of a called function.

WEEK – 6 : Arrays and Their Applications

a) To utilize one dimensional and multi-dimensional arrays to solve problems that use set(s) of similar type input data.
b) To write programs that perform multiple classical operations like searching, sorting, updation, or deletion on array elements.

WEEK – 7 : Strings, String I/O and Manipulation Functions

a) To write programs that work on read, write and manipulate fixed length and variable-length strings and/or arrays of strings
b) To write programs that use predefined string I/O functions.
c) To write programs that use string manipulation functions from the string library.

WEEK – 8 : Concepts of User Defined Functions

a) Design and develop programs depending on functions both user defined andstandard library functions in C with different approaches.
b) To write a program using more than one function with or without parameters and function return type.

WEEK – 9 : Pointers and Their Applications

a) Programs on declaration of pointers and their usage in C.
b) Programs to relate between arrays and pointers and use them efficiently in a program.
c) To pass pointers as an argument to a function, and use it efficiently in a program.
d) To write programs using static and dynamic memory allocation.

WEEK – 10 : Structure, Union, and Enumeration

a) Programs to define, declare and access structure and union variables
b) Design and develop programs to work with pointers to access data within a structure
c) Programs to pass structure as an argument to a function
d) To write C programs using enumeration data types, an easiest way of mapping symbolic names to integer values.

WEEK – 11 : File Handling Operations

a) Programs to open and close text and binary files using file I/O commands.
b) Write programs to perform read and write operations using the formatting I/O and character I/O functions.

c) Apply file positioning, status and system commands based on a problem requirements.

WEEK – 12 : Command Line Arguments

a) To use command line arguments to pass inputs in a single line while executing a program through the DOS command prompt or Linux terminal.
b) To use atoi function to convert a default string value argument to an integer value inside the main function in a program.
c) To use atof function to convert a default string value argument to a float value inside the main function in a program.

Text Book(s)

[1] Behrouz A. Forouzan and Richard F. Gilberg, "Computer Science A Structured Programming Approach Using C", CENGAGE Learning, Third Edition.

REFERENCE BOOKS

[1] Anil B. Chaudhuri, "Flowchart and Algorithm Basics: The Art of Programming", Mercury Learning & Information, 2020.

[2] R.G. Dromey, "How to Solve it By Computer", Prentice-Hall International Series in Computer Science,1982.

[3] YashwantKanetkar , "Let us C" , BPB Publications, 16th Edition 2017.

[4] Kernighan and Ritchie,"The C programming language", The (Ansi C Version), PHI, second edition.

[5] Paul J. Dietel and Harvey M. Deitel, "C: How to Program", Prentice Hall, 8th edition (Jan 19, 2021).

[6] K.R.Venugopal, Sundeep R. Prasad, "Mastering C", McGraw Hill, 2nd Edition, 2015.

E-RESOURCES AND OTHER DIGITAL MATERIAL

1] Computer Science and Engineering - Noc:problem Solving Through Programming in C. [online] https://nptel.ac.in/courses/106/105/106105171/
[2] Computer Science and Engineering - Noc:introduction To Programming in C. [online] https://-nptel.ac.in/courses/106/104/106104128/
[3] C For Everyone: Structured Programming. [online]https://www.coursera.org/learn/c-structured -programming
[4] Advanced C Programming CourseTim Academy-Jason Fedin. [online] https://www.udemy.com/-course/advanced-c-programming-course/

20HS1153
TECHNICAL ENGLISH AND COMMUNICATION SKILLS LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Practical	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Basic understanding of the language skills viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Develop active and authentic listening comprehension skills relevant for the professional world.
CO2	Execute web related(On-line) communication with felicity of expression
CO3	Apply relevant speech patterns including standard pronunciation
CO4	Demonstrate Proficiency in Interpersonal Communication with fluency and accuracy

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1						3				3		
CO2									2	3		
CO3										3		
CO4									2	3		

COURSE CONTENT

UNIT I

Listening Skills:

- **Exposure to structured and open talks**- Active listening, Appreciative listening, Biased listening, Critical listening Empathetic listening, Judgmental listening
- **Content-oriented Listening Skills** :
  Short Conversations- 5-10 minute duration- components, statistics, nominal and other references
- **Concept oriented/ purposive Listening skills**:
  Long Conversations- 10-30minute duration -
- **Problems in comprehension & retention** – Note-taking practice – Listening tests-
- **Overcoming Barriers to listening**: Physical & psychological – Steps to overcome them with demonstration and practice

Unit-II

Professional and On-line drafting skills:

- **Professional drafting skills** : Circular, Notice, Executive summary
- **E-mail etiquette**- Awareness with Illustrations and practice
- **Elements of Chat-room interaction**- courtesy, techniques of argumentation
- **Written Response to web-content**- conciseness with accountability
- **Data interpretation-** compiling analytical, comparative and critical observations by interpreting graphs, charts, etc.

UNIT III

Phonetics and Speech patterns:

- **Speech Mechanism** – Organs of speech and patterns of articulation of speech sounds.
- **Vowels, Consonants and Diphthongs**- Transcription using International Phonetic Alphabet
- **Word Stress and Rhythm-** practice
- **Intonation pattern practice**- Tones , Tone group boundaries and Tonal variations
- **Strong forms and weak forms in Connected speech** **-** Illustrations and Practice

UNIT IV

Interpersonal Spoken communication skills:

- **Fluency & accuracy in speech** –Improving self-expression
- **Listener oriented speaking** - Interpersonal Conversation- Manner and Temper
- **Developing persuasive speaking skills-** Role play
- **Overcoming Barriers to speaking** – Building self-confidence– through Conversation practice
- **Improving responding capacity** - Extempore speech practice

TEXT BOOKS

1. Garner, Bryan A, HBR Guide to Better Business Writing, Harvard Business Review Press, Boston, Massachusetts, 2013.
2. Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL,(Currently English and Foreign Languages University) OUP, 21st Impression, 2003

REFERENCE BOOKS

[1] Randolph Quirk, Use of English, Longman, I Edition (1968) Reprinted 2004.
[2] Thomson A.J & A.V, Martinet, Practical English Grammar, III Edition, Oxford University Press,2001
[3] V.Sethi and P.V. Dhamija, A Course in Phonetics and Spoken English, II Edition, PHI, 2006

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. ODll Language Learner's Software, Orell Techno Systems
2. Visionet Spears Digital Language Lab software Advance Pro
3. www.natcorp.ox.ac.uk, *British National Corpus*

20ES1154
COMPUTING AND PERIPHERALS LABORATORY

Course Category:	Engineering Sciences	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Able to assemble a PC and install operating system and other software.
CO2	Able to trouble shoot hardware and software issues.
CO3	Able to configure network settings to connect to internet.
CO4	Able to createdocuments, presentations and spread sheets using office productivity tools.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3										
CO2	3	2							3			
CO3	3			1	2							
CO4	3									2		

COURSE CONTENT

PC Hardware/Software

Week 1 – Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 1– Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 2 – Task 1: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 2 – Task 2: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Week 3 – Task 1: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer

back to working condition. The work done should be verified by the instructor and followed up with a Viva

Week 3 – Task 2: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Networks, Internet & World Wide Web

Week 4: Types of Network cables, connectors, crimping straight and crossover cables, identification of network devices (Hubs, Switches, Routers).

Week 5: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email.

Week 6: Wifi router configuration, connecting to internet, Static/Dynamic IP address configuration, DNS, Gateway, Security configuration.

Productivity tools

LaTeX and Word

Week 7– Word Orientation: The mentor needs to give an overview of Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in word – Accessing, overview of components of toolbars, saving files, Using help and resources, rulers, format painter.

Week 8- Latex: Using LaTeX to create project certificate. Features to be covered: Formatting Fonts, Drop Cap, Applying Text effects, Using Character Spacing, Borders and Colours, Inserting Header and Footer, Using Date and Time option in both LaTeX.

Week 9: Creating project abstract Features to be covered: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Excel

Week 10 - Task 1 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Week 10 – Task2: Calculating GPA -Features to be covered: Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

Power Point or equivalent (FOSS) tool

Week 11– Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes: PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Week 12 - Task 3: Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide master, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

TEXT BOOKS

REFERENCE BOOKS

1. LaTeX Companion – Leslie Lamport, PHI/Pearson.
2. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
3. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
4. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
5. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
6. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

E-RESOURCES AND OTHER DIGITAL MATERIALL

1. https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17- 1.pdf
2. https://www.protosystech.com/rapid-prototyping.htm
3. https://www.arduino.cc/en/Tutorial/Foundations
4. https://www.tutorialspoint.com/arduino/

SEMESTER – II

20BS2101
LAPLACE TRANSFORMS AND INTEGRAL CALCULUS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Vectors, Integration, Curve Tracing.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Solve the Linear differential equations using Laplace Transforms.
CO2	Evaluate areas and volumes using Double, Triple Integrals.
CO3	Evaluate Grad, Div & Curl of scalar and vector point functions.
CO4	Convert Line Integrals to Area Integrals and Surface Integrals to Volume Integrals.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2			1							
CO2	3	2			1							
CO3	3	2			1							
CO4	3	2			1							

COURSE CONTENT

UNIT I

Laplace Transforms: Introduction, Definition, Conditions for the Existence, Transforms of Elementary functions, Properties of Laplace Transforms, Transforms of Periodic functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by t^n, Division by 't', Inverse Transforms-Method of partial fractions, Other methods of finding Inverse Transform, Convolution Theorem, Unit Step and Unit Impulse functions.
Applications: Evaluation of Integrals, Solving Differential Equations by Laplace Transforms.

UNIT II

Integral Calculus: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Triple Integrals, Change of Variables.
Applications: Area enclosed by Plane Curves, Volumes of Solids.

UNIT III

Vector Differential Calculus: Scalar and Vector point functions, Del applied to Scalar point functions, Gradient, Del applied to Vector point functions, Physical interpretation of Divergence and Curl, Del applied

twice to point functions, Del applied to products of point functions.

UNIT IV

Vector Integral Calculus: Integration of Vectors, Line Integral, Surface Integral, Green's Theorem in th plane, Stokes's Theorem, Volume Integral, Gauss Divergence Theorem, Irrotational Fields.

TEXT BOOK

B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2019.

REFERENCE BOOKS

[1].Erwin Kreyszig , Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.

[2].B.V.Ramana, Higher Engineering Mathematics,Tata MC Graw Hill, 1st Edition, 2007
[3].N.P.Bali, Dr.Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 9th Edition, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)

[2]. nptel.ac.in/courses/122104017

[3]. nptel.ac.in/courses/111105035

[4]. Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/Loughborough%20website/

20BS2102
ENGINEEERING CHEMISTRY

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Chemistry knowledge at Intermediate level	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Analyze various water treatment methods and boiler troubles.
CO2	Apply the concept of phase equilibrium to different materials and the knowledge of working of electrodes and batteries in various technological fields.
CO3	Evaluate corrosion processes as well as protection methods.
CO4	Apply the knowledge of conventional fuels and mechanistic aspects of conducting polymers for their effective and efficient utilisation.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L - Low, M - Medium, H - High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		3										
CO2	2											
CO3			3									
CO4					2							

COURSE CONTENT

UNIT I **(10 hours)**

Water technology-I: WHO standards - Water treatment for drinking purpose - sedimentation, coagulation, filtration, disinfection by chlorination, breakpoint chlorination and its significance - Desalination of brackish water - principle and process of electrodialysis and reverse osmosis, advantages and disadvantages.

Water technology-II: Boiler troubles - scales-formation, disadvantages and internal conditioning methods - phosphate conditioning, calgon conditioning and sodium aluminate, caustic embrittlement- reasons, mechanism and its control, and boiler corrosion – causes and control.

UNIT II **(10 hours)**

Phase rule and applications: Definition and explanation of the terms – phase, component and degree of freedom, phase rule equation, phase equilibria of single component system – water system, two component system – silver-lead system, applications of phase rule.

Electrochemistry: Construction and working of Calomel electrode, silver-silver chloride electrode, and principle, construction and working of glass electrode, determination of pH using glass electrode. Chemistry of modern batteries - $Li/SOCl_2$ battery and $Li_xC/LiCoO_2$ battery – construction, working and advantages.
Fuel cells: General working principle of a fuel cell, examples, chemistry of H_2-O_2 fuel cell.

UNIT III **(10 hours)**

Corrosion principles: Introduction, definition, reason for corrosion, examples – types of electrochemical corrosion - hydrogen evolution and oxygen absorption – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion – pitting corrosion and concept of passivity.

Corrosion control methods: Cathodic protection- principle and types - impressed current method and sacrificial anode method, anodic protection-principle and method, corrosion inhibitors – types and mechanism of inhibition – principle, process and advantages of electroplating and electroless plating.

UNIT IV **(10 hours)**

Conducting polymers: Definition, examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped polyacetylene, doping of conducting polymers- mechanism of conduction of p-doped and n-doped polyacetylenes – applications of conducting polymers.

Fuel technology: Fuel-definition, calorific value- lower and higher calorific values and numericals on calculation of HCV and LCV relation, analysis of coal – proximate analysis and ultimate analysis, flue gas analysis by Orsat's apparatus, numericals based on calculation of air required for combustion.

TEXT BOOKS

[1] Shikha Agarwal, "Engineering Chemistry – Fundamentals and Applications", Cambridge University Press, New Delhi, 1st edition (2015).

REFERENCE BOOKS

[1] Sunita Rattan , "A Textbook of Engineering Chemistry", S.K. Kataria & Sons, New Delhi, First edition 2012.
[2] P.C. Jain , "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Limited, New Delhi, 15th edition.
[3] B.S. Bahl, G. D. Tuli and Arun Bahl, "Essentials of Physical Chemistry", S. Chand and Company Limited, New Delhi.
[4] O. G. Palanna, " Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd., New Delhi.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.cip.ukcentre.com/steam.htm
[2] http://corrosion-doctors.org/Modi;es/mod-basics.htm
[3] http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR%2063%289%29%20715-728.pdf
[4] https://chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry
[5] http://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipal-water-treatment/
[6] NPTEL online course, "Corrosion Part-I" offered by MHRD and instructed by Prof. Kallol Mondal of IIT Kanpur

20ES2103A
OBJECT ORIENTED PROGRAMMING USING PYTHON

Course Category:	Engineering Science	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3- 0 - 0
Prerequisites:	20ES1103Programming for Problem Solving 20ES1152Programming for ProblemSolving Laboratory	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Interpret the python syntax and semantics of control flow statements
CO2	Apply functions, modules and string handling in Python to solve problems
CO3	Determine the methods to create and manipulate programs with Python data structures
CO4	Analyse the concepts of object oriented approach to solve problems

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1		2						1		3	
CO2			1		2						1		1	
CO3		1	1		1						1		2	
CO4		3	2		2						2		3	

COURSE CONTENT

UNIT I

Introduction to Object Oriented Programming: Features of Object Oriented Programming, Merits and demerits of object oriented programming languages, applications of object oriented programming, comparison between commonly used programming languages.

Basics of Python Programming: Features, History, future of python, , writing and executing first python program, Literal constants, variables and identifiers, data types, input operation, comments, reserved words, indentation, operators and expressions, expressions, Type conversion

Decision control statements: Introduction, Selection/conditional branching statements, Basic loop

structures/iterative statements, Nested loops, break, continue and pass statements

UNIT II

Functions and Modules: Introduction, function declaration and definition, function definition, function call variable scope and lifetime, the return statement, recursive functions, modules, packages in python.

Strings: Concatenating, appending and multiplying strings, immutability, String formatting operator, built-in string methods and function, slice operation.

Lists: access and update values in lists, nested and cloning lists, basic list operations, List methods, Using lists as Stack and Queues, list comprehensions, loping in lists.

Tuple: Creating tuple, utility of tuples, accessing values in a tuple, updating tuple, deleting elements in tuple basic tuple operations

UNIT III

Sets: Creating a Set and set operations

Dictionaries: Creating a dictionary, accessing values, add, modify, delete, sort items in a dictionary, looping over a dictionary.

Classes and Objects: Introduction, classes and objects, class method and self argument, init() method, class and object variables, del() method, other special methods, public and private data members, private methods, calling a class method from another class method, built-in class attributes, garbage collection, class and static methods

Inheritance: Introduction, inheriting classes in python, types of inheritance composition/containership/complex objects, abstract classes and interfaces, Meta class.

UNIT IV

Operator Overloading: Introduction, implementing operator overloading, reverse adding, overriding __getitem__() and __setitem__() methods, overriding the in operator, overriding miscellaneous functions, overriding the _call__() method.

Error and Exception Handling: Introduction to errors and exceptions, handling exceptions, multiple except blocks, multiple exceptions in a single block, except block without exception, the else clause, raising exceptions, built-in and user-defined exceptions, the finally block.

Self-Study:

String functions: ord(), chr() functions, in and not in operators
Standard Library modules, Globals(), Locals(), Reload(),date,time,sys
Comparing, iterating string, the String module, Regular expressions, meta characters in regular expression.
Re-raising exception, Assertions in python

TEXT BOOKS:

[1] ReemaThareja,"Python ProgrammingUsing Problem Solving Approach", Oxford University Press, 2019.

REFERENCE BOOKS:

[1] Zed Shah, “Learn PythonThe Hard Way”, Third edition, Addison-Wesley, 2013.
[2] Charles Severance, " Python for Informatics- Exploring Information", 1st edition Shroff Publishers, 2017.
[3] John V. Guttag, “Introduction to Computation and Programming Using Python”, The MIT Press, 2013
[4] W.Chun , "Core Python Programming", 2nd Edition, Prentice Hall, 2006.

E-resources and other digital material:

[1] Charles Severance: University of Michigan,Python for Everybody [COURSERA]. (05-01-2021) Available: https://www.coursera.org/

[2] Prof. SudarshanIyengar, IIT Ropar, Prof. Yayati Gupta, IIIT Dharwad, The Joy Of Computing Using Python [NPTEL], (05-01-2021), Available:https://nptel.ac.in/courses/106/106/106106182/#

[3] Prof KannanMoudgalya, Professor, IIT Bombay, Python 3.4.3, [SWAYAM], (05-01-2021), Available https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

[4] Corey Schafer,Python OOP Tutorials - Working with Classes, (05-01-2021), Available: Python OOP Tutorials - Working with Classes - YouTube

20ES2104A
BASIC ELECTRONICS ENGINEERING

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Comprehend the fundamentals of electronic components, devices, transducers
CO2	Understand and apply the principles of digital electronics
CO3	Learn the principles of various communication systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3			2									
CO2	3	3												
CO3	2				2									

COURSE CONTENT

UNIT I

Electronic Components: Passive components - resistors, capacitors &inductors (properties, common types, I-V relationship and uses). Semiconductor Devices: Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, Zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, photo couplers).

UNIT II

Transducers: Transducers - Instrumentation - general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers - piezoelectric and thermocouple -DHT, ULTRASONIC , PIR..sensors

UNIT III

Digital Electronics: Number systems - binary codes - logic gates Boolean algebra, laws & theorems - simplification of Boolean expression - Implementation of Boolean expressions using logic gates – standard forms of Booleanexpression.

UNIT IV

Digital Communication: Block diagram of a basic communication system - frequency spectrum - need for modulation, Types of communication-Analog and Digital communication-Advantages and Disadvantages of Digital Communication, Time and frequency domain representation of signals, Sampling theorem, Nyquist

rate and Nyquist interval, Pulse code modulation, Line coding-Various formats, Generation of digital modulation techniques-ASK,FSK,PSK

TEXT BOOKS

[1] Thyagarajan.T, SendurChelvi.K.P, Rangaswamy, "Engineering Basics: Electrical, Electronics and computer Engineering", T.R, New Age International, Third Edition, 2007. (UNIT- I&II)

[2] Thomas L. Floyd, "Electronic Devices", Pearson Education, 9thEdition, 2011. (UNIT- III)

[3] Dr. Sanjay Sharma, "Communication Systems(Analog & Digital)", S.K.Kataria& Sons (KATSON Books), 6th edition, 2014 (UNIT- IV)

REFERENCE BOOKS

[1] M. Morris Mano, Michael D. Ciletti, ―Digital Design‖, 4th edition, Prentice Hall, 2007.

[2] S. Salivahanan, N.Suresh Kumar & A. Vallavaraj, "Electronic Devices & Circuits", 2nd Edition, Tata McGraw Hill,2008.

[3] Simon Haykin. ―Communication Systems, 4th edition, 2000, John Wiley and Sons

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/117/103/117103063/

[2] https://nptel.ac.in/courses/108/105/108105132/

[3] https://nptel.ac.in/courses/108/102/108102096/

20ES2105
ENGINEERING GRAPHICS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory & Practice	**Lecture -Tutorial-Practice:**	1 - 0 - 4
Prerequisites:	Nil	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the Scales and conics.
CO2	Draw Orthographic projections of points, Lines and Planes.
CO3	Draw Orthographic projections of Solidsand to understand basics of Auto CAD.
CO4	Understand the sections, Developmentsof solids and draw isometric views using Auto CAD.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3		3				3					
CO2	2		3				3					
CO3	2		3				3					
CO4	1		3				3					

COURSE CONTENT

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance

Scales: Construction of plain and diagonal Scales

Conic Sections: Construction of ellipse, parabola and hyperbola (Treatment is limited to Eccentricity or General method only)

UNIT – II

Orthographic Projections: Principles of Orthographic Projections –Projections of Points, Lines (Treatment is limited to First Angle Projection) and Projections of Plane regular geometric figures (Up to Plane Inclined to both of the Reference planes)

UNIT – III

Projections of Solids: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions (Limited to Solid Inclined to one of the Reference planes)

INTRODUCTION TO AUTO CAD: Basic introduction and operational instructions of various commands in AutoCAD.**(**Internal Evaluation only**)**

UNIT – IV

Sections and Development of Surfaces of Right Angular Solids:

Sections and sectional views of right angular solids of Prism, Pyramid and Cone, Development of surfaces of Right Regular Solids of Prism, Pyramid and Cone.

Isometric Projections: Conversion of isometric views into Orthographic Projections of simple castingsusing Auto CAD. (Treatment is limited to simple objects only, Internal Evaluation only).

TEXT BOOKS

[1] BasanthAgrawal& C M Agrawal," Engineering Drawing", McGraw Hill Education Private Limited, New Delhi.
[2] N.D. Bhatt "Engineering Drawing", Charotar Publishing House, Anand. 53rd Edition – 2019.

REFERENCE BOOKS

[1] K. L. Narayana& P. Kannaiah, "Text Book on Engineering Drawing", Scitech publications (India) Pvt. Ltd.,Chennai, 2nd Edition - fifth reprint 2006
[2] K. Venugopal, "Engineering Drawing and Graphics + Auto CAD", New Age International, New Delhi
[3] D M Kulkarni, AP Rastogi, AK Sarkar, "Engineering Graphics with Auto CAD", PHI Learning Private Limited, Delhi Edition – 2013

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.youtube.com/watch?v=XCWJ XrkWco.
[2] http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html# isodrawing.
[3] https://onlinecourses.nptel.ac.in/noc20_me79/preview
[4] http://nptel.ac.in/courses/112/103/112103019/

20MC2106
PROFESSIONAL ETHICS & PRACTICE

Course Category:	Mandatory Learning	**Credits:**	--
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1 - 0 - 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100 -- 100

COURSE OUTCOMES

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

CO1	Know the moral autonomy and uses of ethical theories.
CO2	Understand Engineering as Experimentation
CO3	Understand about safety, risk and professional rights.
CO4	Know the ethics regarding Global issues related to Environment, Computers and weapon's development. Understand general principles of contracting.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	**2**											
CO2					**3**							
CO3					**3**							
CO4											**2**	

COURSE CONTENT

UNIT I **(4 lectures)**

Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issues- types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory -Gilligan's theory - consensus and controversy - Models of Professional Roles -theories about right action - Self-interest - customs and religion- uses of ethical theories.

UNIT II **(4 lectures)**

Engineering as Social Experimentation: Engineering as experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

UNIT III **(4 lectures)**

Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority

- collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT IV **(4 lectures)**

Global Issues: Multinational corporations- Environmental ethics- computer ethics - weapons development engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership sample code of Ethics (Specific to a particular Engineering Discipline).

General principles of contracts management : Indian contract act,1972 and amendments covering general principles of contracting.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York (1996).
2. Govindarajan M, Natarajan S, Senthil Kumar V. S., "Engineering Ethics", Prentice Hall of India, New Delhi(2004).

REFERENCE BOOKS

[1] Baum, R.J. and Flores, A., "Ethical Problems in Engineering, Center for the studyof the Human Dimensions of Science and Technology", Rensellae Polytechnic Institute,Troy, New York, 335 pp. eds (1978)

[2] Beabout, G.R., Wennemann, D.J. , "Applied Professional Ethics: A Developmental Approach for Use with Case Studies", University Press of America Lanham, MD, 175 pp (1994).

[3] Dutt (1994) Indian Contract Act, Eastern Law House.

20BS2151B
ENGINEERING CHEMISTRY LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Knowledge of chemistry practicals at Intermediate level	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Analyze ores, commercial samples, quality parameters of water samples from different sources
CO2	Perform quantitative analysis using instrumental methods.
CO3	Apply the knowledge of preparation of polymers, separation of ions, mechanism of corrosion and photochemical reactions.

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		3										
CO2				2								
CO3	2											

COURSE CONTENT

List of Experiments:

1. Determination of MnO_2 in Pyrolusite / Iron in Haematite ore
2. Determination of total alkalinity of a water sample
3. Determination of purity of a boric acid sample
4. Conductometric analysis of a strong base using a strong acid
5. Determination of total hardness of a water sample
6. Determination of copper in a given sample
7. Chemistry of blueprinting
8. Determination of Mohr's salt - Permanganometry
9. Determination of Mohr's salt - Dichrometry
10. Comparison of corrosion rates of different metals
11. Determination of available chlorine in a bleaching powder sample
12. Determination of chlorides in a water sample
13. pH metric analysis of a strong base using a strong acid
14. Preparation of urea-formaldehyde resin
15. Separation of ions by paper chromatography
16.

REFERENCE BOOKS

[1] *S.K. Bhasin and Sudha Rani*, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2nd edition.

[2] *Sunitha Rattan*, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2nd edition.

20ES2152A
OBJECT ORIENTED PROGRAMMING USING PYTHON LABORATORY

Course Category:	Engineering Science	**Credits:**	1.5
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	20ES1103 Programming for Problem Solving 20ES1152 Programming for Problem Solving Laboratory	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Demonstrate the usage of Python syntax and semantics in solving the problems
CO2	Develop python programs using functions and built in modules
CO3	Implement Python data structures to solve the complex problems
CO4	Apply object oriented concepts to design solution to real world scenarios

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1		2						1		3	
CO2			1		2						1		1	2
CO3		1	1		1						1		2	2
CO4		2	2		2						2		3	

COURSE CONTENT

Week 1: Understanding Object Oriented Programming, Python installation

a. Differentiate procedure oriented and Object Oriented Programming
b. Identify a simple real world scenario using the concept of classes and objects
c. Demonstrate different types of inheritance in the scenario identified
d. Practice Python Installation

Week 2: Declaration of Variables, identifiers and type conversions

a. Write simple programs by defining variables and assigning values of different basic data types
b. Write programs to know data type of a variable using Type statement
c. Write programs to do multiple assignments at a time
d. Write programs for writing multiple statements in a single line
e. Use Input statement, type conversion
f. Use different operators in programs

Week 3: Python programs on Decision Control Statements

a. Write programs using selection statements

b. Implement programs on and conditional branching statements

Week 4: Python programs on looping control structures

a. Design and develop programs using Iterative statements- while, for , nested loops
b. Use Break, continue, pass statements in programs
c. Understand the usage of else statement in loops with a case study

Week 5 & 6: Identify the need and importance in the creation of Python Functions and Modules

a. Write programs for defining and calling functions
b. Understand Scope of a variable and Use global statement
c. Differentiate fruitful and void functions through a case study
d. Apply recursive and Lambda functions
e. Understand different kinds of arguments through a case study
f. Installing and usage of standard library modules
g. Use python packages

Week 7: Solve the problems using Strings and understanding the methods and operations on Lists

a. Apply string formatting operator
b. Use built in string methods, functions and regular expressions
c. Define a list and write programs to access and modify elements of a list
d. Practice basic list operations, methods
e. Write programs to use list as a stack and queue

Week 8:Programs on the implementation of methods and operations of List data structure

a. Define a list and write programs to access and modify elements of a list
b. Practice basic list operations, methods
c. Write programs to use list as a stack and queue

Week 9: Implement programs to solve the problems using Python other data structures:Tuples and Dictionaries

a. Write programs to define a dictionary and write programs to modify values, adding new keys
b. Apply looping over a dictionary
c. Use built in dictionary methods, functions
d. Create a tuple and assign values
e. Use basic tuple operations and comparisons

Week 10& 11: Implement the Python Classes and Objects to address the real world scenarios

a. Define classes and objects using python for the real world scenario
b. Defining constructors and using Self
c. Understand public and private members
d. Practice calling class methods from another class
e. Write built in functions to check, get, set and delete attributes

Week 12&13: Develop the programs to implement parent-child relationship

a. Demonstrate different inheritance types
b. Apply polymorphism and method overriding
c. Create abstract classes

Week 14: Write the programs to address the exceptions via exception handling in the development of solutions and implement operator overloading

a. Write a simple exception handling program with try- except
b. Write a program for catching multiple exceptions
c. Demonstrate raising and re raising exceptions
d. Apply else and finally clauses
e. Demonstrate the usage of polymorphism in overloading of operators

TEXT BOOKS

[1]. ReemaThareja,"Python ProgrammingUsing Problem Solving Approach", Oxford University Press 2019.

REFERENCE BOOKS

[1]. Zed Shah, "Learn PythonThe Hard Way", Third edition, Addison-Wesley, 2013.
[2]. Charles Severance, " Python for Informatics- Exploring Information", 1st edition Shroff Publishers 2017.
[3]. John V. Guttag, "Introduction to Computation and Programming Using Python", The MIT Press, 2013
[4]. W.Chun , "Core Python Programming", 2nd Edition, Prentice Hall, 2006.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. Charles Severance: University of Michigan,Python for Everybody [COURSERA]. (05-01-2021) Available: https://www.coursera.org/
[2]. Prof. SudarshanIyengar, IIT Ropar, Prof. Yayati Gupta, IIIT Dharwad, The Joy Of Computing Using Python [NPTEL], (05-01-2021), Available:https://nptel.ac.in/courses/106/106/106106182/#
[3]. Prof KannanMoudgalya, Professor, IIT Bombay, Python 3.4.3, [SWAYAM], (05-01-2021), Available https://onlinecourses.swayam2.ac.in/aic20_sp33/preview
[4]. Corey Schafer,Python OOP Tutorials - Working with Classes, (05-01-2021), Available: Python OOP Tutorials - Working with Classes - YouTube

20ES2153
ENGINEERING WORKSHOP

Course Category:	Engineering Sciences	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Understand the basic joints using wood and familiarize with various fundamental aspects of house wiring.
CO2	Prepare basic models using sheet metal and practice joining of metals using arc welding technique.
CO3	Familiarize with various manufacturing processes such as injection moulding and 3D printing
CO4	Understand the preparation of PCB
CO5	Understand simple IOT Applications using Arduino

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			**2**					**1**			**3**	**2**		**2**
CO2			**2**					**1**			**3**	**2**	**2**	**2**
CO3			**2**					**1**			**1**	**2**		
CO4						**1**							**1**	**1**
CO5							**2**						**1**	**1**

COURSE CONTENT

PART-A

Carpentry:

a. Demonstration of Cross half lap and T joints. (1 class)
b. Demonstration of power tools.

Electrical Wiring:

a. Fundamentals of Electric wiring and practice of Series wiring. (1 class)

b. Practice of stair case wiring and connecting a fluorescent Tube.

Sheet metal & soldering:

a. Preparation of complete funnel using sheet metal and practice of soldering. (2 classes)

b. Preparation of a square box using sheet metal and practice of soldering.

Welding:

a. Preparation of Corner Joint using arc welding process. (1 class)

b. Preparation of "T" joint using arc welding process.

Manufacturing processes:

a. Preparation of a small plastic part using injection moulding process. (1 class)

b. Demonstration of manufacturing a simple model using 3D printing process.

Electronic Circuits:

1. **To prepare PCB for the given electronic circuit**
   a. To prepare the layout and printing it on copper clad board
   b. To etch and drill the holes on PCB (2 classes)

2. **To solder the components on the PCB prepared and test the circuit**
   a. To identify and solder the components on the PCB prepared
   b. To test the operation of the circuit.

Basic IOT:

1**. Demonstration of Arduino board**
   a. Demonstrate different components & pin configuration of Arduino
   b. To set up Arduino IDE for programming.

2.**To measure Temperature & Humidity**

a. Interfacing of temperature & humidity sensor with Arduino. (2 classes)

b. Execute the program on Arduino IDE & display the measured values.

3. **To measure Distance**

a. Interfacing of Ultrasonic Sensor with Arduino

b. Execute the program on Arduino IDE & display the measured value.

PART-B

GROUP ACTIVITY (4 classes)

Students must prepare a Working model / Assembly using the knowledge gained from the above trades.

TEXT BOOKS

[1] Kannaiah P. & Narayana K. C., "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.
[2] Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

REFERENCE BOOKS

[1] Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, Practice and Work Book", Suma Publications, Chennai, 2005

E-RESOURCES AND OTHER DIGITAL MATERIALL

1. https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17- 1.pdf
2. https://www.protosystech.com/rapid-prototyping.htm
3. https://www.arduino.cc/en/Tutorial/Foundations
4. https://www.tutorialspoint.com/arduino/

SEMESTER - III

20BS3101A
DISCRETE MATHEMATICS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Set theory, Basic probability, probability distributions	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Analyze propositional calculus and first order logic	K4	1.2.1, 1.7.1, 2.5.1, 4.6.3, 12.4.2
CO2	Apply the basic and advanced counting techniques	K3	1.2.1, 2.5.1, 2.5.3, 12.4.2
CO3	Analyze of relations and digraphs and their applications	K4	1.2.1, 2.8.1, 4.4.1, 12.4.2
CO4	Analyze of graphs and their applications	K4	1.2.1, 2.5.3, 4.4.1, 12.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**3**		**1**								**1**		
CO2	**3**	**3**		**1**								**1**		
CO3	**3**	**3**		**1**								**1**		
CO4	**3**	**3**		**1**								**1**		

COURSE CONTENT

UNIT I: Propositional Calculus

Propositional Calculus

Fundamentals of Logic: Propositions, Connectives, Propositional functions, Truth Tables, Tautology, Contradiction, Logical equivalences, Normal forms, Logical inferences, Methods of proof of an implication.

First Order Predicate Logic: Predicate, Quantifiers, and Rules of inference for Quantified propositions.

UNIT II: Counting Techniques

Basics of Counting: Sum and product rules, Indirect counting, One to One Correspondence, Combinations and permutations, Enumerating Combinations and Permutations with and without repetitions.

Advanced Counting Techniques: Generating function of sequences, Recurences relations, Solving recurrences relations – substitution- Generating functions-The method of characteristic roots, Solution of Inhomogeneous recurrences relations.

UNIT III: Relations and Digraphs

Relations and basic graphs, Special properties of binary relations, Equivalence relation, Partially ordered sets, Hasse diagrams, Lattices, Operations on relations, Paths and closures, Directed graphs and Adjacency matrices, Transitive closure, Warshall's algorithm

UNIT IV: Graph Theory

Introduction(graphs, sub graphs, circuits, trees) Sum of degrees theorem, Isomorphism and sub graphs, planar graphs, Euler's formula, Multi graphs and Euler's circuits, Hamiltonian graphs, Grin-berg's theorem, Graph coloring, Chromatic numbers.

TEXT BOOKS

[1] Discrete Mathematics for Computer Scientists & Mathematicians : J.L.Mott,Kandel,Baker.

REFERENCE BOOKS

[1] Trembly& Manohar.;Discrete Mathematical structures with applications to computer science.

[2] Rosen,TMH; Discrete Mathematics and its Applications.

[3] Malik & Sen Thomson Discrete Mathematical Structures: Theory and applicatons

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] discretemathsweb.berkeley.edu/teaching.html

[2] dmsci.org/teaching.html

[3] video lectures.nptel.iitm.ac.in

20ES3102
JAVA PROGRAMMING

Course Category:	Engineering Science	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the basic concepts of object oriented programming.	K2	1.7.1,2.5.1,2.5.2,2.7.1
CO2	Apply multiple inheritance through interfaces for a given application.	K3	1.7.1,2.5.1,2.5.2,2.6.3, 2.7.1,3.5.1,3.8.2
CO3	Apply exceptions, thread capabilities and handling files on a given application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,3.8.2
CO4	Apply functional programming and Collections framework for a given application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,3.6.2,3.8.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**3**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**		**2**								**2**	**2**

COURSE CONTENT

UNIT I

Introduction, The History and Evolution of Java: Java history and evolution, Java features, Java's Magic: Byte Code, How Java differs from C and C++.

An Overview of Java: Object Oriented Programming: Two paradigms, Principles of OOP, A First simple Program and Control statements.

Data Types, Variables and Arrays: Java keywords, Primitive types, Integers, Floating-Point Types, Characters, Booleans, Variables, Operators, Type Conversion, Casting and Arrays.

Introducing Classes and Objects: Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, this keyword, Garbage collection, overloading methods, using objects as parameters, returning objects, static and final keywords, nested and inner classes.

UNIT II

String Handling: The String Constructors, String Buffer Class, String Tokenizer class.

Inheritance: Inheritance basics, using super, multilevel hierarchy, method overriding, dynamic method dispatch, using abstract classes, final with inheritance.

Packages & Interfaces: Defining a package, finding package and CLASSPATH. Access protection, importing packages, Defining an interface, implementing interfaces, nested interfaces, applying interfaces, variables in interfaces.

UNIT III

Exception handling: Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, throw, throws, finally, creating your own exception subclasses.

I/O streams: Byte Streams- InputStream, OutputStream, FileInputStream, FileOutputStream, Character Streams- Reader, Writer, FileReader, FileWriter.

Multithread Programming: The Java Thread Model, Creating a thread: Implementing Runnable, Extending Thread, creating multiple threads, Thread Priorities, Synchronization: Using Synchronized methods, The synchronized Statement.

UNIT IV

Pragmatic Functional Programming using Lambdas: Introduction to Functional programming, Functional Programming concepts and terminology, Functional Interfaces, Working with Lambda Expressions and Method References.

Collections Framework: Collections overview, Collection interfaces: Collection, List, and

Set. Collection Classes: ArrayList, LinkedList, HashSet.Map Classes:HashMap, TreeMapJ

The Stream API: Stream basics, Reduction operations, Using parallel streams, Mapping, Collecting, Iterators and Streams.

TEXT BOOKS

[1] Herbert Schildt, “Java The Complete Reference”, Eleventh Edition, Oracle Press, . 2019.

REFERENCE BOOKS

[1] Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehension Introduction”, Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2017.
[2] E Balaguruswamy, "Programming with Java", 4th Edition, Mc Graw Hill , 2020.
[3] Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, Eleventh Edition, Deitel & Associates, Inc.l , 2018.
[4] Timothy Budd, “Understanding Object Oriented Programming with Java “, Updated edition,Pearson Education, 2013.
[5] Kathy Sierra & Bert Bates, "Head First Java", 2nd Edition, Oreilly.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Debasis Samanta. (14th,July, 2021), Department of Computer Science & Engineering, I.I.T.,Kharagpur, Swayam, NPTEL. https://onlinecourses.nptel.ac.in/noc21_cs03/preview.
[2] Evan Jones, Adam Marcus,Eugene Wu "Introduction to Programming in Java", MIT OpenCourseWare, Massachusetts Institute of Technology, May 28, 2021. https://ocw.mit.edu › courses
[3] Prof. Owen Astrachan, "Object Oriented Programming in Java", Duke University, 21st May 2021. coursera.org https://www.coursera.org/specializations/object-oriented-programming
[4] Dheeru Mundluru, "Java In-Depth: Become a Complete Java Engineer", Udemy, 14th May 2021. https://www.udemy.com/course/java-in-depth-become-a-complete-java-engineer/
[5] Prof. Olufisayo Omojokun,"Introduction to Object-Oriented Programming with Java I: Foundations and Syntax Basics", Georgia Institute of Technology, edX, May 2021.

https://www.edx.org/course/introduction-to-java-programming-i-foundations-and-syntax- basics

20CS3303
OPERATING SYSTEMS

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	understand the basic components of an Operating System	K2	1.7.1
CO2	Apply CPU Scheduling and disk scheduling algorithms to achieve specific criteria	K3	1.7.1,2.6.3, 2.6.4, 2.8.3, 2.8.4
CO3	Analyze the mechanisms used for process synchronization and handling deadlocks	K4	1.7.1,2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1
CO4	Analyze virtual memory techniques & File system Implementation techniques	K4	1.7.1,2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**												**2**	
CO2	**3**	**3**											**2**	
CO3	**3**	**2**	**1**										**2**	
CO4	**3**	**3**	**1**										**2**	
Weightage	**100%**	**50%**	**25%**											

COURSE CONTENT

UNIT I

Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls: Example, Application Programming Interface, Types of System Calls, System Services

Processes: Process Concept: The Process, Process State, Process Control Block, Threads, Process Scheduling: Scheduling Queues, CPU Scheduling, Context Switch, Operations on Processes: Process Creation, Process Termination, Interprocess Communication, IPC in Shared-Memory Systems, IPC in Message-Passing Systems: Naming, Synchronization, Buffering.

UNIT II

CPU Scheduling: Basic Concepts: CPU-I/O Burst Cycle, CPU Scheduler, Preemptive & Nonpreemptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling, Thread Scheduling: Contention Scope, Pthread Scheduling, Multiple-Processor Scheduling: Approaches, Multicore Processors, Load Balancing, Processor Affinity, Heterogeneous Multiprocessing, Real-Time CPU Scheduling: Minimizing Latency, Priority-Based, Rate-Monotonic, Earliest-Deadline-First, Proportional Share Scheduling**.**

Process Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Hardware Support for Synchronization, Mutex Locks, Semaphores: Semaphore usage, Semaphore Implementation, Monitors**:** Usage, Implementing using Semaphores, Resuming a Process, Liveness: Deadlock, Priority Inversion, Classic Problems of Synchronization: The Bounded-Buffer Problem, The Readers-Writers Problem, The Dining-Philosophers Problem

UNIT III

Deadlocks: System Model, Deadlock in Multithreaded Applications: Livelock, Deadlock Characterization: Necessary conditions, Resource-Allocation Graph, Methods for Handling Deadlocks, Deadlock Prevention: Mutual Exclusion, Hold and Wait, No Preemption, Circular Wait, Deadlock Avoidance: Safe State, Resource-Allocation-Graph Algorithm, Bankers Algorithm, Deadlock Detection:

Single Instance of Each Resource type, Several Instances, Detection Algorithm Usage, Recovery from Deadlock: Process and Thread Termination, Resource Preemption**.**

Main Memory: Background: Basic Hardware, Address Binding, Logical Vs Physical Address Space, Dynamic Loading, Dynamic Linking & Shared Libraries, Contiguous Memory Allocation: Memory Protection, Memory Allocation, Fragmentation, Paging : Basic Method, Hardware Support, Protection, Shared Pages, Structure of the Page Table: Hierarchical, Hashed Page Tables, Inverted Page Tables, Swapping: Standard Swapping, Swapping with Paging, Swapping on Mobile Systems.

UNIT IV

Virtual Memory: Background, Demand Paging: Basic Concepts, Free-Frame List, Performance, Copy-on-Write, Page Replacement: Basic Page Replacement, FIFO, Optimal, LRU, LRU Approximation, Counting Based, Page Buffering, Allocation of Frames: Minimum Number of Frames, Allocation Algorithms, Global vs Local Allocation, Non Uniform Memory Access, Thrashing: Cause of Thrashing, Working-Set Model, Page-Faulty Frequency, Memory Compression

Mass-Storage Structure: HDD Scheduling: FCFS, SCAN, C-SCAN Scheduling, Disk Management: Disk Formatting, Boot Block, Bad Blocks, Swap-Space Management: Swap-Space Use, Location, RAID Structure- RAID Levels

File -System Implementation: Directory Implementation: Linear List, Hash Table, Allocation Methods: Contiguous, Linked, Indexed Allocation, Free-Space Management: Bit Vector, Linked List, Grouping, Counting, Space Maps, Efficiency and Performance, Recovery: Consistency Checking, Log-Structured File Systems.

TEXT BOOKS

[1]Abraham Silberschatz, Peter B. Galvin and Greg Gagne, “Operating System Concepts’, 10th Edition, John Wiley & Sons Pvt. Ltd, 2018.

REFERENCE BOOKS

[1] William Stallings, “Operating System: Internals and Design Principles”. 6th ed 2009.

[2] Andrew S.Tanenbaum, “Modern Operating Systems”. 3rd ed, PHI, 2008.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Santanu Chattopadhyay - NPTEL Course on Operating Sytems @ https://nptel.ac.in/courses/106/105/106105214/ Available from 25-7-19

[2] Stanford University - Lecture Notes on Operating Systems @ https://www.scs.stanford.edu/21wi-cs140/notes/ Available on 21-05-21

[3] IIT Bombay – Lecture Notes on Operating Systems @ https://www.cse.iitb.ac.in/~mythili/os/ Available on 21-05-21

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Santanu Chattopadhyay - NPTEL Course on Operating Sytems @ https://nptel.ac.in/courses/106/105/106105214/ Available on 25-7-19

[2] Stanford University - Lecture Notes on Operating Systems @ https://www.scs.stanford.edu/21wi-cs140/notes/ Available on 21-05-21

[3] IIT Bombay – Lecture Notes on Operating Systems @ https://www.cse.iitb.ac.in/~mythili/os/ Available on 21-05-21

20CS3304
DIGITAL LOGIC AND COMPUTER DESIGN

Course Category:	Program Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply simplification techniques to minimize the Boolean functions.	K3	1.2.1, 1.7.1
CO2	Apply concepts ofcombinational logic to design MSI and LSI circuits.	K3	1.7.1,2.7.1,2.7.2,3.7.1 ,3.8.1
CO3	Apply sequential logic techniques to design Counters and Registers.	K3	1.7.1,2.7.1,2.7.2,3.7.1 ,3.8.1
CO4	Understand the organization and design of a basic computer.	K2	2.7.1,2.7.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2	**1**	**2**	**2**											
CO3	**1**	**2**	**2**											
CO4	**1**	**2**	**2**											
Weightage	**80%**	**80%**	**60%**											

COURSE CONTENT

UNIT I

Boolean Functions

Introduction to Boolean Functions, Boolean Functions Simplification- The Map Method, Two and three variable Maps, Four-variable Map, Five variable Map, Product of Sums Simplification, Don't care conditions, The Tabulation Method, Determination of Prime Implicants, Selection of Prime-Implicants.

Combinational Logic: Introduction**,** Design Procedure, Adders, Subtractors, Code Conversions, Exclusive-or Gates, Parity Generators and Checkers.

UNIT II

Combinational Logic with MSI and LSI: Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Demultiplexers, Encoders, Multiplexers.

Programmable Logic: Read only memory (ROM), Programmable read only memory (PROM), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Introduction to FPGA.

UNIT III

Sequential Logic: Sequential circuits, Classification, Latches, Flip Flops, Triggering of Flip-Flops, Master slave flip-flop, Flip-Flop Excitation tables, flip-flop direct inputs.Analysis of Clocked Sequential Circuits, State table, State diagram, state equations, State Reduction and Assignment, Design Procedure, design with unused states.

Registers, Counters: Registers, Shift Registers, Asynchronous Counters, Synchronous Counters, Ring Counter, Johnson Counter, Timing Sequences.

UNIT IV

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input-Output and Interrupt, Design of Basic Computer, Design of Accumulator Logic.

TEXT BOOKS

[1] M.Morris Mano, Digital Logic & Computer Design 1 e/d reprint, Pearson education, 2016.
[2] Morris M. Mano, Computer System Architecture, 3/e, Pearson/PHI ,2007

REFERENCE BOOKS

[1] A. Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI,2013
[2] M.Morris Mano, Michael D Ciletti Digital Design with an Introduction toVerilog HDL 5th e/d, Pearson education, 2013
[3] Charles H.Roth , Fundamentals of Logic Design, 6/e, Cengage learning,2010

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Neeraj Goel IIT Ropar, 20th May 2021, Digital Systems, NPTEL VIDEO, Available: https://nptel.ac.in/courses/108/106/108106177/
[2] Prof. N.J. Rao, IISc Bangalore, 20th May 2021, Digital systems, NPTELWEB Notes , Available at: https://nptel.ac.in/courses/106/108/106108099/

20CS3305
DATA STRUCTURES

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply different techniques to evaluate algorithms	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO2	Apply linear data structures to given applications.	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO3	Understand the operations on tree and heap non-linear data structures.	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO4	Apply different kinds of linear data structures to solve problems.	K3	1.2.1, 1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.6.3, 2.6.4, 2.8.4

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**											**2**	
CO2	**2**	**2**											**2**	
CO3	**2**	**2**											**2**	
CO4	**2**	**3**											**2**	
Weightage	**47%**	**53%**												

COURSE CONTENT

UNIT I

Introduction: Basic concepts, algorithm specification, randomized algorithm, data abstraction, performance analysis-time complexity, space complexity, asymptotic notations, linear and binary searches complexity analysis.

Stacks: Definition, representing stacks, ADT stack and its operations: algorithms and their complexity analysis, Applications of stacks: expression conversion and evaluation – corresponding algorithms. recursion, Towers of Hanoi problem.

Queues: Queue and its sequential representation, queue as an abstract data type, types of queue: simple queue, circular queue, operations on each types of queues: algorithms.

UNIT II

Linked lists: Representation in memory, singly linked lists: operations and algorithms; linked list representation of stack and queue, doubly linked list: operations and algorithms; circular linked lists: all operations their algorithms. applications: polynomials addition and multiplication.

UNIT III

Trees: Introduction: terminology, representation of trees, binary Tree, complete binary tree, applications of binary trees, expression trees construction and evaluation; binary tree traversals: inorder, preorder and postorder – recursive and non-recursive, binary search trees, operations on binary search trees, threaded binary trees, operations on threaded binary trees.

Heap: Min heap and max heap, operations on min Heap and max Heap, priority queue.

UNIT IV

Sorting: Merge Sort, quick sort, radix sort, heap sort, shell sort, tree sort, comparison of sorting algorithms, external Sorting.

Hashing and Collision: Introduction, hash tables, hash functions, different hash functions, collisions: collision resolution by open addressing, collision resolution by chaining, pros and cons of hashing, applications of hashing.

TEXT BOOKS

[1] Horowitz Sahni and Anderson-Freed “Fundamentals of Data Structures in C”. 2nd Edition, Universities Press, 2008. (Unit I, II, III)

[2] Reema Thareja, “Data Structures using C”, Second Edition, Oxford University Press, 2011. (Unit IV)

REFERENCE BOOKS

[1] Richard F. Gilberg & B. A. Forouzan “Data Structures A Pseudocode Approcah with C”, Second Edition, CENGAGE Learning.
[2] Mark Allen Weiss,”Data structure and Algorithm Analysis in C”. Addison Wesley Publication. 2006.
[3] Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, McGraw Hill, 1984.
[4] Thomas Cormen, C.Leiserson, R. L.Rivest & C.Stein, “Introduction to Algorithms”. 3rd Edition, The MIT Press, 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr.P.P. Chakraborty, IIT Kharagpur, May 19, 2010, Data Structures, NPTEL,Available:www.youtube.com/ watch? v=S47aSEqm_0I
[2] Dr. Naveen Garg, IIT Delhi, Sep 24, 2008, Data Strucutres, NPTEL, Available:http://nptel.iitm.ac.in, http://freevideolectures.com/ Course /2279/Data-Structures-And-Algorithms
[3] Shai Simonson, Jun 16, 2014, Data Structures, NPTEL, Available: http://nptel.ac.in/video.php? subjectId=106102064

20ES3151
JAVA PROGRAMMING LABORATORY

Course Category:	Engineering Science	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 -0- 3
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply the concepts of object oriented programming to solve problems	K3	1.7.1, 2.5.1, 2.5.2, 2.7.1, 5.4.1, 5.4.2, 11.4.1
CO2	Apply multiple inheritance through interfaces.	K3	2.5.1, 2.5.2, 2.6.3, 2.7.1, 3.5.1, 3.8.2, 5.4.1, 5.4.2
CO3	Apply exceptions, thread capabilities and handling files.	K3	3.5.1, 3.8.2, 5.4.1, 5.4.2, 9.6.1, 11.4.1
CO4	Analyze the use of functional programming and Collections framework	K4	3.8.2, 5.4.1, 5.4.2, 9.6.1, 11.4.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**			**1**						**1**		**1**	
CO2		**2**	**1**		**2**								**2**	**1**
CO3			**2**		**2**				**1**		**1**		**2**	
CO4			**3**		**3**				**2**		**2**		**3**	**3**

COURSE CONTENT/TASKS

Task 1

Apply fundamentals of java data types, variables, operators and control statements to a given application.

Task 2

Implementation of classes and objects concepts.

Task 3

Implement Arrays to a given application

Task 4

Implementation of Inheritance and types of Inheritance

Task 5

Use String and String Tokenizer classes and develop a java application.

Task 6

Use interfaces and develop a java application

Task 7

Create a package and access members from a package

Task 8

Develop a java Application using Method overloading and Method overriding

Task 9

Create a java application to copy content from one file to another file using I/O Streams

Task 10

Implement Handling Exceptions to a given application.

Task 11

Apply Thread Capabilities on a given application

Task 12

Use Collections framework and create a java application

Task 13

Apply Lambda functions and Streams API to a given application

Projects:

Design and develop an automated ballot vote system.

Design and develop a banking application.

TEXT BOOKS

[1] Herbert Schildt, “Java The Complete Reference”, Eleventh Edition, Oracle Press, . 2019.

REFERENCE BOOKS

[1] Herbert Schildt, Dale Skrien, “Java Fundamentals A Comprehension Introduction”, Special Indian Edition, McGraw-Hill Education India Pvt. Ltd, 2017.

[2] E Balaguruswamy, "Programming with Java", 4th Edition, Mc Graw Hill , 2020.

[3] Paul J. Dietel and Dr.Harvey M. Deitel, “Java How to Program”, Eleventh Edition, Deitel & Associates, Inc.l , 2018.

[4] Timothy Budd, “Understanding Object Oriented Programming with Java “, Updated edition,Pearson Education, 2013.

[5] Kathy Sierra & Bert Bates, "Head First Java", 2nd Edition, Oreilly.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Debasis Samanta. (14th,July, 2021), Department of Computer Science & Engineering, I.I.T.,Kharagpur, Swayam, NPTEL. https://onlinecourses.nptel.ac.in/noc21_cs03/preview.

[2] Evan Jones, Adam Marcus,Eugene Wu "Introduction to Programming in Java", MIT OpenCourseWare, Massachusetts Institute of Technology, May 28, 2021. https://ocw.mit.edu › courses

[3] Prof. Owen Astrachan, "Object Oriented Programming in Java", Duke University, 21st May 2021. coursera.org https://www.coursera.org/specializations/object-oriented-programming

[4] Dheeru Mundluru, "Java In-Depth: Become a Complete Java Engineer", Udemy, 14th May 2021. https://www.udemy.com/course/java-in-depth-become-a-complete-java-engineer/

[5] Prof. Olufisayo Omojokun,"Introduction to Object-Oriented Programming with Java I: Foundations and Syntax Basics", Georgia Institute of Technology, edX, May 2021. https://www.edx.org/course/introduction-to-java-programming-i-foundations-and-syntax- basics

20CS3352
DIGITAL LOGIC DESIGN LABORATORY

Course Category:	Program Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-3
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply Boolean functions to minimum number of literals.	K3	1.2.1, 1.7.1
CO2	Analyze different combinational logic circuits.	K4	1.7.1, 2.7.1, 2.7.2, 3.7.1, 3.8.1
CO3	Analyze clocked sequential logic circuits using flip flops.	K4	1.7.1, 2.7.1, 2.7.2, 3.7.1, 3.8.1
CO4	Analyze different Counters and Registers.	K4	1.7.1, 2.7.1, 2.7.2, 3.7.1, 3.8.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2	**1**	**2**	**2**											
CO3	**1**	**2**	**2**											
CO4	**1**	**2**	**2**											

COURSE CONTENT/TASK

Laboratory Experiments with Standard ICS and FPGA

1. **Realization of All logic gates using universal gates.**
   a) Verification of logic gates from DIGITAL IC'S.
   b) Realization of logic gates using NAND and NOR.

2. **Design and Implementation of Arithmetic circuits.**
   a) Design and Implementation of half adder and half sub tractor.
   b) Design and Implementation of full adder and full sub tractor.

3. **Design and implement different types of code converters.**
   a) Design and implement i) Binary to Gray ii) Gray to Binary code converters
   b) Design and implement i) BCD to EX-3 ii) EX-3 to BCD code converters.

4. **Design and implementation of magnitude comparators.**
   i. Design and Implement single bit comparator.
   ii. Design and Implement two bit comparator.

5. **Implementation of Decoders and encoders.**
   i. Implementation of i) 2X4 Decoder ii)3X8 Decoder iii) BCD to Decimal Decoder iv) BCD to 7segment Display
   ii. Implementation of i) 4x2 Encoder ii) Octal to Binary encoder iii) Decimal to BCD encoder.

6. **Implementation of Multiplexer and De Multiplexer.**
   i. Implementation of i) 2X1 MUX ii)4X1 MUX
   ii. Implementation of i) 1X2 De MUX ii)1X4 De MUX

7. **Implementation of all types of FLIP-FLOPS using gates.**
   i. Implementation of SR latch using NAND & NOR
   ii. Implementation of SR, JK, D, T flip flops.
   iii. Implementation of Master-Slave JK Flip flop

8. **Design of Synchronous counters**.
   i. Design and implementation of synchronous up, synchronous down counter and Up-down Counters .
   ii. Design and implementation of synchronous MOD counters.

9. **Design of Asynchronous counters.**
   i. Design of Asynchronous up and down counters.
   ii. Design and implementation of Asynchronous Mod counters.

10. **Design of Ring-counter and Johnson counter.**
   i. Design and implementation of 4-bit Ring counter.

ii. Design and implementation of 4-bit Johnson counter.

Laboratory Projects

Reading and Writing data to EEPROM

TEXT BOOKS

[1] M.Morris Mano, Digital Logic & Computer Design 1 e/d reprint, Pearson education, 2016.

[2] M.Morris Mano, Michael D Ciletti Digital Design with an Introduction toVerilog HDL 5th e/d, Pearson education, 2013.

REFERENCE BOOKS

[1] A. Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI,2013

[2] Charles H.Roth , Fundamentals of Logic Design, 6/e, Cengage learning,2010

[3] A. P. Malvino, D. P. Leach and G.Saha, Digital Principles and Applications 7/e, McGraw Hill, 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Neeraj Goel IIT Ropar, 20th May 2021, Digital Systems, NPTEL VIDEO, Available: https://nptel.ac.in/courses/108/106/108106177/

[2] Prof. N.J. Rao, IISc Bangalore, 20th May 2021, Digital systems, NPTELWEB Notes,

Available at: https://nptel.ac.in/courses/106/108/106108099/

20CS3353
DATA STRUCTURES LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0-0-3
Prerequisites:	-	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply stack and queue data structures to different applications	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO2	Apply linked list data structures to solve problems	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO3	Implement operations on different tree and heap data structures.	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO4	Apply sorting algorithms to arrange a set of data items.	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**											**2**	
CO2	**2**	**2**											**2**	
CO3	**2**	**2**											**2**	
CO4	**2**	**2**											**2**	

COURSE CONTENT/TASK

Task 1: Operations on a stack data structure.

Task 2 and 3: Stack applications (expression conversion and evaluation, Tower of Hanoi problem).

Task 4: Operations on queues and circular queues.

Task 5: Operations on singly linked list and doubly linked list.

Task 6: Operation on circular linked list and circular doubly linked list.

Task 7: Linked list applications : polynomial addition and multiplications

Task 8: Binary search tree operations and tree traversal techniques using recursion.

Task 9: Binary search tree traversal techniques using non recursion.

Task 10: Operations on threaded binary trees and priority Queues

Task 11: Sorting techniques: Merge sort, quick sort, and radix sort.

Task 12: Sorting techniques: Heap sort, shell sort, and tree sort.

TEXT BOOKS

[1] Horowitz Sahni and Anderson-Freed "Fundamentals of Data Structures in C". 2nd Edition, Universities Press, 2008. (Unit 1, 2, and 3).

[2] Reema Thareja, "Data Structures using C", Second Edition, Oxford University Press, 2011. (Unit 4)

REFERENCE BOOKS

[1] Richard F. Gilberg & B. A. Forouzan "Data Structures A Pseudocode Approcah with C", Second Edition, CENGAGE Learning.

[2] Mark Allen Weiss,"Data structure and Algorithm Analysis in C". Addison Wesley Publication. 2006.

[3] Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, 1984.

[4] Thomas Cormen, C.Leiserson, R. L.Rivest & C.Stein, "Introduction to Algorithms". 3rd Edition, The MIT Press, 2009.

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr. P. P. Chakraborty, IIT Kharagpur, May 19, 2010, Data Structures, NPTEL, Available: www.youtube.com/watch? v=S47aSEqm_0I

[2] Dr. Naveen Garg, IIT Delhi, Sep 24, 2008, Data Strucutres, NPTEL, Available: http://-nptel.iitm.ac.in, http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

[3] Shai Simonson, Jun 16, 2014, Data Structures, NPTEL, Available: http://nptel.ac.in/video.php?-subjectId=106102064

20TP3106
LOGIC AND REASONING

Course Category:	Soft Skills - 1	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0-0-2
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Think reason logically in any critical situation	2
CO2	Analyze given information to find correct solution	4
CO3	To reduce the mistakes in day to day activities in practical life	2
CO4	Develop time-management skills by approaching different shortcut methods	3
CO5	Use mathematical based reasoning to make decisions	3
CO6	Apply logical thinking to solve problems and puzzles in qualifying exams in any competitive exam.	3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**

CO1	**3**	**3**												
CO2	**3**	**3**												
CO3	**3**	**3**			**1**									
CO4	**3**	**3**		**2**										
CO5	**3**	**2**												
CO6	**3**	**3**												

COURSE CONTENT

UNIT I :

1. Series Completion,
2. Coding-Decoding,
3. Blood Relations,
4. Puzzles test

UNIT II:

1. Direction sense test,
2. Logical Venn diagrams,
3. Number test, ranking test,
4. Mathematical operations

UNIT III:

1. Arithmetical Reasoning,
2. Inserting missing character,
3. Syllogism.

UNIT IV: Non – Verbal:

1. Water images,
2. Mirror images,
3. Paper folding,
4. Paper cutting,
5. Embedded Figures,
6. Dot situation,
7. Cubes & Dice

TEXT BOOKS

[1] R. S. Aggarwal, " Verbal and non-verbal reasoning", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6

20MC3107A
ENVIRONMENTAL STUDIES

Course Category:	Institutional Core	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Identify various factors causing degradation of natural resource and control measures	2
CO2	Identify various ecosystem and need for biodiversity	2
CO3	Realize and explore the problems related to environmental pollution and its management	2
CO4	Apply the information and technology to analyze social issues, use acts associated with environment	3

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**							**1**					**1**	
CO2		**1**	**1**							**1**			**1**	
CO3				**1**	**1**							**1**	**1**	
CO4						**1**	**1**	**1**					**1**	

COURSE CONTENT

UNIT I

The Multidisciplinary Nature of Environmental StudiesDefinition, scope and importanceNeed for public awareness.

Natural Resources :

Renewable and Non-renewable Resources: Natural resources and associated problems.

(a)Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.

(b)Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c)Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

(d)Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

(e)Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

(f)Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT II

Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b)Grassland ecosystem (c)Desert ecosystem

(d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation

Introduction, definition: genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-

wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III

Environmental Pollution

Definition ,Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards

Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Disaster management: Floods, earthquake, cyclone and landslides.

UNIT IV

Social Issues and the Environment:

From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation.Consumerism and waste products.

Environment Protection Act

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation.

Public awareness

Human Population and the Environment,Population growth, variation among nations, Population explosion—Family Welfare Programme.

Environment and human health

Human rights, Value education,HIV/AIDS,Women and Child Welfare,Role of Information Technology in environment and human health.

Field Work/ Case Studies

Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.

Self Study:

Water resources, Threats to biodiversity, Solid waste management, Role of Information Technology in environment and human health.

TEXT BOOKS

[1] Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi, Bharati Vidyapeeth Institute of Environment Education and Research

REFERENCE BOOKS

[1] AnjaneyuluY. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad

[2] Anjireddy.M Environmental science & Technology, BS Publications PVT Ltd, Hyderabad

[3] Benny Joseph, 2005, Environmental Studies, The Tata McGraw- Hill publishing company limited, New Delhi.

[4] Principles of Environmental Science. & Engg. P.Venu Gopala Rao, 2006, Prentice-Hall of India Pvt. Ltd., New Delhi.

[5] Ecological and Environmental Studies – Santosh Kumar Garg, Rajeswari Garg (or) Rajani Garg, 2006, Khanna Publishers, New Delhi.

[6] Essentials of Environmental Studies, Kurian Joseph & R Nagendran, Pearson Education publishers, 2005

[7] A.K Dee – Environmental Chemistry, New Age India Publications

[8] Bharucha Erach- Biodiversity of India, Mapin Publishing Pvt.Ltd.

E RESOURCES AND OTHER DIGITAL MATERIAL

[1] Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi, BharatiVidyapeeth Institute of Environment Education and Research.https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf

[2] NPTEL Courses - Environmental Studies By Dr.Tushar Banerjee | Devi AhilyaViswavidyalaya, Indore.

SEMESTER - IV

20BS4101
PROBABILITY AND STATISTICS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Set theory, Basic probability, Probability distributions.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Examine probability distributions with random variables	3	**1.2.1, 1.2.2, 2.6.3, 4.6.1**
CO2	Apply random phenomena of sample to test the Hypothesis concerning means.	3	1.2.2, 2.6.3, 4.6.1, 4.6.3
CO3	Analyze the Hypothesis concerning variance and proportions.	4	1.2.2, 2.6.3, 4.6.1, 4.6.3
CO4	Apply Quality improvement, control charts and reliability to improve Statistical skills.	3	1.2.2, 2.6.3, 4.6.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**3**		**2**										
CO2	**3**	**3**		**2**										

CO3	3	3		2												
CO4	3	3		2												

COURSE CONTENT

UNIT I: Probability Distributions: Random Variables (discrete and continuous), Expectation, Variance and Standard deviation of discrete random variable, Binomial distribution, Poisson distribution. Expectations, Variance and standard deviation of continuous random variables, Normal distribution, Normal approximation to the Binomial distribution

Joint distribution: Joint distributions-Discrete and Continuous.

UNIT II: Sampling Distributions: Introduction, Populations and Samples

Inferences Concerning Mean: Point Estimation- Interval Estimation

Test of Hypothesis – Null Hypothesis and Tests of Hypothesis – Hypothesis concerning one mean – Relation between tests and Confidence intervals – Operating characteristic curves - Inferences concerning two means.

UNIT III: Inferences Concerning Variances: Estimation of variances- Hypothesis concerning one variance- Hypothesis concerning two variances.

Inference Concerning Proportions: Estimation of Proportions- Hypothesis concerning one Proportion- Hypothesis concerning several Proportions – The Analysis of r x c Tables- Goodness of fit.

UNIT IV: The Statistical Content of Quality Improvement Programs: Quality Control- Control Charts for Measurements - Control Charts for Attributes.

Applications to Reliability and Life Testing: Reliability - Failure – Time Distributions – The Exponential Model in Reliability.

TEXT BOOKS

[1] Probability and Statistics for Engineers Eighth edition by Richard A. Johnson Prentice Hall of India.

REFERENCE BOOKS

[1] Probability & Statistics for Engineers & Scientist by R.E. Walpole, R.H.Myers&S.L.Myers, Sixth Edition, Prentice Hall of India / Pearson Education.

[2] Probability and Statistics, Purna Chandra Biswal, Pearson Education Prentice Hall of India 2007.
[3] Probability and Statistics by T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.PrasadS.Chand.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] probweb.berkeley.edu/teaching.html
[2] statsci.org/teaching.html
[3] video lectures.nptel.iitm.ac.in

20CS4302
ADVANCED DATA STRUCTURES AND ALGORITHMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Data Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the functions of different non-linear data structures – binary trees, search trees and graphs. Apply graph-based algorithms.	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3, 2.6.4
CO2	Apply the algorithm design technique - divide and conquer, and greedy methods for solving complex problems.	K3	1.2.1, 1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.6.3, 2.8.4
CO3	Apply dynamic programming and backtracking design techniques to solve complex problems.	K3	1.2.1, 1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.6.3, 2.8.4
CO4	Apply the concepts of Branch and Bound techniques to solve complex problems; Understand NP-Hard, and NP-Complete problems.	K3	1.2.1, 1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.6.3, 2.8.4

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**											**2**	
CO2	**2**	**3**											**2**	
CO3	**2**	**3**											**2**	
CO4	**2**	**3**											**2**	

Weightage														

COURSE CONTENT

UNIT – I

Efficient Binary Trees: AVL trees, Red-Black trees, Splay trees: bottom up splay trees

Multi-way Search Trees: Introduction, B Trees, B+ trees, operations on B and B+ trees.

Graphs: Introduction, graph terminology, representation of graphs, graph taversal algorithms: breadth-first search, depth first search; topological sorting, Warshall, applications of graphs.

UNIT – II

Divide and conquer: General method, Finding the maximum and minimum, applications: binary search, strassen's matrix multiplication.

Greedy method: General method, Applications-Job sequencing with deadlines, knapsack problem, minimum cost spanning trees, optimal storage on tapes, optimal merge patterns, single source shortest path problem.

UNIT - III

Dynamic Programming: General method, applications: matrix chain multiplication, multi stage graph problem, optimal binary search trees, 0/1 knapsack problem, all pairs shortest path problem, Traveling sales person problem.

Backtracking: General method, applications- n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles, 0/1 knapsack problem.

UNIT - IV

Branch and Bound: General method, applications - Traveling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, classes NP Hard and NP Complete, Cook's theorem

TEXT BOOKS

[1] Reema Thareja, “Data Structures using C”, Second Edition, Oxford University Press, 2011. (Unit I)

[2] Ellis Horowitz, SatrajSahni and Rajasekharan, “Fundamentals of Computer Algorithms”, Galgotia Publications Pvt. Ltd, 2008. (Unit II, III, and IV)

REFERENCE BOOKS

[1] Horowitz Sahni and Anderson-Freed, “Fundamentals of Data Structures in C”,2nd Edition, Universities Press, 2008.

[2] Richard F.Gilberg & B.A.Forouzan "Data Structures A Pseudo code Approach with C”, 2nd Edition, CENGAGE Learning, 2013

[3] M.T.Goodrich and R.Tomassia, “Algorithm Design: Foundations, Analysis and Internet examples”, John Wiley and sons, 2006.

[4] T.H.Cormen,C.E.Leiserson, R.L.Rivest and C.Stein, “Introduction to Algorithms”, 2/e, PHI Pvt. Ltd., Pearson Education, 2009.

[5] Allen Weiss, “Data structures and Algorithm Analysis in C++”, Third Edition, Pearson Education, 2007.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] N. Garg, IIT Delhi, Dec 31, 2009, Data Structures and Algorithms, NPTEL, Available: http://nptel.ac.in/courses/106102064/25.

[2] A. G. Ranade, S. Viswanathan, and A. A. Diwan, IIT Bombay, Dec 31, 2009, Design and Analysis of Algorithms, NPTEL,

Available: https://nptel.ac.in/courses/106/101/106101060/

[3] E. Demaine, S. Devadas, and N. Lynch, MIT, Design and Analysis of Algorithms, MIT OpenCourseWare,

Available:https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/

[4] Timroughgarden.org.Tim Roughgarden's Online Courses. Available : http://timroughgarden.-org/videos.html.

20CS4303
COMPUTER ORGANIZATION AND MICROPROCESSOR

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Digital Logic and Computer Design	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand microprogramming and organization of CPU.	K2	1.6.1, 1.7.1
CO2	Apply algorithms to perform arithmetic operations on fixed point and floating point data.	K3	1.6.1,1.7.1 ,2.7.1, 2.8.1,
CO3	Understand Memory Hierarchy and I/O Organization.	K2	1.6.1,1.7.1,2.7.1, 2.7.2
CO4	Understand the concepts of 8086 microprocessor interrupts and interfacing.	K2	1.6.1, 1.7.1,2.7.1,2.7.2, 3.6.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1														**2**
CO2	**1**	**2**												
CO3	**1**	**2**												
CO4	**2**	**2**	**2**											
Weightage	**80%**	**80%**	**20%**											**20%**

COURSE CONTENT

Unit I:

Micro Programmed Control: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.

Central Processing Unit: General register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC)

Unit II

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms – Signed Magnitude Multiplication, Booth Multiplication(Signed 2's Complement Multiplication), Array Multipliers, Division Algorithm, Floating-point Arithmetic operations.

Memory and I/O Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor.

Unit III

The 8086 Microprocessor:

Overview of microcomputer structure & operation, overview of 8086 microprocessor family, 8086 internal architecture, Machine language Vs assembly language. 8086 pin diagram, 8086 minimum mode and maximum mode

8086 Instruction Set & Programming:

Data transfer instructions, arithmetic instructions, bit manipulation instructions, string instructions, program execution transfer instructions, and processor control instructions, Assembler directives.

Unit IV

Interrupts: 8086 interrupts and interrupt responses, 8259A priority interrupt controller

Interfacing With 8086 Microprocessor

Programmable parallel ports and hand shake input/output, the programmable peripheral interface 8255A: modes of operation and initialization, Basics of D/A and A/D converters. Interfacing of DAC and ADC to 8086 microprocessor.

TEXT BOOKS

[1] Morris M. Mano, Computer System Architecture, 3/e, Pearson/PHI ,2007
[2] Douglas V Hall, "Microprocessor and Interfacing", 3rd edition, McGraw Hill, 2016

REFERENCE BOOKS

[1] Computer Architecture and Organization Designing for Performance, William Stallings, Ninth edition, Pearson Education series, 2014.
[2] K M Bhurchandi, A.K.Ray, "Advanced Microprocessors and Peripherals", 3rd edition, McGraw Hill, 2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Krishna Kumar, IISc Bangalore "Microprocessors and Microcontrollers" [Web Content]. Available: http://nptel.ac.in/courses/106108100/ (Accessed on 25.05.2020)
[2] Prof. S.Raman Department of Computer Science & Engineering, IIT Madras " Introduction to Digital Computer Organization" NPTEL
http://www.nptel.iitm.ac.in/video.php?subjectId=117105078

20CS4304
COMUPTER NETWORKS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3-0-0
Prerequisites:	Operating Systems	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand fundamentals of concepts of computer networks and reference models	K2	1.7.1, 2.6.4
CO2	Analyze error and flow control mechanisms in data link layer	K4	1.7.1, 2.5.2,2.6.2
CO3	Analyse subnetting and various routing protocols of network layer	K4	1.7.1, 2.5.2,2.6.4
CO4	Analyze transport layer and application layer protocols for specific applications.	K4	1.7.1, 2.6.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**2**											**2**	
CO2	**3**	**2**											**2**	
CO3	**3**	**2**											**2**	
CO4	**3**	**2**											**2**	
Weightage	**100%**	**60%**												

COURSE CONTENT

UNIT – I

Introduction: Uses of Computer Networks, Network Topology, Network Hardware: LANs, MANs, WANs, Connection oriented vs Connection less.

Reference Models: The OSI Reference Model, TCP/IP Reference Model, the comparison of the OSI and TCP/IP reference models.

Physical Layer: Guided transmission media: Magnetic Media, Twisted Pair, Coaxial Cable, and Fiber Optics, Wireless Transmission: Radio transmission, Infrared and Light Transmission

UNIT - II

Data Link Layer: Design issues - Framing, Error Detection and Correction- Hamming Code , CRC, Checksum, Sliding Window Protocols – One bit sliding window, GoBack – N, Selective Repeat.

Medium Access Control Sub layer: Multiple access protocols- Aloha - Slotted Aloha -CSMA, CSMA/CD, Collision Free Protocols, Ethernet: Architecture, Frame Formats – DIX, IEEE 802.3, Wireless LAN: Architecture and Protocol stack, IEEE 802.11 format

UNIT – III

Network Layer: Design Issues: Store and forward, Services to transport layer, Implementation of connection less and connection oriented, VC and Datagram Networks, **Routing Algorithms**: Shortest Path, Flooding, DVR, and Link State routing algorithm, Congestion Control Algorithms. IPv4 Protocol, IP address- Classful Addressing – Classless Addressing – Network Address Translation, IPv6- Header, Extension Header

UNIT – IV

Transport Layer: UDP Header, TCP Header, Connection establishment, Connection Release, Connection Management, Congestion Control. **Application Layer:** The Domain Name System (DNS), and E-Mail- Architecture, Message Format – RFC 5322, MIME, SMTP

TEXT BOOKS

[1] Andrew S Tanenbaum, David J Wetherall “Computer Networks”, 5th Edition, Pearson Education

REFERENCE BOOKS

[1] Behrouz A.Fourozan, “Data Communications and Networking”. 4th Ed, TATA McGraw Hill.
[2] J.F. Kurose and K.W.Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, 6th Ed., Pearson Education, 2017
[3] Larry L. Peterson, Bruce S. Davie, "Computer Networks - A Systems Approach", 5th Edition, Morgan Kaufmann Publications, 2011
[4] William Stallings, "Data and Computer Communications", 10th Edition, Pearson Education, 2013

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Sowmya Kanti Ghosh, IIT Kharagpur, NPTEL Lectures, 18th April 2018, Video Lectures, Available: https://nptel.ac.in/courses/106/105/106105183/
[2] MIT Open Courseware, MIT, 14th May 2015, Video Lectures, Available: http://ocw.mit.edu/courses/electricalengineering-and-computer-science/6-033-computer-systemengineering-spring-2009/video-lectures/
[3] Dheeraj, IIT Kharagpur, 14th May 2015, Lecture Notes, Available: http://www.cse.iitk.ac.in/users/dheeraj/cs425

20HS4105
UNIVERSAL HUMAN VALUES – II : UNDERSTANDING HARMONY

Course Category:	Humanities and Social Sciences	**Credits:**	3
Course Type:	Mandatory Course (Suggested by AICTE)	**Lecture -Tutorial-Practice:**	3 – 0 – 0
Prerequisites:	Universal Human Values - I desirable.	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES			
Upon successful completion of the course, the student will be able to:		**BTL**	**POI**
CO1	Understand and aware of themselves and their surroundings (family, society and nature).	2	
CO2	Handle problems with sustainable solutions, while keeping human relationships and human nature in mind.	2	
CO3	Exhibit critical ability and become sensitive to their commitment towards their understanding of human values, human relationship and human society.	2	
CO4	Apply what they have learnt to their own self in different day-to-day settings in real life.	3	

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1						**1**			**2**					
CO2			**3**											
CO3						**2**								
CO4								**3**				**2**		

COURSE CONTENT

UNIT – I: **Course introduction, need, basic guidelines, content and process for value education:**

Part-1: Purpose and motivation for the course, recapitulation from UHV-I, Self-exploration: what is it?, its content and process, 'Natural acceptance' and experiential validation- as the process for self-exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations.

Part-2: Right understanding, Relationship and Physical Facility – the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

(Practice sessions are to be included to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking).

UNIT – II: Understanding Harmony in the Human Being – Harmony in Myself:

Part-1: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' – happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).

Part-2: Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

(Practice sessions are to be included to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation.

Discuss program for ensuring health vs. dealing with disease).

UNIT – III: Understanding Harmony in the Family and Society – Harmony in Human-Human Relationship:

Part-1: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.

Part-2: Understanding the harmony in the society (society being an extension of family); Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society–Undivided Society, Universal Order–from family to world family.

(Practice sessions are to be included to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education, etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives).

UNIT – IV:

Part-1:Understanding Harmony in Nature & Existence – Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of Nature – recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Part-2: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for humanistic

education, humanistic constitution and humanistic universal order, Competence in professional ethics: a) ability to utilize the professional competence for augmenting universal human order, b) ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) at the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) at the level of society: as mutually enriching institutions and organizations.

(Part-1: Practice sessions are to be included to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc. Part-2: Practice exercises and case studies are to be taken up in practice (tutorial) sessions eg. to discuss the conduct as an engineer or scientist, etc.)

TEXT BOOKS

[1] Human values and professional ethics, R. R. Gaur, R. Sangal and G. P. Bagaria, Excel Books Private Limited, New Delhi (2010).

REFERENCE BOOKS

[1] Jeevan Vidya: Ek Parichaya, A. Nagaraj, Jeevan Vidya Prakashan, Amarkantak (1999).

[2] Human Values, A. N. Tripathi, New Age International Publishers, New Delhi (2004).

[3] The Story of Stuff: The impact of overconsumption on the planet, our communities, and our health and how we can make it better, Annie Leonard, Free Press, New York (2010).

[4]The story of my experiments with truth: Mahatma Gandhi Autobiography, Mohandas Karamchand Gandhi, B. N. Publishing

(2008).

[5] Small is beautiful: A study of economics as if people mattered, E. F. Schumacher, Vintage Books, London (1993).

[6] Slow is beautiful: New Visions of Community, Cecile Andrews, New Society Publishers, Canada (2006).

[7] Economy of Permanence, J. C. Kumarappa, Sarva-Seva-Sangh Prakashan, Varanasi (2017).

[8] Bharat Mein Angreji Raj, Pandit Sunderlal, Prabhath Prakashan, Delhi (2018).

[9] Rediscovering India, Dharampal, Society for Integrated Development of Himilayas (2003).

[10] Hind Swaraj or Indian Home Rule, M. K. Gandhi, Navajivan Publishing House, Ahmedabad (1909).

[11] India Wins Freedom: The Complete Version, Maulana Abul Kalam Azad, Orient Blackswan (1988).

[12] The Life of Vivekananda and the Universal gospel, Romain Rolland, Advaitha Ashrama, India (2010).

[13] Mahatma Gandhi: The Man who become one with the Universal Being, Romain Rolland, Srishti Publishers & Distributors, New Delhi (2002).

E RESOURCES AND OTHER DIGGITAL MATERIAL

[1] AICTE – SIP Youtube Channel:

https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLAx6AhQ

[2] AICTE – UHV Teaching Learning Material:
https://fdp-si.aicte-india.org/download.php#1

20CS4351
ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Labratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Co - requisites:	Data Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES			
Upon successful completion of the course, the student will be able to:		**BTL**	**POI**
CO1	Implement efficient binary trees, M-way search trees, graph traversal and shortest path algorithms.	3	1.2.1, 1.7.1 2.5.1, 2.5.2, 2.5.3 2.6.3
CO2	Use divide and conquer, and greedy methods for implementing solutions for problems.	3	1.2.1, 1.7.1 2.5.1, 2.5.2, 2.5.3 2.6.3
CO3	Implement solutions for problems using dynamic programming and backtracking.	3	1.2.1, 1.7.1 2.5.1, 2.5.2, 2.5.3 2.6.3
CO4	Apply Branch and Bound techniques to write programs for different problems.	3	1.2.1, 1.7.1 2.5.1, 2.5.2, 2.5.3 2.6.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**											**3**	
CO2	**2**	**3**											**3**	

CO3	2	3										3		
CO4	2	3										3		
Weightage														

COURSE CONTENT

WEEK 1: Implement operations on efficient binary trees.

WEEK 2: Implement operations on multi-way search trees: B and B+ Trees.

WEEK 3: Implement breath first search and depth first search for a connected graph.

WEEK 4: Implement Warshall's and Dijkstra's single source shortest path algorithms.

WEEK 5: Programs to find minimum spanning tree using Kruskal and Prim algorithms.

WEEK 6: Perform strassen's matrix multiplication using divide and conquer technique.

WEEK 7: Design programs to solve Job sequencing and Knapsack problems using greedy method.

WEEK 8: Implement shortest path algorithms using greedy methods.

WEEK 9: Implement matrix chain multiplication and optimal binary tree algorithms using dynamic programming.

WEEK 10: Implement graph algorithms using dynamic programming.

WEEK 11: Implement solutions for traveling sales person and 0/1 knapsack problems using dynamic programming.

WEEK 12: Implement solutions for n-queen and subset subset sum problems using backtracking technique.

WEEK 13: Implement graph coloring and hamiltonian cycle algorithms for a connected graph using backtracking technique.

WEEK 14: Implement solutions for traveling sales person and 0/1 knapsack problems using branch and bound technique.

TEXT BOOKS

[1] Reema Thareja, "Data Structures using C", Second Edition, Oxford University Press, 2011. (Unit I)
[2] Ellis Horowitz, SatrajSahni and Rajasekharan, "Fundamentals of Computer Algorithms", Galgotia Publications Pvt. Ltd, 2008. (Unit II, III, and IV)

REFERENCE BOOKS

[1] Horowitz Sahni and Anderson-Freed, "Fundamentals of Data Structures in C",2nd Edition, Universities Press, 2008.

[2] Richard F.Gilberg & B.A.Forouzan "Data Structures A Pseudo code Approach with C", 2nd Edition, CENGAGE Learning, 2013

[3] M.T.Goodrich and R.Tomassia, "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley and sons, 2006.

[4] T.H.Cormen,C.E.Leiserson, R.L.Rivest and C.Stein, "Introduction to Algorithms", 2/e, PHI Pvt. Ltd., Pearson Education, 2009.

[5] Allen Weiss, "Data structures and Algorithm Analysis in C++", Third Edition, Pearson Education, 2007.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] N. Garg, IIT Delhi, Dec 31, 2009, Data Structures and Algorithms, NPTEL, Available: http://nptel.ac.in/courses/106102064/25.
[2] A. G. Ranade, S. Viswanathan, and A. A. Diwan, IIT Bombay, Dec 31, 2009, Design and Analysis of Algorithms, NPTEL,
Available: https://nptel.ac.in/courses/106/101/106101060/
[3] E. Demaine, S. Devadas, and N. Lynch, MIT, Design and Analysis of Algorithms, MIT OpenCourseWare,
Available:https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/

[4] Timroughgarden.org.*Tim Roughgarden's Online Courses*. Available : http://timroughgarden.-org/videos.html.

20CS4352
MICROPROCESSOR LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Digital Logic and Computer Design	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand microprogramming and organization of CPU.	K2	1.6.1, 1.7.1
CO2	Apply algorithms to perform arithmetic operations on fixed point and floating point data.	K3	1.6.1,1.7.1 ,2.7.1, 2.8.1,
CO3	Understand Memory Hierarchy and I/O Organization.	K2	1.6.1,1.7.1,2.7.1, 2.7.2
CO4	Understand the concepts of 8086 microprocessor interrupts and interfacing.	K2	1.6.1, 1.7.1,2.7.1,2.7.2, 3.6.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1														**2**
CO2	**1**	**2**												
CO3	**1**	**2**												
CO4	**2**	**2**	**2**											
Weightage	**80%**	**80%**	**20%**											**20%**

COURSE CONTENT

Programming on

Task 1: Data transfer instructions (With different Address Modes).

Task 2: Demonstration on 8086 μP Flag Register with operations.

Task 3: Arithmetic instructions (8-bit /16-bit Data Size With different Address Modes)

Task 4: Loop instructions

Task5: Jump instructions

Task 6: Logical/ rotate/ shift instructions

Task 7: String instructions.

Task 8: Demonstration of subroutines Execution

Task 9: ADC interfacing

Task 10: DAC interfaces

Task 11: Stepper motor interfacing

Task12:Complete study of ARM Cortex processor

TEXT BOOKS

[1] Douglas V Hall, "Microprocessor and Interfacing", 3rd edition, McGraw Hill, 2016.

[2] Kenneth J. Ayala, "8051 MICRO CONTROLLER ARCHITECTURE" 3rd edition, Thomson Delmar Learning, 2007

REFERENCE BOOKS

[1] K M Bhurchandi, A.K.Ray, "Advanced Microprocessors and Peripherals", 3rd edition, McGraw Hill, 2014

[2] Microprocessors and Microcomputer-Based System Design , Mohamed Rafiquzzaman , 2nd Edition , CRS press,1995.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Krishna Kumar, IISc Bangalore "Microprocessors and Microcontrollers" [Web Content]. Available: http://nptel.ac.in/courses/106108100/ (Accessed on 10-8-18)

20CS4353
COMPUTER NETWORKS LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Co - requisites:	Data Structures	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand fundamental concepts of computer networks and reference models
CO2	Analyze data link layer mechanisms for error control, flow control and multiple access
CO3	Analyze functioning of routing algorithms, congestion control & QoS techniques used at network layer
CO4	Analyze the different protocols used at transport layer and Application layer.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		**1**												
CO2					**2**									
CO3									**3**					
CO4									**3**					

COURSE CONTENT/TASKS

Task 1:

Installation of Packet Tracer & environment

Network Representation (PT 1.5.5)

Task 2:

Investigate OSI and TCP reference models in action
Part 1: Examine HTTP Web Traffic (PT 3.5.5)
Part 2: Display Elements of the TCP/IP Protocol Suite

Task 3:

Basic Switch and End Device Configuration
Configure Initial Switch Settings (PT 2.5.5)
Basic Switch and End Device Configuration (PT 2.9.1)

Task 4:

Physical Layer
Connect a Wired and Wireless LAN (PT 4.6.5)
Connect the Physical Layer (PT 4.7.2)

Task 5:

Basic Router Configuration
Configure Initial Router Settings (PT 10.1.4)
Connect a Router to a LAN (PT 10.3.4)
Troubleshoot Default Gateway Issues (10.3.5)
Basic Device Configuration (PT 10.4.3)

Task 6:

Data Link Layer Protocols
Identify MAC and IP Addresses (PT 9.1.3)
Examine the ARP Table (PT 9.2.9)

Task 7:

IPv4 Addressing
Subnet an IPv4 Network (PT 11.5.5)
Subnetting Scenario (PT 11.7.5)

Task 8:

VLSM
VLSM Design and Implementation Practice (PT 11.9.3)
Design and Implement a VLSM Addressing Scheme (PT 11.10.1)

Task 9:

IPv6 Addressing
Configure IPv6 Addressing (PT 12.6.6)
Implement a Subnetted IPv6 Addressing Scheme (PT 12.9.1)

Task 10:

ICMP for network testing
Verify IPv4 and IPv6 Addressing (PT 13.2.6)

Use Ping and Traceroute to Test Network Connectivity (PT 13.2.7)
Use ICMP to Test and Correct Network Connectivity (PT 13.3.1)

Task 11:

Transport Layer
TCP and UDP Communications (PT 14.8.1)

Task 12:

Device Security
Configure Secure Passwords and SSH (PT 16.4.6)
Secure Network Devices (PT 16.5.1)
Installing Wireshark & Using Wireshark to View Network Traffic

Supplementary Coding Tasks:

1. Compute Cyclic Redundancy Check (CRC) for a given data frame using the three CRC polynomials – CRC 12, CRC 16 & CRC CCITT.
2. Implement Dijkstra‘s algorithm to compute the Shortest path for a given graph
3. Obtain Routing table at each node using Distance Vector Routing (DVR) algorithm fora given subnet

TEXT BOOKS

[1] Andrew S Tanenbaum, David J Wetherall “Computer Networks”, 5th Edition, Pearson Education

REFERENCE BOOKS

[1] Kurose and Ross, “Computer Networks – A Top-down Approach Featuring the Internet”, Pearson Education.
[2] Behrouz A.Fourozan, “Data Communications and Networking”. 4th Ed, TATA McGraw Hill.
[3] Nader F.Mir, Computer and Communication Networks. PHI Publications

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Sowmya Kanti Ghosh, IIT Kharagpur, NPTEL Lectures, 18th April 2018, Video Lectures, Available: https://nptel.ac.in/courses/106/105/106105183/
[2] MIT Open Courseware, MIT, 14th May 2015, Video Lectures, Available: http://ocw.mit.edu/courses/electricalengineering-and-computer-science/6-033-computer-systemengineering-spring-2009/video-lectures/
[3] Dheeraj, IIT Kharagpur, 14th May 2015, Lecture Notes, Available: http://www.cse.iitk.ac.in/users/dheeraj/cs425

20TP4106
ENGLISH FOR PROFESSIONALS

Course Category:	Soft Skills - 2	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0 – 0 – 2
Prerequisites:	-	**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	How conversations are made.	3
CO2	Usage of grammar.	3
CO3	Etiquettes and manners.	3
CO4	Speaking Skills.	3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1									**3**	3				
CO2										3				
CO3										3				
CO4									**3**	3				

COURSE CONTENT

UNIT-I

Beginners, Functional, Situational Conversations: Introduction: Importance of spoken English in the placements and Group Discussion, Beginners Conversation: Self Introduction - Introducing Self, Introducing each other in a team (Pair Activity), Functional Conversation: Seeking Permission from Seniors Teachers and other superiors (Team Activity), Asking Direction - Direction from stranger or from Helpline, Making Requests - Requests for borrowing books, applications, or any other help from

office staff in college or outside. Just a minute: Give a topic and ask the student to talk impromptu, To present the topic in a structured manner. **UNIT-II** Structuring and forming sentences: Structure of mother tongue and pit falls in translation to English, Formation of sentences in English. Errors in Usage: Difficulty in right usage of words, Difficulty in Pronunciation - Phonetic differences in mother tongue and English – areas to improve, Idioms and Phrase – Frequently used Idiom and Phrases which help to enhance the quality of presentation and make the presentation meaningful, Meaning of frequently used Idioms and Phrases. **UNIT-III** Introduction to different ways of speaking: Elocution, Debate and Extempore, Principles of Elocution and its challenges practice in session, Principles of Debates and its challenges –practice session, Principles of Extempore - its pitfalls – practice sessions. **UNIT-IV** Etiquette: Need of Etiquette in Social arena, Dining Etiquette, Social Etiquette in conversation - formal and informal gathering, Book a table etc. Versant Test: Mode of versant Test, Aim of the test and various methods it follows, Practice session.	
TEXTBOOKS	
Audio—visuals / hand outs (compiled/ created by training division, T&P cell, VR Siddhartha Engineering College).	
REFERENCE BOOKS	
1. Sadanand, K. & Punitha, S. (2014). Spoken English: A Foundation Course (Part 1 & 2) (Rev. ed.). Orient BlackSwan Pvt. Ltd. 2. Bhatnagar, N., & Bhatnagar, M. (2010). Communicative English for Engineers and Professionals. Pearson Education India.	
E-RESOURCES AND OTHER DIGITAL MATERIALS	
1. Chaudhary, S. (2015, April 30). Better Spoken English. NPTEL. https://npte l.ac.in/courses/109106067. Last accessed on June 6, 2022.	

2. Roy, A. G. (2019, September 5). Speaking Effectively. NPTEL Online Courses.
https://onlinecourses.nptel.ac.in/noc20 hs14/preview. Last accessed on
June 6, 2022.
3. UsingEnglish.com: English Language (ESL) Learning Online. (2002). UsingEnglish-
.Com. https://www.usingenglish.com/. Last accessed on June 6, 2022.
4. Goodreads. (n.d.). Goodreads | Meet your next favorite book. https://www.go
odreads.com/. Last accessed on June 6, 2022.

20CS4607
INDUSTRY STANDARD CODING PRACTICE – I

Course Category:	Skill Oriented Course - 1	**Credits:**	2
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	1-0-2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES			
Upon successful completion of the course, the student will be able to:		**BTL**	**POI**
CO1	Understand test and development aspects of programming by solving problems at Industry standards.	2	1.2.1, 1.7.1, 2.5.1, 4.6.3
CO2	Apply domain skills and mathematical knowledge to solve any given problem.	3	1.2.1, 2.5.1, 2.5.3,4.4.1
CO3	Apply methods to optimize solutions for any given problem.	3	1.2.1, 2.5.3, 4.4.1
CO4	Apply elementary data structures to solve problems with test driven development	3	1.2.1, 2.5.3, 4.4.1
Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)			

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**3**		**2**										
CO2	**3**	**3**		**2**									**2**	**2**
CO3	**3**	**3**		**2**									**2**	**2**
CO4	**3**	**3**		**2**									**2**	**2**

COURSE CONTENT

UNIT I

Problem solving through Competitive Coding, Problem solving using control structures, Numeric series and patterns, Code Complexity analysis, Linear/ Logarithmic/ Super linear/ Polynomial/ Exponential/ Factorial Algorithms, Problem solving on rotations of data, Problem solving on Order statistic problems, Problem Solving Examples Problem solving on matrix data, Memory manipulation techniques using pointers. Memory Arithmetic, Problem solving implementing pointer to an array, Memory Layout, overcoming the segmentation faults, Run-time memory allocation, Coding comparisons of Linear list data structure and Pointers, examples and Practice problems.

UNIT II

Problem solving on string data, Problem solving on String manipulations, coding problems using string handling functions, Problem solving on Multi-String Problems, Problem Solving for long strings, Examples, Practice problems. Problem solving using modular programming, Inter module communications, scopes of data in the code, Problem solving approaches using recursions, Evaluation of Recursive algorithms, Significance of mathematical Recurrence Relations, Evaluation of recurrence relations, Time Analysis, Examples, Practice problems.

UNIT III

Problem solving on operational and traversal logics on linked lists, Problem solving to compare linked lists, detection of a cycle/ merge point, Merging sorted linked lists, coding problems on circular linked lists/Double linked lists, Examples, Practice problems. Problem Solving Problem solving through Linked list coding, traversals, Problem solving to compare linked lists, detection of a cycle/ merge point, Merging sorted linked lists, Circular linked list formation, Double linked list formation, Examples, Practice problems.

UNIT IV

Problem solving through testing, implementing various testing approaches: Test strategy, Test development, Test execution, Bug fixing, Examples, Practice problems, Problem solving Methods and techniques. Understanding the problem as math abstract, formation of the logic, Identifying the corner cases, Examples, Practice problems, Version control systems, Git repositories and working trees, adding new version of the files to a Git repository, Examples, practice problems.

TEXT BOOKS

[1] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013.
[2] Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012

REFERENCE BOOKS

[1] Programming Challenges: The Programming Contest Training Manual By

Steven S Skiena, Miguel A. Revilla
[2] Guide to Competitive Programming: Learning and Improving Algorithms Through Contests By Antti Laaksonen

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Topcoder tutorials - https://www.topcoder.com/community/data-science/data-science-tutorials/
[2] Nite Nimajneb's site - http://comscigate.com/Books/contests/icpc.pdf
[3] Slides from a Stanford Course - http://web.stanford.edu/class/cs97si/
[4] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. Ebook available at lulu.com. Site associate with with the book is http://cpbook.net

20MC4108B
INDIAN CONSTITUTION

Course Category:	Mandatory Course	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2-0- 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100 0 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**BTL**
CO1	Understand the fundamental law of the land	2
CO2	Understand how fundamental rights are protected	2
CO3	Understand the structure and formation of the Indian Government System	2
CO4	Understand when and how an emergency can be imposed and what are the consequences.	2

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1						**3**	**2**							
CO2						**2**	**3**							
CO3						**1**								
CO4						**2**	**1**							

COURSE CONTENT

UNIT I

Introduction to Constitution of India: Meaning of the Constitution Law and Constitutionalism, Historical perspective of constitution of India, Salient features of Constitution of India.

UNIT II

Fundamental Rights: Scheme of the fundamental rights, scheme of the fundamental right to equality, scheme of the fundamental right to certain freedoms under Article 19, scope of the right of life and personal liberty under Article 21, writs jurisdiction

UNIT III

Nature of the Indian Constitution: Federal structure and distribution of legislative and financial powers between the Union and states

Parliamentary form of Government in India: The Constitution powers and status of the President of India, Amendment of the Constitutional powers and Procedure, Historical Perspectives of the constitutional amendments in India

Local Self Government: Constitutional Scheme in India

UNIT – IV

Emergency Provisions: National Emergency, President rule, Financial Emergency

TEXT BOOKS

[1] Dr. J.N. Pandey, Constitutional Law of India published by Central law Agency, Allahabad, Edition 2018

REFERENCE BOOKS

[1] V.N Shukla's, Constitution of India Eastern Book Company, Lucknow.
[2] M.P. jain, Indian Constitution Law, Wadhwa and Company, Nagpur.
[3] D.D. basu, Constitution of India, Wadhwa and Company, Nagpur

SEMESTER V

20CS5301
DATABASE MANAGEMENT SYSTEMS

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	**Data Structures: 20CS3305 Discrete Mathematics : 20BS3101A**	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the concepts of database systems	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO2	Analyse the Entity-Relationship models, inturn develop the Relational models that leads to database design	K4	2.5.2, 2.5.3, 2.6.3,2.7.2,3.5.6,3.6.2
CO3	Apply various normalization techniques to relational models in order to improve database design quality	K3	2.5.2, 2.5.3, 2.6.3,2.7.2,3.5.6,3.6.2
CO4	Understand database transactions processing, protocols for Concurrency control and Recovery techniques in database	K2	1.7.1, 2.5.2, 2.6.3,2.7.2
CO5	Implement database management techniques using relational SQL database to real world applications	K5	2.5.2, 2.5.3, 2.6.3, 2.6.4, 2.8.4, 5.4.2,5.5.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**2**											**1**	**1**
CO2		**2**	**3**										**1**	**1**
CO3		**2**	**3**										**1**	**1**
CO4	**1**	**2**											**1**	**1**

CO5		**2**	**3**		**3**							**2**	**2**

COURSE CONTENT

UNIT I

Introduction to Database Systems -Databases and Database users: Introduction, An example, Characteristics of Database Approach, Actors on the scene, Workers behind the scene.

Database System—Concepts and Architecture: Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment.

SQL Schema Definition, Basic Constraints and Queries- SQL: SQL Data Definition and Data Types specifying basic constraints in SQL, Basic retrieval queries in SQL, Insert, Delete and Update statements in SQL, Additional features of SQL ,More complex SQL Queries, Specifying Constraints as Assertions and Triggers, Views (Virtual Tables) in SQL,Schema Change Statement in SQL.

Unit II

Data Modeling Using the Entity-Relationship Model-Using High-Level Conceptual Data Models for Database Design; A Sample Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types;

Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher than two, Relational Database Design using ER-to-Relational Mapping.

Unit III

Relational Model and Relational Algebra- Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations.

Relational Algebra: Unary Relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory Binary Relational Operations:

JOIN and DIVISION, Additional
Relational Operations, Examples of Queries in Relational Algebra.
Relational Database Design - Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Properties of Relational Decompositions; Multivalued Dependencies, Fourth Normal Form and Fifth Normal Form.

Unit IV

Transaction Processing, Concurrency Control, and Recovery: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Two-Phase Locking Techniques for Concurrency Control, Recovery Concepts ,NO-UNDO/REDO Recovery Techniques based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm.

TEXT BOOKS

[1] Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems",7th edition, Pearson Education Ltd, 2016.

REFERENCE BOOKS

[1] Raghu Rama Krishnan,Johannes Gehrke, "*Database Management Systems*", 3rd Edition, McGraw Hill Education, 2014

[2] Abraham Silberschatz, Henry F.Korth, S.Sudarshan, "*Database System Concepts*", 6th edition, McGraw-Hill Education,2013

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. Dr S.Srinath IIT-Madras "Conceptual design process " https://nptel.ac.in/courses/106/106/106106093/ Last accessed on 10/02/2022
2. Prof P.Srinivasa Kumar IIT-Madras " Normalization process" https://nptel.ac.in/courses/106/106/106106095/ Lecture 7, Last accessed on 10/02/2022
3. Prof D.Janakiram IIT-Madras "Concurrency Control techniques" https://nptel.ac.in/courses/106/106/106106093/ Lecture 20,21,22,23 Last accessed on 10/02/2022
4. Andy Pavlo, Carnegie Mellon University, Relational model concepts, https://15445.courses.cs.cmu.edu/fall2017/slides/01-introduction.pdf

20CS5302
ADVANCED JAVA PROGRAMMING

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Java Programming: 20ES3102	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Create GUI application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4
CO2	Create distributed application.	K3	1.7.1,2.5.1,2.5.2,2.6.3, 2.7.1, 3.5.1,3.8.2
CO3	Develop web application	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4 3.5.1,3.8.2
CO4	Develop enterprise application	K3	2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,3.6.2,3.8.2, 5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**3**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**		**2**								**2**	**2**
Weighatge	**75%**	**100%**	**75%**		**25%**								**75%**	**75%**

COURSE CONTENT

UNIT I

Event Handling : The Delegation Event Model, Event Classes, Event Listener Interfaces,Handling Mouse Events, Handling Keyboard Events.

GUI Programming: Introduction to Swings, JLable and ImageIcon, JTextField, The Swing Buttons: JButton, Checkboxes, RadioButtons, JTabbedPane, JList, JComboBox, JTable, JMenu Bars and JMenus.

Java Database Connectivity: JDBC Connectivity, Types of JDBC drivers, Connecting to the database, JDBC Statements, JDBC Exceptions, Manipulations on the database.

UNIT II

Network Programming: Introduction, InetAddress, Client/Server Interaction with Stream Socket Connections, Client/Server Interaction with Datagrams socket connections.

Remote Method Invocation: Introduction to RMI, RMI Architecture, Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client.

UNIT III

Servlets: Introduction to servlets, Lifecycle of a Servlet, Simple servlet, the Servlet API, the javax.servlet package, Reading Servlet parameters, the javax.servlet.http package, Handling Http Request & Responses, Using Cookies, Session Tracking.

Java Server Pages: Introduction to JSP, The Problem with Servlet, the Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC architecture.

UNIT IV

JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing, Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing data between JSP pages, Requests and Users, Passing Control and Data between Pages, Sharing Session and Application Data.

Microservies for Java Developes: What is a Microservice Architecture?,Challenges,Technology Solutions.

Spring Boot for Microservices: Getting Started, Hello World, Calling Another Service.

TEXT BOOKS

[1] Herbert Schildt, "Java The Complete Reference", Eleventh Edition, Oracle Press, . 2019. [Unit I Chapter 1&2, Unit II Chapter 1, Unit III Chapter 1].
[2] H. M. Deitel, P.J. Deitel, S.E. Santry, "Advanced Java 2 Platform How to Program", 3rd Edition, 2016, Prentice Hall Publications. [Unit I Chapter 2, Unit- II Chapter 2]
[3] Hans Bergsten, "JavaServer Pages", 3rd Edition 2017, O'Reilly Media. [Unit III Chapter 2 , Unit- IV Chapter 1].
[4] Christian Posta,"Microservices for Java Developers", O'Reilly Media Inc.,September 2016. [Unit IV Chapter 2 & 3]

REFERENCE BOOKS

[1] Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2016.
[2] David Geary, Cay S. Horstmann "Core JavaServer Faces" Third edition, 2016, Prentice Hall.
[3] Jim Keogh, "The Complete reference to J2EE", reprint 2017, Tata McGraw-Hill

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] AbhayRedkar, JSF Developer, "Java Micro services", Udemy. Last accessed on 10-02-2022 . https://www.udemy.com/course/microservices-with-spring-boot-and-spring-cloud/

20HS5103
ENGINEERING ECONOMICS AND MANAGEMENT

Course Category:	Humanities and Social Sciences	**Credits:**	2
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand various forms of organizations and principles of management
CO2	Understand the various aspects of business economics.
CO3	Acquire knowledge on Human resources and Marketing functions
CO4	Understand different methods used in calculating depreciation and evaluating alternatives economicaly.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**2**											**2**		**2**
CO2	**2**				**3**							**2**		**2**
CO3	**2**											**2**		**2**
CO4	**2**				**3**							**2**		**2**

COURSE CONTENT

UNIT - I

Forms of Business Organization: Salient Features of Sole Proprietorship, Partnership, Joint Stock Company, Co-operative Society and Public Sector.

Management: Introduction to Management, Functions of Management, Principles of Scientific Management, Modern Principles of Management.

UNIT - II

Introduction to Economics: Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility.

Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity.

Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function.

UNIT – III

Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management.

Marketing Management: Concept of Selling And Marketing – Differences, Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales Promotion, Types of Distribution Channels, Marketing Research, Break-Even Analysis.

UNIT – IV

Financial Management: Functions of Financial Management, Time value of money with cash flow diagrams, Concept of Simple and Compound Interest.

Depreciation: Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year's Digits Method –Problems.

Economic Alternatives: Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method - Problems.

TEXT BOOKS

[1] M. Mahajan Industrial Engineering and Production Management Dhanpat Rai Publications 2nd Edition.

[2] Martand Telsang" Industrial & Business Management" S.Chand publications

REFERENCE BOOKS

[1] R.Paneer selvam "Production and Operations Management" PHI
[2] Philip Kotler & Gary Armstrong "Principles of Marketing" ,pearson prentice Hall, New Delhi,2012 Edition.
[3] IM Pandey, "Financial Management" Vikas Publications 11th Edition
[4] B.B Mahapatro, "Human Resource Management",New Age International, 2011

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/
[2]https://keydifferences.com/difference-between-personnel-management- and-human-resource-management.html
[3] http://productlifecyclestages.com/
[4] https://speechfoodie.com/cash-flow-diagrams/

20CS5404A
APPLIED STATISTICS

Course Category:	Programme Elective	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 -0- 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the role of statistics in engineering	K2	1.2.1, 1.6.1
CO2	Analyze Discrete Random variables and Continuous Random variables	K4	1.2.1, 2.7.1, 2.8.1
CO3	Apply random sampling and point estimations to real world problems.	K3	1.2.1, 1.7.1, 2.7.1, 2.8.1,4.4.2
CO4	Analyze Simple Linear Regression and Multiple Linear Regression	K4	2.8.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2	**2**	**3**												**2**
CO3	**2**	**2**		**2**										**2**
CO4		**2**												**2**
Weighatge														

COURSE CONTENT

UNIT I

The Role Of Statistics In Engineering : The Engineering Method and Statistical Thinking, Collecting Engineering Data ,Mechanistic and Empirical Models,

Probability and Probability models.

Discrete Random Variables and Probability Distributions: Discrete Random Variables, Probability Distributions and Probability Mass functions, Cumulative Distribution Functions, Mean and Variance of a Discrete Random Variable, Discrete Uniform Distribution, Binomial Distribution, Geometric and Negative Binomial Distributions ,Hypergeometric Distribution, Poisson Distribution .

UNIT II

Continuous Random Variables And Probability Distributions: Continuous Random Variables, Probability Distributions and Probability Density Functions ,Cumulative Distribution Functions, Mean and Variance of a Continuous Random Variable, Continuous Uniform Distribution ,Normal Distribution, Normal Approximation to the Binomial and Poisson Distributions, Exponential Distribution Erlang and Gamma Distribution, Weibull Distribution , Lognormal Distribution

UNIT III

Random Sampling and Data Description: Data Summary and Display, Random Sampling , Stem-and-leaf Diagrams, Frequency Distributions and Histograms, Box Plots, Time sequence Plots ,Probability Plots.

Point Estimation of Parameters: Introduction, General Concepts of Point Estimation, Methods of Point Estimation, Sampling Distributions , Sampling Distributions of Means

UNIT IV

Simple Linear Regression: Empirical Models, Simple Linear Regression, Properties of the Least square Estimators, Hypothesis Tests in Simple Linear Regression, Confidence Intervals, Prediction of New Observations, Adequacy of the Regression Model, Transformation to a straight line, Correlation**.**

Multiple Linear Regression: Multiple Linear Regression Model, Hypothesis Tests in Multiple Linear Regression, Confidence Intervals in Multiple Linear

Regression, Prediction of New Observations, Model Adequacy Checking, Aspects of Multiple Regression Modelling

TEXT BOOKS

[1] Douglas C. Montgomery, George C. Runger (2018), Applied Statistics and Probability for Engineers, Wiley

REFERENCE BOOKS

[1] Härdle, Wolfgang; Okhrin, Ostap; Okhrin, Yarema (2017),Basic Elements of computational Statistics, Springer

[2] Sheldon M.Ross (2006) : Introductory Statistics , 2/e, Elsevier Publications

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]Introduction to computational statistics
https://www.coursera.org/specializations/compstats

20CS5404B
PRINCIPLES OF CLOUD COMPUTING

Course Category:	Programme Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Computer Networks: 20CS4304	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand Cloud Computing concepts, technologies, architecture and applications	K1	1.7.1,2.5.1
CO2	Understand the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.	K2	1.7.1, 2.6.3, 2.6.4, 2.8.3, 2.8.4
CO3	Analyze the different Cloud Platforms and Cloud Applications	K4	1.7.1, 2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1
CO4	Apply the security issues and legal issues in cloud computing	K3	1.7.1, 2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**2**												
CO2	**3**	**2**												
CO3	**1**	**3**	**2**										**1**	**2**
CO4	**3**	**2**	**3**										**1**	**2**
Weightage														

COURSE CONTENT

UNIT I

Introduction to Cloud Computing - Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks

Migrating into a Cloud - Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud

UNIT II

Virtualization: Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques - Execution Virtualization, Other types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples – Xen, VMware, Microsoft Hyper-V. **Virtual Machines Provisioning and Migration Services** - Introduction, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context

UNIT III

Cloud Platforms in Industry: Amazon web services - Compute services, Storage services, Communication services and Additional Services. Google AppEngine - Architecture and core concepts, Application life cycle, Cost model, Observations. Microsoft Azure – Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

Cloud Applications: Scientific Applications – Healthcare, Biology, Geoscience, Business and Consumer Applications – CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming. **Features of Cloud and Grid Platforms** - Cloud Capabilities and Platform Features, Traditional Features Common to Grids and Clouds, Data Features and Databases, Programming and Runtime Support. **Programming Support of Google App Engine** - Programming the Google App Engine, Google File System (GFS), BigTable, Google's NOSQL System, Chubby, Google's Distributed Lock Service. Programming on Amazon AWS and Microsoft Azure - Programming on Amazon EC2, Amazon Simple Storage Service (S3), Amazon Elastic Block Store (EBS) and SimpleDB, Microsoft Azure Programming Support.

UNIT IV

Data Security in the Cloud - Introduction, Current State, Homo Sapiens and

Digital Information, Cloud Computing and Data Security Risk, Cloud Computing and Identity, The Cloud, Digital Identity, and Data Security

Legal Issues in Cloud Computing - Introduction, Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location

TEXT BOOKS

[1] Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "**Cloud Computing: Principles and Paradigms**", Wiley, 2013

[2] Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, **"Mastering Cloud Computing"**, McGraw Hill, 2013

REFERENCE BOOKS

[1] Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishers, 2012.

[2] Kai Hwang, Geoffrey C Fox, Jack J Dongarra, "Distributed and Cloud Computing - From Parallel Processing to the Internet of Things", Morgan Kaufman Publishing, 2012

[3] Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", 1st Ed, Pearson, 2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://cs.uwaterloo.ca/~a78khan/courses-offered/cs446/2010_05/lecture-slides/16_CloudComputing.pdf

[2] http://www.cs.iit.edu/~iraicu/teaching/CS553-S12/index.html

[3] https://www.youtube.com/user/arch4cloud/playlists

20CS5404C
INFORMATION SECURITY AND RISK MANAGEMENT

Course Category:	Programme Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Computer Networks 20CS4304	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the fundamentals of Information Security	K1	2.6.3, 2.6.4
CO2	Analyse the threats and attacks on information systems	K3	3.7.1
CO3	Understand the need for risk management and risk control	K2	2.5.2, 2.6.3, 2.6.4, 2.8.4
CO4	Understand the importance of security planning and education	K2	2.5.2, 2.6.3, 2.6.4, 2.8.4

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1		**3**												
CO2			**3**											
CO3		**2**												
CO4		**2**												
Weightage														

COURSE CONTENT

UNIT I: Introduction to Information Security

The History of Information Security, What Is Security?, CNSS Security Model, Components of an Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Systems Development Life Cycle, The Security Systems Development Life Cycle, Security Professionals and the Organization, Communities of Interest, Information Security: Is it an Art or a Science?

UNIT II: The Need for Security

Introduction, Business Needs First, Threats, Attacks, Secure Software Development.

Law and Ethics in Information Security, International Laws and Legal Bodies, Ethics and Information Security, Codes of Ethics and Professional Organizations

UNIT III: RISK MANAGEMENT

An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategies, Selecting a Risk Control Strategy, Quantatitive Versus Qualitative Risk Control Practices, Risk Management Discussion Points, Recommended Risk Control Practices.

UNIT IV: Planning for Security

Information Security Planning and Governance, Information Security Policy, Standards, and Practices, The Information Security Blueprint, Security Education, Training, and Awareness Program, Continuity Strategies

TEXT BOOKS

[1] Michael E Whitman, Herbert J Mattord, "Principles of Information Security", 4th Edition, Cengage Learning, 2012

REFERENCE BOOKS

[1] Steven Hernandez, Corey Schou, “Information Assurance Handbook: Effective Computer Security and Risk Management Strategies”, 1st Edition, McGrawHill, 2014.

[2] William Stallings, “Cryptography and Network Security- Principles and Practice”, 6th Edition, Pearson Education, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] nptelonlinecourse.com, “Cryptography and network Security”, 2021. [Online].
Available: https://nptel.ac.in/courses/106/105/106105162/ Accessed on 02/12/2021.
[2] cybrary.com, “Cryptography”, 2021, [Online].
Available:https://www.cybrary.it/course/fundamental-cryptography-data-protection/. Accessed on 02/12/2021

20CS5404D
PROGRAMMING FOR GAMES

Course Category:	Programme Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the Overview of Unity 3D & C# programming.	K2	1.6.1,3.5.6,5.4.1
CO2	Understand the Unity 3D Architecture & develop game code.	K2	1.7.1,3.8.3,5.4.2
CO3	Apply the game programming fundamentals & Unity 3D execution order.	K3	3.8.2,5.5.2
CO4	Apply the advanced concepts of C# for game programming	K3	1.7.1,5.5.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**		**2**		**2**									
CO2	**1**		**2**		**3**									**3**
CO3			**2**		**3**								**2**	**3**
CO4	**2**				**3**									**3**
Weightage														

COURSE CONTENT

UNIT 1

Introduction to C#: A Flexible Programming Language, Overview of C#, Compiling, Unity 3D Overview: The Main Panel, Creating a New Project, A New Unity 3D Project, Sample Code , Working with C#: Game Engines

UNIT 2

Tokens, Statements and Expressions, Keywords, White Space, Code Blocks, Classes, Variables, Variable Names

Basics Building Blocks of Code, Building Up a Game Idea, Creating a Class, Directives, Functions, Order of Operation, Logic and Operators, Loops.

UNIT 3

Fundamentals: Inheritance, Instancing, Static, Turning Ideas into Code, Jump Statements, Operators and Conditions, Arrays, Jump Statements, Multidimensional Arrays, Array List, Strings.

Class Constructors, Using Arrays in Unity 3D,Enums, Switch, Structs, Class Data, Namespaces, Functions Again, Unity 3D Execution Order, Type Casting, Working with Vectors, Out Parameter, Ref Parameter, Type Casting Numbers, Types and Operators, Operator Overloading, Controlling Inheritance.

UNIT 4

Function Overloading, Accessors (or Properties), Base Classes, Optional Parameters, Delegate Functions, Interface, Preprocessor Directives, Exceptions, IEnumerator.

Generics, Events, Unity-Friendly Classes, Destructors, Concurrency or Coroutines, Dictionary, Stacks, and Queues, Callbacks, Lambda Expressions.

Debugging, Recursion, Reflection, LINQ, Bitwise Operators, Bitwise Math, Attributes, Architectures and Organization, Design Patterns.

TEXT BOOKS

[1] Alex Okita, Learning C# Programming with Unity 3D,CRC Press, Taylor & Francis Group,2015

REFERENCE BOOKS

[1] Balagurusamy, Emir. Programming in C#: A Primer. McGraw-Hill Education, 2010.
[2] Norton, Terry. Learning C# by developing games with unity 3D. Packt Publishing Ltd, 2013.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Intro to C# Programming and Scripting for Games in Unity, https://www.udemy.com/course/3dmotive-intro-to-c-programming-and-scripting-for-games-in-unity/ accessed on 13.05.2022.
[2] Coding in C# in Unity for beginners, https://unity.com/how-to/learning-c-sharp-unity-beginners. Accessed on 13.05.2022.
[3] Scripting in Unity for experienced programmers, https://unity.com/how-to/programming-unity accessed on 13.05.2022.

20CS5404E
NETWORK PROGRAMMING

Course Category:	Programme Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	20CS4304 - Computer Networks	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Apply socket API based programs.	3	1.2.1, 1.7.1, 2.5.1
CO2	Analyze client-server applications using TCP and UDP sockets.	4	1.2.1, 2.5.1, 2.5.3
CO3	Analyse network programs.	4	1.2.1, 2.5.3
CO4	Apply raw sockets for network communication.	3	1.2.1, 2.5.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**3**												
CO2	**3**	**3**												
CO3	**3**	**3**												
CO4	**3**	**3**												
Weightage														

COURSE CONTENT

UNIT I

Introduction to Network Programming: OSI model, Unix standards, TCP and

UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application. **Sockets :** Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT II

TCP client server : Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host. **Elementary UDP sockets**: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP. **I/O Multiplexing:** I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server,

UNIT -III

Socket options: getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options. **Advanced I/O Functions**-Introduction, Socket Timeouts, recv and send Functions,readv and writev Functions, recvmsg and sendmsg Functions, Ancillary Data, How Much Data Is Queued?, Sockets and Standard I/O, T/TCP: TCP for Transactions.

UNIT -IV

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

Raw Sockets: Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program, An ICMP Message Daemon, Datalink Access-Introduction, BPF: BSD Packet Filter, DLPI: Data Link Provider Interface, Linux: SOCK_PACKET, libpcap: Packet Capture Library, Examining the UDP Checksum Field. Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

TEXT BOOKS

[1] UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education
[2] UNIX Network Programming, 1st Edition, -W. Richard Stevens. PHI.

REFERENCE BOOKS

[1 UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
[2] Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

E-RESOURCES AND OTHER DIGITAL MATERIAL

20CS5404F
OBJECT ORIENTED ANALYSIS AND DESIGN

Course Category:	Programme Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	--	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the basic concepts of object oriented analysis and design.	K1	1.7.1, 2.5.1, 2.5.2
CO2	Apply object oriented methodologies for a given application.	K3	1.7.1, 2.5.1, 3.5.2, 3.5.6
CO3	Apply object oriented analysis process for any given application.	K3	1.7.1, 2.5.1, 3.5.2, 3.5.6
CO4	Apply object oriented design process concepts for a given application.	K3	1.7.1, 2.5.1, 3.5.2, 3.5.6

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**3**												
CO2	**2**	**2**	**3**										**2**	
CO3	**2**	**2**	**3**										**2**	
CO4		**2**	**3**										**2**	

COURSE CONTENT

UNIT I

Introducing UML and UP. What is UML?, What is Unified Process?, Requirements, Requirements Workflow, Use Case Modelling, Advanced use case modelling,

Unit II

Analysis, The analysis workflow, Objects and Classes, Finding analysis classes, Relationships, Inheritance and Polymorphism.

Unit III

Analysis Packages, Use Case realization, Advanced Use Case realization, Activity Diagrams, Advanced activity Diagrams.

Unit IV

Design, The Design workflow, Design Classes, Refining analysis relationships, Interfaces and components, Use case realization- Design, State Machines. Implementation, The Implementation work flow, Deployment

TEXT BOOKS

[1] Jim Arlow, Ila Neustatd, UML2 and the Unified Process Second Edition, Practical Object Oriented Analysis and Design, Addison- Wesley Publication. 2015.

REFERENCE BOOKS

[1] Object Oriented Analysis Design and Implementation, An integrated approach, Second Edition, Springer University Press.2015.

[2] R. S.Pressman, and Bruce Maxim Software Engineering A Practitioner's approach, Eigth Edition, Tata McGraw Hill, 2015.

E-RESOURCES AND OTHER DIGITAL MATERIAL

20CS5205A
WEB PROGRAMMING

Course Category:	Open Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 2
Prerequisites:	**Java Programming**	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the concepts of Web designing	K2	1.3.1, 2.1.1
CO2	Apply the concepts of HTML5 and CSS to design static web pages	K3	2.2.3, 3.2.1, 3.2.2
CO3	Apply client side technologies to design interactive Web interfaces using	K3	2.2.3, 2.2.4, 3.3.1, 3.2.1, 3.2.2
CO4	Apply the concepts to Design and validate XML Documents	K3	2.2.3, 2.4.2 3.2.1, 3.2.2
CO5	Apply interactive server side scripting for a web application	K3	2.2.3, 3.2.1, 3.2.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**2**												
CO2		**2**	**3**										**2**	
CO3		**2**	**3**										**2**	
CO4		**2**	**3**										**3**	
CO5		**2**	**3**										**3**	
Weightage														

COURSE CONTENT

UNIT I

Introduction : Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation

UNIT II

HTML : Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT III

JavaScript: Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and Javascript, Events and buttons

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT

UNIT IV

PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object

Oriented Programming with PHP

PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs

TEXT BOOKS

Moseley, R., & Savaliya M. T. (2011). Developing Web Applications. Wiley India Pvt. Limited.

REFERENCE BOOKS

1. Sklar, J. (2012). Web design principles. Course Technology Cengage Learning.
2. Deitel, H. M., Deitel, P. J., & Nieto, T. R. (2004). Internet world wide web: how to program. Pearson/Prentice Hall
3. Harwani, B. M. (2010). DevelopingWeb Applications in PHP and AJAX. McGraw Hill Education.

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. Sengupta, I. (2014, June 28). Internet Technology. NPTEL. https://nptel.ac .in/courses/106105084. Last accessed on June 5, 2022.
2. PHP Group. (n.d.). PHP: MySQL (Original) - Manual. PHP: Hypertext Preprocessor. https://www.php.net/manual/en/book.mysql.php. Last accessed on May 13, 2022.

20CS5205B
LINUX Usage Essentials

Course Category:	Open Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 2
Prerequisites:	---	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand and work confidently in Linux Environment	K1	1.6.1,1.7.1, 2.5.1
CO2	Apply the security and administration mechanisms for user or group management and permissions	K3	1.7.1,2.5.2,2.7.1, 2.7.2,3.5.1
CO3	Apply shell scripts for solving problems	K3	2.6.3,2.7.1, 2.7.2,2.8.1,2.8.2, 3.5.1,3.8.2
CO4	Analyse client/server communication using IPC mechanisms	K4	2.6.2,2.7.1,3.6.2, 3.6.3 3.8.2,3.8.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**	**2**												
CO2	**1**	**3**	**2**										**1**	**1**
CO3		**2**	**3**										**1**	**1**
CO4		**2**	**3**										**1**	**1**
Weightage														

COURSE CONTENT

UNIT I

Selecting an Operating System: What Is an OS, Investigating User interfaces.

Using Common Linux Programs: Using a Linux Desktop Environment, Working with Productivity Software, Using Server Programs, Managing Programming Languages, Handling Software Packages.

UNIT II

Managing Hardware: Learning about Your CPU, Understanding Disk Issues, Managing Displays, Handling USB Devices, Managing Drivers.

Getting to Know the Command Line: Starting a Command Line ,Running Programs ,Using Shell Features ,Getting Help Using man Pages ,Getting Help Using info Pages.

UNIT III

Managing Files: Navigating Files and Directories, Manipulating Files, Manipulating Directories.

Searching, Extracting, and Archiving Data: Using Regular Expressions Searching for and Extracting Data, Redirecting Input and Output, Archiving Data.

Exploring Processes and Process Data: Understanding Package Management, Understanding the Process Hierarchy, Identifying Running Processes, Using Log Files.

UNIT IV

Creating Scripts: Beginning a Shell Script, Using Commands, Using Arguments Using Variables, Using Conditional Expressions, Using Loops, Using Functions.

Understanding Basic Security: Understanding Accounts, Using Account Tools, Working as root.

Managing Network Connections: Understanding Network Features, Configuring a Network Connection, Testing Your Network Connection, Protection.

TEXT BOOKS

[1] Christine Bresnahan, Richard Blum," Linux Essentials", 2nd Edition, September 2015

REFERENCE BOOKS

[1] Richard Petersen, ”Linux:The Complete Reference”, 6th edition, Tata McGraw-Hill, 2007.
[2] Mc Kinnon, Mc Kinnon, “Installing and Administrating Linux“, 2nd edition, Wiley, 2004.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] NDG Linux Essentials, https://www.netacad.com/courses/os-it/ndg-linux-essentials last accessed on 10-02-2022.
[2] O'Reilly Network: Directory of Linux Commands http://www.oreillynet.com/linux/cmd/ last accessed on 10-02-2022.

20CS5205C
FUNDAMENTALS OF DATA STRUCTURES

Course Category:	Open Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand linear data structures - stack and queues.	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO2	Apply linear and non linear data structures on real time problems	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO3	Apply different tree traversal techniques	K2	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3
CO4	Apply Divide and Conquer, Greedy method and Dynamic Programming techniques to solve problems	K3	1.2.1, 1.7.1, 2.5.1, 2.5.2, 2.5.3, 2.6.3, 2.6.4, 2.8.4

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**											**2**	
CO2	**2**	**2**											**2**	
CO3	**2**	**2**											**2**	
CO4		**3**	**3**										**2**	
Weightage	**47%**	**51%**	**2%**											

COURSE CONTENT

UNIT 1

Introduction: Algorithm, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation.

Stacks: Definition, Representing stacks, ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation.

Queues: Queue and its Sequential Representation, Queue as an abstract data type, Types of Queue: Simple Queue, Circular Queue, Operations on each types of Queues: Algorithms

UNIT II

Linked lists: Representation in memory, singly linked lists: operations and algorithms, doubly linked list: operations and algorithms; circular linked lists: all operations their algorithms, applications.

UNIT III

Trees: Introduction: terminology, representation of trees, binary Tree, complete binary tree, applications of binary trees, expression trees construction and evaluation; binary tree traversals: inorder, preorder and postorder

Sorting: Merge Sort, quick sort, radix sort, heap sort, shell sort, tree sort, comparison of sorting algorithms, external Sorting.

UNIT IV

ALGORITHM DESIGN TECHNIQUES

Divide and Conquer: Binary Search - Greedy Algorithm: Knapsack Problem – Dynamic Programming: Multistage Graph – Backtracking: Sum of Subset Problem – Branch and Bound: Travelling Salesman Problem.

TEXT BOOKS

[1]Horowitz Sahni and Anderson- Freed “Fundamentals of Data Structures in C”. 2nd Edition, Universities Press, 2008. (Unit I, II, and III).
[2]EllisHorowitz,SatrajSahniandRajasekharan,“FundamentalsofComputerAlgorithms”,GalgotiaPublications Pvt. Ltd, 2008. (Unit IV)

REFERENCE BOOKS

[1] Richard F. Gilberg & B. A. Forouzan “Data Structures A Pseudocode Approcah with C”, Second Edition, CENGAGE Learning.

[2] Mark Allen Weiss,"Data structure and Algorithm Analysis in C". Addison Wesley Publication. 2006.
[3] Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill, 1984.
[4] Thomas Cormen, C.Leiserson, R. L.Rivest & C.Stein, "Introduction to Algorithms". 3rd Edition, The MIT Press, 2009

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr.P.P. Chakraborty, IIT Kharagpur, May 19, 2010, Data Structures, NPTEL,Available:www.youtube.com/ watch? v=S47aSEqm_0I
[2] Dr. Naveen Garg, IIT Delhi, Sep 24, 2008, Data Strucutres, NPTEL, Available:http://nptel.iitm.ac.in, http://freevideolectures.com/ Course /2279/Data-Structures-And-Algorithms
[3] Shai Simonson, Jun 16, 2014, Data Structures, NPTEL, Available: http://nptel.ac.in/video.php? subjectId=106102064

20CS5205D
DATA MINING & DATA WAREHOUSING

Course Category:	Open Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the fundamentals of Data mining	K2	1.2.1, 1.7.1
CO2	Apply various pre-processing techniques in Data mining	K3	1.2.1, 1.7.1 2.5.2, 2.6.4, 2.8.1
CO3	Apply various schemas and operations of the Data Warehouse.	K3	1.2.1, 1.7.1 2.5.2, 2.6.4, 2.8.1 3.6.1
CO4	Analyze different types of data science algorithms to solve real life problems.	K4	1.2.1, 1.7.1 2.5.2, 2.6.4, 2.8.1 3.5.1, 3.6.1, 3.7.1 9.4.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**													
CO2	**1**	**3**												
CO3	**1**	**3**	**2**											
CO4	**1**	**2**	**3**										**1**	

COURSE CONTENT

UNIT I

Introduction to Data Mining: Why Data Mining?, What Is Data Mining?, What Kinds of Patterns Can Be Mined?, Which Technologies Are Used?, Which Kinds of Applications Are Targeted?, Major Issues in Data Mining.

Getting to Know your data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT II

Data Preprocessing: An Overview; **Data Cleaning-** Missing Values, Noisydata;

Data Integration-Entity Identification problem, Redundancy and Correlation Analysis;

Data Reduction- Overview of Data Reduction Strategies, Wavelet Transformation, Principal Components Analysis; **Attribute Subset selection;**

Data Transformation and Data Discretization-Data Transformation Strategies Overview, Data Transformation by Normalization, Discretization by Binning.

UNIT III

Data Warehouse Basic Concepts- What Is a Data Warehouse, Differences between Operational Database Systems and Data Warehouses, Data Warehousing: A Multitiered Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart, and Virtual Warehouse, Extraction, Transformation, and Loading, Metadata Repository

Data Warehouse Modeling: Data Cube and OLAP - Data Cube: A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Data Models, Dimensions: The Role of Concept Hierarchies, Measures: Their Categorization and Computation, Typical OLAP Operations

UNIT IV

Mining Frequent Patterns, Associations-Market Basket Analysis: A Motivating Example, Frequent Item sets, Closed Item sets, and Association, Apriori Algorithm: Finding Frequent Item sets by Confined Candidate Generation, Generating Association Rules from Frequent Item sets.

Classification : What Is Classification, Decision Tree Induction, Attribute Selection Measures.

Cluster Analysis: What Is Cluster Analysis?, Requirements for Cluster

Analysis, k-Means Algorithm

TEXT BOOKS

[1] Jiawei Han, Micheline Kamber, Jian Pei , Data mining : concepts and techniques, 2012. Third edition

REFERENCE BOOKS

[1] Joel Grus , Data Science from Scratch, 2019, 2nd Edition
[2] Emily Robinson and Jacqueline Nolis, Build a Career in Data Science, Manning, 2020

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Google's Machine Learning Crash Course, last accessed on 11-02-2022, https://developers.google.com/machine-learning/crash-course
[2] IBM's Machine Learning with Python, last accessed on 11-02-2022, https://cognitiveclass.ai/courses/machine-learning-with-python

20CS5351
DATABASE MANAGEMENT SYSTEMS LABATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Data Structures Discrete Mathematical Structures	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Demonstrate DDL, DML and DCL statements with integrity constraints	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3 ,3.5.1,3.6.2,5.4.2
CO2	Design relational database and manipulate the same using simple and complex queries in SQL	K6	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3 ,3.5.1,3.6.2,5.4.2,5.5.2
CO3	Develop Entity Relationship and the corresponding Relational models for the given real-world application	K6	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3 ,3.5.1,3.6.2,5.4.2,5.5.2
CO4	Illustrate database objects like Procedure, Functions, Triggers and Package using PL/SQL	K4	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3 ,3.5.1,3.6.2,5.4.2
CO5	Apply transactions processing, Concurrency control and Recovery techniques on relational database	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3, 2.6.3 ,3.5.1,3.6.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**2**	**2**		**2**								1	1
CO2	**1**	**3**	**3**		**3**								1	1
CO3	**1**	**3**	**3**		**3**								1	1
CO4	**1**	**2**	**2**		**2**								1	1
CO5	**1**	**2**	**2**		**2**								2	2
Weightage														

TASKS

Task 1:Execute DDL, DML and DCLCommands on the suitable database.

Task 2: Implement the following Integrity Constraints on relevant Database

a. Primary Key b. Foreign Key c. Unique

d. Not NULL e. Check

Task 3: Execute the aggregate functions like count, sum, avg etc on the suitable database. Make use of built-in functions according to the need of database chosen. Retrieve data from the database based on date function.

Task 4: Apply Set operations (UNION, UNION ALL, INTERSECT and MINUS), Sub-queries,

Group by, Order by clause and Pattern Matching operators (LIKE, %, _) on fine-tuned Database

Task 5: Implementation of different types of Joins, Views and Ranks.

Task 6: Draw ER diagram for an application with at least 3 entities and establish relationships between them using a tool. Perform ER to Relational mapping to derive Relational database.

Task 7: Write PL/SQL procedure for an application using exception handling for the following

a. Predefined exceptions.

b. User defined exceptions.

Task 8: Write a PL/SQL block for transaction operations of a typical application using triggers.

Task 9:create concurrent transactionsand obtainconcurrency control using SSMS

Task 10:Utilizing recovery management, restore the database in case a catastrophic disk loss occurred.

(DBMS LAB PROJECT)

Design and Implement the given Database Application using the following requirements

- **Database Analysis and Design**
  - ✓ Build Conceptual schema using tools
  - ✓ Apply Normalization process for relational database design
  - ✓ Relational Model Database
- **Implementation:**
  - ✓ Front End: Java/Perl/PHP/Python/Ruby/.net
  - ✓ Backend: SQL/MySQL/SQLite
  - ✓ Database Connectivity: ODBC/JDBC/Servlets

Testing: Data Validation

TEXT BOOKS

[1] Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖,7thedition, Pearson Education Ltd, 2016.

REFERENCE BOOKS

[1] Gordon S Linoff Data Analysis Using SQL and Excel, 2nd Edition Wiley 2016
[2] Joan Casteel, Oracle 12c:SQL, Cengage Learning ,2017
[3] J D Ullman, ―Principles of database systems‖, Computer Science Press, 2001.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof Arnab Bhattacharya IIT Kanpur, SQL Introduction
https://nptel.ac.in/courses/106104135/10
[2] Prof Arnab Bhattacharya IIT Kanpur SQL: Updates, Joins, Views and Triggers
https://nptel.ac.in/courses/106104135/11
[3] Geoff Allix and Graeme Malcolm: Microsoft , Querying with Transact-SQL (edX) https://www.mooc-list.com/course/querying-transact-sql-edx

20CS5352
ADVANCED JAVA PROGRAMMING LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Java Programming Lab	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Create GUI application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,3.6.2,3.8.2, 4.6.2,5.4.2
CO2	Create distributed application.	K3	1.7.1,2.5.1,2.5.2, 2.6.3,2.7.1,3.5.1,3.8.2
CO3	Develop web application	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4 3.5.1,3.8.2
CO4	Develop enterprise application	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,3.6.2,3.8.2, 4.6.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**3**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**	**2**	**2**								**2**	**2**
Weightage														

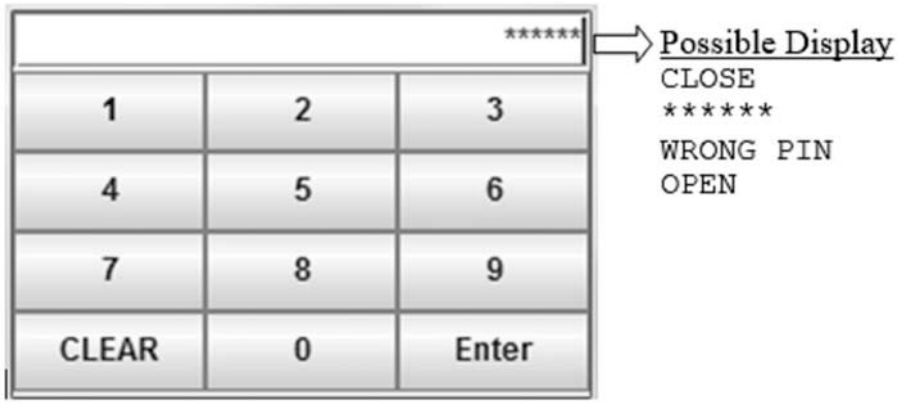
COURSE CONTENT

Task 1:

Create a GUI application in java using Swing components, which enter the details of an Employee and on the submit display the details of the Employee (Employee details is like contains name, code, address, phone, joining details, blood group etc.)

Task 2:

Create a Java Swing GUI application for an electronic lock as shown below. The display shall show the state of either "CLOSE" or "OPEN". In the "CLOSE" state, the user types his PIN followed by the "Enter" key to unlock the system. The display shall show an asterisk (*) for each number entered. The display shall show "WRONG PIN" if the PIN is incorrect. The "Clear" button clears the number entered (if any), locks the system and sets the display to "CLOSE". Assume the methods that to be defined: public booleancheckPIN(String PIN); // return true for correct PIN public void unlock(); // Unlock the system public void lock(); // Lock the system



Task3:

Design Employee Database for company or Organization (Employee Personal Details, Department, Salary (basic, DA, HRA.,) Details) and develop JDBC based java application for following tasks:

1. Insert Records into respective table

2. Select records of particular table of database

3. Delete Records from table.

Connect GUI application to database and perform SQL commands via JDBC API.

Task 4:

Write a client server program using TCP where client sends 10 numbers to server program and server program responds with the numbers in ascending

order to respective client.

Task 5:
Create Application for Datagram server and Client interaction as per given below. i] Datagram server to send a message to client. ii]Datagram client to receive the message sent by the server. Create a simple UDP chat application where client and server can chat with each other.

Task 6:
Design an RMI client/server application to implement the Bank Transactions. RMI server provides three remotely accessible methods to perform deposit, withdrawal and balance enquiry transactions. So that the Client can access the methods.

Task 7:
Verify installation and setting of Web container/Web Server/Tomcat and prepare an installation report, which contains setting of class path,server port, starting and shutting down of server. Develop Web Application to display a greeting message in the browser by using HttpServlet.

Task 8:
Create a simple Sign in and Signup web application using HTTPServlet class.

Task 9:
Create a simple vehicle registration form web page using servlet that receives all the data entered by user and search for the record whether it is existed into the database using JDBC API.



Task 10:
Create JSP to output, "Welcome to JSP world. The time now is: system current time.", Use a scriptlet for the complete string, including the HTML tags.

Task 11:
Create a simple JSP application for online poll application that prompts the user to answer a question and display the results in bar graph representation.

Task 12:
Design a Web application to read Product information from user and compute the bill amount and discount using JSP.

***Lab Projects**:*

1. Apply the concepts of Java Swings, JDBC Connectivity and Networking programming to develop any real-time GUI based application. Ex. e-Shopping cart application.

2. Apply the key concepts of Servlets, JSP and EJB to develop web based application. Ex. interactive online-based quiz application.

TEXT BOOKS

[1] Herbert Schildt, "Java The Complete Reference", Eleventh Edition, Oracle Press, . 2019.
[2] H. M. Deitel, P.J. Deitel, S.E. Santry, "Advanced Java 2 Platform How to Program", 3rd Edition, 2016, Prentice Hall Publications.
[3] Hans Bergsten, "JavaServer Pages", 3rd Edition 2017, O'Reilly Media.
[4] Christian Posta,"Microservices for Java Developers", O'Reilly Media Inc.,September 2016.

REFERENCE BOOKS

[1] Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2016.
[2] David Geary, Cay S. Horstmann "Core JavaServer Faces" Third edition, 2016, Prentice Hall.
[3] Jim Keogh, "The Complete reference to J2EE", reprint 2017, Tata McGraw-Hill .

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]AbhayRedkar, JSF Developer, "Java Micro services",
Udemy.https://www.udemy.com/topic/Microservices/
Available: Last accessed on August 2018.
[2] Prof. I. Sengupta. (14th , May, 2017), Department of Computer Science & Engineering, I.I.T.,Kharagpur, "Internet Technologies", NPTEL videos.

20HS5153
ENGLISH COMMUNICATION SKILLS LABATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-2
Prerequisites:	Technical English & Communication Skills	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**BTL**
CO1	Execute rational pronunciation of speech sounds including accentuation.	3
CO2	Apply elements of listening comprehension in professional environments.	4
CO3	Develop the abilities of rational argumentation and skills of public speaking.	4
CO4	Demonstrate proficiency in the elements of professional communication including the competitive examination	4

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						3				3				
CO2			2	2	2	3	3	1		3	2			
CO3	3		2	3	2	3	3	2		3	2			
CO4	2	1	2	2	1	3	2	3	2	3	3	2		

COURSE CONTENT/TASK

UNIT:I :Elements of Spoken Expression and processes of Listening Comprehension:

- Speech Mechanism
- Articulation of vowels and consonants

- Patterns of Accentuation

Types and processes of Listening comprehension

UNIT II: : Patterns of Substantiation and Refutation in Public Speaking:

- Group Discussion(Open and Monitored)
- Pyramid Discussion
- PNI

Seminar Talk and Power Point Presentation

UNIT III: Professional Communication:

- Self Affirmation
- Advanced Composition including Memo and e-mail
- Résumé Preparation

Corporate ethic of Non-Verbal Communication

UNIT IV: Life Skills and Vocabulary for Competitive Examinations:

- Select Life Skills(50)
- Select Logies, Isms, Phobias and Manias (25 each)
- Sentence Completion and Double Unit Verbal Analogies (50 items)

Fundamentals of Syllogisms(Descriptive and Pictorial)

TEXT BOOKS

[1] Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011
[2] Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21st Impression, 2003

REFERENCE BOOKS

[1] Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004
[2] Eclectic Learning Materials offered by the Department

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] ODll Language Learner's Software, 27-6-2012 Orell Techno Systems
[2] Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015
[3] www.natcorp.ox.ac.uk, British National Corpus accessed on 28-11-2017

20TP5106
PERSONALITY DEVELOPMENT

Course Category:	Soft Skills - 3	**Credits:**	1
Course Type:	Learning by Doing	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**BTL**
CO1	Understand the corporate etiquette	2
CO2	Make presentations effectively with appropriate body language	3
CO3	Be composed with positive attitude.	3
CO4	Understand the core competencies to succeed in professional and personal life.	2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1								**2**		**3**				
CO2									**2**	**3**				
CO3										**3**				
CO4									**2**	**3**				

COURSE CONTENT

UNIT – I

UNIT I

Analytical Thinking and Communication Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self–Analysis, Developing Positive Attitude, Perception; Verbal Communication, Non Verbal Communication (Body Language)

UNIT II
Self-Management Skills and Etiquette: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities; Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette
UNIT III
Standard Operation Methods and Verbal Ability: Note Making, Note Taking, Minutes Preparation, Email Letter Writing; Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work
UNIT IV
Career-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

METHODOLOGY

Audio—Visuals / Hand Outs (Compiled/Created by Training Division, T&P Cell, VR Siddhartha Engineering College), Board & Chalk and Interactive Sessions.

REFERENCE BOOKS
1. Mitra, B. K. (2011). Personality development and soft skills (Vol. 156). Oxford University Press.
2. Dhanavel, S. P. (2011). English and Soft Skills. Orient Blackswan Pvt Limited.
3. Aggarwal, R. S. (2018). A Modern Approach to Vernbal & Non Verbal Reasoning.
S. Chand.
4. Meenakshi, R. & Sharma, S. (2011). Technical Communication Principles and Practice. Oxford University Press.

E-RESOURCES AND OTHER DIGITAL MATERIALS
1. Aptitude Questions and Answers. (n.d.). IndiaBIX. https://www.indiabix.com /. Last accessed on June 5, 2022.
2. Placement Papers of all IT Companies. (n.d.). Freshersworld. https://placement.freshersworld.com/placement-papers. Last accessed on June 5, 2022.

20CS5354
ENGINEERING PROJECT FOR COMMUNITY SERVICES

Course Category:	Project Work/Internship	**Credits:**	1.5
Course Type:		**Lecture -Tutorial-Practice:**	0-0-3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Identify the Societal problems.
CO2	Solve the problems.
CO3	Design of the problem/work plan.
CO4	Design of the prototype/model.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1						**2**	**3**							
CO2						**3**	**1**			**2**				
CO3						**3**			**2**					
CO4									**1**	**3**				

The students may register

EPICS: Students will go to the society (Villages/ Hospitals / Towns etc,.) to identify the problem and survey the literature for a feasible solution. The work will be carried out during summer vacation after IV Semester. The student is encouraged to take up real life problems leading to innovative model building.

Internship: The students are expected to do internship of minimum 3 weeks duration in the industry approved by respective Head of the Department. It carries two credits. The candidate shall submit the comprehensive report to the department. The report will be evaluated for 100 marksby the project review committee.

20CS5607
INDUSTRY STANDARD CODING PRACTICE – II

Course Category:	Skill Oriented Course - 2	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	1-0-2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Able to understand test and development aspects of programming by solving problems at Industry standards.
CO2	Able to interpret any given problem using required domain skills, mathematics.
CO3	Able to learn and apply methods to optimize solutions for any given problem.
CO4	Able to solve problems using elementary data structures with test driven development

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1											
CO2		3											2	2
CO3		1							2		3		3	3
CO4	2	3									2		2	2

COURSE CONTENT

UNIT I

Problem solving through Competitive Coding, Problem solving using control structures, Numeric series and patterns, Code Complexity analysis, Linear/ Logarithmic/ Super linear/ Polynomial/ Exponential/ Factorial Algorithms, Problem solving on rotations of data, Problem solving on Order statistic problems, Problem Solving Examples Problem solving on matrix data, Memory manipulation techniques using pointers. Memory Arithmetic, Problem solving implementing pointer to an array, Memory Layout, overcoming the segmentation faults, Runtime memory allocation, Coding comparisons of Linear list data structure and Pointers, examples and Practice problems.

UNIT II

Problem solving on string data, Problem solving on String manipulations, coding problems using string handling functions, Problem solving on Multi-String Problems, Problem Solving for long strings, Examples, Practice problems. Problem solving using modular programming, Inter module communications, scopes of data in the code, Problem solving approaches using recursions, Evaluation of Recursive algorithms, Significance of mathematical Recurrence Relations, Evaluation of recurrence relations, Time Analysis, Examples, Practice problems.

UNIT III

Problem solving on operational and traversal logics on linked lists, Problem solving to compare linked lists, detection of a cycle/merge point, Merging sorted linked lists, coding problems on circular linked lists/Double linked lists, Examples, Practice problems. Problem Solving Problem solving through Linked list coding, traversals, Problem solving to compare linked lists, detection of a cycle/merge point, Merging sorted linked lists, Circular linked list formation, Double linked list formation, Examples, Practice problems.

UNIT IV

Problem solving through testing, implementing various testing approaches: Test strategy, Test development, Test execution, Bug fixing, Examples, Practice problems, Problem solving Methods and techniques. Understanding the problem as math abstract, formation of the logic, Identifying the corner cases, Examples, Practice problems, Version control systems, Git repositories and working trees, adding new version of the files to a Git repository, Examples, practice problems.

TEXT BOOKS

[1] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013.
[2] Ahmed Shamsul Arefin, Art of Programming Contest, ACMSolver, Second Edition, 2012

REFERENCE BOOKS

[1] Programming Challenges: The Programming Contest Training Manual By Steven S Skiena, Miguel A. Revilla
[2] Guide to Competitive Programming: Learning and Improving Algorithms Through Contests By Antti Laaksonen

E- RESOURCES AND OTHER DIGITAL MATERIAL

[1] Topcoder tutorials - https://www.topcoder.com/community/data-science/data-science-tutorials/
[2] Nite Nimajneb's site - http://comscigate.com/Books/contests/icpc.pdf
[3] Slides from a Stanford Course - http://web.stanford.edu/class/cs97si/
[4] Halim, Steven and Halim, Felix, Competitive Programming 3, 2013. Ebook available at lulu.com. Site associate with with the book is http://cpbook.net

20MC5108A
BIOLOGY FOR ENGINEERS

Course Category:	Humanities Elective	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Describe the fundamental Principles and methods of engineering
CO2	Identify the functions of different types in bio-molecules
CO3	Describe mechanisms underlying the working of molecular biological processes including enzyme catalysis, metabolic pathways, gene expression.
CO4	Use Excel, MATLAB and other computational tools to quantitatively analyze biological processes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3												
CO2		3												
CO3		2		3										
CO4		1		2	3									

COURSE CONTENT

Unit-I Introduction and Classification of Living organisms

Introduction:

Fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Biology as an

independent scientific discipline. Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.

Classification:

Classification of living organisms based on (a) Cellularity- Unicellular or multicellular (b) Ultrastructure- prokaryotes or eukaryotes. (c) Energy and Carbon utilization -Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat- acquatic, terrestrial (e) Molecular taxonomy- three major kingdoms of life.

Unit-II Biomolecules and Enzymes

Biomolecules:

Biomolecules: Structures of sugars(Glucose and Fructose), starch and cellulose. Nucleotides and DNA/RNA. Amino acids and lipids. Proteins- structure and functions- as enzymes, transporters, receptors and structural elements.

Enzymes:

Enzyme classification. Mechanism of enzyme action.

Enzyme kinetics and kinetic parameters.

Unit-III Genetics and Gene information Transfer

Genetics:

"Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Concepts of recessiveness and dominance. Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring.

Information Transfer:

DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Unit-IV Metabolism and Microbiology

Metabolism:

Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. Breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions.

Microbiology:

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms. Microscopy.

TEXT BOOKS

[1] Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

[2] Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

[3] Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

[4] Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher, Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]https://bee.cals.cornell.edu/sites/bee.cals.cornell.edu/files/shared/documents/Career_Bee_Final-for-Web.pdf

[2] https://www.teachengineering.org/subjectareas

SEMESTER VI

20CS6301
Machine Learning

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	Data Structures	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES		BTL	POI
Upon successful completion of the course, the student will be able to:			
CO1	Understand the concepts of computational intelligence in machine learning	K2	1.2.1, 1.7.1, 2.5.3
CO2	Apply machine learning techniques to address the real time problems	K3	1.6.1, 2.5.2, 2.6.3, 2.6.4, 2.7.2,3.6.1, 3.6.2 ,4.4.2, 4,6,1, 5.4.2
CO3	Apply dimensionality reduction techniques for feature selection	K3	1.2.1, 2.6.2, 2.6.4,2.7.2,4.6.4
CO4	Analyze ensemble models to solve classification problems	K4	1.6.1, 2.5.2, 2.6.3, 2.6.4, 2.7.2,3.6.1, 3.6.2 ,4.4.2, 4,6,1, 5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**1**	**1**											**1**	**1**
CO2	**2**	**2**	**2**	**2**	**2**								**1**	**2**
CO3	**2**	**2**		**2**									**1**	**1**
CO4	**1**	**2**	**2**	**2**	**2**								**1**	**2**

COURSE CONTENT

UNIT I

Introduction to Machine Learning: Introduction. Different types of learning, Hypothesis space and inductive bias, Evaluation. Training and test sets, cross validation, Concept of over fitting, under fitting, Bias and Variance

Linear Regression: Introduction, Linear regression, Simple and Multiple Linear regression,

Polynomial regression, evaluating regression fit, Logistic Regression

UNIT II

Decision tree learning: Introduction, Decision tree representation, appropriate problems for decision tree learning, the basic decision tree algorithm, hypothesis space search in decision tree learning, issues in decision tree learning, over fitting in decision tree and methods to avoid over fitting.

The Curse of Dimensionality, Feature Selection: univariate , multivariate feature selection approach, missing values ratio,

Feature reduction Techniques: Principal Component Analysis, Linear Discriminate Analysis

UNIT III

Probability and Bayes Learning: Bayesian Learning, Naïve Bayes

Artificial Neural Networks: Introduction, Biological motivation, ANN representation, appropriate problem for ANN learning, Perceptron, multilayer networks and the back propagation algorithm

Instance based Learning: K nearest neighbour,

UNIT IV

Support Vector Machine: Introduction, the Dual formulation, Maximum margin with noise, nonlinear SVM and Kernel function, solution to dual problem

Ensembles: Introduction, Bagging and boosting, Random forest

Clustering: Introduction, K-mean clustering, agglomerative hierarchical clustering, k-means clustering.

Algorithm evaluation methods

TEXT BOOKS

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Alpaydin, Ethem. Introduction to machine learning. MIT press, 2020.

REFERENCE BOOKS

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2007

E-RESOURCES AND OTHER DIGITAL MATERIAL

https://www.cmpe.boun.edu.tr/~ethem/i2ml2e/
https://www.cmpe.boun.edu.tr/~ethem/i2ml/

20CS6302
CRYPTOGRAPHY AND NETWORK SECURITY

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand various security issues related to cryptography and Network Security.	K2	1.7.1, 2.6.4
CO2	Analyze the process of cryptographic ciphers.	K3	1.7.1, 2.5.2,2.6.2
CO3	Summarizes the Network Security Scenarios.	K3	1.7.1, 2.5.2,2.6.4
CO4	Inspect the protection methods against Network security threats.	K3	1.7.1, 2.6.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**				**2**									
CO2	**2**	**3**					**2**							**2**
CO3	**2**													
CO4		**2**			**3**		**2**							**2**
Weightage	**100%**	**60%**			**60%**		**60%**							

COURSE CONTENT

UNIT I:

Overview : Security attacks, Services, A model for network security; Basics of Cryptography, Cryptanalysis. Symmetric cipher model.

Classical encryption techniques: Substituion Techniques: Caeser Cipher, Mono

alphabet Cipher, Playfair Cipher Transposition Techniques: Rail Fence, Row & Column Transposition,
Block Cipher: Stream and Block Cipher, DES, Strength of DES, AES ,
Block cipher Operations: Multilple Encryption, ECM, CBC, CFM,OFM

UNIT II:
Number Theory: Prime Numbers, Fermat's theorem, Euler's Theorem,
Public Key Cryptography: Principles of Public Key Crypto System, RSA algorithm, Diffie-Hellman Key Exchange, Problems, ECC
Cryptographic Hash Functions : Applications -Message Authentication, Digital signatures, SHA- Logic, Round Functions

UNIT III:
Authentication Applications: X. 509 Certificates, Kerberos: Motivation Kerberos Version 4 Kerberos Version 5
Transport Level Security : Web Security Threats, Web Traffic Security Approaches.
Secure Socket Layer and Transport Layer Security : TLS **-** TLS Architecture, Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Cryptographic Computations, Difference between TLS, SSL.
HTTPS: Connection Initiation Connection Closure

UNIT IV:
Email Security : Pretty Good Privacy- Notation, Operational Description
IP Security: Overview: Applications , Benefits , IPsec Documents, IPsec Services, Transport and Tunnel Modes, Authentication Header Format, Encapsulating Security Payload - ESP Format Encryption and Authentication Algorithms Padding Anti-Replay Service Transport and Tunnel Modes,
Malicious Software: Types – Viruses, Backdoor, Logic Bomb, Trojan Horses
Firewalls : The Need for Firewalls, Characteristics, Types of Firewalls - Packet Filtering Firewall, Stateful Inspection Firewalls, Application-Level, Gateway Circuit-Level Gateway, Firewall Basing- Bastion Host, Host-Based Firewalls, Personal Firewall.

TEXT BOOKS

[1] William Stalligs, Cryptography and Network Security: Principles and Practice. 5th & 7th ed, Pearson Education, 2017.
[2] J. Katz and Y. Lindell, "Introduction to Modern Cryptography", CRC Press, 2008

REFERENCE BOOKS

[1] Cryptography and Network Security: ForouzanMukhopadhyay, McGraw Hill, 2nd Edition
[2] Network Security and Cryptography, Bernard Menezes, CENGAGE Learning
[3] Cryptography & Network Security, AtulKahate, McGraw Hill

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] nptelonlinecourse.com,"Cryptography and network Security", 2021. [Online]. Available: https://nptel.ac.in/courses/106/105/106105162/ Accessed on 02/12/2021.
[2]cybrary.com, "Cryptography", 2021, [Online]. Available: https://www.cybrary.it/course/ fundamental-cryptography-data-protection/. Accessed on 02/12/2021

20CS6303
SOFTWARE ENGINEERING

Course Category:	Programme Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Compare different software engineering process models.	K1	1.7.1,2.5.1, 2.5.2, 2.6.4,2.7.1
CO2	Analyse the principles of requirement engineering.	K3	1.7.1,2.5.1,2.7.1, 3.5.1,3.5.2,3.5.6
CO3	Create architectural design for a given project.	K3	1.7.1,2.5.1,2.6.4 3.5.1,3.8.1
CO4	Apply different testing techniques	K3	1.7.1,2.5.1,2.6.4, 3.5.1,3.6.2,3.8.2, 4.4.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**3**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**	**2**	**2**								**2**	**2**
Weighatge														

COURSE CONTENT

UNIT I

The Nature of Software: The Nature of Software, The changing nature of software.

Software engineering: The Software Process, Software Engineering Practice, Software Development Myths.

The Software Process: Software Process Structure. A Generic Process Model, Defining a framework activity, identifying a task set, Process patterns, Process Assessment and Improvement.

Process models: Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models.

Agile Development: What Is Agility? Agility and the Cost of Change, What Is an Agile Process? Extreme Programming (XP) Other Agile Process Models, A Tool Set for the Agile Process.

UNIT II

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Analysis Model, Negotiating Requirements, Requirements monitoring, and Validating Requirements.

Requirements Modelling: Scenario Based Methods: Requirements Analysis, Scenario-Based Modelling, UML Models That Supplement the Use Case.

Requirements Modelling: Class based methods, Identifying Analysis classes, Specifying attributes, Defining operators, Class-Responsibility-Collaborator Modelling, Associates and Dependencies, Analysis Packages

Requirements Modelling: Behaviour, Patterns, And Web apps: Creating a Behavioural Model, Identifying events with Use Cases, State Representations, Patterns for Requirements Modelling, Requirements Modelling for Web and Mobile Apps.

UNIT III

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Considerations, Architectural Decisions,

Architectural Design.

Component-Level Design: What Is a Component? Designing Class-Based Components, Conducting Component Level Design, and Component level design for Web Apps, Component Level Design for Mobile Apps.

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Webapp and Mobile Interface Design.

UNIT IV

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Test Strategies for MobileApps, Validation testing, System testing, the art of debugging.

Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing.

TEXT BOOKS

[1] Roger S. Pressman, Bruce R.Maxim, "Software Engineering a practitioners approach" 8th edition, McGraw-Hill Publication 2019

REFERENCE BOOKS

[1] Ian Somerville, “Software Engineering”. 9th ed, Pearson Education. 2011.

[2] Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, “Fundamentals of Software Engineering”.2 ed, PHI. 2009

[3] RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Lecture Series on Software Engineering by Prof.N.L. Sarda, Prof. Umesh Bellur,Prof.R.K.Joshi and Prof.Shashi Kelkar, Department of Computer Science & Engineering ,IIT Bombay https://nptel.ac.in/courses/106101061/2

[2] Software Engineering By Dr. B. LAVANYA, Assistant Professor | University of Madras
https://onlinecourses.swayam2.ac.in/cec20_cs07/preview.

[3] Software Engineering Basics
https://www.youtube.com/watch?v=sB2iQSvrcG0

20CS6404A
ARTIFICIAL INTELLIGENCE

Course Category:	Programme Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Probability and Statistics, Artificial Intelligence Tools Techniques and Applications	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the basic principles and applications of Artificial Intelligence.	K1	1.2.1,2.7.1
CO2	Represent Knowledge by using various rules.	K2	1.7.1,2.5.1,3.5.1
CO3	Apply filler structures for different sentences and know the concepts of Natural Language Processing.	K3	1.7.1, 2.5.1, 2.7.1, 3.5.1
CO4	List the key aspects of Expert Systems and realize the concepts of Connectionist Models.	K1	1.7.1, 2.5.1, 3.5.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**2**												
CO2	**1**	**2**	**3**											
CO3		**2**	**3**						**2**					
CO4		**2**	**3**											
Weightage														

COURSE CONTENT

UNIT I

Problems, Problem Spaces And Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

UNIT II

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation.

Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

Representing Knowledge Using Rules - Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

UNIT III

Weak Slot-and-Fillers Structures: Semantic Nets, Frames

Strong Slot-and- Fillers Structures: Conceptual Dependency, Scripts.

Natural Language Processing: Introduction, syntactic processing, Semantic analysis, Discourse and pragmatic processing, Statistical Language processing, Spell checking

UNIT IV

Connectionist Models: Introduction: Hopfield Networks, Learning in Neural Networks, Applications of Neural Networks.

Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition

TEXT BOOKS

[1] Elaine Rich, Kevin Knight, Shivashankar B Nair, “Artificial Intelligence”, 3rd Edition, Tata McGraw Hill Edition.

REFERENCE BOOKS

[1] Patrick Henry Winston 'Artificial Intelligence', 3rd Edition,Prentice Hall, 1992.

[2] Stuart Russell and Peter Norvig, 'Artificial Intelligence', 3rd Edition, Prentice Hall of India, 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106105077/

[2]https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/

[3] https://web.stanford.edu/class/cs221/

20CS6404B
PROGRAMMING FOR DATA SCIENCE

Course Category:	Programme Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the fundamentals of Data Science concepts	K2	1.2.1, 1.7.1
CO2	Apply various pre-processing techniques in Data Science	K3	1.2.1, 1.7.1 2.5.2, 2.6.4, 2.8.1
CO3	Apply various schemas and operations of the Data Warehouse.	K3	1.2.1, 1.7.1 2.5.2, 2.6.4, 2.8.1 3.6.1
CO4	Analyze different types of data science algorithms to solve real life problems.	K4	1.2.1, 1.7.1 2.5.2, 2.6.4, 2.8.1 3.5.1, 3.6.1, 3.7.1 9.4.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**													
CO2	**1**	**3**												
CO3	**1**	**3**	**2**											
CO4	**1**	**2**	**3**						**1**				**1**	
Weightage														

COURSE CONTENT

UNIT I

Introduction: AI, Machine Learning and Data Science;

What is data Science: Extracting Meaningful patterns, Building representative models, Combination of statistics, Machine learning and Computing, learning algorithms, Associated fields.

Case for Data Science: Volume, Dimensions, Complex Questions; **Data Science Classification; Data Science Algorithms**

Getting to Know your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT II

Data Preprocessing: An Overview; **Data Cleaning-** Missing Values, Noisydata;

Data Integration-Entity Identification problem, Redundancy and Correlation Analysis;

Data Reduction- Overview of Data Reduction Strategies, Wavelet Transformation, Principal Components Analysis; **Attribute Subset selection;**

Data Transformation and Data Discretization-Data Transformation Strategies Overview, Data Transformation by Normalization, Discretization by Binning.

UNIT III

Data Warehouse Basic Concepts- What Is a Data Warehouse, Differences between Operational Database Systems and Data Warehouses, Data Warehousing: A Multitiered Architecture, Data Warehouse Models: Enterprise Warehouse, Data Mart, and Virtual Warehouse, Extraction, Transformation, and Loading, Metadata Repository

Data Warehouse Modeling: Data Cube and OLAP - Data Cube: A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Data Models, Dimensions: The Role of Concept Hierarchies, Measures: Their Categorization and Computation, Typical OLAP Operations

UNIT IV

Mining Frequent Patterns, Associations-Market Basket Analysis: A Motivating Example, Frequent Item sets, Closed Item sets, and Association, Apriori Algorithm: Finding Frequent Item sets by Confined Candidate Generation, Generating Association Rules from Frequent Item sets.

Classification : What Is Classification, Decision Tree Induction, Attribute

Selection Measures.

Cluster Analysis: What Is Cluster Analysis?, Requirements for Cluster Analysis, k-Means Algorithm

TEXT BOOKS

[1] Vijay Kotu and Bala Deshpande, Data Science concepts and Practice, 2019, Second Edition
[2] Jiawei Han, Micheline Kamber, Jian Pei , Data mining : concepts and techniques, 2012. Third edition

REFERENCE BOOKS

[1] Joel Grus , Data Science from Scratch, 2019, 2nd Edition
[2] Emily Robinson and Jacqueline Nolis, Build a Career in Data Science, Manning, 2020

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Google's Machine Learning Crash Course, last accessed on 11-02-2022, https://developers.google.com/machine-learning/crash-course
[2] IBM's Machine Learning with Python, last accessed on 11-02-2022, https://cognitiveclass.ai/courses/machine-learning-with-python

20CS6404C
INTERNET OF THINGS

Course Category:	Programme Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	20CS4303 Computer organization & Microprocessor 20CS4304 Computer Networks	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the design concepts and applications of Internet of Things	K2	1.6.1, 1.7.1,2.7.1, 2.7.2
CO2	Illustrate Standards and Key Technologies in IoT.	K2	1.6.1, 1.7.1,2.7.1,2.7.2, 3.6.2
CO3	Apply the steps of the design methodology in developing IoT applications using Raspberry Pi	K3	3.6.2,4.4.3,4.5.1, 5.4.1
CO4	Understand the Privacy ,security and Vulnerabilities of internet of Things	K2	1.6.1, 1.7.1,2.7.1,3.6.2, 5.4.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**												**1**	**2**
CO2	**2**												**1**	**2**
CO3		**2**	**2**										**2**	
CO4					**2**		**2**							
Weightage														

COURSE CONTENT

UNIT I

Introduction to Internet of things: Introduction, Physical design of IoT, Logical Design of IoT, IoT Enabling technologies, IoT levels & Deployment templates.

Domain Specific IoTs – Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle

UNIT II

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT

IoT Platforms Design Methodology: Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.

UNIT III

IoT Physical Devices and Endpoints – What is an IoT Device, Introduction to Raspberry Pi, Board, Linux on Raspberry Pi, Raspberry Pi Interfaces (serial, SPI, I2C)

Programming Raspberry PI with Python – Controlling LED with Pi, Interfacing LED and Switch with Pi, Interfacing a light sensor/LDR with Pi.

UNIT IV

IoT Privacy, Security and Vulnerabilities Solutions: Vulnerabilities, Security Requirements and Threat Analysis – Privacy, Vulnerabilities of IoT, Security Requirements, Threat Analysis, IoT Security Tomography and Layered Attacker

TEXT BOOKS

[1]Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1st Edition, University Press Private Limited, 2017

[2] Raj Kamal, "Internet of Things, Architecture and Design Principles" 1st Edition, McGraw Hill Education Private Limited, 2017.

REFERENCE BOOKS

[1] Matt Richardson & Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 2014

[2] David Hanes, “IOT FUNDAMENTALS” 1ST Edition, CISCO PRESS, 2018

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Sudip Misra, IIT Kharagpur “Introduction to Internet of things” Available: https://nptel.ac.in/courses/106/105/106105166/
[2] Prof. T V Prabhakar, IISc Bangalore “Design for Internet of things” [Web Content]. Available: https://nptel.ac.in/courses/108/108/108108098/

20CS6404D
MULTIMEDIA SECURITY AND FORENSICS

Course Category:	Programme Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Computer Networks Cryptography & Network Security	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the concepts of cyber forensics related Issues.	K2	1.7.1, 2.6.4
CO2	Analyse the process of various forensic systems.	K3	1.7.1, 2.5.2,3.6.2
CO3	Analyze Evidence capture mechanism and Recovery steps	K3	1.7.1, 2.5.2,2.6.4
CO4	Evaluate and Report electronic communications evidences.	K3	1.7.1, 2.6.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**													
CO2	**2**		**2**											**2**
CO3	**2**													
CO4		**2**												**2**
Weightage	**100%**	**60%**	**60%**											

COURSE CONTENT

UNIT I

Forensic Terminology and Investigations: Introduction, Traditional problems in investigation, Forensic science and disk structure. Forensic Laboratory:

Developing computer Forensic Science capabilities, Minimum Housing requirements, Hardware and Software requirements, Popular Software.

UNIT II

Search and Seize Computer Related Evidence: Identifying Digital Evidence, Collecting the Evidence in Private-Sector Incident Scenes, Processing law Enforcement Crime Scenes, Preparing for a Search, Securing a Computer Incident or Crime Scene, Sizing Digital evidence at the Scene, Storing Digital evidence, obtaining a Digital Hash.

UNIT III

Computer Forensics Analysis and Validation: Determining What Data to Collect and Anlyze, Validating Forensic Data, Addressing Data-Hiding Techniques, Performing Remote Acquisition, Current Forensic Tool: Evaluating Computer Forensics Toll Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software

UNIT IV

E-mail Investigations& Report Writing: Exploring the Role of E-mail in Investigations, Exploring the Role of Client and Server in E-mail, Investigating E-mail Crimes and Violations, Using Specialized E-mail Forensics Tools, Report Writing

TEXT BOOKS

[1] Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
[2] Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning .

REFERENCE BOOKS

[1] Real Digital Forensics by Keith J. Jones, Richard Bejtlieh, Curtis W. Rose, Addison – Wesley Pearson Education
[2] Forensic Compiling. A Tractitioneris Guide by Tony Sammes and Brain Jenkinson, Springer International edition.
[3] Computer Evidence Collection & Presentation by Christopher L.T.Brown, Firewall Media.
[4] Chuck Eastom, “Certified Cyber Forensics Professional Certification:McGraw Hill, July 2017

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.cybrary.it/glossary/d-the-glossary/digital-forensics/

[2] https://www.udemy.com/topic/digital-forensics/

20CS6404E
ADVANCED PROGRAMMING FOR GAMES

Course Category:	Programme Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Programming for Games	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand advanced concepts in game design and development.	**K2**	1.6.1,3.5.6,5.4.1
CO2	Understand the architecture of Game Programming	**K2**	1.7.1,3.8.3,5.4.2
CO3	Apply scripting on game using Lua programming.	**K3**	3.8.2,5.5.2
CO4	Apply 3D Game graphics, sound and AI on Gamming	**K3**	1.7.1,5.5.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**		**2**		**2**									
CO2	**1**		**2**		**3**									**3**
CO3			**2**		**3**								**2**	**3**
CO4	**2**				**3**									**3**
Weightage														

COURSE CONTENT

UNIT 1

Game Architecture - Applying the Game Architecture, Application Layer, Game Logic, Game view for human player, Networked Game Architecture

Coding – General coding styles, smart code design practices, smart pointers and naked pointers, Using memory correctly

Building Your Game – Creating a Project, Source Code Repositories and Version Control, Building the Game, Creating Build Scripts

UNIT 2

Game Actors and Component Architecture - Component Architecture, Creating Actors and Components, Defining Actors and Components, Storing and Accessing Actors, Data Sharing

Controlling the Main Loop - Organizing the Main Loop Hard – Coded Updates Multithreaded Main Loops

A Hybrid Technique, A Simple Cooperative Multitasker, Using the DirectX 11 Framework

Loading and Caching Game Data - Game Resources: Formats and Storage Requirements, Resource Files, The Resource Cache

UNIT 3

Programming Input Devices - Getting the Device State, Using Xinut or DirectInput, Working with Two-Axis Controls, Working with a Game Controller, Working with the Keyboard

Game Event Management - Game Events, Importance of Game Events, Distinguishing Events from Processes

Scripting with Lua - Brief History of Game Programming Languages, Using a Scripting Language, Scripting Languge Integration Strategies, A crash course in Lua,Object Oriented Programming in Lua, Memory Management, Binding Lua to C++,LuaPlus

UNIT 4

Game Audio - How Sound Works, Game Sound System Architecture, Technical Hurdles

3D Graphics Basics - 3D Graphics Pipeline,3D Math 101, C++ Math Classes

An Introduction to Game AI - AI Techniques, Finite – State Machines, Decision Trees, Fuzzy Logic, Utility Theory, Goal –Oriented Action Planning, Path Finding

TEXT BOOKS

[1] Mike McShaffry and David Graham, Game Coding Complete, Course Technology PTR, 4th Edition

REFERENCE BOOKS

[1] Goldstone, Will. Unity game development essentials. Packt Publishing Ltd, 2009.
[2] Zapušek, Matej, and Jože Rugelj. "Learning programming with serious games." EAI Endorsed Transactions on Serious Games 1.1 (2013).

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Game Development – Advanced Programming, https://academics.sheridancollege.ca/programs/game-development-advanced-programming

20CS6404F
SOFTWARE DEFINED NETWORKS

Course Category:	Programme Elective I	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Computer Networks: 20CS4304	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the evolution of Software Defined Networks	K2	1.7.1, 2.7.2, 3.6.1
CO2	Apply various components of SDN architecture and make use of it	K3	1.6.1, 2.7.1, 5.5.1
CO3	Apply SDN in the current networking scenario	K3	1.2.2, 4.5.1, 5.4.1
CO4	Apply SDN and NFV applications in various use cases	K3	1.2.2, 3.8.1, 5.6.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**3**	**2**											
CO2	**1**	**2**			**3**								**1**	**1**
CO3	**1**			**3**	**2**								**2**	
CO4	**1**		**2**		**3**								**1**	**3**
Weightage	**100**													

COURSE CONTENT

UNIT I: INTRODUCTION

Introduction: Historical Background, The Modern Data Center, Traditional Switch Architecture.

Why SDN: Evolution of Switches and Control Planes, SDN Implications for Research and Innovation, Data Center Innovation, Data Center Needs.

How SDN Works: Fundamental Characteristics of SDN, SDN Operation, SDN Devices, SDN Controller, SDN Applications, Alternate SDN Methods.

UNIT II: OPEN FLOW & SDN CONTROLLERS

Open Flow Specification: OpenFlow Overview, OpenFlow 1.0 and OpenFlow Basics, OpenFlow Additions (1.1, 1.2, 1.3), OpenFlow Limitations.

Alternative Definition of SDN: Potential Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening Up the Device, Network Functions Virtualization.

SDN Controllers: General Concepts, VMware, Nicira, VMware/Nicira, OpenFlow-Related, Mininet, NOX/POX, Trema, Ryu, Big Switch Networks/Floodlight.

UNIT III: SDN IN DATA CENTER AND OTHER ENVIRONMENTS

Data Center Concepts and Constructs: Introduction, Multitenant Data Center, Virtualized Multitenant Data Center, SDN Solutions for the Data Center Network.

SDN in Data Center: Data Center Definition, Data Center Demands, Tunneling Technologies, Path Technologies, Ethernet Fabrics, SDN Use Cases, Open SDN versus Overlays, Real-World Data Center Implementations.

SDN in Other Environments: Wide Area Networks, Service Provider and Carrier Networks, Campus Networks, Hospitality Networks, Mobile Networks, In-Line Network Functions, Optical Networks, SDN vs. P2P/Overlay Networks.

UNIT IV: SDN APPLICATIONS AND NETWORK FUNCTION VIRTUALIZATION

SDN Applications: Reactive versus Proactive Applications, Analyzing Simple SDN Applications, A Simple Reactive Java Application, Background on Controllers, Using Floodlight Controller - OpenDaylight Controller - Cisco XNC Controller - Hewlett-Packard Controller, Switch Considerations, Creating

Network Virtualization Tunnels, Offloading Flows in the Data Center, Access Control for the Campus, Traffic Engineering for Service Providers.

Network Function Virtualization: Virtualization and Data Plane I/O, Services Engineered Path, Service Locations and Chaining, NFV at ETSI, Non-ETSI NFV Work.

TEXT BOOKS

[1] Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.

[2] Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, O'Reilly Media, 2013.

REFERENCE BOOKS

[1] Siamak Azodolmolky, Software Defined Networking with Open Flow, Packet Publishing, 2013.

[2] Vivek Tiwari, SDN and Open Flow for Beginners, Amazon Digital Services, Inc., 2013.

[3] Fei Hu, Editor, Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Dr. Nick Feamster Software Defined Networking, last accessed on 10-02-2022, https://www.coursera.org/learn/sdn

[2] Software Defined Networking, https://www.coursera.org/learn/sdn

20CS6404G
TEXT ANALYTICS AND NATURAL LANGUAGE PROCESSING

Course Category:	Programme Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Fundamentals of Python	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the basics of Text Analytics and language processing	K1	1.7.1,2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1
CO2	Apply conventional techniques in NLP	K3	1.7.1, 2.6.3, 2.6.4, 2.8.3, 2.8.4
CO3	Use tools, techniques, and opportunities for performing text analytics in a variety of contexts	K3	1.7.1,2.5.2, 2.6.3, 2.6.4, 2.8.4, 3.7.1
CO4	To learn Topic Models, Sentiment Analysis and chatbots	K1	1.7.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**													
CO2		**2**												
CO3					**3**									
CO4		**1**												
Weightage														

COURSE CONTENT

UNIT I

What is text analysis?, Where's the data at?, Garbage in, garbage out, Why should you do text analysis? **Python Tips for Text Analysis:** Why Python? Text manipulation in Python, Spacy's Language Models, **Spacy**, Installation, Troubleshooting, Language models, Installing language models ,Installation – how and why?, Basic preprocessing with language models, Tokenizing text, Part-of-speech (POS) – tagging, Named entity recognition ,Rule-based matching, Preprocessing

UNIT II

Gensim – Vectorizing Text and Transformations and n-grams: Introducing Gensim, Vectors and why we need them, Bag-of-words, TF-IDF, Other representations ,Vector transformations in Gensim , N-grams and some more preprocessing **POS-Tagging and Its Applications:** What is POS-tagging?, POS-tagging in Python, POS-tagging with spacy, Training our own POS-taggers, POS-tagging code examples

UNIT III

NER-Tagging and Its Applications: What is NER-tagging? NER-tagging in Python, NER-tagging with spacy, Training our own NER-taggers, NER-tagging examples and visualization

Dependency parsing: Dependency parsing in Python, Dependency parsing with spacy, Training our dependency parsers

UNIT IV

Topic Models

What are topic models?, Topic models in Gensim, Latent Dirichlet allocation, Latent semantic indexing, Hierarchical Dirichlet process, Dynamic topic models, Topic models in scikit-learn

Sentiment Analysis and chatbots

Sentiment analysis, Reddit for mining data, Twitter for mining data, Chatbots

TEXT BOOKS

[1] Srinivasa-Desikan, Bhargav, Natural Language Processing and Computational Linguistics, Pakt 2018.

REFERENCE BOOKS

[1] Daniel Jurafsky and James Martin, Speech and Language Processing, Prentice-Hall , Second Edition, 2008 ISBN: 0131873210

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www1.cs.columbia.edu/~sbenus/Teaching/APTD/McKee_Ch1.pdf

[2] https://www.udemy.com/course/text-analytics-and-natural-language-processing-with-r/

20CS6205A
MOBILE APPLICATION DEVELOPMENT

Course Category:	Open Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 -2
Prerequisites:	Programming for Problem Solving, Java Programming	**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the fundamentals of Android Operating System.	K1	1.7.1,2.5.1,2.5.2,2.7.1
CO2	Design and develop user interfaces for Android platform.	K3	1.7.1,2.5.1,2.5.2,2.6.3, 2.7.1,3.5.1
CO3	Deploy and publish a given mobile application into android device.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4 3.5.1,3.8.2
CO4	Develop a database connection for a given mobile application.	K3	1.7.1,2.5.1, 2.5.2,2.6.3,2.6.4, 3.5.1,3.6.2,3.8.2, 4.6.2,5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**	**2**	**2**								**2**	**2**
Weightage														

COURSE CONTENT

UNIT I

Introduction to Android: An open platform for mobile development, Native android applications, Android SDK Features, Introducing the Development Framework, Downloading and Installing the Android SDK, Creating your First Android Application, Types of Android Applications, Developing for Mobile and Embedded devices, Android Development Tools.
Creating Applications and Activities: Introducing the Application Manifest File, Externalizing Resources, The Android Application Lifecycle, A Closer look at Android Activities.

UNIT II

Building User Interfaces: Fundamental Android UI Design, Android User Interface fundamentals, Introducing Layouts.
User Interface (UI) Components: Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling: Handling clicks or changes of various UI components.

UNIT III

Introducing Fragments: Creating New Fragments, The Fragment Lifecycle, Introducing the Fragment Manager, Adding Fragments to Activities, Interfacing Between Fragments and Activities, Fragments Without User Interfaces.
Introducing Adapters: Introducing Some Native Adapters, Customizing the Array Adapter, Using Adapters to Bind Data to a View
Introducing Intents: Using intents to launch activities, Introducing Linkify, Using Intents to broadcast Events, Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT IV

Creataing Intent Filters and Broadcast Receivers: Using Intent Filters to Service Implicit Intents, Using Intent Filters for Plug-Ins and Extensibility, Listening for Native
Working with SQLite Databases: Introducing the SQLiteOpenHelper, Opening and Creating Databases without SQLite Open Helper, Android Database design considerations, Quering a Database, Extracting values from a cursor, Adding, Updating and Removing Rows.

TEXT BOOKS

[1] Reto Meier , “Professional Android 4 Application Development”, Wiley India, (Wrox)

REFERENCE BOOKS

[1] David Griffiths and Dawn Griffiths, Head First Android Development: A Brain-Friendly Guide, O'Reilly Media, Inc.
[2] James C Sheusi, "Android Application Development for Java Programmers", Cengage Learning.
[3] Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India (Wrox)
[4] Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, “Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC”, 3rd Edition.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Oak Academy, Mehmet Ongel, Build Real Android Apps: Android 11 App Development:
Java,https://www.udemy.com/course/build-real-android-apps-android-app-development-with-java/
[2] Courseera : Dr. Jerry Roth, Android App Development Specialization, Department of Computer Science and Electrical Engineering, Vanderbilt University
https://www.coursera.org/specializations/android-app-development

20CS6205B
NO SQL DATABASES

Course Category:	Open Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 -2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand different types of NoSQL Databases		
CO2	Analyze the detailed architecture and performance tune of Document-oriented NoSQL databases.		
CO3	Analyze the performance tune of Key-Value Pair NoSQL databases.		
CO4	Apply NoSQL development tools on different types of NoSQL Databases		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**													
CO2		**2**	**2**						**2**		**1**			
CO3		**2**	**2**						**2**		**1**			
CO4		**3**	**3**						**1**					
Weightage														

COURSE CONTENT

UNIT I

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL.

UNIT II

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations.

UNIT III

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability.

UNIT IV

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Storing Session Information, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, Graph Database Features, Consistency, Transactions, Availability.

TEXT BOOKS

[1] Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

REFERENCE BOOKS

[1] Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to Information Retrieval, Cambridge University Press

[2] Daniel Abadi, Peter Boncz and Stavros Harizopoulas, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers.

[3] Guy Harrison, Next Generation Database: NoSQL and big data, Apress.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.ibm.com/cloud/learn/nosql-databases

[2]https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
[3] https://www.geeksforgeeks.org/introduction-to-nosql/
[4] https://www.javatpoint.com/nosql-databa

20CS6205C
EMBEDDED SYSTEMS

Course Category:	Open Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2-0 -2
Prerequisites:	**Microprocessor and micro controllers and Operating Systems.**	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Distinguish the characteristics of embedded computer systems.	K2	1.6.1,1.7.1,2.5.2, 2.6.2, 3.6.1, 3.6.3
CO2	Identify the various vulnerabilities of embedded computer systems.	K2	2.5.2, 2.6.2, 2.6.3, 2.6.4,3.6.1,3.6.3
CO3	Understand RPC, threads and tasks.	K1	1.6.1,1.7.1
CO4	Design and develop modules using RTOS.	K3	1.6.1,1.7.1, 2.6.2, 3.6.1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**2**	**1**											
CO2	**2**	**2**	**1**											
CO3	**2**	**2**												
CO4	**2**	**2**	**2**										**1**	
Weightage														

COURSE CONTENT

UNIT 1:

Introduction to embedded systems:

Embedded system, Processor embedded into a system, embedded hardware units and devices in a system, embedded software in a system and an overview of programming languages, Classification of embedded systems, skills required for an embedded system designer, Examples of embedded systems.

Embedded System Design and Development process:

Design process in embedded system, Design challenges in embedded system design, challenges in embedded system design: optimising the design metrics, challenges and issues related to embedded software development, Formalism of system design, Design process and design examples.

UNIT 2:

I/O Devices, Communication buses and distributed networked embedded architectures: I/O types and example, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Distributed Network embedded systems Architecture, Serial bus communication protocols, Parallel bus device protocols, Internet enabled systems, Wireless and mobile system protocols.

Device drivers and interrupts and service mechanism: Port for device access without interrupts servicing mechanism using programmed I/O, Interrupt-driven input and output, ISR concept, Interrupt sources, Hardware Interrupts, Interrupt servicing Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt-service deadline, Direct memory access driven I/O, Device driver programming.

UNIT 3:

Processes, Tasks and Threads and their synchronization using Inter-process communication: Multiple processes in an application, Multiple threads in an application, Tasks, Task and Thread states, Tasks and Data, Clear-cut distinction between function, ISR, IST and task by their characteristics, Inter-process communication and synchronization, Signals, concept of semaphores, Disabling and Enabling Functions, Shared data Problem, Queues and Mailboxes, Pipe and Socket functions, RPC functions.

UNIT 4:

Real-time operating systems: OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and I/O subsystems management, Interrupt routines in RTOS environment and handling

of interrupt source calls, introduction to Real-time operating systems, Basic design using an RTOS, RTOS task- scheduling models, OS security issues. Introduction to embedded software development process and tools, Host and target machines, Linking and location software.

TEXT BOOKS

[1] Raj Kamal, "Embedded Systems: Architecture, Programming, and Design" 3rd edition , Tata McGraw hill-2017.

REFERENCE BOOKS

[1] Marilyn Wolf, "Computer as Components, Principles of Embedded Computing System Design" 3rd edition, Elsevier-2014.

[2] K.V Shibu, "Introduction to Embedded System", TMH Education private limited,2009.

[3] Kenneth. J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded Systems Using Assembly and C", 1st edition, Cengage learning, 2010.

[4] Frank Vahid and Tony Givargis, *Embedded Systems Design – A Unified Hardware Software Introduction.* John Wiley, 2002

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Introduction to embedded systems Prof. Indranil Sengupta, Department of Computer Science and Engineering Indian Institute of Technology-Kharagpur, https://nptel.ac.in/courses/106/105/106105193/

[2] Embedded systems By Prof. Prof. Santanu Chaudhary, Department of Electrical Engineering IIT Delhi https://nptel.ac.in/courses/108/102/108102045/#

[3] Introduction to embedded systems design by PROF. BADRI SUBUDHI Department of Electrical, Electronics and Communications Engineering IIT Jammu https://nptel.ac.in/courses/108/102/108102169/

20CS6205D
INTRODUCTION TO
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Category:	Open Elective 2	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 -2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand the basic problem characteristics and techniques of Artificial Intelligence .		
CO2	Analyze the approaches and issues of representing knowledge.		
CO3	Understand the concepts of machine learning and analyze supervised learning		
CO4	Analyze regression algorithms and apply unsupervised learning to real time problems.		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**2**												
CO2	**1**	**2**	**2**						**2**		**1**			
CO3	**1**	**2**												
CO4	**1**	**3**							**2**		**1**			
Weightage														

COURSE CONTENT

UNIT I

Problems, Problem Spaces And Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem
Reduction.

UNIT II

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation.

Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Resolution.

UNIT III

Introduction to Machine Learning: Human Learning and Machine Learning, Types of Machine Learning, Languages and Tools in Machine Learning, Framework for Developing Machine Learning Models.

Supervised Learning: Introduction, Classification Naïve Bayes, Decision Trees, Random Forest, XGBoost.

UNIT IV.

Regression: Simple Linear Regression and Multiple Linear Regression, Polynomial Regression, Logistic Regression.

Unsupervised Learning: Introduction ,Unsupervised Vs Supervised Learning, Unsupervised Learning Models, Dimensionality Reduction ,Clustering : Association Rule Mining ,Applications of Unsupervised Learning.

TEXT BOOKS

[1] Elaine Rich, Kevin Knight, Shivashankar B Nair, “Artificial Intelligence”, 3rd Edition, Tata McGraw Hill Edition, 2008 .

[2] Ethem Alpaydın, “Introduction to Machine Learning” ,Second edition ,The MIT Press Cambridge.

REFERENCE BOOKS

[1] Patrick Henry Winston 'Artificial Intelligence', 3rd Edition, Prentice Hall, 1992.
[2] Stuart Russell and Peter Norvig, 'Artificial Intelligence', 3rd Edition, Prentice Hall of India, 2009
[3] Machine Learning, Tom M. Mitchell, McGraw-Hill International Edition, 1997

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://nptel.ac.in/courses/106105077/
[2]https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/
[3] https://web.stanford.edu/class/cs221/
[4]https://www.coursera.org/learn/machine-learning/lecture/yfbJY/evaluating-ahypothesis
[5] https://www.youtube.com/watch?v=fC7V8QsPBec/

20CS6351
MACHINE LEARNING LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-3
Prerequisites:	**Data Structures Python Programming**	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Demonstrate the concepts of computational intelligence in machine learning	K3	1.2.1, 1.7.1, 2.5.2, 2.5.3 2.6.3 ,3.5.1,3.6.2,5.4.2
CO2	Apply machine learning techniques to address the real time problems	K3	1.6.1, 2.5.2, 2.6.3, 2.6.4 2.7.2,3.6.1, 3.6.2 ,4.4.2, 4,6,1, 5.4.2
CO3	Apply dimensionality reduction techniques for feature selection	K3	1.2.1, 2.6.2, 2.6.4,2.7.2,4.6.4,5.4.2
CO4	Analyze ensemble models to solve classification problems	K4	1.6.1, 2.5.2, 2.6.3, 2.6.4 2.7.2,3.6.1, 3.6.2 ,4.4.2, 4,6,1, 5.4.2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**1**	**1**			**2**								1	1
CO2	**2**	**2**	**2**	**2**	**2**								1	2
CO3	**2**	**2**		**2**	**2**								1	1
CO4	**1**	**2**	**2**	**2**	**2**								1	2
Weightage														

TASKS

Task 1. Python exercise on Feature engineering, data visualisation

Task 2. Programs on Covariance, Correlation, Covariance Matrix and Correlation Matrix

Task 3. Implement Linear Regression and logistic regression and calculate sum of residual error

Task 4. Program to implement decision tree learning

Task 5. Program to implement K nearest neighbour classifier

Task 6. Program to implement Principle Component Analysis

Task 7. Program to implement perceptron for different learning task

Task 8 Program to implement classification task using Support Vector machine

Task 9. Program to implement Ensemble method

Task 10. Program to implement Clustering algorithm

TEXT BOOKS

[1] Swamynathan, Manohar. Mastering machine learning with python in six steps: A practical implementation guide to predictive data analytics using python. Apress, 2019.
[2] Raschka, Sebastian. Python machine learning. Packt publishing ltd, 2015.

REFERENCE BOOKS

[1] Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
[2] Alpaydin, Ethem. Introduction to machine learning. MIT press, 2020.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.cmpe.boun.edu.tr/~ethem/i2ml2e/
[2] https://www.cmpe.boun.edu.tr/~ethem/i2ml/

20CS6352
CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Understand various security issues related to cryptography and Network Security.	K2	1.7.1, 2.6.4
CO2	Analyze the process of cryptographic ciphers.	K3	1.7.1, 2.5.2,2.6.2
CO3	Summarizes the Network Security Scenarios.	K3	1.7.1, 2.5.2,2.6.4
CO4	Inspect the protection methods against Network security threats.	K3	1.7.1, 2.6.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**3**				**2**									
CO2	**2**	**3**					**2**							**2**
CO3	**2**													
CO4		**2**			**3**		**2**							**2**
Weightage	**100%**	**60%**			**60%**		**60%**							

TASKS

Software Requirements:

- Virtual Box.
- Ubuntu Desktop OS.
- Burpsuite, John The Ripper, macchanger, Wireshark, Nmap, tcpdump

Task 1: Prepare a write-up and familiarize with the following concepts

a. Security basics (Authentication, Authorization, Data Confidentiality, Non-repudiation, Data Integrity)
b. Network security (ACL, Firewall, IDS, IPS, Vulnerability Assessment, CVEs, Penetration testing and its phases, NAT, Honeypots, WLAN Encryption – WEP, WPA, WPA2, WPA3, Malware)
c. Physical Security (Mantrap, CCTV, Cable protection in Data centers, Lock Pickers, in- person security for data centers, Defense-in-depth)
d. Cloud Security (Identity and Access Management -Azure, AWS, GCP, Microsoft Defender for cloud, AWS Security Hub, Single sign-on)
e. System Security (buffer overflow, secure code analysis, port security, host security)

Application Security – OWASP Top 10 2021.

Task 2: Deploy an Open-source Linux Distribution (Ubuntu) in a Virtual Box and configure virtual networking to it. Also, install common tools like – Nmap, Wireshark, tcpdump, macchanger, Burpsuite, JohnTheRipper.

Task 3: Understand the usage of nmap and perform a ping sweep in your LAN with nmap and output verbosely to normal, XML formats. – Disable port scan.

Task 4: Perform a port scan (SYN, CONNECT, ACK, NULL, FIN, XMAS) on scanme.nmap.org domain and identify what ports and services including OS detection and output to normal and XML formats.

Task 5: Demonstrate TCP three-way handshake with Wireshark

Task 6: Sniff traffic with Wireshark and apply some filters based on IP address and protocols

Task 7: Know the usage of tcpdump and use it show the ICMP live traffic.

Task 8: Create a new Linux user and Perform a Password less authentication for newly created user and know how SSH works.

Task 9: Crack common password Hashes with John The Ripper with RockYou wordlist.

Task 10: Create a Linux Bash Script to get a hash signature (MD5, SHA1, SHA256, SHA512) for any given file for maintaining Integrity.

Task 11: Know about NIC and MAC Address. Change the MAC Address of your NIC to some random, custom, and vendor specific.

Task 12: Develop a small PHP webapp (no database required) and intercept the webapp

traffic with Burp Suite. Webapp Requirement:

- A HTML File having login form.
- A PHP File handling authentication of HTML login form.
- Dummy Username and Password can be used.

Supplementary Coding Tasks

Using any programming language of your choice, implement the following:

- Classic Encryption Techniques such as Caesar cipher, Playfair cipher, Hill cipher and other techniques
- Encryption algorithms - DES, AES, RSA, ECC
- Hashing algorithms - MD5, SHA-1
- Digital Signature standard

TEXT BOOKS

[1] William Stalligs, Cryptography and Network Security: Principles and Practice. 5th & 7th ed, Pearson Education, 2017.
[2] J. Katz and Y. Lindell, "Introduction to Modern Cryptography", CRC Press, 2008

REFERENCE BOOKS

[1] Cryptography and Network Security: ForouzanMukhopadhyay, McGraw Hill, 2nd Edition
[2] Network Security and Cryptography, Bernard Menezes, CENGAGE Learning
[3] Cryptography & Network Security, AtulKahate, McGraw Hill

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] nptelonlinecourse.com,"Cryptography and network Security", 2021. [Online]. Available: https://nptel.ac.in/courses/106/105/106105162/ Accessed on 02/12/2021.
[2]cybrary.com, "Cryptography", 2021,
[Online]. Available: https://www.cybrary.it/course/ fundamental-cryptography-data-protection/. Accessed on 02/12/2021

20CS6353
SOFTWARE ENGINEERING LABORATORY

Course Category:	Programme Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0- 0-3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES		**BTL**	**POI**
Upon successful completion of the course, the student will be able to:			
CO1	Compare different software engineering process models.	K1	1.7.1,2.5.1, 2.5.2, 2.6.4,2.7.1
CO2	Analyse the principles of requirement engineering.	K3	1.7.1,2.5.1,2.7.1, 3.5.1,3.5.2,3.5.6
CO3	Create architectural design for a given project.	K3	1.7.1,2.5.1,2.6.4 3.5.1,3.8.1
CO4	Apply different testing techniques	K3	1.7.1,2.5.1,2.6.4, 3.5.1,3.6.2,3.8.2, 4.4.3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**3**												
CO2	**2**	**2**	**3**										**2**	**2**
CO3	**2**	**2**	**3**										**2**	**2**
CO4		**2**	**3**	**2**	**2**								**2**	**2**
Weightage														

TASKS

Task 1: Overview of SDLC: A Study

Task 2: Studying various phases of waterfall model.

Task 3: Estimation of Project Metrics using COCOMO model

Task 4: Identifying the Software Requirement from problem statements

Task 5: Project Planning.

Task 6: Capturing use case and modelling use case diagram for the given problem

Task 7: System modelling.

Task 8: OOA: Identifying Domain Classes from the problem statement and State Transition Diagram.

Task 9: Interaction diagrams: Sequence and collaboration diagrams and Flow of events and activity diagram.

Task 10: Software Design: software architecture and object oriented design.

Task 11: Component and Deployment diagrams.

Task 12: Estimation of test coverage metrics and Structural Complexity.

Task 13: Software Testing.

Task 14: Design Test Suits.

TEXT BOOKS

[1] Roger S. Pressman, Bruce R.Maxim, "Software Engineering a practitioners approach" 8th edition, McGraw-Hill Publication 2019

REFERENCE BOOKS

[1] Ian Somerville, “Software Engineering”. 9th ed, Pearson Education. 2011.
[2] Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, “Fundamentals of Software Engineering”.2 ed, PHI. 2009
[3] RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Lecture Series on Software Engineering by Prof.N.L. Sarda, Prof. Umesh Bellur,Prof.R.K.Joshi and Prof.Shashi Kelkar, Department of Computer Science & Engineering ,IIT Bombay https://nptel.ac.in/courses/106101061/2

[2] Software Engineering By Dr. B. LAVANYA, Assistant Professor| University of Madras
https://onlinecourses.swayam2.ac.in/cec20_cs07/preview.

[3] Software Engineering Basics
https://www.youtube.com/watch?v=sB2iQSvrcG0

20TP6106
QUANTITATIVE APTITUDE

Course Category:	Soft Skills - 4	**Credits:**	1
Course Type:	Learning by doing	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	100 0 100

COURSE OUTCOMES

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

CO1	Effectively organize, summarize and present information in quantitative forms including tables,
CO2	Use mathematical based reasoning and to evaluate alternatives and make decisions
CO3	Think and reason logically and critically in any given situation.
CO4	Apply logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1										3	3			
CO2									3	3	3			
CO3										3	3			
CO4								2		3	3			

COURSE CONTENT

UNIT I

- Number system
- HCF & LCM,
- Average,
- Percentages,
- Profit & Loss

UNIT II

- Ratio & Proportion,
- Partnership,
- Chain Rule,
- Time & Distance,
- Time & Work

UNIT III

- Pipes & Cistern,
- Problems on Trains,
- Problems on boats &Steams,
- Allegation,
- Simple interest and compound interest.

UNIT IV

- Area, Volume and Surface areas,
- Races & Games of skills,
- Calendar & Clock,
- Stocks & Shares,
- Permutations & Combination, Probability.

METHODOLOGY

Learning Resources: Quantitative Aptitude by R.S..Aggarwal

20CS6554
MINI PROJECT - I

Course Category:	Internship/Project	**Credits:**	1
Course Type:	Project	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

1. Formulate Domain Analysis, Elaboration through Modeling and Implementation through state of the art technology available.
2. Develop generic and modular programs that includes Handling exceptionalcases in providing reliable solutions
3. Testing and verification of programs for different scenarios
4. Conclude findings through oral presentations
5. Prepare proper documentation consisting of Software Requirements Specification (SRS), Modeling Techniques, Development Strategies, Implementation and Testing Strategies. Student may use any Design Methodologies such as SSAD, OOAD and UML
6. Builds the spirit of team work in design process.7.Become proficient in the programming languages

20MC6107B
INNOVATION, IPR & ENTREPRENEURSHIP

Course Category:	Mandatory Course	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2-0-0
Prerequisites:		**Continuous Evaluation:**	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES	**BTL**	**POI**
Upon successful completion of the course, the student will be able to:		
CO1		
CO2		
CO3		
CO4		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1														
CO2														
CO3														
CO4														
Weightage														

Course Content
TEXT BOOKS
REFERENCE BOOKS
E-RESOURCES AND OTHER DIGITAL MATERIAL