

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
ACCREDITED BY NAAC WITH 'A' GRADE
Marching Beyond 30 Years Successfully

B.Tech - IT
Cloud and Mobile Based Application Development

Curriculum and Syllabus

Regulation 2022

Based on Choice Based Credit System (CBCS)
&
Outcome Based Education (OBE)

Effective from the Academic year 2022 – 2023

Department of Computer Science and Engineering
School of Engineering

VISION AND MISSION OF THE DEPARTMENT

Vision

To develop a knowledge hub for Computer Science Engineers and Technocrats in application of their competence for the betterment of the Individual, Industry and Society.

Mission

- To nurture the students to be industry ready by providing a strong conceptual foundation and by enhancing their employability and entrepreneurial skills.
- To provide holistic growth by conducting relevant enrichment programs, which includes curricular, co-curricular, extra-curricular and extension activities.
- To inculcate innovation and creativity through practically viable Internships and Project works.
- To create a research oriented mindset and focus in fulfilling growing demands of the society through mentoring and lifelong learning.

Program Educational Objectives (PEOs)

- **PEO1**: To adopt a systematic approach to design, develop, implement and innovate integrated systems that include people,technology,information and resources.

- **PEO2**: To apply principles and practices in information technology to solve multiple real world problems.

- **PEO3**: To become Entrepreneurs or Employees of reputed Organizations or pursue Higher Education for better adaptability.

- **PEO4**: To accomplish any tasks with ethical values and commitment to meet the Social needs.

PROGRAMME SPECIFIC OUTCOME (PSO)

- **PSO1:** An expert with an aptitude and competence to analyses design, model, develop test and manage information systems to offer customized solutions.

- **PSO2**: A professional with learning abilities to face upcoming challenges in the field of Information Technology.

PROGRAM OUTCOMES (PO)

PO 1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: **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.

PO 4: **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.

PO 5: **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 limitations.

PO 6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi disciplinary settings.

PO 10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Competencies and Performance Indicators			
PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering Specialisation for the solution of complex engineering problems.			
1.1	Demonstrate competence in mathematical modelling	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
		1.1.2	Apply the concepts of probability, statistics and queuing theory in modeling of computer-based system, data and network protocols.
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of computer science and engineering to solve an engineering problem
PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Evaluate problem statements and identifies objectives
		2.1.2	Identify processes/modules/algorithms of a computer-based system and parameters to solve a problem
		2.1.3	Identify mathematical algorithmic knowledge that applies to a given problem
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe the computer-based system into interconnected subsystems
		2.2.2	Identify functionalities and computing resources.
		2.2.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
		2.2.4	Compare and contrast alternative solution/methods to select the best methods
		2.2.5	Compare and contrast alternative solution processes to select the best process.
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
		2.3.2	Identify design constraints for required performance criteria.
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applies engineering mathematics to implement the solution.
		2.4.2	Analyze and interpret the results using contemporary tools.
		2.4.3	Identify the limitations of the solution and sources/causes.
		2.4.1	Arrive at conclusions with respect to the objectives.
PO 3: 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 public health and safety, and cultural, societal,and environmental considerations.			
3.1	Demonstrate an ability	3.5.1	Able to define a precise problem statement

	to define a complex/ open-ended problem in engineering terms		with objectives and scope
		3.1.2	Able to identify and document system requirements from stake- holders
		3.1.3	Able to review state-of-the-art literature to synthesize system requirements.
		3.1.4	Able to choose appropriate quality attributes as defined by ISO/IEC/IEEE standard
		3.1.5	Explore and synthesize system requirements from larger social and professional
		3.1.6	Able to develop software requirement specifications (SRS).
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Able to explore design alternatives.
		3.2.2	Able to produce a variety of potential design solutions suited to meet functional requirements.
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions.
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Able to perform systematic evaluation of the degree to which several design concepts meet the criteria.
		3.3.2	Consult with domain experts and stakeholders to select candidate engineering
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Able to refine architecture design into a detailed design within the existing constraints.
		3.4.2	Able to implement and integrate the modules.
		3.4.3	Able to verify the functionalities and validate the design.
PO 4: 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.			
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purposes of investigation, its scope and importance
		4.1.2	Able to choose appropriate procedure/algorithm, dataset and test cases.
		4.1.3	Able to choose appropriate hardware/software tools to conduct the experiment.
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data
		4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2	Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
		5.2.2	Demonstrate proficiency in using discipline-specific tools
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources
		5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.			
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at the global, regional and local level
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.			
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts.	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity
		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability
7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify tenets of the ASME professional code of ethics
		8.2.2	Examine and apply moral & ethical principles to known case studies
PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			

9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
9.2	Demonstrate effective individual and team operations-- communication, problemsolving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills
		9.2.2	Treat other team members respectfully
		9.2.3	Listen to other members
		9.2.4	Maintain composure in difficult situations
9.6	Demonstrate success in a team-based project	9.6.1	Present results as a team, with smooth integration of contributions from all individual efforts
PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions			
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents
		10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation
PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.			
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity
		11.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering project
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
		11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget.
PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			

12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
		12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information
		12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.
PSO 1: An expert with an aptitude and competence to analyse, design, model, develop, test and manage information systems to offer customized solutions.			
13.1	Ability to investigate complex problems	13.1.1	Identify problem statements and develop smart solutions for real time applications
		13.1.2	Investigate all the probable solutions towards the identified problem
13.2	Design and Develop solutions systematically	13.2.1	Specify the design tools that may help in finding the solution
		13.2.2	Systematically evaluate and idenfyiy the testing strategies to develop an optimal solution
		13.2.3	Implement a customized solution for the problem
PSO 2: A professional with learning abilities to face upcoming challenges in the field of Information Technology.			
14.1	Develop cost benefit solutions using engineering principles and practices	14.1.1	Describe the rationale for choosing solutions based on engineering principles
		14.1.2	Conduct feasibility and cost-benefit analysis for implementing the solution
14.2	Ability to understand and develop solutions in the field of Information Technology	14.2.1	Identify the problem and develop an appropriate solution
		14.2.2	Develop an innovative solution with ethics in IT sector

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

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SCHOOL OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Panel members for Board of studies meeting are listed below

S. No	Name of the BoS Member	Designation	Institute / Industry
Internal Members			
1	**Dr. R. Anandan**	Professor & Head Department of Computer Science and Engineering Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Chairman
2	**Dr. S. Arun**	Director, IQAC Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
3	**Dr. R. A. Karthika**	Associate Professor Department of Computer Science and Engineering Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
4	**Dr. A. Rajesh**	Associate Professor Department of Computer Science and Engineering Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
5	**Dr. K. Kalaivani**	Assistant Professor Department of Computer Science and Engineering Vels Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
External Expert Members			
1	**Dr. Asnath Victy Phamila Y**	Associate Professor School of Computer Science and Engineering Vellore Institute of Technology - VIT Chennai	Academic Expert
2	**Mr. Santhosh Gopynadhan**	Senior Director Optum Global Solutions (India) Private Limited, Chennai	Industrial Expert
Student Member			
1	**Mr. Pavan Srivatsav**	Project Associate Cognizant Technology Solutions, Chennai	Alumni

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

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SCHOOL OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CREDIT DISTRIBUTION

B.Tech IT Cloud and Mobile based Application Development										
Credits Per Semester										
S.No	**Course Category**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total Credits**
1	**HSC**		3	2	2	2	2			11
2	**BSC**	8	8	4	7					27
3	**ESC**	6	7	4						21
4	**PCC**	4		13	15	15	11	4		58
5	**PEC**					3	7	7	3	20
6	**OEC**					3	3	6	6	18
7	**Project**							5	10	15
8	**MC**									0
	TOTAL	**18**	**18**	**23**	**24**	**23**	**23**	**22**	**19**	**170**

HSC	Humanities and Social Science Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
EEC	Employability Enhancement Courses
MC	Mandatory Courses

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES

(MINIMUM CREDITS TO BE EARNED: 170)

B.Tech IT Cloud and Mobile based Application Development (Regulation 2021-22)								
Category	**Course Title**	**Lecture**	**Tutorial**	**Practical**	**Credits**	**CA**	**SEE**	**Total**
SEMESTER 1								
BSC	Engineering Chemistry	3	-	-	3	40	60	100
BSC	Mathematics I(Calculus and Linear Algebra)	3	1	-	4	40	60	100
PCC	Software Foundation and Programming I	3	-	-	3	40	60	100
ESC	Basics of Civil and Mechanical Engineering	3	-	-	3	40	60	100
ESC (Blended)	Workshop and Manufacturing Practices	1	-	4	3	40	60	100
BSC	Chemistry Laboratory	-	-	2	1	40	60	100
PCC (Practical)	Software Foundation and Programming I Laboratory	-	-	2	1	40	60	100
MC	Student Induction Program	-	-	-	-	-	-	-
MC	Universal Human Values	2	-	-	-			100
		15	**1**	**8**	**18**			
SEMESTER II								
HSC	English	2	-	-	2	40	60	100
BSC	Physics (Semiconductor)	3	-	-	3	40	60	100
BSC	Mathematics II (Probability and Statistics)	3	1	-	4	40	60	100
PCC	Software Foundation and Programming II	3	-	-	3	40	60	100
ESC (Blended)	Engineering Graphics and Design	1	-	4	3	40	60	100
HSC	English Laboratory	-	-	2	1	40	60	100

BSC	Physics Laboratory	-	-	2	1	40	60	100
PCC (Practical)	Software Foundation and Programming II Laboratory	-	-	2	1	40	60	100
MC	Constitution of India	2	-	-	-			100
		14	**1**	**10**	**18**			
SEMESTER III								
BSC	Mathematics III (Fourier series and Transforms)	3	1	-	4	40	60	100
ESC	Digital Electronics	3	-	-	3	40	60	100
PCC	Operating Systems	3	-	-	3	40	60	100
PCC	Data Structures and Algorithms	3	1	-	4	40	60	100
PCC (Blended)	Essentials of Object Oriented Programming using Java	3	-	2	4	40	60	100
PCC (Practical)	Operating Systems Laboratory	-	-	2	1	40	60	100
PCC (Practical)	Data Structures and Algorithm Laboratory	-	-	2	1	40	60	100
HSC	Personality Development I	2	-	-	2	40	60	100
MC	Basic Life Skills	2	-	-	-			100
		19	**2**	**6**	**22**			
SEMESTER IV								
BSC	Mathematics IV(Random Process and Queuing Theory)	3	1	-	4	40	60	100
PCC	Computer Organization and Architecture	3	-	-	3	40	60	100
PCC	DBMS,MYSQL and SQLITE	3	-	-	3	40	60	100
PCC	Python Programming	3	-	-	3	40	60	100
PCC (Blended)	Introduction to AI and ML	3	-	2	4	40	60	100

PCC (Practical)	DBMS,MYSQL and SQLITE LAB	-	-	2	1	40	60	100
PCC (Practical)	Python Programming Lab	-	-	2	1	40	60	100
HSC	Personality Development II	2	-	-	2	40	60	100
BSC	Environmental Science and Engineering	3	-	-	3	40	60	100
MC	Gender Institution And Society	2	-	-	-			100
		22	**1**	**6**	**24**			
SEMESTER V								
PCC	Computer Networks	3	-	-	3	40	60	100
PCC	Business Intelligence Using Cognos	3	-	-	3	40	60	100
PEC	Professional Elective Course I	3	-	-	3	40	60	100
OEC (Technical)	Open Elective Course - I	3	-	-	3	40	60	100
PCC (Blended)	Fundamentals of Block chain and Use Cases	3	-	2	4	40	60	100
PCC (Practical)	Computer Networks Lab	-	-	2	1	40	60	100
PCC	Machine Learning using Watson Studio	3	-	-	3	40	60	100
HSC	Personality Development III	2	-	-	2	40	60	100
PCC	Industrial Training/ Mini Project/ MOOC Course	-	-	4	2	40	60	100
PCC (Practical)	Fundamentals of Requirement Analysis & Management	-	-	2	1	40	60	100
		20	**0**	**10**	**25**			
SEMESTER VI								
PCC	Foundation Course in Cloud Computing	3	-	-	3	40	60	100
PCC	Artificial Intelligence Analyst	3	-	-	3	40	60	100
PEC	Professional Elective Course - II	3	-	-	3	40	60	100

PEC (Blended)	Professional Elective Course - III	3	-	2	4	40	60	100
OEC (Technical)	Open Elective Course - II	3	-	-	3	40	60	100
PCC (Practical)	Cloud Computing Lab	-	-	2	1	40	60	100
PCC (Practical)	Artificial Intelligence Analyst Lab	-	-	2	1	40	60	100
HSC	Pesonality Development - IV	2	-	-	2	40	60	100
PCC	Summer Internship (4 weeks)	-	-	4	2			100
		17	**0**	**10**	**22**			
SEMESTER VII								
PCC	Micro services Architecture and Implementation	3	1	-	4	40	60	100
PCC	Design Thinking, Agile, Devops	3	-	-	3	40	60	100
OEC(Tech/ Manag)	Open Elective Course - III	3	-	-	3	40	60	100
PEC	Professional Elective Course - IV	3	-	-	3	40	60	100
PEC (Blended)	Professional Elective Course - V	3	-	2	4	40	60	100
PCC (Practical)	Design Thinking, Agile, Devops Lab	-	-	2	1	40	60	100
Project	Project Phase I	-	-	10	5	40	60	100
		15	**1**	**14**	**23**			
SEMESTER VIII								
PEC	Professional Elective Course - VI	3	-	-	3	40	60	100
OEC (Technical)	Open Elective Course -IV	3	-	-	3	40	60	100
OEC (Tec/Man)	Open Elective Course - V	3	-	-	3	40	60	100
Project	Project Phase II	-	-	20	10	40	60	100
		9	**0**	**20**	**19**			

LIST OF ALL BASIC SCIENCE COURSES

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
BSC - 01	Physics(Semi Conductor)	3	-	-	**3**
BSC - 02	Mathematics I (Calculus and Linear Algebra)	3	1	-	4
BSC - 03	Physics Laboratory	-	-	2	1
BSC - 04	Engineering Chemistry	3	-	-	3
BSC - 05	Mathematics II (Probability and Statistics)	3	1	-	4
BSC - 06	Chemistry Laboratory	-	-	2	1
BSC - 07	Mathematics III (Fourier Series and Transforms)	3	1	-	4
BSC - 08	Environmental Science and Engineering	3	-	-	3
BSC - 09	Mathematics IV(Random Process and Queuing Theory)	3	1	-	4

LIST OF ALL HUMANITIES AND SOCIAL SCIENCES COURSES

Code No	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
HSC-01	English	2	-	-	2
HSC-02	English Laboratory	-	-	2	1
HSC-03	Personality Development I	2	-	-	2
HSC-04	Personality Development II	2	-	-	2
HSC-05	Personality Development III	2	-	-	2
HSC-06	Personality Development IV	2	-	-	2

LIST OF ALL ENGINEERING SCIENCE COURSES

Code No	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
ESC-01	Engineering Graphics and Design	1	-	4	3
ESC-02	Basics of Civil and Mechanical Engineering	3	-	-	3
ESC-03	Workshop and Manufacturing Practices	1	-	4	3

LIST OF ALL PROFESSIONAL ELECTIVE COURSES

Code No	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
PEC-01	Applied Cryptography	3	-	-	3
PEC-02	Big-Data Programming	3	-	-	3
PEC-03	Cloud Computing	3	-	-	3

PEC-04	Cryptography and Network Security	3	-	-	3
PEC-05	Cyber Forensics	3	-	-	3
PEC-06	Data Warehousing and Data Mining	3	-	-	3
PEC-07	Digital Image Processing	3	-	-	3
PEC-08	E-Commerce	3	-	-	3
PEC-09	Ethical Hacking	3	-	-	3
PEC-10	Information Retrieval	3	-	-	3
PEC-11	Object Oriented Analysis and Design	3	-	-	3
PEC-12	Soft Computing	3	-	-	3
PEC-13	Software Engineering	3	-	-	3
PEC-14	Software Project Management	3	-	-	3
PEC-15	Software Quality Assurance	3	-	-	3
PEC-16	Software Testing	3	-	-	3
PEC-17	System Software	3	-	-	3
PEC-18	User Interface Design	3	-	-	3
PEC-19	Virtual Reality	3	-	-	3
PEC-20	Agile Methodologies	3	-	-	3
PEC-21	Information Security	3	-	-	3
PEC-22	Software Defined Networks	3	-	-	3
PEC-23	Block Chain Technologies	3	-	-	3
PEC-24	Natural Language Processing	3	-	-	3
PEC-25	Applications of AI	3	-	-	3
PEC-26	Information Security Analysis and Audit	3	-	-	3
PEC-27	Intelligent Database System	3	-	-	3
PEC-28	Recommender Systems	3	-	-	3
PEC-29	Text and Speech Analysis	3	-	-	3
PEC-30	Business Analytics	3	-	-	3
PEC-31	Image and Video Analysis	3	-	-	3
PEC-32	Computer Vision	3	-	-	3

LIST OF ALL MANDATORY COURSES

Code No	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
MC	Constitution of India	2	-	-	-
MC	Basic Life Skills	2	-	-	2
MC	Universal Human Values	2	-	-	-
MC	Gender Institution and Society	2	-	-	-

LIST OF ALL OPEN ELECTIVE COURSES

Code No.	Course	Hours / Week			
		Lecture	Tutorial	Practical	Credits
OEC– 01	Data Exploration and Visualization	3	0	0	3
OEC– 02	Big Data Analytics	3	0	0	3
OEC– 03	Python for Data Science	3	0	0	3
OEC– 04	NOSQL Database	3	0	0	3
OEC– 05	Game Programming	3	0	0	3
OEC– 06	Robotics and its applications	3	0	0	3
OEC– 07	Concepts of Virtual and Augmented Reality	3	0	0	3
OEC– 08	Embedded System for Internet of Things	3	0	0	3
OEC– 09	Embedded Systems	3	0	0	3
OEC– 10	Engineering Economics	3	0	0	3
OEC– 11	Fundamentals of Nano Science	3	0	0	3
OEC– 12	Geographical Information Systems	3	0	0	3
OEC– 13	High Speed Networks	3	0	0	3
OEC– 14	Intellectual Property Rights	3	0	0	3
OEC– 15	Mobile Ad-hoc Networks	3	0	0	3
OEC– 16	Neural Networks	3	0	0	3
OEC– 17	Operations Research	3	0	0	3
OEC– 18	Optical Networks	3	0	0	3
OEC– 19	Personal Computer Systems	3	0	0	3
OEC– 20	Principles of Management & Professional Ethics	3	0	0	3
OEC– 21	Remote Sensing	3	0	0	3
OEC– 22	Robotics	3	0	0	3
OEC– 23	Satellite Communication	3	0	0	3
OEC– 24	Total Quality Management	3	0	0	3
OEC– 25	Wireless Sensor Networks	3	0	0	3
OEC– 26	Development of iot based applications	3	0	0	3
OEC– 27	Fundamentals of Enterprise Apps Development for Cloud	3	0	0	3

BSC	**Engineering Chemistry**	**3**	**0**	**0**	**3**

Course objective

- To learn about the molecular orbitals, ionic interactions, and periodic properties.
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states, and electro-negativity.
- List major chemical reactions that are used in the synthesis of molecules.

UNIT I Atomic and molecular structure, Intermolecular and potential energy surfaces 9

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene, benzene, and aromaticity. Valence Bond Theory and the energy level diagrams for transition metalions and their magnetic properties. Iovan derdipolar and vanDer Waals interactions, potential energy surfaces of H_3, H_2F and HCN.

UNIT II Spectroscopic techniques and applications 9

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational, rotational spectroscopy of diatomic molecules, Morse equations , and Mossbauer spectroscopy. Applications. Diffraction and scattering

UNIT III Use of free energy in chemical equilibria 9

Thermodynamic functions: energy, entropy, free energy, and fugacity. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction, and solubility equilibria. Water chemistry. Corrosion.

UNIT IV Periodic properties 9

Variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, diagonal relationship, anomalous behavior of Lithium, carbon and Nitrogen, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

UNIT V Organic reactions and synthesis of a drug molecule 9

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization, Coupling reaction and ring openings. Synthesis of a commonly used drug molecule.

TOTAL: 45 hours

Text Books

T1: Chemistry: Principles and Applications, by M. J. Sienko and R.Plane.
T2: Fundamentals of Molecular Spectroscopy, by C. N.Banwell.
T3: Engineering Chemistry (NPTELWeb-book), by B.L.Tembe, Kamaluddin and M.S.Krishnan.

Reference Books

R1: Physical Chemistry, by P.W.Atkins.

R2: Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore,5th Edition - http://bcs.whfreeman.com/vollhardtschore5e/default.asp.

R3: University chemistry, by B.H.Mahan.

Web Links:

1. https://opentextbc.ca/chemistry/chapter/10-1-intermolecular-forces/
2. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf
3. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Thermodynamics/Chemical_Energetics/Free_Energy d_Equilibrium
4. https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements
5. https://www.bcebhagalpur.ac.in/wp-content/uploads/2020/03/Organic-Reactions-Synthesis-of-Drug-Molecule.pdf

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1: Analyze microscopic chemistry in erms of atomic and molecular or bitals and intermolecular forces

CO2: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

CO3: Analyze bulk properties and processes using thermodynamic considerations.

CO4: Classify the properties and reactivity of different types of elements based on the periodic table.

CO5: Apply the basic terms involved in an Organic reactions and synthesis of a drug molecule.

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemesterExams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration /Presentation**
			✓	✓

BSC	**Mathematics-I (Calculus and Linear Algebra)**	**3**	**1**	**0**	**4**

Course Objectives

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus andlinear algebra.
It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well in tackling more advanced level of mathematics and applications that they would find useful in their disciplines

Unit-I: Calculus (12hours)

Rolle's theorem-Mean value theorems-Taylor's and Maclaurin theorems -Indeterminate forms and L'Hospital's rule-Curvature-radius of curvature–Evolutes and envelopes.

Unit-II: Multivariable Calculus (12hours)

Limits-continuity- partial derivative – total derivative – maxima and minima- saddle points-method of Lagrange multipliers

Unit-III: Sequence and series (12hours)

Convergence of sequence and series–test for convergence-power series–Comparison test test, D'Alembert's test and Leibnitz's test

Unit-IV: Matrices (12hours)

Introduction to Matrices- Rank of a matrix- Linear systems of equations-symmetric- skew symmetric matrix and orthogonal matrices-Eigen values and Eigen vectors Diagonalization of matrices- Cayley-Hamilton theorem and orthogonal transformation.

Unit-V: Vector spaces (12hours)

VectorSpace-linear Independence and dependence of vectors, basis, dimension-Linear transformations (maps), range and kernel of a linear map, rank and nullity- Inner product spaces-Gram-Schmidt Orthogonalization.

TotalHours: 60

Text books:

1. G.B.Thomas and , R.L.Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
2. Ramana B.V, Higher Engineering Mathematics, TataMcGraw Hill New Delhi,11, Reprint,2010
3. N.P.Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Reference books:

1. P.Sivaramakrishna Das and C.Vijayakumari, Mathematics-I, First Edition, Pearson India Education Services Pvt. Ltd.
2. Erwinkreyszig, Advanced Engineering Mathematics,9 Edition, JohnWiley & Sons,2006.
3. VeerarajanT., Engineering Mathematics for first year,TataMcGraw-Hill,NewDelhi,2008.

4. D.Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition,2010.

Course Outcome

CO1:	Apply the concept of differential calculus and to evaluate the curvature, radius of Curvature and envelope	**K3**
CO2:	Understand the concept of limits, continuity and to evaluate derivatives	**K2**
CO3:	Analyze the convergence of the series using root test, D'Alembert'stest, Leibnitz'stest	**K3**
CO4:	Determine the rank of a matrix, linear system of Equation, and Eigen values and Eigenvectors	**K3**
CO5:	Evaluate the linear independence and dependence of vectors, linear transformations and inner Product space.	**K4**

Mapping of Program outcomes with course outcomes

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

Assessment Methods:

CAT1	**CAT2**	**ModelExam**	**End SemesterExams**	**Assignments**
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration /Presentation**

PCC	SOFTWARE FOUNDATION AND PROGRAMMING I	3	0	0	3

Course Objective:

• This course provides conceptual and foundational knowledge of the Fundamentals of technologies in the context of software and programming.

• For a conceptual understanding of History of Computing, including programming and the Open Source concepts.

- The course includes enough hands on exercises for the students to be glued on to it.

UNIT I INTRODUCTION TO OPEN SOURCE PARADIGM 9

Brief History of Computing - Art and Science of Programming - Open Standards, Open Source, and IBM - What is an Open Standard - Open Standards Model - Industries needing standards - The Impact of Standards - Open Source Software - Open Source - Open Source Technology - The OPEN Proposition

UNIT II INTRODUCTION TO LINUX 9

What is Linux - Background of Linux - Why is Linux so popular - What can you do with Linux - Linux Distributions - Linux Technology Center - Future of Linux.

UNIT III INTRODUCTION TO EMERGING AREAS OF TECHNOLOGY 9

Cloud Computing – Pros and Cons of Cloud computing – Case study - Business Analytics – Need for Analytics – Mobile Apps Development – Social Business - Information Security.

UNIT IV INDUSTRY USAGE OF COMPUTER PROGRAMMING 9

Industry Session on C Programming - Background of C- Getting Started with C- Constructs- Loops & Arrays- Functions- Pointers- User Defined Types- Binary I/O With Structures..

UNIT V FILE HANDLING 9

File Handling in C – Stream File – Text File functions – Binary File functions – File System functions – Command Line Parameters – File Handling Programs.

TOTAL : 45 h + 30 h (Lab)

TEXT BOOK:

1. IBM Career Education IBM CE – Software Foundation and Programming 1, IBM Student Course Material

Course Outcome:

Course Outcome	Description	Knowledge Level
CO1	Analyze the need of Open Source Standards and its impact in industries	K4
CO2	Analyze the advantages and limitations of Linux.	K4
CO3	Understand the emerging areas of technology like cloud, data analytics and mobile app development	K2
CO4	Create programming code for various applications using C language	K5
CO5	Implement the various file operations in C	K3

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO 1	3	3	3	3	3	2	0	1	2	3	2	3	3	2
CO 2	3	3	3	3	3	2	0	1	2	3	2	3	3	2
CO 3	3	3	3	3	3	2	0	1	2	3	2	3	3	2
CO 4	3	3	3	3	3	2	0	1	2	3	2	3	3	2
CO 5	2	3	3	3	3	2	0	1	2	3	2	3	3	2
Av g	2.8	3	3	3	3	2	0	1	2	3	2	3	3	2

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**
•	•	•	•	•
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			•	•

ESC	BASIC CIVIL AND MECHANICAL ENGINEERING	3	0	0	3

Course Objectives :

- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for Construction.
- To provide an insight to the essentials of components of a building and the infrastructure Facilities.
- To explain the component of power plant units and detailed explanation to IC engines their Working principles.
- To explain the Refrigeration & Air-conditioning system.

UNIT I PART A: OVERVIEW OF CIVIL ENGINEERING (5 hours)

Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

UNIT I PART B: OVERVIEW OF MECHANICAL ENGINEERING (4 hours)

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the Welfare of Society –Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile, and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.

UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS (9 hours)

Surveying: Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours. Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building components (brief discussion only)

UNIT III BUILDING COMPONENTS AND INFRASTRUCTURE (9 hours)

Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering. Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS (9 hours)

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four-stroke and two-stroke engines. Working principle of boilers turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM (9 hours)

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Properties of air - water mixture, concepts of psychometric and its process.

TOTAL: 45 PERIODS

Course Outcomes:

CO1	Understanding profession of Civil and Mechanical engineering.	K2
CO2	Summarise the planning of building, infrastructure and working of Machineries.	K2
CO3	Apply the knowledge gained in respective discipline	K3
CO4	Illustrate the ideas of Civil and Mechanical Engineering applications.	K2
CO5	Appraise the material, Structures, machines and energy.	K3

TEXT BOOKS:

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill

Education; First edition, 2018

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
2. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
4. Shantha Kumar SRJ., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.

Web Links:

1. https://nptel.ac.in/courses/105106201
2. https://geekztrainerblog.wordpress.com/basic-civil-and-mechanical-engineering/

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	1	2	2	2	2	-	-	-	-	-	-	2	1
CO2	1	2	2	3	3	3	-	-	-	-	-	-	3	2
CO3	1	2	2	3	3	3	-	-	-	-	-	-	3	2
CO4	1	2	2	3	3	3	-	-	-	-	-	-	2	3
CO5	2	3	2	2	3	2	-	-	-	-	-	-	2	3
	1.2	2	2	2.6	2.8	2.6	-	-	-	-	-	-	2.4	2.2

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemesterExams	Observation
		□	□	□
Record	**MCQ**	**Projects**	**Viva**	**Demonstration /Presentation**
□			□	□

ESC (Blended)	**WORKSHOP AND MANUFACTURING PRACTICES**	**1**	**0**	**4**	**3**

GROUP A– MECHANICAL AND CIVIL ENGINEERING PRACTICES

COURSE OBJECTIVE:

- To study bench fitting drawings for making male and female fittings as per the given dimensions and Tolerances.
- To study Arc welding drawings for making common weld joints as per the given dimensions.
- To study sheet metal development drawings for making common metalparts/components as per the given dimensions.

MECHANICAL ENGINEERING PRACTICE

1. Welding

To make singleV, butt, lap and Tfillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.

2. Basic Machining

To make Simple Turning and Taper turning in the lathe.

3. Fitting Work

To make square, hexagonal, V joint in bench fitting as per the given dimensions and Tolerances.

4. Sheet Metal Work

To make simple Cubical blocks, Rectangular trays in sheet metal with the jigsasper the given dimensions.

CIVIL ENGINEERING PRACTICE

a. **Buildings :** Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

b. Plumbing Works : Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in house hold fittings.

c. Basic pipe connections–Mixed pipe material connection–Pipe connections with different joining components.

TOTAL: 60 Hours

Course Outcomes

CO1:	Understand the various type of workshop machines and practices in Manufacturing	**K2**
CO2:	Develop operating skills in different workshop machines	**K3**
CO3:	Develop simple objects and illustrations based on the dimensions	**K3**
CO4:	Measure the parameters and features of the workshop and manufacturing Machines	**K5**
CO5:	Demonstrate the complete functioning and process of the workshop machines	**K2**

Mapping of Program outcomes with course outcomes

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

AssessmentMethods:

CAT1	**CAT2**	**Model Exam**	**End SemesterExams**	**Assignments**
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**
				✓

BSC	**CHEMISTRY LABORATORY**	**0**	**0**	**2**	**1**

Course Objectives

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.
- The students will learn to:
  - Estimate rate constants of reactions from concentration of reactants/products as a function of time.
  - Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
  - Synthesize a small drug molecule.

Experiments

1. Determination of the rate constant of are action.
2. Determination of the partition coefficient of a substance between two immiscible liquids.
3. Determination of surface tension and viscosity.
4. Thin layer chromatography.
5. Determination of chloride content in water.
6. Determinationofcellconstantandconductanceof solutions.
7. Synthesis of a polymer/drug.
8. Determination of saponification/acid value of an oil.
9. Determination of redox potentials and emf by Potentio metric method.
10. Estimate the adsorption of acetic acid by charcoal.

Text Books

T1: S.Sundaram andK.Raghavan"PracticalChemistry",S.Viswanathan.Co.3rdedition2011.
T2: Gnanaprakasam, Ramamurthy,"OrganicChemistryLabManual" S.Viswanathan Pvt. Ltd. 3rdedition2011.

Reference Books

R1: Vogel's–"Text book of qualitative organic Analysis", Longmann,12thedition,2011
R2: J.N.Gurtu and R.Kapoor " Advanced experimental Chemistry", S.Chandand Co.6th edition,2010.

Web Links

1. https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:kinetics/x2eef969c74e0d802:introduction-to-rate-law/v/experimental- determination-of-rate-laws
2. https://www.youtube.com/watch?v=qdmKGskCyh8
3. https://www.youtube.com/watch?v=7_6_dKlo67k

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1: Estimate the rate constants of reactions and partition coefficient of immiscible liquids.
CO2: Find the viscosity and to test the purity of the compound.
CO3: Estimate the amount of chlorine content present in drinking water and to know the conductance of a solution.

CO4: Develop a small drug molecule and to know the saponification of an oil.
CO5: Find out the unknown element by Potentiometric method and to remove some of the toxic chemical by charcoal method.

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemesterExams	Observation
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstratio/ Presentation**
✓			✓	✓

PCC (Practical)	**SOFTWARE FOUNDATION AND PROGRAMMING LABORATORY - I**	**0**	**0**	**2**	**1**

Course Objectives:

- The course will focus on using a teacher-student interactive and decision-oriented learning exercises.
- For the active learning mode in the course to be effective, participating in class discussions is extremely important along with self paced learning to clear the concepts of software.
- In addition to the lectures, discussions and demonstrations, students would be required to work on sample applications and exercises.

List of Experiments

1. Write a Program to calculate and display the volume of a CUBE having its height (h=10cm), width (w=12cm) and depth (8cm).

2. Write a program to take input of name, rollno and marks obtained by a student in 4 subjects of 100 marks each and display the name, rollno with percentage score secured.

3.Write a program to print whether a given number is even or odd.

4.Write a program to compute grade of students using if else adder. The grades are assigned as followed:

Marks	Grade
marks<50	F
50≤marks< 60	C
60≤marks<70	B
70≤marks<80	B+
80≤marks<90	A
90≤mars≤ 100	A+

5.Write a program to find whether a character is consonant or vowel using switch statement.

6.Write two programs to print positive integers from 1 to 10. Using while and for loop.

7.Write a program to display the following pattern.
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5

8. Write a C program to find both the largest and smallest number in a list of integers.

9. Write a program to store information of 5 students in structure and display it.

10. Write a C Program to print the multiplication table for the number given by the user.

11. Write a C Program to implement call by value using functions.

MC	**UNIVERSAL HUMAN VALUES : UNDERSTANDING HARMONY**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- 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.

UNIT II Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), 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 indetail, Programsto ensure Sanyam andHealth

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

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to worldfamily!.

UNIT IV Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

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 (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT V 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, technologies and management models, 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.

Course Outcome:

On completion of this course, the students will be able to

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, Human Values and Professional Ethics Excel Books, New Delhi, 2010

References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.

HSC	ENGLISH	2	0	0	2

Course Objective:

- To acquire ability to speak effectively in real life situations.
- To write letters and reports effectively informal and business situations.
- To develop listening skills for academic and professional purposes.
- To gain effective speaking and listening skills in communication.
- To develop the soft skills and interpersonal skills to excel in their career.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment procedures.

UNIT I VOCABULARY BUILDING **08**

General Vocabulary–Nouns—Compound nouns , Synonyms, Antonyms, Prefixes and Suffixes,Homonyms, Homographs and Homophones, Changing words from one form to another, Acronyms and Abbreviations.-Instructions.

UNIT II BASIC WRITING **08**

Sentence structures –Kinds of sentences, Types of sentences, Clauses and Phrases, Punctuations, Blending and Clipping, Framing questions- Yes/No types and "Wh" questions, Summarizing, Precise writing, Paragraph Writing.

UNIT III IDENTIFYING COMMON ERRORS IN ENGLISH **08**

Articles, Prepositions, Subject-verb Agreement, Pronouns - Relative pronouns, Demonstrative pronouns, MisplacedModifiers, Redundancies, Clichés, Infinitives& Gerund,Checklist.

UNIT IV NATURE AND STYLE OF SENSIBLE WRITING **08**

Situational Dialogues, Process description, Definitions ,Numerical Expressions, Recommendation, Information Transfer- Flowchart Barchart and Piechart, Writing introduction and conclusion.

UNIT V WRITING PRACTICES **08**

Active voice and Passive voice, Making negative sentences, Tenses, Letter Writing-Formal & Informal Letters ,Report Writing- Letter Report, Accident Report, Investigation Report and Survey, Essay writing, Reading Comprehension Passages.

TOTAL - 40 HOURS

Text Books:

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt.Ltd, Chennai: 2012.
2. Department of Humanities and Social Sciences, Anna University, ' English for Engineers and Technologists' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt.Ltd., 2006.
3. Department of English, AnnaUniversity, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.

Reference Books:

(i) Practical English Usage.Michael Swan.OUP.1995.
(ii) Remedial English Grammar. F.T.Wood. Macmillan.2007
(iii) On Writing Well. William Zinsser.Harper Resource Book.2001

(iv) Study Writing. LizHamp-Lyons and BenHeasly. Cambridge University Press. 2006.
(v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press.2011.
(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Web links:

- https://ehlion.com/magazine/technical-english/
- https://www.kkcl.org.uk/pdf/KKCL_Technical_English_for_Engineers_Brochure.pdf

Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO 1: Improve the language proficiency of a technical under-graduate in English with emphasison Learn, Speak, Read and Write skills.

CO 2: Develop listening skills for academic and professional purposes.

CO 3: Acquire the ability to speak effectively in English in real life situations

CO 4: Provide learning environment to practice listening, speaking, reading and writing skills.

CO 5: Variety of self-instructional modes of language learning and develop learner autonomy.

Mapping of Program outcomes with course outcomes

CO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	-	-	-	-	2	2	-	2	3	3	3	3	2	-
CO 2	-	-	-	-	2	2	-	2	3	3	3	3	2	-
CO 3	-	-	-	-	-	-	2	-	1	1	1	1	2	-
CO 4	-	-	-	-	2	1	3	1	-	-	-	-	2	-
CO 5	-	1	2	2	2	2	-	2	3	3	3	3	2	-
Average		1	2	2	2	1.75	2.5	1.75	2.5	2.5	2.5	2.5	2	-

Assessment Methods:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**

BSC	Physics (Semi Conductor)	3	0	0	3

Course Objectives

- To learn the basics of electronic materials, semiconducting materials and their interaction with light, new engineered semiconductor devices.
- To apply these fundamental principles to solve practical problems related to materials used for engineering applications.

UNIT I Electronic materials 9

Energy bands in solids -Types of electronic materials: metals - semiconductors and insulators - Direct and indirect band gaps- Free electron theory-electrical conductivity and thermal conductivity-Fermi distribution-Effect of temperature on Fermi function–Density of energy states-Kronig-Penny model-E-k diagram.

UNIT II Semiconductors 9

Intrinsic semiconductor-carrier concentration derivation–Variation of Fermienergy level with temperature –extrinsic semiconductors–derivation-carrier concentration in n type and p type semiconductor–Variation of Fermi energy level with temperature and impurity concentration.

UNIT III Light-semiconductor interaction 9

Optical transitions in bulk semiconductors: absorption-spontaneous emission and stimulated emission- Einstein's coefficient- derivation –Photo voltaic effect –Solar cells –principle and working -excitons

UNIT IV Semiconductor devicesandMeasurements 9

Semiconductor diodes: construction and working–PN diode–Zener diode–Light Emitting Diode(LED)–
Measurements : UV-Vis spectroscopy –Hall effect –Determination of Hall coefficient–Applications.

UNIT V Engineered semiconductor materials 9

Shape Memory Alloys (SMA) – Characteristics, Properties of Ni-Ti alloy - Applications - SemiconductorNanomaterials: Synthesis, properties and applications of nanophase materials – Quantum confinement –Quantum nano structures:quantum dots- quantum wires - quantumwells.

TOTAL: 45 hours

Textbooks:

T1: Rajendran V, and Marikani A, 'Materials Science'Tata McGraw Hill publications, NewDelhi,2011.
T2: Vijaya,M .and RangarajanG,'MaterialsScience'TataMcGraw Hill publications , NewDelhi2006.
T3: Dr.ManiP, 'Atextbook of EngineeringPhysics– II'Shri DhanamPublilsher, Chennai2016
T4: Murugeshan R, Kiruthiga Sivaprasath,'Modern Physics' S ChandPublisher2016

Reference Books:

R1: S.M.Sze, Semiconductor Devices: Physics and Technology, Wiley(2008).
R2: Charles Kittel 'Introduction to Solid State Physics', John Wiley and sons, 7th edition, Singapore 2008.

R3: KasapS.O,"Principles of Electronic Materials",3rdedition, McGraw Hill Higher Education,2005.
R4: PradeepT,"A textbook of Nano science and Nano technology", McGraw Hill Higher Education,
2012.
R5: PalanisamyP.K, 'Materials Science', Sci tech publications, Chennai,2007.
R6: J. Singh, Semi conductor Opto electronics: Physics and Technology, McGraw-Hill Inc. (1995).R7: P.Bhattacharya, Semiconductor Opto electronic Devices, Prentice HallofIndia (1997).

Web Links:

1. https://nptel.ac.in/courses/115102026/2
2. https://nptel.ac.in/courses/115102026/15
3. http://textofvideo.nptel.ac.in/115102026/lec18.pdf
4. https://nptel.ac.in/courses/122103010/34
5. http://orbit.dtu.dk/files/4817236/petersen.pdf

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1: Analyze the behavior of free electrons in conducting materials.
CO2: Analyze the type of semi conducting materials and their applications.
CO3: Identify thedirect andindirectbandgapsemiconductors.
CO4: Demonstrate the construction and working of various semiconductor devices.
CO5: Develop the design and fabrication of quantum nano structures.

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	3	3	-	-	-	-	-	-	3	-	3	3
CO5	-	3	3	3	-	-	-	-	-	-	3	-	-	2
AVG	**3.00**	**2.60**	**2.25**	**3.00**	-	-	-	-	-	-	3	-	**2.25**	**2.50**

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration /Presentation**
			✓	✓

BSC	**Mathematics-II (Probability and Statistics)**	**3**	**1**	**0**	**4**

Course Objective:

The objective of this course is to familiarize the students with statistical techniques.It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

UNIT I : Basic Probability (12)

Introduction to Probability-Conditional probability–Baye's Theorem-Random Variables-Discrete random variables- Continuous Random Variables– Probability mass function-Probability density function.

UNIT II: Standard Distributions (12)

Introduction to theoretical distribution-Discrete Distributions- Binomial, Poisson, Geometric Distributions- Continuous Distribution-Uniform, Normal, Exponential and Gamma distribution-Properties.

UNIT III : Correlation and Regression Analysis (12)

Correlation: Types of Correlation - Methods of studying correlation –Scatter diagram method, Karl Pearson's Coefficient of correlation, Spearman's Rank Correlation Coefficient. Regression: Regression Lines and Regression equations-simple problems

UNIT IV: Basic Statistics (12)

Introduction- Measures of Central tendency: Mean, Median and Mode- Measure of Dispersion- Range, Mean deviation- Standard Deviation and coefficient of variation

UNIT V: Sampling (12)

Introduction to small sample – t-test- Single mean, difference of means, and Paired t-test- F-test-Chi-square test for goodness off it and independence of attributes.

Total Hours: 60

Course Outcome :

CO1: Apply the fundamental concepts of probability.
CO2: Understand of standard distributions which can describe real life phenomenon.
CO3: Understand and criticallydiscuss the issues surrounding ofcorrelation and Regression
CO4: Evaluate the underlying assumptions of analysis tools of measures of central tendency
CO5: Analyze the uses and limitations of Testing of hypothesis used in engineering

Text Books :

1. N.P. Bali and Manish Goyal, A text book of engineering mathematics, laxmi publications, reprint, 2014(NinthEdition)

2. S.P.Gupta, Statistical Methods. Sultan Chand & Sons,NewDelhi
3. S.C.GuptaandV.K.Kapoor, Fundamentals of Applied Statistics, Sultan Chand &Sons,3rd Edition, 2001.
4. S.Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics , 9thEdition, John Wiley &Sons,2006.
2. P.G.Hoel, S.C.Port and C.J.Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
3. W.Feller, An Introduction to Probability Theory and its Applications, Vol.1, 3rdEd., Wiley, 1968.
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

PCC	**Software Foundation and Programming II**	**3**	**0**	**0**	**3**

Course Objectives:

- This course provides conceptual and practical knowledge of the Fundamentals of technologies in the context of building enterprise web based applications.
- The contents of this course will ensure that a student interest in the subject is well founded and sows a seed for a conceptual understanding of software and computing practices of current generation.
- This course provides knowledge on open source software PHP, XML, Eclipse.

UNIT I INTRODUCTION TO PROGRAMMING LANGUAGES 9

Art and Science of Programming - Introduction to OOPS - Introduction to C++ - Conditional Programming Constructs

UNIT II CLASSES AND OBJECTS 9

Essentials of Programming (Classes, Objects) - Features of C++ - Inheritance, Polymorphism& Encapsulation - Operator Overloading - I/O in C++ - Friend Function

UNIT III FILE HANDLING 9

File Handling - Template Functions - Template Classes - Exception Handling - Information Management

UNIT IV XML 9

XML Basics, Document type definitions (DTDs), XML namespaces, XML schema, XPath, XSL transformation

UNIT V INTRODUCTION TO ECLIPSE 9

Introduction to Integrated Development Environment – Eclipse, Java Development Tools - Debugging Applications - The Eclipse Architecture - Eclipse Web Tools Platform Project 1.0 - Software in Real World: The IBM Canvas and their Applications

TOTAL : 45h

TEXT BOOK:

1. IBM Career Education IBM CE – Software Foundation and Programming II(with C++), IBM Student Course Material.

Course Outcome:

Course Outcome	Description	Knowledge Level
CO1	Write simple code in open source paradigm like PHP, Ruby, Rails	K4
CO2	Understand XML and related technologies	K3
CO3	Describe Eclipse Architecture, Terms and Concepts	K4
CO4	Identify and analyze Big Data applications	K3
CO5	Find the need of mobility and Cloud Based Applications Development	K6

Mapping of Program outcomes with course outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	0	0	2	0	2	0	0	0	0	0	1	-
CO2	3	2	1	1	3	1	3	3	0	0	0	0	2	-
CO3	3	2	1	1	3	1	3	3	0	0	0	0	2	-
CO4	3	2	1	1	3	1	3	3	0	0	0	0	2	-
CO5	3	2	1	1	3	1	3	3	0	0	0	0	2	-

Assessment Methods:

CAT 1	CAT 2	Model Exam	End Semester Exams	Observations
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration/ Presentation**
✓		✓	✓	✓

ESC (Blended)	**ENGINEERING GRAPHICS AND DESIGN**	**1**	**0**	**4**	**3**

COURSE OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments– BIS conventions and specifications–Size, layout and folding of drawing sheets–Lettering and dimensioning.

UNIT I INTRODUCTION TO ENGINEERING DRAWING AND PLANE CURVES 12

Curves used in engineering practices: Conics – Construction of ellipse, Parabola andhyperbola byeccentricity method – Construction of cycloid, Epicycloid, Hypocycloid – construction of involutes ofsquad and circle – Drawing of tangents and normal to the above curves. Scales – Plain, Diagonal andVernierScales.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 12

Projection of points and straight lines located in the first quadrant–Determination of true lengths and true inclinations–Projection of polygonal surface and circular lamina inclined to both reference planes-Auxiliary Planes.

UNIT III PROJECTION OF SOLIDS 12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method- Auxiliary Views.

UNIT IV PROJECTION OF SECTION OF SOLIDS AND DEVELOPMENT OF SURFACE 12

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference planeand perpendicular to the other – Obtaining true shape of section - Auxiliary Views. Development of lateral surfaces of simple and truncated solids–Prisms, pyramids, cylinders and cones– Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V PROJECTION OF ORTHOGRAPHIC AND ISOMETRIC 12

Free hand sketching: Representation of Three- Dimensional objects – General principles of ortho graphic projection – Need for importance of multiple views and their placement - layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects Principles of isometric projection – isometric scale–isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

TOTAL:60 Hours

TEXTBOOKS:

1. N.D.Bhatt,"EngineeringDrawing"CharotarPublishingHouse,46thEdition,(2003).
2. K.V.Natrajan,"AtextbookofEngineeringGraphics",DhanalakshmiPublishers,Chennai(2006).

REFERENCES

1. M.S.Kumar,"Engineering Graphics",D.D.Publications,(2007).
2. K.Venugopal &V.PrabhuRaja,"Engineering Graphics",New Age International(P) Limited(2008).
3. M.B.Shahand, B.C.Rana,"Engineering Drawing",PearsonEducation(2005).
4. K.R.Gopalakrishnana,"Engineering Drawing"(Vol.I&II), Subhas Publications(1998).
5. Dhananjay A.Jolhe,"Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
6. Basant Agarwal and AgarwalC.M.,"Engineering Drawing",Tata Mc Graw Hill Publishing Company Limited, New Delhi, (2008).

Course Outcomes

CO1:	Understand the theory of projection able to know and understand the Conventions and the methods of engineering drawing	K2
CO2:	Improve their visualization skills so that they can apply these skills in projection of surfaces	K3
CO3:	Improve their visualization skills so that they can apply these skills in projections of solids	K3
CO4:	Impart and inculcate a proper understanding of the theory of projection. Improve the visualization skills	K3
CO5:	Understand the various concepts like dimensioning, conventioning and standards related to working drawings.	K4

Mapping of Program outcomes with course outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2	2	3	-	-	-	-	-	-	-	3	-
CO 2	3	3	3	2	3	-	-	-	-	-	-	-	3	-
CO 3	3	3	3	2	2	-	-	-	-	-	-	-	3	-
CO 4	3	3	2	2	2	-	-	-	-	-	-	-	3	-
CO 5	3	3	2	2	3	-	-	-	-	-	-	-	3	-

Assessment Methods:

CAT1	CAT2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**
				✓

HSC	**ENGLISH LABORATORY**	**0**	**0**	**2**	**1**

Course Objectives

- To enable the student to explore the knowledge in communication skills.
- To gain knowledge in the process of Placement Interviews, Group Discussions and other recruitment procedures.

List of Experiments **40**

1. Introduction to English sounds
2. Consonants and vowels
3. Syllable and Stress
4. Intonation
5. Communication Skills
6. Summarizing
7. Report Writing
8. Information Transfer
9. Presentation Skills
10. Group Discussion
11. Letter Writing
12. Cover letter and Resume

Text Books:

1. Department of English,Anna University, Mindscapes,'English for Technologists and Engineers', Orient Longman Pvt.Ltd,Chennai:2012.
2. M.Ashraf Rizvi," Effective Technical Communication",TataMcGraw-Hill Publishing Company Limited,New Delhi.2009.

Reference Books:

1. Practical English Usage.Michael Swan.OUP.1995.
2. Communication Skills.Sanjay Kumar and Pushp Lata.Oxford University Press.2011.
3. Exercises in Spoken English.Parts.I-III.CIEFL, Hyderabad. Oxford University Press

Web links:

- https://onlinemasters.ohio.edu/blog/engineering-communication/
- https://online.rice.edu/courses/communication-skills-for-engineers-specialization

Course Outcome

CO1 : Distinguish various listening & written contexts for understanding the implied meanings and responding to them accordingly.

CO2 : Use appropriate pronunciation and rhythm of spoken language in oral communication.

CO3 : Draft and interpret the written communication in official contexts like narrative, descriptive, creative, critical and analytical reports.

CO4 : Infer implied meanings of different genres of texts and critically analyze and evaluate them for ideas, as well as formethod of oral presentation.

CO5 : Make use of suitable communicative strategies to express their point of views convincingly in any type of discussions, negotiation and conversations.

Mapping of Program outcomes with course outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	0	0	2	0	2	0	0	0	0	0	1	-
CO2	3	2	1	1	3	1	3	3	0	0	0	0	2	-
CO3	3	2	1	1	3	1	3	3	0	0	0	0	2	-
CO4	3	2	1	1	3	1	3	3	0	0	0	0	2	-
CO5	3	2	1	1	3	1	3	3	0	0	0	0	2	-

Assessment Methods:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Observations**
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration/ Presentation**
✓		✓	✓	✓

BSC	**PHYSICS LABORATORY**	**0**	**0**	**2**	**1**

Course Objectives

- To enable the student to explore the field of Mechanics of Solids and Properties of Matter.
- To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Experiments

1. Determination of Rigidity Modulus–Torsional pendulum
2. Determination of wave length and particle size using laser
3. Ultrasonic Inter ferometer
4. Determination of band gap of a semiconductor material
5. Hooke's law– Determination of spring constant
6. Determination of Young's Modulus–Uniform Bending
7. Determination of Young's Modulus–Non Uniform Bending
8. Determination of Viscosity of a liquid -Poiseuille's method
9. Spectrometer– Grating
10. Deflection Magnetometer –TanA position
11. Deflection Magnetometer –TanB position
12. Potentiometer-Calibration of low range Voltmeter

Text Books:

T1: C.C.Ouseph, U.J.Rao, V.Vjiayendran, Practical Physics, 1st Edition, 2015.

T2: Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.

Reference Books:

R1: G.L.Squires, Practical Physics, 4th Edition,Cambridge University Press,2001.

R2: D.Chattopadhyay, P.C.Rakshit, B.Saha,"An Advanced Course in Practical Physics",2nded.,Books& AlliedLtd.,Calcutta,1990.

Web Links:

2. http://amrita.olabs.edu.in/?sub=1&brch=5&sim=155&cnt=2
3. https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1509&cnt=4

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1**:** Measure the wavelength and particle size of semiconductor diode laser.

CO2: Analyze the coefficient of viscosity of a liquid.

CO3: Estimate the band gap energy of given semiconductor material.

CO4: Determine the compressibility of the liquid using ultrasonic interferometer.

CO5: Measure the Young's modulus of the given solid materials.

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	2	3	3	-	-	-	3	-	3	-	3	2
CO2	-	-	-	2	2	-	-	-	3	-	3	-	3	3
CO3	-	-	3	3	3	-	-	-	3	-	3	-	3	2
CO4	-	-	-	3	3	-	-	-	3	-	3	-	3	3
CO5	-	-	3	3	3	-	-	-	3	-	3	-	3	2
Average	-	-	2.66	2.80	2.80	-	-	-	3.00	-	3.00	-	3.00	2.40

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Observation
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration /Presentation**
✓			✓	✓

PCC (Practical)	**SOFTWARE FOUNDATION AND PROGRAMMING LAB II**	**0**	**0**	**2**	**1**

Course Objectives:

- This course provides conceptual and practical knowledge of the Fundamentals of technologies in the context of building enterprise web based applications.
- The contents of this course will ensure that a student interest in the subject is well founded and sows a seed for a conceptual understanding of software and computing practices of current generation.
- This course provides knowledge on open source software PHP, XML, Eclipse.

List of Experiments

1. Write the C++ program on based on the If else condition.
2. Write a C++ program on based on the For-loop concept using break statement.
3. Write the C++ program on based on the Simple If condition.
4. Write the C++ program on based on the do-while loop concept.
5. Write the C++ program on based on the While loop concept using continue statement
6. Write a program to print whether a given number is even or odd.
7. Write the C++ program on based on the Switch condition
8. Write the C++ program on based on the Multiple Inheritance concept.
9. Write the C++ program on based on the Multilevel Inheritance Concept.
10. Write the C++ program on based on the Encapsulation concept.

MC	**CONSTITUTION OF INDIA**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

- The purpose of the course is to acquaint the students with basic principles of the Constitution of India and its working.
- To help students be familiar with the historical and significant aspects of the constitution of India.
- To make students aware of their fundamental duties andrights.
- To know about central and state government functionalities in India.

UNIT I NATURE, OBJECT AND SCOPE OF THE CONSTITUTION 6

Nature, object and scope of Constitutional Law and Constitutionalism–Historical Perspective of the Constitution of India–Salient Features and Characteristics of Constitutionof India.

UNIT II FUNDAMENTAL RIGHTS 6

Nature and scope of Fundamental Rights – Scheme of Fundamental Rights – Right to Equality – Right toFreedom of Speech and Expression – Right to Life – Right against Exploitation – Right to Religious Freedom –Minority Rights.

UNIT III DIRECTIVE PRINCIPLES OF STATE POLICY AND DUTIES 6

Directive Principles of State Policy –Importance and Implementation–Scheme of Fundamental Duties and its Legal Status.

UNIT IV FEDERAL STRUCTURE 6

Federal Structure–Distribution of Legislative and Financial Powers between the Union and the States–Parliamentary Form of Government in India–Constituent Powers and Status of the President of India.

UNIT V AMENDMENT AND EMERGENCY PROVISIONS 6

Amendment of the Constitution – Procedure – Historical Perspective of the Constitutional Amendments in India – Emergency Provisions – National Emergency – President Rule – Financial Emergency – Local Self Government–Constitutional Scheme in India.

TOTAL: 30 hours

COURSEOUTCOME:

At the end of this course the students will be able to,

CO1 : Elaborate the constitution of India and its salient features.

CO2: Know the fundamental rights and duties.

CO3: Discuss the Parliamentary Form of Government in India.

CO4: Recognize the Directive Principles of State Policy.

CO5: Understand and abide the rules of the Indian constitution and to appreciate different culture among the people.

TEXT BOOKS:

1. V.N.Shukla, Constitutional Law of India
2. D.D.Basu,Commentary on the Constitution of India
3. J.N.Pandey,Constitution of India
4. Durga Das Basu,"Introduction to the Constitution of India",Prentice Hall of India,NewDelhi.
5. R.C.Agarwal,(1997)"Indian Political System",S.Chandand Company,New Delhi.
6. Maciver and Page,"Society: An Introduction Analysis", Mac Milan India Ltd., NewDelhi.
7. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, NewDelhi.

REFERENCES BOOKS:

1. V.D.Mahajan,Constitutional Law of India
2. H.M.Seervai,Constitution of India
3. Sharma,Brij Kishore,"Introductionto the Constitution of India:,Prentice Hall of India,NewDelhi.
4. U.R.Gahai,"Indian Political System",New Academic Publishing House, Jalaendhar.
5. R.N.Sharma,"Indian Social Problems",Media Promoters and Publishers Pvt.Ltd.

BSC	Mathematics-III (Fourier series and Transforms)	3	1	0	4

Course Objective:

This course aims to provide the students to study Fourier Transforms and some concepts of infiniteFourier Sine and Cosine transforms, finite Fourier Sine and Cosine transforms and applications to solve someinfinite and boundary value problems using finite and infinite transforms.

UNIT I FOURIER SERIES 12

Dirichlet's conditions – Fourier series–Odd and even functions–Half range sine series– Half range cosine series–Complex form of Fourier Series-Parseval'sidentity–Harmonic Analysis.

UNIT II FOURIER TRANSFORM 12

Fourier integral theorem (without proof) – Fourier transform pair – Fourier Sine andCosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval'sidentity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations - singular integrals- Solutions of standard types of first orderpartial differential equations – Lagrange's linear equation - Linear partial differential equations of secondandhigher orderwithconstant coefficientsof homogeneousfunctions.

UNIT IV APPLICATIONSOFPARTIALDIFFERENTIAL EQUATIONS 12

Classification PDE-Method of separation of variables–One dimensional wave equation and One dimensional heat equation of heat conduction – Steady state solution of two-dimensional heat equation of heat conduction (square plate only).

UNIT V Z-TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform–Introduction-properties–InverseZ-transform(using partial fraction and residues)–Convolution theorem - Formation of difference equations – Solution of difference equations using Z-transform.

Total Hours:60

TEXT BOOKS:

1. Grewal.B.S,"Higher Engineering Mathematics", Khanna Publications, Delhi, 43rdEdition,2013.
2. RamanaB.V,"Higher Engineering Mathematics",Tata McGraw Hill Publishing Company,New Delhi,6th reprint,2008.
3. SivaramakrishnaDas.P &Vijayakumari.C , A Textbook of Engineering Mathematics-III

REFERENCE BOOKS:

1. Bali.N.P. and Manish Goyal' A Text book of Engineering Mathematics', Laxmi Publications,9thedition,2011.
2. Erwin Kreyszig,"Advanced Engineering Mathematics",WileyIndia,9thEdition,2011.
3. GlynJames,"Advanced Modern Engineering Mathematics",Pearson Education,3rd Edition,2012.

Course Outcome:

At the end of the course the students will be able to

CO1: Develop Fourier series for different types of functions.
CO2: Acquaint the student with Fourier Transform techniques used in wide variety of situations.
CO3: Introduce the basic concepts of Partial differential equations for solving standard Partial differential equations
CO4: Analyze the student with Fourier series techniques in solving heat flow problems used in various situations.
CO5: Understand the z-transforms and its properties

Mapping of Program out comes with course outcomes

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

Assessment Methods:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration /Presentation**

ESC	**DIGITAL ELECTRONICS**	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions

To introduce the methods for simplifying Boolean expressions

To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits

To introduce the concept of memories and programmable logic devices.

UNIT I LOGIC GATES, BOOLEAN ALGEBRA AND MINIMIZATION TECHNIQUES 9

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De-Morgan's Theorem, Minimum of Boolean Expressions, Minterm, Maxterm, Sum of Products (SOP) & Product of Sums (POS) forms, Canonical forms, Karnaugh maps, Quine McCluskey method of minimization

UNIT II COMBINATIONAL LOGIC DESIGN 9

Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Adder/ Subtractor, Code Converters, Magnitude Comparator, Multiplexer, Demultiplexer, Encoder, Decoder.

UNIT III SEQUENTIAL LOGIC DESIGN 9

Flip Flop design: SR, JK, D and T Flip Flop, Realization of Flip flops, Counters: Modulo N Counter, UP/DOWN Counter, Ripple Counter, Ring Counter, Shift registers- SISO, SIPO, PIPO, PISO, Races, Hazards.

UNIT IV MEMORIES, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES 9

Memories: ROM, PROM, EPROM, EEPROM, RAM, Static RAM cell, Bipolar RAM cell, MOSFET RAM cell, Dynamic RAM CELL. Programmable logic devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Array (FPGA).

UNIT V VHDL CONCEPTS IN DIGITAL DESIGN 9

Design entry: Different modeling styles in VHDL, Dataflow, Behavioral and Structural Modeling, VHDL constructs and codes for combinational and sequential circuits.

TOTAL: 45 h

COURSE OUTCOME:

At the end of this course the students will be able to,

CO1:	Examine the laws of Boolean algebra and Simplify minterms and maxterms using K map and tabulation methods.	K4
CO2:	Analyze combinational logic circuits like adders, subtractors, multiplexers and Demultiplexers.	K4
CO3:	Distinguish the operations of SR,JK,T and D flip-flops.	K4

CO4:	Criticize the different types of memories and their designs.	K5
CO5:	Compile VHDL codes to design combinational and sequential circuits.	K6

TEXT BOOKS:

T1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
T2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
T3. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

WEBLINKS:

1. www.tutorialspoint.com/digital_electronics/index.asp
2. www.coertvonk.com/hw/logic/synchronous-sequential-logic-30712

REFERENCE BOOKS:

R1. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.
R2. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989.
R3. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition2012.
R4. Donald D. Givone, Digital Principles and Design, Tata McGraw–Hill Education, 2002.

CO/PO MAPPING:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO1**	**PSO 2**
CO1	2	2	2	2	-	-	-	-	-	-	2	2	2	2
CO2	2	2	2	2	-	-	-	-	-	-	2	2	2	2
CO3	1	3	3	2	-	-	-	-	-	-	2	2	2	2
CO4	2	2	2	2	-	-	-	-	-	-	1	2	2	2
CO5	3	2	2	2	-	-	-	-	-	-	1	2	2	2

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓				✓

PCC	**OPERATING SYSTEMS**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the features of operating system and its role in managing various system resources.
- To learn the Structure and functions of OS, Process scheduling, Deadlocks, Device management, Memory management and File systems

UNIT I PROCESSES AND THREADS 9

Introduction to operating systems– review of computer organization– operating system structures– System calls– system programs – system structure – virtual machines. Processes: Process concept– Process scheduling – Operations on processes – Cooperating processes –Inter process communication- Communication in client-server systems. Threads: Multi- threading models–Threading issues.

UNIT II PROCESS SCHEDULING AND SYNCHRONIZATIO 9

CPU Scheduling: Scheduling criteria– Scheduling algorithms–Multiple-processor scheduling– Real Time scheduling– Algorithm Evaluation.Process Synchronization: The critical-section problem–Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions –Monitors. Deadlock: System model – Deadlock characterization – Methods for handling deadlocks –Deadlock prevention–Deadlock avoidance–Deadlock detection– Recovery from deadlock.

UNIT III STORAGE MANAGEMENT 9

Memory Management: Background – Swapping – Contiguous memory allocation – Paging– Segmentation – Segmentation with paging. Virtual Memory: Background– Demand paging– Process creation–Page replacement–Allocation of frames –Thrashing.

UNIT IV FILE SYSTEMS 9

File-System Interface: File concept– Access methods – Directory structure–File system mounting–Protection. File System Implementation: Directory implementation –Allocation methods– Free-space management–efficiency and performance– recovery– log- structured file systems.

UNIT V I/O SYSTEMS 9

I/O Systems–I/O Hardware–Application I/O interface–kernel I/O subsystem–streams– performance. Mass storage Structure : Disk scheduling – Disk management–Swap-space management – RAID– disk attachment –stable storage–tertiary storage.

TOTAL : 45hours

Text Books:

T1: Silbers chatz, Galvin, and Gagne, "Operating System Concepts", Sixth Edition, Wiley India Pvt Ltd,2003

T2:Andrew S. Tanenbaum,"Modern Operating Systems",Second Edition,Pearson Education,2004

Reference Books:

R1: Andrew S. Tanenbaum," Modern Operating Systems",Second Edition,Pearson Education,2004

R2: Gary Nutt,"Operating Systems", Third Edition,Pearson Education,2004

Web Links:

1. https://www.tutorialspoint.com/operating_system/index.html
2. https://onlinecourses.nptel.ac.in/noc21_cs44/preview

COURSE OUTCOMES

CO1:	Understand the concept of operating system structures, system calls, system Programs and build user programs based on it	K2,K6
CO2:	Compare the performance of various CPU scheduling algorithms	K4
CO3:	Compare and contrast various memory management schemes	K4
CO4:	Use allocation methods to allocate disk space to the files	K3
CO5:	Evaluate the various file and disk management strategies	K5

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO3**	**PO 4**	**PO5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	2	2	1	2	0	0	0	0	0	0	0	0	2	3
CO2	3	2	3	3	3	0	0	0	0	0	0	0	0	3
CO3	3	1	3	2	3	0	0	0	0	0	0	0	3	1
CO4	3	3	3	3	3	0	0	0	0	0	0	0	3	1
CO5	1	3	1	3	3	0	0	0	0	0	0	0	3	3
AV G	2.4	2.2	2.2	2.6	2.4	0	0	0	0	0	0	0	2.2	2.2

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**EndSemester Exams**	**Assignments**	**CaseStudies**
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**	**Openbook test**

PCC	DATA STRUCTURES & ALGORITHMS	3	1	0	4

Course Objectives

- To understand the basic concepts of data structures and algorithms.
- To differentiate linear and non-linear data structures and the operations upon them.
- To perform sorting and searching in a given set of data items.
- To comprehend the necessity of time complexity in algorithms.

UNIT I Introduction to Algorithms and Analysis 12

Overview and importance of algorithms and data structures. Fundamentals of algorithm analysis, Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth, Algorithm efficiency – best case, worst case, average case, Analysis of non- recursive and recursive algorithms, Asymptotic analysis for recurrence relation – Recursive Tree Method.

UNIT II Linear Data Structures 12

Array- 1D and 2D array, Stack - Applications of stack: Expression Evaluation - Conversion of Infix to postfix and prefix expression, Tower of Hanoi. Queue - Types of Queues: Circular Queue, Double EndedQueue (deQueue), Applications – Priority Queue using Arrays - List - Singly linked lists – Doubly linked lists - Circular linked lists, Applications -Polynomial Manipulation - Josephus problem(permutation)

UNIT III Sorting and Search Techniques 12

Searching - Linear Search and binary search, Applications - Findingsquare root of 'n'-Longest Common Prefix- Sorting – Insertion sort - Selection sort – Bubble sort – (Counting Sort) - Quick sort- Merge sort, Analysis, Applications - Finding the 'n' closest pair's

UNIT IV Non-linear Data Structures 12

Tree - Terminology, Binary Tree – Terminology and Properties, Tree Traversals, Expression Trees – BinarySearch Trees – operations in BST – insertion, deletion, finding min and max, Applications - Graph – basicdefinition and Terminology – Representation of Graph – Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS) - Minimum Spanning Tree: Prim's, Kruskal's- Single Source Shortest Path: Dijkstra's Algorithm.

UNIT V Hashing, Heaps and Balanced Binary SearchTrees 12

Hash functions, open hashing-separate chaining, closed hashing-linear probing, quadratic probing,double hashing, random probing, rehashing, extendible hashing, Applications - Heaps- Heap sort, Applications-Priority Queue using Heaps- AVL trees–Terminology - basic operations (rotation, insertion and deletion) –Recent trends in algorithms and data structures

TOTAL : 60 hours

Text Books:

1. Thomas H. Cormen,C.E.Leiserson, RL. Rivest and C.Stein, Introduction to Algorithms, Third edition, MIT Press, 2009.
2. MarkA.Weiss, Data Structures & Algorithm Analysis in C++,3rd edition, 2008, PEARSON.

Reference Books:

1. Kurt Mehlhorn, and Peter Sanders– Algorithmsand Data Sturctures,The BasicToolbox, Springer- VerlagBerlin Heidelberg, 2 008.
2. Horowitz, Sahni,and S.Anderson-Freed,"Fundamentals of Data Structures in C", UNIVERSITIES PRESS,Second Edition,2008.

Web Links:

1. https://nptel.ac.in/courses/106102064
2. https://archive.nptel.ac.in/courses/106/106/106106127/

COURSE OUTCOMES

CO1	Understand the fundamental analysis and compute time complexity for a given problem	**K3**
CO2	Articulate linear data structures and perform various operations permitted on them	**K2**
CO3	Design and apply a suitable algorithm for searching and sorting Problems	**K6**
CO4	Develop an algorithm using non-linear datastructures	**K6**
CO5	Understand and apply appropriate hashing techniques to find solutions for practical problems	**K6**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**EndSemesterExams**	**Assignments**
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminar s**	**Demonstratio/ Presentation**
			✓	✓

PCC	**Essentials of Object Oriented programming using Java**	**3**	**1**	**0**	**4**

Course Objectives:

- The course will focus on using a teacher-student interactive and decision-oriented learning.
- For the active learning mode in the course to be effective, participating in class discussions is extremely important along with self paced learning to clear the concepts of software.
- In addition to the lectures, discussions and demonstrations, students would be required to work on sample applications and exercises.

UNIT I OBJECT ORIENTED CONCEPTS 9

Object and Classes in OOP-Command Line arguments-History of the Java Program-Java Evolution-How to develop Java Programs-Encapsulation-Aggregation and Inheritance-Cosmic Class-Polymorphism-Abstract classes and Interfaces

UNIT II JAVA LANGUAGE FUNDAMENTALS 9

Introduction-Eclipse IDE-Datatypes-Variables and Operators-Programming Constructs-Arrays-Single Dimensional Array and Multi Dimensional Array-Java Classes and Objects-Overloading-Static Members-Initialization Blocks

UNIT III JAVA API CLASSES 9

Java Application Programming Interfaces (API)-Wrapper Class-String-String Builder-String Buffer Classes-String class and its functions-Data and Time Class-Exceptions-Checked and Unchecked Exceptions-Custom Exceptions

UNIT IV FILE HANDLING AND MULTI THREADING 9

Introduction-Files and Folder-Stream API and Its Implementation-Serialization-Deserialization-Multithreading-Java threads and its lifecycle-Synchronization-How to Implement Multi thread programs.

UNIT V LAMBDA EXPRESSIONS AND JDBC 9

Introduction to Lamba expressions-Collection Framework-Utility classes-Functional Inference in Java 8-JDBC Concepts-How to implement JDBC Program-JDBC program using Data Access Object (DAO).

TOTAL: 45h

TEXT BOOK:

1. IBM CE – Essentials of Object Oriented Programming Using Java, IBM Student Course Material.

Course Outcome :

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Implement the Concepts of Object Oriented Programming	K3
CO2	Develop the Java Programs using Arrays,Variables and Operators	K4
CO3	Understand the usage of String, String Builder and String Buffer classes	K3
CO4	Implement programs to stream classes to read data from file	K6
CO5	Implement JDBC program using Data Access Object (DAO)	K6

PCC (Practical)	OPERATING SYSTEMS LAB	0	0	2	1

Course Objective:

To practice various system calls and concepts of process management, memory management techniques.

List of Experiments:

1. Study of Linux commands
2. Writing programs using the following system calls of UNIX operating system : fork, exec, getpid, exit, wait, close,stat,opendir,readdir
3. Writing programs using the I/O system calls of UNIX operating system (open,read,write,etc)
4. Writing C programs to simulate UNIX commands like ls,grep,etc.
5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turn around time. (2 sessions).
6. Given the list of processes, their CPU burst times and arrival times, display/print the Ganttchart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turn around time. (2sessions)
7. Developing Application using Inter Process communication (using shared memory,pipes or message queues)
8. Implementation of Producer –Consumer problem using semaphores (using UNIX systemcalls).
9. Implementation of Deadlock avoidance using Banker's algorithm.
10. Implementation of some memory management schemes–I
11. Implementation of some memory management schemes–II
12. Implementation of any file allocation technique (Linked, Indexed or Contiguous)

Text Books:

T1: Silberschatz, Galvin, and Gagne,"Operating System Concepts", Sixth Edition, Wiley India Pvt Ltd, 2003

T2: Andrew S. Tanenbaum,"Modern Operating Systems",Second Edition,Pearson Education,2004

Reference Books:

R1: Andrew S. Tanenbaum,"Modern Operating Systems",Second Edition,Pearson Education,2004

R2: GaryNutt,"Operating Systems",Third Edition,Pearson Education,2004

Web Links:

1. https://www.tutorialspoint.com/operating_system/index.html
2. https://onlinecourses.nptel.ac.in/noc21_cs44/preview

COURSE OUTCOME:

Course Outcome	Description	Knowledge Level
CO1	Implementthe conceptofLinux commands inLinux terminal.	K3
CO2	Developaprogramusingthe system callsofUNIXoperatingsystem	K6
CO3	Analyze the performance of different CPU Scheduling Algorithms for thegiven process	K4
CO4	DevelopApplicationusingInterProcesscommunication.	K6
CO5	SolveDeadlock usingBanker'salgorithm.	K3

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PS O2
CO1	3	2	2	2	0	0	0	0	0	0	0	2	3	2
CO2	2	2	2	2	0	0	0	0	0	0	0	2	3	3
CO3	3	2	2	2	0	0	0	0	0	0	0	2	2	2
CO4	2	2	3	3	0	0	0	0	0	0	0	2	3	2
CO5	2	3	2	3	0	0	0	0	0	0	0	3	1	3
Average	2.4	2.2	2.2	2.4	0	0	0	0	0	0	0	2.2	2.4	2. 4

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemesterExams	Observation
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration /Presentation**
✓			✓	✓

PCC (Practical)	**DATA STRUCTURES AND ALGORITHM LAB**	**0**	**0**	**2**	**1**

Course Objectives

- Understand various datarepresentation techniques in the real world.
- Implement linear and non-lineardata structures.
- Analyze various algorithms based on their time and space complexity.
- Develop real-time applications using suitable data structure.
- Identify suitable data structure to solve various computing problems

Experiments

1. Implementation of Single Linked List operations: (i)Creation (ii)insertion (iii)deletion (iv)traversal
2. Implementation of polynomial expression in memory using single linked list.
3. Implementation of Circular Linked List operations: (i) Creation (ii) insertion (iii) deletion (iv) traversal
4. Implementation of Double Linked List operations: (i)Creation (ii)insertion (iii)deletion (iv)traversal in both ways.
5. Design and implement Stack and its operations using List.
6. Implementationof stack operations:

a. To convert infix expression into postfix expression.

b. To evaluate the postfix expression.

7. Design and implement Queue and its operations using List.
8. Implementation of binary search tree operations: a. Creation of node. b. Traverse the above binary search tree recursively in pre-order, post-order and in-order. c. Count the number of nodes in the binary search tree.
9. Implementation of searching techniques:
   a.Linear search b.Binary search c. Fibonacci search
10. Implementation of sorting techniques to arrange a list of integers in ascending order.a.Bubble sort b.Insertion sort c. Selection sort
11. Implementation of sorting techniques to arrange a list of integers in ascending order.a. Quick sort b. Merge sort
12. Implementation of graph traversal algorithms:a. Depth first search.b. Breadth first search.

Text Books:

T1: M.A. Weiss," Data Structures and Algorithm Analysis in C", third Edition, Pearson Education,2007

T2: A.V.Aho, J.E.Hopcroft, and J.D.Ullman, "Data Structures and Algorithms",Pearson Education, First Edition Reprint 2003.

Reference Books:

R1**:**R.F.Gilberg,B.A.Forouzan,"Data Structures",Second Edition,Thomson India Edition, 2009

Web Links:

1. https://nptel.ac.in/courses/106102064
2. https://onlinecourses.nptel.ac.in/noc22_cs26/preview

COURSE OUTCOMES

At the end of this course the student swill be able to,

CO1**:** Gain skills to design and analyze simple linear and non linear data structures.
CO2: Examine insertion, deletion and modification in singly and doubly linkedlist.
CO3: Construct Stack, Queue in array for which all insertions and deletions are made at both end using various operations
CO4: Apply Insertion, find and deletion operations in Binary Search Tree and Hashing functions.
CO5: Evaluate shortest path in an undirected graph using depth and breadth first algorithms

MAPPING OF COURSE OUT COMESTO PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	2	-	-	-	-	-	-	-	2	3	2
CO2	2	2	2	2	-	-	-	-	-	-	-	2	3	3
CO3	3	2	2	2	-	-	-	-	-	-	-	2	2	2
CO4	2	2	3	3	-	-	-	-	-	-	-	2	3	2
CO5	2	3	2	3	-	-	-	-	-	-	-	3	1	3
Average	**2.4**	**2.2**	**2.2**	**2.4**	-	-	-	-	-	-	-	**2.2**	**2.4**	**2.4**

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Observation**
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration /Presentation**
✓			✓	✓

HSC	PERSONALITY DEVELOPMENT I	2	0	0	2

COURSE OBJECTIVES:

- To nurture and develop winning personalities and eventually leading them to become dynamicandsocially responsible leaders

UNIT I SOFT SKILLS I **6**

Introduction to Personality Development – Meaning – Features of personality – Dimensions of Personality Determinants of Personality– Features and Traits– Components of self concept–Barriers–Self analysis

UNIT II SOFT SKILLS II **6**

Importance of Soft Skills – First impression–Work Place requirements–Discipline – Cleanliness Hygiene –general Appearance—Building Confidence—Concept of Thinking and Usage –Value of Time–Focus & Commitment.

UNIT III SOFT SKILLS IN ACTION **6**

Grooming – Attire – Understanding others– Stability & Maturity Development – Strength s – Weakness –Opportunities–threats–Merits of SWOT Analysis – Components – how to convert weakness into strengths – Goal settings

UNIT IV SELF AWARENESS AND SELF ESTEEM **6**

Definitions–Components of Self awareness–Developing Self awareness – Self esteem–meaning–Steps to improve self esteem.

UNIT V SELF MOTIVATION **6**

Motivation –Meaning–Techniques of self motivation – Motivation & goal setting– Motivation and emotion – Motivation at work.

TOTAL: 30h

TEXT BOOKS:

1. Personality Development And Soft Skills Barun K Mitra, Oxford Publication
2. Seven habits of Highly Effective people–Stephen R. covey

REFERENCE BOOKS:

1. Emotion, motivation and Self regulation – Nathan C. Hall, McGill University, Canada Thomas Goetz,University of Konstanz, Germany http://www.emeraldgrouppublishing.com.
2. Psychology of Self esteem – Nathaniel Branden, Nash (1st edition), Jossey – Bass (32 ndanniversaryedition)

COURSE OUTCOME:

At the end of this course the students will be able to,

CO1:	Discuss the features, dimensions and determinants of personality	**K2**
CO2:	Make a good first impression in professional and other situations	**K3**
CO3:	Demonstrate confidence, punctuality and commitment as an engineer	**K3**
CO4:	Set goals for development using SWOTanalysis	**K5**
CO5:	Develop self-awareness and improve self esteem	**K3**

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemester Exams	Assignments	Case Studies
			✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**	**Openbook test**
✓	✓	✓	✓	✓	

MC	BASIC LIFE SKILLS	2	0	0	0

COURSE OBJECTIVE:

To provide value education to improve the students' character, principle life, Physical health, maintaining youth fulness, measures and methods in five aspects of life.

UNIT I PHYSICAL HEALTH 6

Manavalakalai (SKY) Yoga: Introduction - Education as a means for youth empowerment - Greatness ofEducation Yoga for youth Empowerment. Simplified Physical Exercises: Hand,Leg,Breathing, Eye exercises - Kapalabathi, Makarasana Part I, Makarasana Part II, Body Massage, Acu pressure, Relaxation exercises - Benefits.Yogasanas: Pranamasana – Hastha Uttanasana – Pada Hasthasana – Aswa Sanjalana Asana – Thuvipathaasva Sanjalana asana – Astanga Namaskara - Bhujangasana–Atha Muktha Savasana –AswaSanjalana Asana – Pada Hasthasana– Hastha Uttanasana - Pranamasana.Pranayama: Naddisuddi –Clearance Practice- Benefits.

UNIT II LIFE FORCE 6

Reasons for Diseases - Natural reasons (Genetic / imprints, Planetary Position, Natural calamities and climatic changes) - Unnatural reasons (Food habits, Thoughts, Deeds).Philosophy of Kaya kalpa – Physical body-Sexual vital fluid-Life force-Bio-Magnetism-Mind. Maintaining youth fulness.Postponing old age-Transformation of food into seven components- Importance of sexual vital fluid Measure and methodin five aspects of life - Controlling undue Passion. Kayakalpa practice - Aswini Mudra - Ojas breath –Benefits of KayaKalpa.

UNIT III MENTAL HEALTH 6

Mental Frequencies - Beta, Apha, Theta and Delta wave - Agna Meditation explanation - benefits.Shanthi Meditation explanation–Benefits-Thuriya Meditation explanation–Benefit.Benefits of Blessing-Self blessing(Auto suggestion)-Family blessing-Blessing the others-World blessing- Divine protection

UNIT IV VALUES 6

Human Values Self-control - Self-confidence - Honesty Contentment - Humility – Modesty Tolerance -Adjustment - Sacrifice – ForgivenessPurity (Body, Dress, Environment) - Physical purity - Mental purity -Spiritual puritySocial Values:Non-violence– Service Patriotism – Equality Respect for parents and elders –care and protection- Respect for teacher Punctuality- Time Management.

UNIT V MORALITY (VIRTUES) 6

Importance of Introspection - I - Mine (Ego, Possessiveness).Six Evil Temperaments - Greed - Anger -Miserliness - Immoral sexual passion - Inferiority and superiority Complex – Vengeance.Maneuvering ofSix Temperaments - Contentment - Tolerance - Charity - Chastity - Equality - Pardon (Forgiveness).Five essential Qualities acquired through Meditation: Perspicacity-Magnanimity-Receptivity-Adaptability–Creativity. Improved Memory Power- Success in the Examination.

TOTAL : 30 h

COURSE OUTCOME:

At the end of this course the students will be able to,

CO1: Utilize skills developed through participation in Manavalakalai (SKY) Yoga to help maintainlifelonghealthandfitness.

CO2: Demonstrate foundational standing, sitting, balance postures with proper alignment and Maintain youthfulness through kaya kalpa practice.

CO3: Explore relaxation techniques to observe thoughts and to manage emotions and stress, and reflect on those techniques which are most effective to them.

CO4: Demonstrate an understanding of anatomy and physiology as it applies to the intentional integration of breath, postures, and movement within the practice of yoga to understand the human values.

CO5: Achieve a greater sense of awareness, wisdom, introspection, and a deeper sense of relaxation through meditation to keep up morality in life.

TEXT BOOKS/REFERENCE BOOKS:

1. Vethathiri Maharishi, 16th Edi.2013, Yoga for Modern Age, Vethathiri Publications, Erode.
2. Vethathiri Maharishi, 2014, Simplified Physical Exercises, Vethathiri Publications, Erode.
3. Vethathiri Maharishi, 3rd Edi.2014, Kayakalpam, Vethathiri Publications, Erode.
4. Rev.Dr.G.U.Pope ,2016, Thirukkural, Giri Trading Agency,
5. Vethathiri Maharishi, 1994, Mind, Vethathiri Publications, Erode.
6. Chandrasekaran.K, 1999, Sound Health through yoga, Sedapati, Tamilnadu, Premkalyan Publications.
7. Iyengar,B.K.S.2008,Lighton Yoga,Noida,UP India,Harber Collins Publishing India Ltd.,
8. K.R.Dhanalakshmi and N.S.Raghunathan,"Personality Enrichment, Margham Publications
9. D.r V.M.Selvaraj,"Personality Development "Bhavani Publications
10. R.S.Agarwal,"Quantitative Aptitude".
11. A.K Gupta,"Logical and Analytical Reasoning(English)",30th Edition.

BSC	Mathematics-IV (Random Process & Queuing Theory)	3	1	0	4

Course Objective:

- Tounderstand and conduct computersystems modeling and performanceanalysis.
- To introduce the basic probability tools and concepts this is useful in modeling, such as Markov models and queuing theory.
- To provide necessary mathematical support and confidence to tackle real life problems.
- To provide the required mathematical support to develop probabilistic models which can be used in several areas of science and engineering.

UNIT I CLASSIFICATION OF RANDOM PROCESSES 12

Definition and examples – First order– Second order –Strictly stationary– Wide-sense stationary and ergodic process–Markov process–Poisson and Normal process.

UNIT II QUEUEING THEORY - I 12

Markovian queues– Birth and Death Queuing models – Steady state results –Single server queuing models - (M/M/1) : (∞/FIFO) Model–(M/M/1) : (*k*/FIFO) Model-Characteristics of parameters of models.

UNIT III QUEUEING THEORY - II 12

Multiple server queuing models - Little's Formula – queues with finite waiting rooms-Finite source models- (M/M/C) : (∞/FIFO)Model –Characteristics of parameters of models, (M/M/C) : (k/FIFO)Model–Characteristics of parameters of models.

UNIT IV NON-MARKOVIAN QUEUES 12

Finite source models - M/G/∞ queues – Pollaczek -Khinchine formula - M/G/1:(∞/GD) model as specialcases.

UNIT V QUEUEING NETWORKS 12

Queueing Networks-Classification and Basic Concepts. Open and Closed Networks of M/M/m Type Queues, Jackson's Theorem.

Total hours : 60

TEXT BOOKS:

T1: Gross.D. And Harris C.M,"Fundamentals of Queueing Theory", Wiley Student edition, 2004.

T2: Sivaramakrishna Das. Pand Vijayakumari.C, "Probability & Queueing Theory", Pearson Eduaction Asia, 6th Edition , 2013.

T3: S.Palaniammal, "Probability & Queueing Theory",Eastern Economy Edition,2012.

REFERENCE BOOKS:

R1. A.O.Allen,"Probability, "Statistics and QueueingTheory with Computer Applications",Elsevier,2nd edition, 2005.

R2. G.Balaji," Probability & Queueing Theory",Balaji Publishers, 2018.

R3. T.Veerarajan, Probability Statistics and Random Process,Mc GrawHill, 2018.

Web Links :

1. https://www.youtube.com/watch?v=dSej7AHlim4
2. https://www.youtube.com/watch?v=a3eq_8R8uFY
3. https://www.youtube.com/watch?v=DblXnXxUQc0
4. https://www.youtube.com/watch?v=2aPlzhsEsIw
5. https://www.youtube.com/watch?v=mbYVI-5cPUU

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1:	Demonstrate the problems on Ergodic process, Poisson process and Markovchain.	**K2**
CO2:	Analyze the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.	**K4**
CO3:	Apply M/M/C model with finite and infinite capacity.	**K3**
CO4:	Analyze a network of queues with Poisson external arrivals, exponential service Requirements and independent routing.(Jackson networks)	**K4**
CO5:	Identify various elements of a queuing networks and each of its description	**K3**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1	2	0	0	0	0	0	1	1	2	1
CO2	2	1	1	1	1	0	0	0	0	0	1	0	0	0
CO3	2	2	1	1	1	0	0	0	0	0	1	1	2	1
CO4	2	1	1	1	1	0	0	0	0	0	0	0	1	1
CO5	2	2	1	1	1	0	0	0	0	0	1	1	1	1
	2.2	1.6	1	1	1.2	0	0	0	0	0	0.8	0.6	1.2	0.8

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**EndSemesterExams**	**Assignments**
□	□	□	□	□
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration /Presentation**
			□	□

PCC	**Computer Organization and Architecture**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the architecture of computers and to analyze the perform ance using various addressing modes.
- To familiarize with hierarchical memorys ystem including cache memories and virtual memory.
- To impart knowledge about different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC STRUCTURE OF COMPUTERS 9

Functional units – Basic operational concepts – Bus structures – Performance and metrics – Instructionsand instruction sequencing – Hardware – Software Interface – Instruction set architecture – Addressing modes – RISC – CISC –ALU design – Fixed point and floating point operations : Floating Point Numbers and Operations.

UNIT II BASIC PROCESSING UNIT 9

Some Fundamental concepts – Execution of a complete instruction: Branch instructions – Multiple bus organization – Hardwired control : A Complete Processor–Micro programmed control : Micro instructions – Micro program Sequencing– Wide-Branch Addressing– Micro instructions with next address field– Prefetching and emulation– Nano programming.

UNIT III PIPELINING 9

Basic concepts: Role of Cache Memory – Pipeline Performance – Data Hazards – Instruction Hazards –Influence on Instruction Sets: Addressing modes–Condition Codes– Data path and Control Considerations – Super scalar Operation: Out-of-Order Execution – Execution Completion – Dispatch Operation–Performance Considerations–Exception Handling.

UNIT IV MEMORYSYSTEM 9

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache Memories: Mapping Functions – Replacement Algorithms – Example – Performance Considerations: Interleaving – Hit Rate and Miss Penalty–Caches on the Processor Chip– Virtual Memories–Memory Management Requirements–Associative Memories– Secondary Storage devices.

UNITV I/O ORGANIZATION 9

Accessing I/O devices – Interrupts : Interrupt Hardware – Enabling and Disabling Interrupts – Handling Multiple Devices – Controlling Device Requests – Exceptions – Direct Memory Access: Bus Arbitration –Buses: Synchronous Bus–Asynchronous Bus– Interface circuits: Parallel Port–SerialPort Standard I/O Interfaces(PCI, SCSI, and USB), I/O devices and processors.

TEXT BOOK:

Carl Hamacher, ZvonkoVranesic and SafwatZaky,“Computer Organization”,sixth Edition, Tata McGraw Hill, 2011

REFERENCE BOOKS:

1. William Stallings,"Computer Organization and Architecture–Designing for Performance", Eleventh Edition, Pearson Education,2019.
2. David A. Patterson and JohnL. Hennessy," Computer Organization and Design: The Hardware/Software interface",fifth Edition, Elsevier,2014
3. JohnP.Hayes,"and Organization",Third Edition,Tata McGraw Hill, Computer Architecture2012

Web Links:

1. https://nptel.ac.in/courses/106105163

Course Outcomes:

CO	Description	KL
CO1	Apply the basic features of operational concepts with its functional operations.	K3
CO2	Determine hardware blocks and control lines are used for specific instructions that execute at different operational level.	K5
CO3	Demonstrate the operation like add and multiply integers and floating-point numbers using two's complement and IEEE floating point representation forvarious models.	K5
CO4	Analyze clock periods, performance, and instruction throughput of single-cycle, multi-cycle, and pipelined implementations of a simple instruction set	K4
CO5	Deduct and describe the pipeline hazards and identify possible solutions to those hazards	K5

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3	2	2	0	0	0	0	2	2	3	2
CO2	3	3	3	3	2	2	0	0	0	0	2	2	3	2
CO3	3	3	3	3	2	2	0	0	0	0	2	2	3	2
CO4	3	3	3	3	2	2	0	0	0	0	2	2	3	2
CO5	2	3	3	3	2	2	0	0	0	0	2	2	3	2
AV G	2.8	3	3	3	2	2	0	0	0	0	2	2	3	2

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemesterExams	Assignments
□	□	□	□	□
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstratio/ Presentation**
			□	□

PCC	Python Programming	3	0	0	3

Course Objectives

- To learn the basic concepts of Python
  To create a web application using Django
- To explore GUI Programming in tkinter and PyQT5

UNIT I PYTHON BASICS **9**

Introduction to Python, Python Interpreter and its working, Syntax and Semantics- Data Types: Booleans - Numbers - Lists - Tuples – Set - Dictionaries - Comprehensions - Assignments and Expressions, Control Flow Statements - Functions and lambda expressions

UNIT II PYTHON : ADVANCED FEATURES **9**

Iterations and Comprehensions - Handling text files - Modules, Classes and OOP - Exception Handling -- Strings and Regular Expressions

UNIT III PYTHON WEB FRAMEWORK **9**

Introduction to Frameworks, Full Stack Frameworks vs Micro Frameworks, Installing Django creating an application using Django and project folder structure- URLs and views -Models – Migrating the models-Experimenting with models API - Django Template Engine-Creating an Administration Interface-Users, groups, and permissions - Object relational mapper

UNIT IV GUI PROGRAMMING - tkinter **9**

Introduction to tkinter, Top Level Windows, Dialogs, Message and Entry - Event Handling, Menus, List boxes and Scrollbars, Text - SQL Database interfaces with sqlite3 : Basic operations and table load scripts

UNIT V GUI PROGRAMMING - PyQT5 **9**

Creating a User Interface with Qt Components – Radio button, Checkbox, List. Combo box, Scrollbars, Progress bar- Undestanding dialog-Layout, Displaying tabular data using Table Widget, Database Handling

TOTAL : 45 Hours

Text Books:

T1: Sanjeev Jaiswal Ratan Kumar, “Learning Django Web Development”, Packt Publishing

T2: B.M. Harwani, ” Qt5 Python GUI Programming Cookbook, Packt Publishing

Reference Books:

Allen Downey Think Python, Green Tea Press

Web Links:

- https://simpleisbetterthancomplex.com/series/beginners-guide/1.11/
- https://www.fullstackpython.com/

COURSE OUTCOMES

CO1	Understand the basic concepts of Python	**K1**
CO2	Apply the knowledge to use advanced features of python	**K3**
CO3	Demonstrate the skills to create web application using Django	**K4**
CO4	Ability to apply the programming concepts using tkinter	**K3**
CO5	Build GUI application using PyQT5	**K5**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PS O2**
CO1	3	2	1	1	2	0	0	0	0	0	1	1	2	1
CO2	2	1	1	1	1	0	0	0	0	0	1	0	0	0
CO3	2	2	1	1	1	0	0	0	0	0	1	1	2	1
CO4	2	1	1	1	1	0	0	0	0	0	0	0	1	1
CO5	2	2	1	1	1	0	0	0	0	0	1	1	1	1
	2.2	1.6	1	1	1.2	0	0	0	0	0	0.8	0.6	1.2	0.8

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
√	√	√	√	√	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**	**Open book test**

PCC	**DBMS, MySQL and SQLite**	**3**	**0**	**0**	**3**

Course Objectives

To help the learner in understanding the basics of RDBMS, what are Entities and Relationships, Overview on Normalization, Database Design and Performance Tuning, JDBC and Advanced concept in RDBMS like Database Security and Database backup and Restore.

UNIT I INTRODUCTION 9

Understanding Database Concepts- Tables,Primary Keys and Foreign Keys- Installation of SQLite- Installation of Docker based MySQL-DB2 database- Database normalization- Indexes and how they are used in databases- Configure non-clustered indexes- Configure clustered indexes

UNIT II ENTITIES AND RELATIONSHIPS 9

Entities and Their Attributes- Domains- Basic Data Relationships- Dealing with Many-to-Many Relationships-Relationships and Business Rules- Data Modeling Versus Data Flow-The Relational Data Model- Representing Data Relationships- Views and the Data Dictionary

UNIT III NORMALIZATION 9

Translating an ER Diagram into Relations- Normal Forms and types- Database Design and Performance Tuning- Indexing, Clustering and Partitioning- Creating Database Objects- Understand data definition language (DDL)- Choose appropriate data types- Manipulating Data- Data Manipulation Language (DML)

UNIT IV JDBC AS THE FUNDAMENTAL JAVA API 9

JDBC basics- JPA as the JAVA ORM API-Conversion from JDBC to JPA- Database Security- Sources of Internal & External Security Threats- Database Backup and Restore- Different types of backups- Define a backup and recovery strategy

UNIT V INTRODUCTION OF MYSQL 9

Create Tables- Drop Tables- Insert Query- Select Query- Where Query- Update Query- Delete Query- Like Clause- MySQL Joins

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE -DBMS, MySQL and SQLite, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the database concepts like tables and different keys	K3
CO2	Understand concepts like entities, attributes, data modelling and relationship in RDBMS	K4
CO3	Understand the Database Normalization and all the database normal forms	K3
CO4	Understand on how to create Database and to connect through Java API using Java API	K6
CO5	Understand how to insert, delete, select, update, where, drop, create queries in MySQL Database	K6

PCC (Blended)	**Introduction to AI and ML**	**3**	**0**	**2**	**4**

Course Objectives

- Tounderstand the basics of Machine Learning(ML)
- Able to program in Python ML Packages
- To understand the methods of Machine Learning
- To visualize a data set

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 12

Introduction–Foundations of AI–History of AI–Intelligent agent–Types of agents-Structure of agents -– Problem solving agents –Uninformed search strategies – Breadth first search –Uniform cost search – Depth first search – Depth limited search –Bidirectional search – Searching with partial Information.

UNIT II INTRODUCTION TO MACHINE LEARNING 12

Machine learning : Types of Machine Learning- Understanding data–Continuous variable, categorical variable, Independent variable, dependent variable-Regressionand classification-linear regression introduction-Overfitting and Underfitting –Bias and Variance -Machine Learning Life cycle –Data Preprocessing techniques–Feature selection

UNIT III MACHINE LEARNING ALGORITHMS 12

Classification and Regression-Naïve bayes-Decision trees-support vector machine(SVM) – Random forest- Linear Regression- Multiple Linear Regression-Logistic Regression. -K-nearest neighbor- Unsupervised learning-k-means clustering-Principal component analysis

UNIT IV MODEL EVALUATION 12

Model Evaluation and Selection methods, Precision- Recall and ROC Curves Confusion Matrices, Regression Evaluation,Optimizing Classifiers for Different Evaluation Metrics

UNIT V MACHINE LEARNING USING PYTHON 12

Scikit – learn Dataset-Understanding Data frame-slicing a dataframe-managing data-Data Loading with NumPy and pandas- creating training and test sets - Implementation of Machine learning algorithms - predictions - implementation of metrics for validating machine learning algorithms -Scaling and normalization-Data visualization

TOTAL:--60 hours

Text Books:

T1: Kevin P.Murphy,“Machine Learning:A Probabilistic Perspective”, MIT Press,2012
T2: Sebastain Raschka,“Python Machine Learning”,Packt publishing(opensource).

Reference Books:

R1: Stephen Marsland,“Machine Learning–An Algorithmic Perspective”,CRC Press,2009
R2: Hastie,Tibshirani, Friedman,“The Elements of Statistical Learning”(2nded).,Springer,2008

Web Links:

1. https://machinelearningmastery.com/types-of-learning-in-machine-learning/Online
2. https://www.coursera.org/learn/machine-learning
3. https://nptel.ac.in/courses/106/106/106106139/
4. https://www.timberlake.co.uk/machinelearning

COURSE OUTCOMES

CO 1:	Demonstrate fundamental understanding of the history of artificial intelligence (AI)and its foundations.	**K3**
CO 2:	To apply the Basic Concepts of MachineLearning	**K4**
CO 3:	To build various machine learning algorithms using Linear models	**K5**
CO 4:	To apply ML techniques to application and evaluate the models	**K4**
CO 5:	Apply basic principles of AIandML in solutions that require problem solving, inference, perception, knowledge representation, and learning.	**K4**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO3**	**PO 4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	2	0	0	0	0	0	0	0	2	3
CO2	3	2	2	2	2	0	0	0	0	0	0	0	2	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	2	3
CO4	3	3	2	2	3	0	0	0	0	0	0	0	2	3
CO5	2	2	3	2	3	0	0	0	0	0	0	0	2	3
	2.8	2.6	2.6	2.2	2.4	0	0	0	0	0	0	0	2	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**EndSemester Exams**	**Assignments**	**Case Studies**
√	√	√	√	√	√
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**	**Openbook test**
√	√	√	√	√	√

PCC (Blended)	**DBMS,MYSQL and SQLite LAB**	**0**	**0**	**2**	**1**

Course Objective:

To understand the various database management system concepts by working on databases.

List of Experiments:

1. Given an unnormalized table, normalize it up to the third normal form (3NF) and explain the steps taken.
2. Write a SQL query to fetch data from multiple tables using INNER JOIN, GROUP BY, and HAVING clauses to obtain the total sales amount for each product category.
3. Using subqueries, retrieve the names of employees who earn more than the average salary in their department.
4. Create a view that displays customer names, their corresponding orders, and order dates, pulling data from multiple tables.
5. Develop a stored procedure that takes a customer ID as input and returns the total number of orders placed by that customer.
6. Write SQL queries to demonstrate the implementation of transactions. Begin a transaction, perform a series of updates, and commit or rollback based on a condition.
7. Analyze a slow-performing query and optimize it using appropriate indexing techniques. Explain the improvements made and measure the query performance before and after optimization.
8. Write SQL statements to insert, update, and delete records from a table while ensuring data integrity and utilizing appropriate constraints.
9. Demonstrate the implementation of database security by creating users, granting privileges, and revoking access based on specific scenarios.
10. Create a trigger that automatically updates a log table whenever changes are made to a specific table in the database.
11. Implement horizontal partitioning for a large table by splitting it into multiple partitions based on a defined criterion.
12. Perform a database backup, simulate a data loss scenario, and demonstrate the recovery process to restore the database to its previous state.

TOTAL: 30h

Course Outcome:

Course Outcome	Description	Knowledge Level
CO1	Understand the database concepts like tables and different keys	K3
CO2	Understand concepts like queries and subqueries using SQL	K4
CO3	Understand and demonstrate the implementation of transactions	K3
CO4	Understand on how to create the different types of operations using SQL	K6
CO5	Understand how to split the table and simulate a data loss to restore the database	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	1	2	2	2	2	3	2

CO2	2	3	3	3	3	3	3	1	2	2	2	2	3	2
CO3	3	3	3	3	3	3	3	1	2	2	2	2	3	2
CO4	3	3	3	3	3	3	3	1	2	2	2	2	3	2
CO5	2	3	3	3	2	3	3	1	2	2	2	2	3	2
Average	2.6	3	3	3	2.8	3	3	1	2	2	2	2	3	2

ASSESSMENTMETHODS:

CAT 1	**CAT2**	**Model Exam**	**End Semester Exams**	**Observation**
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration /Presentation**
✓			✓	✓

IT	**PERSONALITYDEVELOPMENT II**	**2**	**0**	**0**	**2**

UNIT I SOFT SKILLS III 6

Basic Etiquette–Email etiquette–Business etiquette–Telephone etiquette–Meeting etiquette–Adjustment of Role& Leadership– TeamManagement&Development

UNIT II QUANTITATIVE APTITUDEI 6

Percentage – Profit Loss –Discount – Ratio Proportion–Time & Work–Time, Speed & Distance. Problems relating to ages–Permutation & Combination– Probability

UNIT III QUANTITATIVE APTITUDEII 6

Mensuration–Clocks and Calendars–Boats–Simple Interest–Compound Interest–Fractions and Decimals–Square roots–Functions.

UNIT IV ANALYTICAL PROBLEMS 6

Introduction–Linear Sequencing–Seating Arrangements–Distribution/Double LineUp–Selection–Ordering and Sequencing–Binary Logic–Venn Diagrams–Directions.

UNIT V LOGICAL PROBLEMS 6

Introduction to Logical problems–Cause and Effect–Course of Action–Statement and Assumption–Letter and Symbol series–Analogies.

TOTAL:30 h

TEXT BOOKS:

T1. K. R.DhanalakshmiandN SRaghunathan, Personality Enrichment, Margham Publications, 2012

T2. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishers, 2017

REFERENCE BOOKS:

R1.D.P. Sabharwal,Personality Development Handbook, Finger print publishing, 2021

R2.A.K Gupta,Logical and Analytical Reasoning (English), Ramesh Publishing House, 2022

BSC	**ENVIRONMENTAL SCIENCE AND ENGINEERING**	3	0	0	3

Course Objectives

- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future
- To provide understanding of component of environment, their function, quality, issues related to environment, effect of quality degradation on human beings and their solutions

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition – Scope and importance – Need for public awareness – Concepts 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 (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Bio-geographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-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. Field Study of Common Plants, Insects and Birds.
Field study of simple ecosystems - pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 9

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 municipal solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – disaster Management - Floods, Earthquake, Cyclone and Landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 9

Forest resources -Use and over – Exploitation – Deforestation – Case studies – Timber extraction – Mining – Dams and their ground water – Floods – Drought – Conflicts over water –Dams – Benefits and Problems – Mineral Resources- Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies – Food Resources: World Food Problems, Changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging, salinity, Case Studies – Energy Resources:- Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources, Case Studies – 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. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

From Unsustainable To Sustainable Development – Urban Problems Related to energy – Water conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People, its Problems and Concerns, Case Studies Role of non – governmental organization - Environmental Ethics- Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies –Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act –enforcement machinery involved in environmental Legislation – Central and state pollution control boards - Public Awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

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 – Case Studies.

TOTAL: 45 HOURS

Text Books:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw- Hill,NewDelhi, (2006).

Reference Books

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol.I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

Web Links:

1. https://onlinecourses.nptel.ac.in/noc20_ge16/preview
2. https://ggn.dronacharya.info/APSDept/Downloads/QuestionBank/ENVIRONMENTAL-STUDIES/NPTEL-Link.pdf
3. http://eagri.org/eagri50/ENVS302/pdf/lec14.pdf
4. https://onlinecourses.nptel.ac.in/noc19_ge22/preview

COURSE OUTCOMES

At the end of this course the students will be able to,

CO 1: Understand the core concepts, methods of ecological and physical sciences, their application in environmental problem-solving.

CO 2: Apply system concepts and methodologies to analyse, understand the interactions between social and environmental processes.

CO 3: Apply the ethical, cross-cultural, and historical context of environmental issues and the link between human and natural systems.

CO 4: Develop the understanding based on the observations and illustration, drawn from the experiences of physical, biological, social and cultural aspects of life, rather than abstractions.

CO 5: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	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	1	-	1	-	-
CO2	1	1	-	-	-	-	-	1	1	-	-	-	-	-
CO3	-	1	-	-	-	-	-	2	-	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	2	1	1	-	1	-	-
Average	0.6	0.6	-	-	-	-	-	1.2	0.6	0.6	-	0.6	-	-

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓		

MC	**GENDER INSTITUTION AND SOCIETY**	2	0	0	0

Course Objective:
The course helps the student to understand concepts of social justice and gender justice. It provides the student with the knowledge of various institutions functioning worldwide which aim to eradicate discrimination against women. The course further aids students in understanding feminism and gender in relation to the society and to study the basic constitutional remedies available to women.

UNIT – I
Social Justice and Gender Justice – Theories relating to Social Justice – Theories relating to Gender Justice – Interrelationship between Gender justice and Social Justice

UNIT – II
International Conventions for protection of Women – Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) – National Commission for women – Constitutional remedies available for women under Indian Constitution.

UNIT – III
United Nations Entity for Gender Equality and the Empowerment of Women (UN Women) - Association for Women's Rights in Development (AWID) –Women kind worldwide – Centre for reproductive rights - Women's Environment and Development Organization (WEDO) - Global Fund for Women

UNIT – IV
International Center for Research on Women (ICRW) - European Institute for Gender Equality (EIGE) – Promundo - International Alliance of Women (IAW) - International Women's Development Agency (IWDA).

UNIT – V
World Health organisation – Sex and Gender – Feminism – Theories relating to Feminism – Gender and society

TEXT BOOKS
1. Law relating to Women and children, Mamta Rao
2. Gender, Politics and Institutions: Towards a Feminist Institutionalism, by Mona Lena krook and Fiano Mackay,2010
3. Gender Justice and Feminist Jurisprudence, Dr.Sheetal Kanwal,2015
4. Narain's Gender and society, P.Jain

REFERENCE BOOKS
1. Gender Justice and feminist Jurisprudence by Dr.Ishitha Chatterjee
2. Gender and Institutions, Moira Gatens and Alison Mackkinon

SUGGESTED READINGS:

1. Women and Gender : Society and Community , Siddhartha Sarkar

COURSE OUTCOMES:

After the completion of this Course, the student would be able to:

CO 1: Understand the Concept of Social Justice and Gender Justice.

CO 2: Learning the International Conventions and constitutional remedies available for women.

CO 3: Identify the various gender Institutions and its functions for the development of women.

CO 4: Assessing the International agencies.

CO 5: Summarising the study on feminism and relation of gender and society.

PCC(Practical)	**Python Programming Laboratory**	0	0	2	1

Course Objectives

- To be familiar with programming concepts in python
- To learn to file operations in Python
- To be exposed to creating applications with DJANGO,tkinter,pyQT5

List of Experiments:

1. Introduction to Conda and virtual environments, Manage environments – Create , update and Delete the environments,
2. Ways to install /upgrade /remove packages (pip, conda ,requirement.txt or environment.yml), and Export the installed packages to requirement.txt or environment.yml.
3. Write a program to print the palindrome numbers between 1 to 100
4. Write a program print the Disarium numbers between 1 to 100.
5. Create a menu drive with a dictionary for words and their meanings. Write functions to add a new entry (word: meaning), search for a particular word and retrieve meaning, given meaning find words with the same meaning, remove an entry, display all words sorted alphabetically.
6. File operations a) Traverse a path and display all the files and subdirectories in each level till the deepest level for a given path. Also, display the total number of files and subdirectories.b) Read a file contents and copy only the contents at odd lines into a new file
7. Using Regular Expressions, develop a Python program to
    a. Prompt the user for input.
    b. Identify a word with a sequence of one upper case letter followed by lower case letters.
    c. Find all the patterns of '1(0+)1' in a given string.
    d. Match a word containing 'z' followed by one or more o's.
8. Build a text analyzer application which does the fallowing using Django framework
    i. Accept text from the text box
    ii. Remove if there is any punctuations
    iii. Remove Blank lines
    iv. Remove extra space
    v. Show the processed text in the page
9. Create a CRUD application using Django
10. Build a simple calculator tkinter application which does below operations with 2 or more numbers Addition, Subtraction, Multiplication, Division, GCD and LCM etc

11. Create a login form using GUI programming

1. Build an application to i)fetch the user details from database and display in PyQT5 application.
2. modify user details and save back to database
3. delete the user from PyQT5 application

TOTAL : --30 hours

COURSE OUTCOMES

CO1:	Learn to Setup the python environment	**K1**
CO2:	Build a program using python with basic concepts	**K4**
CO3:	Build a program using python with regular expression	**K6**
CO4:	Apply the GUI components in tkinter	**K4**
CO5:	Create a web application using pyqt5	**K6**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2	2	0	0	0	0	0	0	0	2	3	2
CO2	2	2	2	2	0	0	0	0	0	0	0	2	3	3
CO3	2	2	2	2	0	0	0	0	0	0	0	2	2	2
CO4	2	2	3	3	0	0	0	0	0	0	0	2	3	2
CO5	2	3	2	3	0	0	0	0	0	0	0	3	1	3
	2.2	2.2	2.2	2.4	0	0	0	0	0	0	0	2.2	2.4	2.4

PCC	Computer Networks	**3**	**1**	**0**	**4**

Course Objectives:

To understand the concepts of data communications and to study the functions of different layers.

To introduce IEEE standards employed in computer networking and to familiarize with different protocols and network components.

To help the leaner to design, calculate, and apply subnet masks and addresses to fulfill networking requirements.

UNIT I PHYSICAL LAYER AND MEDIA 9

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OSI model – Transmission Media – Guided Media - Coaxial Cable – Fiber Optics – Unguided Media – Wireless-Switching- Digital Transmission –Analog Transmission- Line Coding – Dial up Modems

UNIT II : DATA LINK LAYER 9

Error Detection and Correction – Introduction-Parity Checking– LRC – CRC – Check Sum-Hamming code – Framing - Flow Control and Error control - Stop and Wait – go back-N ARQ – selective repeat ARQ- Sliding window – HDLC - MultipleAccess – Random Access – Channelization-Wired LAN - Ethernet IEEE-802.3 - IEEE 802.4 –Token Ring-FDDI – IEEE802.11.

UNIT III : NETWORK LAYER 9

Logical Addressing-IPV4 Addresses - IPV6 Addresses-Inter Networking – Address Mapping – ARP, RARP,DHCP, ICMP- Delivery-Forwarding-Unicast Routing protocols- Intra Domain Routing-Inter domain Routing- Distance Vector Routing – Link State Routing – Path Routing – Multicast Routing Protocol- Subnetting – Congestion avoidance in network layer.

UNIT IV : TRANSPORT LAYER 9

Duties of transport layer –Process to Process Delivery-Client Vs Server Paradigm - Multiplexing – DeMultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Flow Control – Error Control – Congestion Control – Open loop congestion control - closed loop congestion control - Quality of services (QOS)- Techniques to improve up QoS.

UNIT V: APPLICATION LAYER 9

Domain Name Space (DNS) – Name Space- Domain Name Space –Distribution of Name Space –DNS in the Internet- DDNS – Electronic Mail- SMTP – POP – IMAP-- FTP – HTTP - WWW – Cryptography-Symmetric Key Cryptography - Asymmetric Key Cryptography-Network Security –Security Services- Digital Signatures- IPsec-PGP.

Total :45 Hrs

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Text Book:

1. Behrouz A. Forouzan, "Data communication and Networking", FourthEdition,Tata McGraw-Hill, 2006.(Unit I to Unit V)

REFERENCE BOOKS:

1. Nader F. Mir, "Computer and Communication Networks", Pearson Education, 2007
2. Comer, "Computer Networks and Internets with Internet Applications", Fourth Edition, Pearson Education, 2003.
3. Andrew S. Tanenbaum, "Computer Networks", Fourth Edition, 2003.William Stallings, "Data and ComputerCommunication", Sixth Edition, Pearson Education, 2000

Web links: https://www.javatpoint.com/computer-network-tutorial

COURSE OUTCOMES

Course Outcome	Description	Knowledge Level
CO1	Discuss the functions of each layer in OSI and TCP/IP model	K6
CO2	Examine the Flow Control and Error control of Datalink layer	K4
CO3	Evaluate the various functions and components of network layer	K5
CO4	Classify the protocols and techniques of transport layer	K4
CO5	Asses the important of application layer	K5

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	0	1	2	0	2	0	1	0	1
CO2	2	2	2	2	3	3	3	3	3	3	2	3	2	3
CO3	2	3	2	2	3	3	3	3	3	3	2	3	3	3
CO4	2	3	3	3	3	3	3	3	3	2	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	2	2.4	2.2	2.2	2.6	2.4	2.6	2.8	2.4	2.6	2	2.6	2.2	2.6

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PCC	BUSINESS INTELLIGENCE USING COGNOS	3	0	0	3

Course Objectives

Cognos BI describes the concept and terminologies of Business Intelligence
To bring the right information at the right time to the right audience in any industry.

UNIT I OVERVIEW OF IBM COGNOS BI 9

Introduction to the Reporting Application- Examine Report Studio and its interface- Explore different report types- Create a simple, sorted, and formatted report- Explore how data items are added to queries- Create List Reports- Format and group reports-Sort list reports

UNIT II FOCUS REPORTS USING FILTERS 9

Introduction-Options for aggregating data- Create a multi-fact query- Create a report with repeated data- Create filters to narrow the focus of reports-Applying filters on aggregate data-Summary of filters

UNIT III CREATE CROSSTAB REPORTS 9

Introduction- Format and sort crosstab reports- Convert a list to a crosstab- Create crosstabs using unrelated data items- Create complex crosstabs using drag and drop functionality- Create charts containing peer and nested items- Present data using different chart type options- Add context to charts

UNIT IV FOCUS REPORTS 9

Introduction-Create and reuse custom chart palettes- Present key data in a single dashboard report- Identify various prompt types- Use parameters and prompts to focus data- Search for prompt items- Navigate between pages- Add run-time information to the reports

UNIT V USTOMIZE REPORTS 9

Create calculations based on data in the data source- Create expressions using functions-Highlight exceptional data- Show and hide data- Conditionally render objects in reports-Conditionally format one crosstab measure- Create multi-lingual reports- Create a Conditionally Rendered Column-Case Study

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE – Business Intelligence using Cognos, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand, monitor and manage business performance which includes business reporting & analysis, profitability measurement, budgeting, forecasting optimization and cost management.	K3
CO2	Understand Gather Requirements and prepare Reusable Metadata report issue, Calculations and Filters	K4

CO3	Understand the Prompts Create List or Crosstab reports	K3
CO4	Understand and focus Reports using Prompts	K6
CO5	Understand Customize Reports with Conditional Formatting	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	0	1	2	0	2	0	1	0	1
CO2	2	2	2	2	3	3	3	3	3	3	2	3	2	3
CO3	2	3	2	2	3	3	3	3	3	3	2	3	3	3
CO4	2	3	3	3	3	3	3	3	3	2	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	2	2.4	2.2	2.2	2.6	2.4	2.6	2.8	2.4	2.6	2	2.6	2.2	2.6

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PCC (Blended)	**Fundamentals of Blockchain & UseCases**	3	0	0	3

Course Objectives

- To understand a broad overview of the essential concepts of blockchain technology
- To familiarize students with Bitcoin protocol followed by the Ethereum protocol
- To lay the foundation necessary for developing applications and programming
- To learn about different types of blockchain and consensus algorithms

UNIT I Basics of Blockchain **9**

TheDouble-SpendProblem,ByzantineGenerals'ComputingProblems,Public- Key cryptography, Hashing, Distributed Systems, Distributed Consensus. Technology Stack:Blockchain, Protocol, Currency

UNIT II Bitcoin Blockchain and Ethereum Blockchain **9**

Bitcoin Blockchain :Structure, Operations, Features, Consensus Model, Incentive Model.

Ethereum Blockchain: SmartContracts,EthereumStructure, Operations, ConsensusModel IncentiveModel.

UNIT III Tiers of Blockchain Technology **9**

Blockchain1.0,Blockchain 2.0, Blockchain3.0 ,Types of Blockchain :Public Blockchain ,Private Blockchain Semi-Private Blockchain, Sidechains.

UNIT IV Types of Consensus Algorithms **9**

Proof of Stake, Proof of Work, Delegated Proof of Stake, Proof Elapsed Time, Deposite-Based Consensus, Proof of Importance, Federated Consensus or Federated Byzantine Consensus, Practical Byzantine Fault Tolerance. Block chain Use Case: Supply Chain Management.

UNIT V Block chain Use Cases **9**

IndustryapplicationsofBlockchain-BlockchininGovernment-Governmentusecases-Preventing Cybercrime through block chain- Chain in defense, Financial Services Related Use Cases Revolutionization of Global Trade, Healthcare Related Services, Block chain and IOT, Blockchain and AI.

TOTAL: --45hours

TextBooks:

T1: Mastering Blockchain :Deeperinsights into decentralization ,cryptography, Bitcoin and Popular Blockchain frame works by Imran Bashir,Packt Publishing(2017).

T2: Mastering Bitcoin: Unlocking Digital Cryptocurrencies by Andreas Antonopoulos O'Reilly, First Edition,2014

ReferenceBooks:

R1: KirankalyanKulkarni, Essentials of Bitcoin and Blockchain , PacktPublishing.

R2: Tiana Laurence, Blockchain for Dummies,2ndEdition 2019, JohnWiley& Sons.

R3: Blockchain:Blue print for a NewEconomy by MelanieSwan ,Shroff PublisherO'Reilly Publisher Media;1stedition(2015).

WebLinks:

1. https://www.coursera.org/specializations/blockchain.
2. https://nptel.ac.in/courses/106105184/
3. https://swayam.gov.in/nd1_noc20_cs01/preview

COURSEOUTCOMES

CO1:	Explain the basic notion of distributed systems & block chain technology stack	**K2**
CO2:	Analyze bitcoin and ethereum blockchain	**K4**
CO3:	Illustrate the essentialtiers of a blockchain technology	**K2**
CO4:	Estimate the types of consensus algorithms	**K5**
CO5:	Apply Blockchain in future usecases for security	**K3**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3	2	0	0	0	0	0	0	0	0	3
CO2	2	2	1	2	2	0	0	0	0	0	0	0	0	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	0	3
CO4	3	3	1	2	3	0	0	0	0	0	0	0	0	3
CO5	3	2	3	2	3	0	0	0	0	0	0	0	0	3

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	EndSemester Exams	Assignments	CaseStudies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open booktest**
✓	✓		✓	✓	

PCC (Practical)	Computer Networks Lab	**2**	**0**	**0**	**2**

Course Objective:
To help the learner to understand the underlying concepts of networked systems and to be able to develop networking programs using Java.

Experiments:

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc..)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols
6. Experiments using simulators (like OPNET)
7. Performance comparison of MAC protocols
8. Implementing Routing Protocols
9. Performance comparison of Routing protocols
10. Implementation of Logical and Physical Address
11. Simulation of ARP/RARP Protocol
12. Study of UDP and TCP performance

TOTAL: 30 h

Text Book:

T1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition,Tata McGraw-Hill, 2006.

Reference Books:

R1. Nader F. Mir, "Computer and Communication Networks", Pearson Education, 2007

R2. Comer, "Computer Networks and Internets with Internet Applications", Fourth Edition, Pearson Education, 2003.

R3. Andrew S. Tanenbaum, "Computer Networks", Fourth Edition, 2003.William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000

Web Links:

1. https://www.cse.iitk.ac.in/users/dheeraj/cs425/

COURSE OUTCOMES

At the end of this course the students will be able to,

Course Outcome	Description	Knowledge Level
CO1	Experiment with TCP, UDP and Raw socket programming	K3
CO2	Construct an application model for RPC	K6
CO3	Model the simulation of sliding window protocol and ARP/RARP	K3
CO4	Identify the Performance comparison of MAC protocols, Routing protocol	K3
CO5	Compose the implementation of Logical and Physical Address	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	-	1	2	2	3	2	3	2
CO2	3	3	3	3	2	2	-	1	2	2	3	2	3	2
CO3	3	3	3	3	2	2	1	1	2	2	3	2	3	2
CO4	3	3	3	3	2	2	-	1	2	2	3	2	3	2
CO5	2	3	3	3	2	2	1	1	2	2	3	2	3	2
Average	2.8	3	3	3	2	2	0.4	1	2	2	3	2	3	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Observation
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration / Presentation**
✓			✓	✓

PCC	MACHINE LEARNING USING WATSON STUDIO	3	0	0	3

Course Objective:

To help the reader in understanding the basics of the Watson Studio and the use of Watson Studio for analytics.

UNIT I I NTRODUCTION TO WATSON STUDIO 9

Introduction- Watson Studio framework for analytics-Development to deployment of models-Watson Studio Overview- How to install and get started with Watson Studio- Environments to run Watson Studio models- Access Control- Collaboration in Watson Studio

UNIT II PREPARING DATA 9

Introduction-Overview-Adding data to a project-Refining data with data refinery-Cleaning data within Watson Studio-Use Case-Case Study

UNIT III DATA SCIENCE 9

Introduction-Overview-Data science using Watson Studio-Analyze Data- Develop applications in R Studio- Data Visualization- Visualize the data without coding with analytic dashboards-Case Study

UNIT IV MACHINE LEARNING AND AI IN WATSON STUDIO 9

Introduction-Overview-Visual recognition-Natural language classification-Watson Machine Learning- Creating a catalog- Finding and viewing an asset- Adding an asset to a catalog- Adding catalog data assets to a project

UNIT V GOVERNANCE & ADMINISTRATION 9

Policies- Data protection rules- Business terms and data classification- Managing Watson apps-Determining roles- Deploying Models-Case study

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE Business Intelligence using Cognos, Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the concepts and how to install and get started with Watson Studio	K3
CO2	Understand Assets and Environments to run Watson Studio models	K4
CO3	Understand Refining data with data refinery and Cleaning data within Watson Studio	K3
CO4	Understand on how to analyze data by writing code in notebooks and Develop applications in RStudio	K6
CO5	Understand details about Machine Leaning & AI built in within Watson Studio	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	3	3	2	0	0	0	0	0	0	0	0	3
CO2	2	2	1	2	2	0	0	0	0	0	0	0	0	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	0	3
CO4	3	3	1	2	3	0	0	0	0	0	0	0	0	3
CO5	3	2	3	2	3	0	0	0	0	0	0	0	0	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**EndSemester Exams**	**Assignments**	**CaseStudies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open booktest**
✓	✓		✓	✓	

HSC	**Personality Development III**	2	0	0	2

UNIT I **VERBAL APPTITUDE I** 6

Phonetics/Neutral Accent/Pronunciation – Speech Mechanism/Mouth & Face Exercise Vowels & Consonants –Sounds–SyllableandSyllableStress/WordStress–SentenceStress&Intonation–ArticulationExercise–RateofSpeech / Flow of Speech/ Idiomatic Phrases.

UNIT II **VERBAL APTITUDE II** ***6***

Singular/plural-presenttense/pasttense—genders-Prepositions-conjunctions- Choice of words—simplesentences—compoundsentences-summarisingphrases—Synonyms—Antonyms —Analogies—Similar Words

UNIT III **SOFT SKILLS IV** ***6***

Attitude—Meaning-Featuresofattitude-Formation-PersonalityFactors-Types of attitude – Change in attitude-Developing Positive attitude.

UNIT IV **TIME MANAGEMENT** ***6***

Definition –Meaning-Importance, Value of time as an important resource- comparison of Time and Money- Circle of influence and circle of control—Definition of URGENT and IMPORTANT—Time Wasters and how to reduce—Procrastination—meaning and impact -4 Quadrants.

UNIT V **TEAM BUILDING** ***6***

Meaning—Aspects of team building—Process of team building—Types of Teams-Team ethics and Understanding-Team trust and commitment

TOTAL: 30h

REFERENCEBOOKS

1. Managing Soft Skills And Personality—BNGhosh Mcgraw Hill Publications
2. Principles and Practices of Management Shejwalkarand Ghanekar McGraw Hill Latest
3. Time management for Busy people–Robertar oesch,Tata mcGraw-Hill Edition
4. Personality Development –Dr VM Selvaraj, Bhavani Publications

Course Outcome:

Course Outcome	Description	Knowledge Level
CO1	Develop the personality skills	K6
CO2	To build the confidence level	K3
CO3	Evaluate the students skills through SWOT analysis	K5
CO4	Develop the self awareness and self esteem	K6
CO5	Improve the motivation skills	K6

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
			✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	

PCC	FOUNDATION COURSE IN CLOUD COMPUTING	3	0	0	3

Course Objectives:

- The course will focus on using a teacher-student interactive and decision-oriented learning exercises.
- For the active learning mode in the course to be effective, participating in class discussions is extremely important along with self paced learning to clear the concepts of software.
- In addition to the lectures, discussions and demonstrations, students would be required to work on sample applications and exercises.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Introduction-Overview of IBM Cloud-Cloud Computing-IBM Cloud Services-Cloud Delivery Models-IBM Cloud-IBM Cloud walkthrough-IBM Cloud Components

UNIT II IBM CLOUD ARCHITECTURE 9

Introduction-IBM Cloud Architecture-Overview of Cloud Foundry-Cloud Foundry Architecture-Various Components Cloud Foundry Framework-Cloud Controller Controller-Cloud Foundry cli calls

UNIT III IBM CLOUD SERVICES 9

Introduction-Overview-Analytics services in IBM Cloud-Watson Services-Auto Scaling-DevOps-IBM Cloud Services Application-Case Study

UNIT IV IBM CLOUD DEVOPS SERVICES 9

Introduction-Overview-IBM Cloud Devops Services-Delivery Feature-Overview on Tool chains-Code Repository-Delivery pipeline-Eclipse Orion Web IDE

UNIT V NODE RED -NODE CREATION 9

Introduction-Overview of Node-RED-Node Flow in Node-RED-Types of Nodes-Functions in Node-RED-How to install and perform on Node-RED-Case Study

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE – Foundation Course in Cloud Computing, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand different Cloud offerings and delivery models	K3

CO2	Understand the IBM Cloud Foundry Architecture	K4
CO3	Understand the IBM Cloud Services to Application	K3
CO4	Understand the IBM Cloud DevOps Services	K6
CO5	Understand the different types of node creation in Node-RED	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	2	0	0	0	0	0	0	0	0	3
CO2	2	2	1	2	2	0	0	0	0	0	0	0	0	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	0	3
CO4	3	3	1	2	3	0	0	0	0	0	0	0	0	3
CO5	3	2	3	2	3	0	0	0	0	0	0	0	0	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**EndSemester Exams**	**Assignments**	**CaseStudies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open booktest**
✓	✓		✓	✓	

PCC	ARTIFICIAL INTELLIGENCE ANALYST	3	0	0	3

Course Objective:

To help the learner to build their own AI solutions using Watson Studio, Watson Machine Learning and Watson Knowledge catalog and understand how they can use Watson Open Scale to monitor their machine learning models in production.

UNIT I WATSON OVERVIEW 9

Watson SaaS offerings -AI lifecycle management tools-Pre-built Watson applications-Watson API's- Watson solutions-Watson knowledge studio and its uses-Watson Discovery service-Watson OpenScale.

UNIT II NATURAL LANGUAGE PROCESSING 9

Introduction-Watson Natural Language Services-Features of Natural Language Understanding(NLU)-Applications-Use Cases of NLU- Speech to Text-Use cases of Speech to Text-Semantics-Pragmatics.

UNIT III CONVERSATIONAL AI 9

Introduction-Building blocks of a chatbot-Usage of Watson Assistant-Use cases of Watson Assistant-Watson Studio-Watson Machine learning-Build and ready AI solutions of your own-How to use Watson Knowledge catalog.

UNIT IV WATSON STUDIO AI TOOLS 9

Introduction-Auto AI Experiment-Decision Optimization-Watson OpenScale-How to deploying the model using Watson Machine learning-Usage of Watson Open Service-Use cases.

UNIT V SPEECH TO TEXT 9

Introduction-Overview-Speech recognition-Acoustic modelling-Feature Extraction-Text normalization-Letter-to-sound-Use Case

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE – Artificial Intelligence Analyst, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the concepts of AI lifecycle management tools and Pre-built Watson applications	K3

CO2	Understand the usage of Watson Natural Language Understanding, Features, Applications & Use Cases of NLU	K4
CO3	Understand the building blocks of a chatbot and the usage of Watson Assistant	K3
CO4	Understand the Auto AI experiment could be easily built and Deploy the model using Watson Machine learning	K6
CO5	Understand how Speech to Text service work and the use cases around the service	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	2	0	0	0	0	0	0	0	0	3
CO2	2	2	1	2	2	0	0	0	0	0	0	0	0	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	0	3
CO4	3	3	1	2	3	0	0	0	0	0	0	0	0	3
CO5	3	2	3	2	3	0	0	0	0	0	0	0	0	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**ModelExam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	

PCC (Practical)	ARTIFICIAL INTELLIGENCE ANALYST LAB	3	0	0	3

Course Objectives:

To help the learner to build their own AI solutions using Watson Studio, Watson Machine Learning and Watson Knowledge catalog and understand how they can use Watson Open Scale to monitor their machine learning models in production.

List of Experiments

1. Applying Machine Learning Algorithms
    1. Determine the centroids of a data set with the K-means clustering algorithm.
    2. Predict the class of an object with the Naïve Bayes classifier.
    3. Apply linear regression to a simple data set.
    4. Construct a decision tree to predict if an athlete is fit.

2. This exercise introduces you to the basic tasks that you perform when you use Watson Studio. Load a data set into the project's object store. Manage IBM Cloud Object Storage. Analyse data by using Watson Studio. Use Pixie Dust for data visualization.
3. This exercise introduces you to the basic tasks that you must perform when you import and deploy machine learning models by using the IBM Watson Machine Learning service and IBM Watson Studio.
4. Creating an Auto AI experiment from marketing data
5. Building and deploying a regression analysis model with Watson Machine Learning
6. Ingesting, converting, enriching, and querying data with the IBM Watson Discovery service
7. Creating a machine learning model with IBM Watson Knowledge Studio
8. This exercise describes how to create a chatbot and publish it quickly without coding by using the IBM Watson Assistant service. For this example, you create a Help Desk chatbot. However, you can customize the chatbot to take any other role, such as delivery service, Q&A, student assistant, and more.
9. Using a basic deep neural network to solve an image recognition problem.

Integrating IBM Watson Knowledge Studio with IBM Watson Discovery for the procurement domain.

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	2	2	-	1	2	2	3	2	3	2
CO2	3	3	3	3	2	2	-	1	2	2	3	2	3	2
CO3	3	3	3	3	2	2	1	1	2	2	3	2	3	2
CO4	3	3	3	3	2	2	-	1	2	2	3	2	3	2

CO5	2	3	3	3	2	2	1	1	2	2	3	2	3	2
Average	2.8	3	3	3	2	2	0.4	1	2	2	3	2	3	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Observation
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Demonstration / Presentation**
✓			✓	✓

HSC	PERSONALITY DEVELOPMENT IV	2	0	0	2

COURSE OBJECTIVES:

To enhance the soft skills and prepare them towards the skills needed for theircareer.

UNIT I: SOFT SKILLS **6**

Assertiveness – Meaning – Importance of assertiveness – Characteristics of Assertive communication –Merits – forms of assertion – Causes of misunderstanding

UNIT II: COMMUNICATION SKILLS **6**

Meaning – Elements of Communication – Functions of Communication – Principles of Communication Formal and Informal Communication – Barriers in Communication – Characteristics of good – communication – Feedback –Communication systems.

UNIT III: PRESENTATION SKILLS **6**

Meaning – Importance of Presentation – Concept of 5 W's and one H – understanding the audience –Types of presentations – How to make effective presentation.

UNIT IV: PRESENTATION SKILLS I **6**

Use of slide, PPT's and visuals – Rules for slide presentation – precautions – seminars and conferences –Steps to eliminate Stage fear.

UNIT V CHANGE MANAGEMENT **6**

Definition – Necessity – Resistance towards Change – 10 Principles of Change Management – Leaders approach – Effective Change management.

TOTAL HOURS: 30

TEXT BOOKS:

1. LaClair, J. and Rao, R. Helping Employees Embrace Change, McKinsey Quarterly, 2002, Number 4.

2. Spencer Johnson, Who Moved My Cheese, Vermilion, First edition

3. Adair, John, Effective Communication, London: Pan Macmillan Ltd., 2003.

REFERENCE BOOKS:

1. Bovee, Courtland L, John V. Thill & Barbara E. Schatzman. Business Communication Today, Tenth Edition. New Jersey: Prentice Hall, 2010.

Weblinks**:** https://onlinecourses.nptel.ac.in/noc22_hs08/preview

COURSE OUTCOMES

CO1	Be assertive in their communication.	**K3**
CO2	Differentiate the principles of formal and informal communication.	**K4**
CO3	Make an effective presentation by understanding the audience.	**K3**
CO4	Practice the rules of presentation using slides, PPT's and visuals.	**K3**
CO5	Discuss the principles of change management.	**K2**

Mapping Of Course Outcomes to Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	2	3	2	2	-	-	2	-	2	2	-	2
CO2	2	3	2	2	2	2	-	-	2	-	2	2	-	3
CO3	3	2	3	2	2	1	-	-	2	-	2	2	-	1
CO4	2	2	3	3	2	2	-	-	2	-	2	2	-	2
CO5	3	3	3	3	2	3	-	-	2	-	2	3	-	3
Average	2.8	3	3	3	2	2	-	-	2	2	3	2	-	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Observation
		✓	✓	✓
Record	**MCQ**	**Projects**	**Viva**	**Presentation**
✓			✓	✓

PCC	MICROSERVICES ARCHITECTURE AND IMPLEMENTATION	3	0	0	3

Course Objectives

The course will focus on introduction about HTML, CSS & JavaScript and provide hands on Docker and Kubernetes concepts including components, Modules and Directive.

UNIT I INTRODUCTION TO JAVASCRIPT 9

Introduction-Overview of Java Script-Java script Functions-DOM Definition-DOM Methods-DOM Manipulation- Validation using JavaScript-Case study

UNIT II MICROSERVICES AND ITS IMPLEMENTATION 9

Introduction-Importance of Micro services-Architecture Implementation-Monolithic Application-Micro service Security-API Management and Gateways-The Future of Micro services-Micro services Governance

UNIT III INTRODUCTION OF NODEJS 9

Introduction to NodeJS-Installation and Configuration-NodeJS Command Line-Sample Project using Node Express command prompt-Nod eclipse plugin-Sample Project using Nod eclipse-Performing CRUD Operations-Key features of MongoDB

UNIT IV INTRODUCTION TO DOCKER 9

Introduction-Overview of the Docker-Docker Architecture-Containers-Virtual Machines versus Containers- Docker: A shipping container for code-Benefits of using containers-Docker File systems

UNIT V CLOUD INTRODUCTION TO KUBERNETES 9

Introduction to Kubernetes-Container and Orchestration-Kubernetes Architecture-Master Node Components-Worker Node Components- Kubernetes Building Blocks-Images and Immutability-Pod-Config Maps & Secrets-Deploying Applications on Kubernetes-Pod Health

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE – Micro services Architecture and Implementation, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Implement the Concepts of JavaScript functions	K3
CO2	Develop the importance of Micro services and describes their need as an Architecture Implementation	K4
CO3	Understand the concepts along with hands-on exercise to NodeJS, Installation and Configuration	K3
CO4	Implement Docker Account and deploying an application on docker	K6
CO5	Analyse the Cloud implementation and how to manage Kubernetes and clusters	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	2	0	0	0	0	0	0	0	0	3
CO2	2	2	1	2	2	0	0	0	0	0	0	0	0	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	0	3
CO4	3	3	1	2	3	0	0	0	0	0	0	0	0	3
CO5	3	2	3	2	3	0	0	0	0	0	0	0	0	3

ASSESSMENT METHODS:

CAT 1	CAT 2	ModelExam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	

PCC	DESIGN THINKING,AGILE,DEVOPS	3	0	0	3

Course Objectives:

The course will focus on understanding the basics of Design Thinking, Agile Approaches and the way of project management approaches like water fall model or V model

UNIT I DESIGN THINKING 9

Introduction-Overview of Design Thinking- IBM Design Thinking methodology-Scaling Types-Loop Model Components- Big Idea Vignettes- Prioritization Grid-Case Study

UNIT II PROJECT EXECUTION METHODOLOGIES 9

Introduction-Overview of Project Management-Project Management Operations-Phases and Features-Program and Portfolio Management-Waterfall Model-V Model-Agile way of Project Management

UNIT III AGILE AND SCRUM DEEP DIVE 9

Introduction- Agile methodology- Various frameworks- Advantage and Disadvantages of Agile-Agile vs Waterfall Model- Agile Certifications- Scrum Frame work- Roles and Responsibility of Scrum team-Sprint

UNIT IV SCRUM ARTIFACTS 9

Introduction- Types of Scrum Artifacts-Importance of Product Backlog-Sprint Backlog-Scrum Ceremonies-Various Scrum Ceremonies-- Sprint Planning- Daily Scrum Meeting- Product Backlog Grooming-Sprint review meeting and Retrospective

UNIT V SCRUM METRICS 9

Introduction- Sprint Goal- User story-Estimation of User Stories-Definition of Done-Scrum Metrics- Sprint Goal Success- Team Velocity- Sprint Burn down chat- Defect Density- Scaling Scrum and Distributed Scrum Practices-Agile Environment and Tools

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE – Design Thinking, Agile, Devops, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand an overview of Design Thinking ,Importance in today competitive world and get an insight to its history	K3
CO2	Implement the various Project Management Methodologies	K4
CO3	Implement the Agile methodology and Scrum Frame work	K3
CO4	Understand the importance of Product Backlog and Sprint Backlog	K6
CO5	Implement the various Scrum Metrics and Agile Environment Tool	K6

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	2	0	0	0	0	0	0	0	0	3
CO2	2	2	1	2	2	0	0	0	0	0	0	0	0	3
CO3	3	3	3	2	2	0	0	0	0	0	0	0	0	3
CO4	3	3	1	2	3	0	0	0	0	0	0	0	0	3
CO5	3	2	3	2	3	0	0	0	0	0	0	0	0	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	

PCC (Practical)	DESIGN THINKING,AGILE,DEVOPS LAB	0	0	2	1

Course Objectives:

Thinking Frame work is different from the various components of IBM Design Thinking Framework.

List of Experiments

1. Listening
2. How Might We (HMW) Statements
3. Storyboarding
4. Crafting Hills
5. Prototyping
6. User Feedback
7. Git Server and Client Installation
8. Installing Docker on Ubuntu and set WSL Environment
9. Create Docker Images using Docker Registry

Implement a Pipeline Continuous Deployment process using Jenkins tool

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand an overview of Design Thinking ,Importance in today competitive world and get an insight to its history	K3
CO2	Implement the various Project Management Methodologies	K4
CO3	Implement the Agile methodology and Scrum Frame work	K3
CO4	Understand the importance of Product and Sprint Backlog	K6
CO5	Implement the Scrum Metrics and Agile Environment Tool	K6

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Observation
Record	MCQ	Projects	Viva	Demonstration / Presentation

LIST OF ALL PROFESSIONAL ELECTIVE COURSES

PEC	APPLIED CRYPTOGRAPHY	3	0	0	3

Course Objective:

- To understand the mathematical background for cryptography.
- To understand the taxonomy of cryptography primitives
- To understand the Symmetric key encryption system, public key encryption system
- To implement cryptographic algorithms

UNIT I - INTRODUCTION **9**

Cryptography goals – Taxonomy of cryptography primitives – Background on functions – Basic terminology – Definition and examples – Block ciphers, stream cipher, substitution ciphers, transposition ciphers – Composition of ciphers – Digital signature – Construction of digital signature – Public key cryptography – Hash functions – Protocol and mechanism – Key establishment and management – Pseudo random numbers – Classes of attack.

UNIT II - NUMBER THEORY **9**

Probability theory – Information theory – Complexity theory – Number theory – Abstract algebra – Finite fields – Primality test – Prime number generation – Irreducible polynomial.

UNIT III - RANDOM GENERATORS **9**

Pseudo random bits and sequences – Random bit generation – Pseudorandom bit generation – statistical tests – Stream Cipher.

UNIT IV - ENCRYPTION ALGORITHMS **9**

Block cipher – DES – FEAL – IDEA – SAFAR – Public key encryption – RSA – Rabin – Elgamal –Mc Eliece – Knapsack.

UNIT V - HASH ALGORITHMS **9**

Hash function and data integrity – Classification and framework – Basic constructions and general results – Unkeyed hash functions – Keyed hash functions – data integrity and message authentication – Advanced attacks and hash function.

TOTAL: 45 hours

TEXT BOOK :

1. A.Menezes, P.Van Oorschot and S. Vanstone, "Hand book of Applied Cryptography" CRC Press, Fifth Printing, 2001.

REFERENCE BOOKS :

1. Charlie Kaufman, Radia Perlman, Mike Speciner, " Network Security, Private communication in public world" PHI 2nd edition 2002.
2. Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, 2003
3. Douglas R Simson "Cryptography – Theory and practice", CRC Press 1995. 3. Stallings, "Cry ptography& Network Security", Pearson Education, 4th Edition 2006.

Weblinks:

1.https://onlinecourses.nptel.ac.in/noc20_cs02/preview

COURSE OUTCOMES

Course Outcome	Description	Knowledge Level
CO1	Understand the basics of cryptographic algorithms and protocols	**K3**
CO2	Analyze the concept of Public key cryptography, Hash functions, Key establishment and management	**K4**
CO3	Acquire knowledge on encryption algorithms such as Block cipher, DES, FEAL, IDEA and SAFAR	**K3**
CO4	Evaluate the performance of Hash function, data integrity and message authentication	**K5**
CO5	Assess existing applications of cryptography and develop new protocols and applications that employ cryptography.	**K6**

Mapping Of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	1	2	3	1	1	2	0	1	2	0
CO2	2	3	2	2	-	-	-	-	-	-	2	-	-	-

CO3	2	3	2	2	1	3	1	2	3	2	2	-	-	2
CO4	2	-	-	-	-	-	2	3	2	2	3	2	3	3
CO5	2	3	3	2	-	-	-	-	-	-	3	3	3	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	BIG DATA PROGRAMMING	3	0	0	3

Course Objectives

- To explore the fundamental concepts of big data analytics, Hadoop, R programming and HiveQL
- To learn big data analytics using R Programming

UNIT I : Introduction to Big Data 9

Introduction to Big Data Platform – Challenges of Conventional Systems - Nature of Data- Evolution Of Analytic Scalability - Intelligent data analysis- Analytic Processes and Tools - Analysis vs. Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error

UNIT II : Hadoop 9

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT III : Hive QL 9

Introduction to HiveQL- Databases in Hive-HiveQL: Queries- SELECT … FROM Clauses , Specify Columns with Regular Expressions , Computing with Column Values , Arithmetic Operators, Using Functions- Mathematical functions, Aggregate functions, Table generating functions, Other built-in functions ,LIMIT Clause ,Nested SELECT Statements, CASE … WHEN … THEN Statements, WHERE Clauses, Predicate Operators, LIKE and RLIKE, GROUP BY Clauses , HAVING Clauses ,JOIN Statements -Inner JOIN ,LEFT OUTER JOIN,RIGHT OUTER JOIN, FULL OUTER JOIN, Cartesian Product JOINs , Map-side Joins, ORDER BY and SORT BY, DISTRIBUTE BY with SORT BY , CLUSTER BY

UNIT IV : Big Data Analytics Using R Programming 9

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Introduction to R and RStudio, Basic analysis in R, Intermediate R, Intermediate analysis in R, Advanced Analytics - K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis

UNIT V Frameworks 9

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services –- fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

TOTAL HOURS : 45

Text Books :

1. Prajapati, Big Data Analytics with R and Hadoop, 2014
2. Stephan Kudyba, Big Data, Mining, and Analytics: Components of Strategic Decision Making, Auerbach Publications, March 12, 2014 .
3. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications,2013
4. Jason Rutherglen, Dean Wampler and Edward Capriolo, Programming Hive, O'REILLY, 2012

Reference Books:

1. Michael Berthold, David J. Hand, ―Intelligent Data Analysis‖, Springer, 2007.
2. Tom White ― Hadoop: The Definitive Guide‖ Third Edition, O'reilly Media, 2012.

3. Chris Eaton, Dirk De Roos, Tom Deutsch, Understanding Big Data: Analytics for Enterprise Class Hadoop andStreaming Data‖, McGraw Hill Publishing, 2012

4. Anand Rajaraman and Jeffrey David Ullman, ―Mining of Massive Datasets, Cambridge University Press, 2012.

Weblinks: https://nptel.ac.in/courses/106104189

COURSE OUTCOMES

CO1	Identify the purpose and need of big data programming and compare it with conventional systems.	**K3**
CO2	Examine and compare various Components of Hadoop and develop a Map Reduce application.	**K4**
CO3	Develop Hive queries using HiveQL interface.	**K3**
CO4	Discuss various statistics modeling techniques and its evaluation using R and other clustering methods.	**K6**
CO5	Discuss various big data frameworks,Pig, HBASE, Zookeeper, IBM Info SphereInsights and Visual data analysis techniques	**K6**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	

PEC	CLOUD COMPUTING	3	0	0	3

Course Objectives

- To understand the concept of cloud and utility computing.
- To understand the various issues in cloud computing.
- To familiarize with the types of virtualization and the lead players in cloud.

UNIT I : INTRODUCTION,PRINCIPLES AND ARCHITECTURE 9

Cloud Computing : Vision, reference model, characteristics and challenges – historical development – building cloud computing environment – computing platforms and Technologies – Parallel Vs distributed computing – Elements of parallel and distributed computing – Technologies for distributed computing. Cloud Computing Architecture: Cloud reference model - NIST Cloud Computing Reference Architecture – types of Clouds - economics – open challenges.

UNIT II : VIRTUALIZATION 9

Characteristics of virtualized environments - Taxonomy of virtualization techniques - Execution virtualization -Machine reference model - Hardware-level virtualization – Hypervisors - Hardware virtualization techniques -Operating system-level virtualization - Programming 210 language-level virtualization - Application-level virtualization - Other types - Virtualization and cloud computing - Pros and cons of virtualization - Technology examples - Xen: Paravirtualization - VMware: full virtualization - Full virtualization and binary translation - Microsoft Hyper-V.

UNIT III : CLOUD INFRASTRUCTURE 9

Cloud Computing and Services Model – Public, Private and Hybrid Clouds – Cloud Eco System - IaaS - PaaS – SaaS. Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources. Case Study: Amazon Web Service reference, GoGrid, Rackspace

UNIT IV : CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENT 9

Cloud capabilities and platform features – data features and databases - Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Dryad and DryadLINQ – sawzall and Pig Latin - Mapping Applications - Programming Support of Google App Engine - Amazon AWS – Microsoft Azure - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack. Case Study: Amazon Web Service reference, GoGrid, Rackspace.

UNIT V : CLOUD PLATFORMS AND APPLICATION 9

Amazon web services - Compute services - Storage services - Communication services - Google AppEngine - Architecture and core concepts – Cloud Security and Trust management. Application life cycle - Cost model – Observations - Microsoft Azure - SQL Azure – Scientific Applications –Business and Consumer Application – Energy efficiency in clouds - Market-based management of clouds - Federated clouds/Inter Cloud - Third-party cloud services.

TOTAL HOURS : 45

Text Books:

T1: Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012. T2: Rajkumar Buyya, Christian Vecchiola. S.Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013.

Reference Books:

R1: James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

R2: George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly.

R3: Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010.

R4: John W.Rittinghouse and James F.Ransome, "Cloud Computing:Implementation, Management, and Security", CRC Press, 2010.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs20/preview.
2. https://www.w3schools.in/cloud-computing.

COURSE OUTCOMES

CO1	Understand the broad perspective of cloud architecture, key technologies, principles, strengths, limitations as well as the possible applications of the state-of-art of cloud computing.	K2, K3
CO2	Gain a basic knowledge of virtualization and its categorization and Design & develop highly scalable cloud-based applications by creating and configuring virtual machines.	K3, K6
CO3	Compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system design, and Identify e design choices when solving real - world cloud problems	K4

CO4	Interpret some important cloud computing driven commercial systems such as: Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.	K5
CO5	Build and deploy cloud application using popular cloud platforms.	K6

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Openbook test**

PEC	**CRYTOGRAPHY AND NETWORK SECURITY**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the fundamental principles, algorithms of cryptographic techniques and expose them to various scenarios of cyber crime with an introduction to cyber law along with a thrust on security on the internet
- To develop an understanding of information assurance as practiced in computer systems, distributed systems, networks and representative applications.

UNIT I : INTRODUCTION 9

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption .Standard – The strength of DES - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Multiple Encryption and Triple DES – Placement of Encryption Function – Traffic Confidentiality – Key distribution – Random Number Generation

UNIT : II PUBLIC KEY CRYPTOGRAPHY 9

Key Management - Diffie- Hellman key Exchange – Elliptic Curve Arithmetic - Elliptic Curve Cryptography

- Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography/RSA

UNIT III : AUTHENTICATION AND HASH FUNCTION 9

Authentication requirements – Authentication functions – Message Authentication Codes – Hash. Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – CMAC Digital Signatures - Digital Signatures - Authentication Protocols – Digital Signature Standard.

UNIT IV : NETWORK SECURITY 9

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security: Pretty good privacy, S/MIME – IP Security – Web Security: Web security considerations, Secure socket layer and Transport layer Security – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management.

UNIT V : SYSTEM LEVEL SECURITY 9

Intruders: Intrusion detection – password management – Malicious software: Viruses and related. Threats, Virus Counter measures, Distributed Denial of Service Attacks – Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation – Internet standards and internet security.

TOTAL HOURS : 45

Text Books:

1 William Stallings, "Cryptography and Network Security – Principles and Practices", Prentice Hall of India, Third Edition, 2003.

2 Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2013

Reference Books:

1 Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.

2 Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson education

Web Links:

1. https://www.tutorialspoint.com/cryptography/index.html
2. https://onlinecourses.nptel.ac.in/noc21_cs16/preview

COURSE OUTCOMES

CO1	Understand OSI security architecture and the design principles of Block cipher	**K3**
CO2	Acquire knowledge on block cipher modes of operation	**K3**
CO3	Describe key management in public key cryptography	**K5**
CO4	Implement the Hash Functions and Authentication Protocols	**K6**
CO5	Analyze the Electronic Mail Security and IP Security	**K4**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓		✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓		

PEC	CYBER FORENSICS	3	0	0	3

Course Objective:

- To understand the fundamentals of Computer Forensics and computing Investigations.
- To recognize the legal underpinnings and critical laws affecting forensics
- To apply the tools and methods to uncover hidden information in digital systems.
- To learn about current licensing and certification requirements to build the career in digital forensic.

UNIT I : INTRODUCTION 9

The Scope of Computer Forensics - Windows Operating and File Systems – Handling Computer Hardware – Anatomy of Digital Investigation.

UNIT II : INVESTIGATIVE SMART PRACTICES 9

Forensics Investigative Smart Practices – Time and Forensics – Incident closure

UNIT III : LAWS AND PRIVACY CONCERNS 9

Laws Affecting Forensic Investigations – Search Warrants and Subpoenas – Legislated Privacy Concerns – The admissibility of Evidence – First Response and Digital Investigator

UNIT IV : DATA ACQUISITION AND REPORT WRITING 9

Data Acquisition – Finding Lost Files – Document Analysis – Case Management and Report Writing – Building a Forensics Workstation

UNIT V : TOOLS AND CASE STUDIES 9

Tools of the Digital Investigator - Licensing and Certification – Case Studies: E-mail Forensics – Web Forensics – Searching the Network – Excavating a Cloud – Mobile device Forensics.

TOTAL HOURS : 45

TEXT BOOKS:

1. Michael Graves, ―Digital Archaeology: The Art and Science of Digital Forensics, Addison-Wesley Professional, 2014.
2. Darren R. Hayes, ―Practical Guide to Computer Forensics Investigation, Pearson, 2015.
3. Albert J. Marcella and Frederic Guillossou, ―Cyber Forensics: From Data to Digital Evidence ―, Wiley, 2015.

REFERENCE BOOK:

1. Bill Nelson, Amelia Phillips and Christopher Steuart, ―Guide to Computer Forensics and Investigations‖, Fourth Edition, Cengage, 2013**.**

Web Links:

https://nptel.ac.in/courses/106106129

https://www.techtarget.com/searchsecurity/definition/computer-forensics

COURSE OUTCOMES:

At the end of this course the students will be able to,

Course Outcome	Description	Knowledge Level
CO1	Acquire knowledge on Forensic Investigative smart practices.	**K3**
CO2	Analyze the importance and need for smart practices in computer investigation.	**K4**
CO3	Analyze the ethical standards of the profession and apply those standards to all aspects of the study and practice of digital forensics.	**K4**
CO4	Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.	**K5**
CO5	Describe web and mobile device forensics.	**K6**

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO2	3	3	3	3	2	2	0	3	2	2	2	2	3	2
CO3	3	3	3	3	2	2	1	3	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	2	2	2	2	3	2
CO5	2	3	3	3	2	-	-	-	-	-	-	2	3	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration**
			✓	✓

PEC	DATA WAREHOUSING AND DATA MINING	3	0	0	3

Course Objective:

- ✓ To introduce the concept of data warehousing with special emphasis on architecture and design.
- ✓ To introduce the concept of data mining with a detail coverage of basic tasks, metrics, issues, andimplication.
- ✓ To learn the core topics like classification, clustering and association rules.

UNIT I : DATA WAREHOUSING 9

Data warehousing Components:Data Warehouse Database**,** Sourcing, Acquisition, Cleanup and TransformationTool,Data Warehouse Administration and Management**, Information Delivery System** – Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

UNIT II : BUSINESS ANALYSIS 9

Reporting and Query tools and Applications – Tool Categories – The Need forApplications – Cognos Impromptu Online Analytical Processing (OLAP) – Need –Multidimensional Data Model – OLAP Guidelines –Multidimensional versusMultirelational OLAP – Categories of Tools – OLAP Tools and the Internet - Data CubeTechnology, From Data warehousing to Data Mining.

UNIT III : DATA MINING 9

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness ofPatterns – Classification ofData Mining Systems- comparison of classification and prediction methods – Data Mining Task Primitives –Integration of a Data Mining System with a Data Warehouse – Issues – DataPreprocessing.-, Mining Descriptive Statistical Measures in Large Databases.

UNIT IV : ASSOCIATION RULE MINING AND CLASSIFICATION 9

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint BasedAssociation Mining – Classification and Prediction - BasicConcepts - Decision TreeInduction - Bayesian Classification – Rule Based Classification – ClassificationByBackpropagation – Support Vector Machines – Associative Classification – LazyLearners – Other Classification

Methods – Prediction

UNIT V: CLUSTERING, APPLICATIONS AND TRENDS IN DATA MINING 9

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods –Hierarchical Methods - Density-Based Methods – GridBased Methods – Model- Based Clustering Methods –Clustering High Dimensional Data- Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.- Case Study.

TOTAL HOURS 45

TEXT BOOKS:

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", TataMcGraw – Hill Edition,Tenth Reprint 2007.(I & II)
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", SecondEdition, Elsevier, 2007.(IIIto V)

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data

Mining",Person Education, 2007.

2. K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory andPractice", Easter EconomyEdition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter EconomyEdition, Prentice Hall of India,2006.
4. Daniel T.Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

Web Links:

W1 : Https://Onlinecourses.Nptel.Ac.In/Noc21_Cs06/Preview

COURSE OUTCOMES :

At the end of this course the students will be able to,

Course Outcome	Description	Knowledge Level
CO1	Apply the basic concepts of DBMS with datawarehousing and datamining	**K3**
CO2	Identify the datawarehouse components to build a data warehouse.	**K3**
CO3	Explain the functionalities and classifications of data mining systems	**K5**
CO5	Identify the issues and understand the integration of a data mining system with a datawarehouse	**K3**
CO5	Explain cluster analysis, outlier analysis and data mining applications	**K5**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	E COMMERCE	3	0	0	3

Course Objectives

- To understand the nature of e-Commerce and recognize the business impact and potential of e- Commerce
- To learn the technologies required to make e-Commerce viable.
- To know about the current drivers and inhibitors facing the business world in adopting and using e-Commerce

UNIT I : Introduction 9

Traditional commerce and Ecommerce - Categories of Electronic commerce – Business models – Revenue models – Business processes. Internet and WWW–role of WWW–value chains–strategic business – Revenue Strategy issues – Industry value chains - supply chain management–role of Ecommerce

UNIT II : Infrastructure for E-Commerce 9

Packet switched networks–Routing packets. TCP/IP protocol script: IP Addressing – Domain names – E- mail protocols. Internet utility programs–SGML,HTML and XML–web client and servers–Web client/server architecture– intranet and extranets – Public and private networks – Virtual private network

UNIT III : Web Based Tools for E-Commerce 9

Web server: Server computers –performance evaluation – Hardware architectures. Web server software feature sets–web server software and tools– Internet Utility programs – Data analysis software – Link checking utilities. web protocol–search engines–intelligent agents –EC software– webhosting–cost analysis

UNIT IV : Security 9

Computer security classification–copyright and Intellectual property–electronic commerce threats: Secrecy threats – Integrity threats – Necessity threats Encryption solutions. Protecting client computers–electronic payment systems– electronic cash–strategies for marketing–sales and promotion–cryptography – authentication

UNIT V: Intelligent Agents 9

Definition and capabilities–limitation of agents – History of software agents – Characteristics and properties a of agents – Tele script Agent Language – safe-Tcl – security–web based marketing– search engines and Directory registration–online advertisements– Portables and info mechanics–website design issues.

TOTAL HOURS : 45

Text books:

T1 Ravi Kalakota, Andrew B. Whinston " Frontiers of Electronic Commerce",Pearson Education, 2008

T2 Gary PSchneider "Electronic commerce", Thomson learning & James TPeny Cambridge USA, 2001 T3 Manlyn Greenstein and Miklos "Electronic commerce" McGraw-Hill, 2002.

Reference Books:

R1 Efraim TurvanJ.Lee, David Kug and Chung,"Electronic Commerce" Pearson EducationAsia2001.

R2 Brenda Kienew Ecommerce Business Prentice Hall,2001.

Weblinks:

https://archive.nptel.ac.in/content/storage2/courses/106108103/pdf/Worked_Examples/WKm13.pdf **COURSE OUTCOMES**

CO1	Construct the implement various business models of E-Commerce	**K3**
CO2	Develop a policy and regulatory issues in E-commerce	**K4**
CO3	Evaluate the basic networking concepts	**K5**
CO4	Make use of the web client server architecture	**K3**
CO5	Develop and acquire knowledge on web server concepts and its performance evaluation	**K6**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	

PEC	ETHICAL HACKING	3	0	0	3

Course Objectives

- To understand how intruders escalate privileges.
- To understand Intrusion Detection, Policy Creation, Social Engineering, Buffer Overflows and different types of Attacks and their protection mechanisms
- To learn about ethical laws and tests

UNIT I : Ethical Hacking 9

Types of Data Stolen From the Organizations, Elements of Information Security, Authenticity and Non- Repudiation, Security Challenges, Effects of Hacking, Hacker – Types of Hacker, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors.

UNIT II : Foot Printing and Social Engineering 9

Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking

UNIT III : Data Security 9

Physical Security – Attacks and Protection, Steganography – Methods, Attacks and Measures, Cryptography – Methods and Types of Attacks, Wireless Hacking, Windows Hacking, Linux Hacking

UNIT IV : Network Protection System & Hacking Web Servers 9

Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking

UNIT V : Ethical Hacking Laws and Tests 9

An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing

TOTAL HOURS 45

TEXT BOOKS:

T1: Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Network Defense", Second Edition, CENGAGE Learning, 2010.

REFERENCE BOOKS:

R1: Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Learning, 2009-11-01.

R2: Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series – Elsevier, August 4, 2011.

R3: Whitaker & Newman, " Penetration Testing and Network Defense" , Cisco Press, Indianapolis, IN, 2006

Weblinks:

1.https://onlinecourses.nptel.ac.in/noc22_cs13/preview

COURSE OUTCOMES

CO1	Utilize the basics of ethical hacking, elements of Information Security, authenticity, non-repudiation and security challenges	**K3**
CO2	Develop a acquire knowledge on Malicious Software (Malware), Protection Against Malware and Intruder Attacks on Computers	**K4**
CO3	Evaluate the web tools for Foot Printing, Competitive Intelligence and Google Hacking.	**K5**
CO4	Determine Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering and shoulder surfing	**K5**
CO5	Develop Analyze Attacks and enhance Physical Security, and Protection	**K6**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**

PEC	INFORMATION RETRIEVAL	3	0	0	3

COURSE OBJECTIVES

1. To understand the basics of information retrieval with pertinence to modeling
2. To understand various components of IR system
3. To understand machine learning techniques for text classification and clustering
4. To explore various IR applications.

UNIT I : INTRODUCTION AND MODELING 9

Basic Concepts: Retrieval process – Architecture – Boolean retrieval; IR Models: Taxonomy and characterization of IR models – Classical IR models – Alternative algebraic models – Models for Browsing – Retrieval Evaluation: Performance evaluation.

UNIT II : INDEXING AND QUERYING 9

Indexing: Inverted indices – Suffix trees – Suffix arrays – Compression; Querying: Query languages; Query Operations: Relevance feedback and query expansion – Automatic local and global analysis.

UNIT III : SEARCHING 9

Searching: Sequential searching – Pattern matching; Searching the Web: Characteristizing the Web – Search engines – Browsing – Searching using hyperlinks.

UNIT IV : CLASSIFICATION AND CLUSTERING 9

Text Classification: Naive Bayes; Vector Space Classification: Rocchio – k-Nearest Neighbour; Flat Clustering: K-Means – Model-based clustering – **Hierarchical clustering – Matrix decompositions and latent semantic indexing.**

UNIT V : APPLICATIONS 9

XML Retrieval – Multimedia IR – Parallel and Distributed IR – Digital Libraries – Social Media Retrieval – Content-based Image Retrieval – Online Public Access Catalogs (OPACs).

TOTAL HOURS: 45

TEXT BOOKS

1. Ricardo Baeza Yates, BerthierRibeiroNeto, "Modern Information Retrieval: The Concepts and Technology behind Search", ACM Press Books, 2nd Edition, 2011.
2. Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, "Introduction to Information Retrieval", Cambridge University Press, 1st South Asian Edition, 2008.

REFERENCES

1. Stefan Buttcher, Charles L A Clarke, Gordon V Cormack,"Information Retrieval – Implementing and Evaluating Search Engines", The MIT Press, Cambridge, Massachusetts London, England, 2010.
2. Cheng Xiang Zhai, Sean Massung, "Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining", ACM Books, 2016.
3. Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, "Social Media Mining: An Introduction", 1st Edition, Cambridge University Press, 2014.
4. VipinTyagi, "Content-Based Image Retrieval: Ideas, Influences, and Current Trends", 1st Edition, Springer, 2017.
5. Marcia J Bates, "Understanding Information Retrieval Systems: Management, Types, and Standards", CRC Press, 2012.

Weblinks:

1. https://nptel.ac.in/courses/106101007

COURSE OUTCOMES

CO1:	Describe various IR modeling techniques	K3
CO2:	Identify and design the various components of an Information Retrieval system	K3
CO3:	Apply machine learning techniques to text classification and clustering for efficient Information Retrieval.	K3
CO4:	Describe various IR applications	K2
CO5:	Apply IR evaluation metrics to measure the performance of IR systems	K3

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**

PEC	OBJECT ORIENTED ANALYSIS AND DESIGN	3	0	0	3

Course Objective:

- To understand the system modelling and design based on requirements, converting design to code.
- To use various UML design diagrams and to apply the appropriate design patterns.
- To learn the basic Object oriented analysis and design skills through an elaborate case study.
- To apply the process of OOAD in software development.

UNIT I : INTRODUCTION 9

Introduction to OOAD – What is OOAD? – What is UML? An Overview of Object Oriented Systems Development - Object Basics – Object Oriented Systems Development Life Cycle: The Software Development Process – Building High-Quality Software – OOSD: A Use-Case Driven Approach - Use case Modeling - Relating Use cases: include,extend and generalization.

UNIT II : OBJECT ORIENTED METHODOLOGIES 9

Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Patterns – Frameworks – Unified Approach – Unified Modeling Language: Static and dynamic model – UML diagrams - UML class diagram – Use case diagramUML dynamic modeling (Sequence diagram, Collaboration Diagram, State Diagram) - Activity Diagram –Implementation diagrams (Component diagram, Deployment diagram).

UNIT III: OBJECT ORIENTED ANALYSIS 9

Identifying use cases : Business object analysis –The unified approach- Business process modeling – Use case model– Developing effective documentation - Object Analysis Classification : Classifications theory – Approaches foridentifying classes – Noun phrase approach – Common class patterns approach – Use case driven approach –Classes, responsibilities and collaborators – Naming classes - Identifying Object relationships, Attributes and Methods: Associations – Super sub class relationship – A part of relationships (aggregation) – Class responsibility – Object responsibility.

UNIT IV : OBJECT ORIENTED DESIGN 9

Design Axioms: The object oriented design process – Design axioms – Corollaries – Design patterns – Designing Classes: The process - Class visibility – Refining attributes – Designing methods and protocols. Access Layer: Object Storage and Object Interoperability: DBMS – Distributed databases and client server computing – Object relational systems – Multidatabase systems – Designing Access layer classes.

UNIT V : SOFTWARE QUALITY AND USABILITY 9

View Layer : Designing Interface Objects : Designing view layer classes – Macro level , Micro level process – Purpose of a view layer interface – Prototyping the user interface- Software Quality Assurance: Quality Assurance Tests – Testing strategies – Impact of Object Orientation – Test Cases – Test Plan – Myer's Debugging Principles – System Usability and Measuring User Satisfaction : Usability Testing – User Satisfaction Test (Test Templates) – Mappingdesign to code.

TOTAL HOURS : 45

TEXT BOOKS:

1. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 1999.
2. Craig Larman,"Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and iterativedevelopment", Third Edition, Pearson Education,2005.

REFERENCE BOOKS:

1. Mike O'Docherty, "Object-Oriented Analysis & Design: Understanding System Development with UML 2.0", JohnWiley& Sons, 2005.
2. James W- Cooper, Addison-Wesley, "Java Design Patterns – A Tutorial", 2000.

Weblinks:

1.https://onlinecourses.nptel.ac.in/noc19_cs48/preview

COURSE OUTCOMES:

CO1	Construct the Software Development Process	K6
CO2	Analyzeobject oriented design methodologies	K5
CO3	Use Attributes and Methods in use case driven approach	K3

CO4	Design Object relational and Multidatabase systems	K6
CO5	Be Familiar with thetest Cases, test Plan and Myer's Debugging Principles	K3

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	**SOFT COMPUTING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

1. To learn the basic concepts of Soft Computing
2. To study various Artificial Neural network architectures
3. To learn fuzzy sets, fuzzy logic and fuzzy inference system
4. To understand genetic algorithm for global optimization
5. To learn hybrids of neuro, fuzzy and genetic algorithm, and their applications.

UNIT I : INTRODUCTION TO SOFT COMPUTING 9

Introduction: Neural networks – Fuzzy logic – Genetic algorithm – Hybrid systems; Artificial Neural Network: Fundamental concepts – Evolution of neural networks – Basic modals of ANN – McCulloch and Pitts neuron – Linear separability – Hebb network.

UNIT II : SUPERVISED, UNSUPERVISED, AND ASSOCIATIVE LEARNING NETWORKS 9

Supervised Learning Network: Perceptron networks – Adaptive linear neuron – Multiple adaptive linear neurons – Back propagation networks – Radial bias function network; Associative Memory Networks: Autoassociative memory network – Bidirectional associative memory – Hopfield networks; Unspervised Learning Networks: Hamming network – Kohonen neural network – Learning vector quantization – Adaptive resonance theory networks.

UNIT III : FUZZY SYSTEMS 9

Introduction to fuzzy logic – Classical sets – Fuzzy sets – Fuzzy relations – Membership functions – Defuzzification methods – Fuzzy arithmetic – Fuzzy measures – Fuzzy rule base and approximate reasoning – Fuzzy decision making.

UNIT IV : GENETIC ALGORITHMS 9

Genetic Algorithm and search space – General genetic algorithm – Operators – Stopping condition – Constraints – Classification – Genetic programming; Applications of genetic algorithm.

UNIT V : HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS 9

Neuro-Fuzzy hybrid systems – Genetic neuro hybrid systems – Genetic fuzzy hybrid and fuzzy genetic hybrid systems; Applications of Soft Computing: A fusion approach of multispectral images with SAR – Optimization of Traveling Salesman Problem using genetic algorithm – Soft computing based hybrid fuzzy controllers.

Total Periods: 45

TEXT BOOKS

1. S N Sivanandam, S N Deepa, “Principles of Soft Computing”, Wiley India, 2nd Edition, 2011.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2002.

REFERENCES

1. Kwang H Lee, “First course on Fuzzy Theory and Applications”, Springer,

2005.

2. George J Klir, Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1996.

3. James A Freeman, David M Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

4. S Rajasekaran, G A VijayalakshmiPai, “Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.

5. N P Padhy, S P Simon, “Soft Computing with MATLAB Programming”, Oxford University Press, 2015.

Weblinks:

1. https://archive.nptel.ac.in/courses/106/105/106105173/

COURSE OUTCOMES:

CO1	Understand various soft computing techniques	K2
CO2	Design and develop different neural network algorithms	K3
CO3	Analyse and apply fuzzy logic and fuzzy inference system	K3
CO4	Solve problems using Genetic Algorithms	K3
CO5	Apply various soft computing techniques for complex problems	K3

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	SOFTWARE ENGINEERING	3	0	0	3

Course Objective:

- To understand the phases in a software project
- To understand the fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures

UNIT I : SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming-XP Process.

UNIT II : REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, PetriNets- Data Dictionary.

UNIT III : SOFTWARE DESIGN 9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design -Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV : TESTING AND MAINTENANCE 9

Software testing fundamentals-Internal and external views of Testing-white box testing – basis path testing-control structure testing-black box testing- Regression

Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNIT V : PROJECT MANAGEMENT 9

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection – Risk Management-Risk Identification- RMMM Plan-CASE TOOLS

TOTAL HOURS : 45

TEXT BOOKS:

1. Roger S. Pressman, ―Software Engineering – A Practitioner‟s Approach, Seventh Edition, Mc Graw- Hill International Edition, 2010.
2. Ian Sommerville, ―Software Engineering, 9th Edition, Pearson Education Asia, 2011.

REFERENCE BOOKS:

1. Rajib Mall, ―Fundamentals of Software Engineering‖, Third Edition, PHI Learning PrivateLimited, 2009.
2. Pankaj Jalote, ―Software Engineering, A Precise Approach‖, Wiley India, 2010.
3. Kelkar S.A., ―Software Engineering, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, ―Software Engineering, Tata McGraw-Hill Publishing Company Limited,2007.

Weblinks:

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview

COURSE OUTCOMES:

CO1	Identify the key activities in managing a software project	K2
CO2	Compare different process models	K4
CO3	Apply systematic procedure for software design and deployment	K3

CO4	Compare and contrast the various testing and maintenance	K4
CO5	Manage project schedule, estimate project cost and effort required	K3

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration**
			✓	✓

PEC	**SOFTWARE PROJECT MANAGEMENT**	**3**	**0**	**0**	**3**

Course Objective:

- To understand the basic knowledge of software management principles.
- To familiarize in choosing an appropriate project development methodology and identifying project risks, monitoring and tracking project deadlines.
- To develop the capability to work in a team environment and be aware of different modes of communications.

UNIT I : INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9

Project Definition – Contract Management – Activities Covered by Software Project Management – Plans, Methods and Methodologies – Management – Objectives – Stakeholders – Requirement Specification – Management control – Activities Covered By Software Project Management – Overview Of Project Planning – Stepwise Project Planning.

UNIT II : PROJECT EVALUATION 9

Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques : Net Profit – Payback Period – Return on Investment – Net Present Value – Internal Rate of Return – Risk Evaluation : Identification and Ranking – Cost-benefit Analysis – Risk Profile Analysis – Using Decision Trees.

UNIT III : ACTIVITY PLANNING 9

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning and Control.

UNIT IV : MONITORING AND CONTROL 9

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V : MANAGING PEOPLE AND ORGANIZING TEAMS 9

Introduction – Understanding Behavior – Organizational Behaviour : a Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation– The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health and Safety – Case Studies.

TOTAL HOURS : 45

TEXT BOOK:

1. Bob Hughes, Mikecotterell, “Software Project Management”, Third Edition, Tata McGraw Hill, 2004.

REFERENCE BOOKS:

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Royce, “Software Project Management”, Pearson Education, 1999.
3. Jalote, “Software Project Manangement in Practive”, Pearson Education, 2002.

Weblinks:

1. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

COURSE OUTCOMES

CO1	Determine the Plans, Methods and Methodologies of Software project Management	**K5**
CO2	Assess the project evaluation techniques based on cost and risk	**K5**
CO3	Elaborate the Sequencing and Scheduling Activities & Hazards	**K6**
CO4	Examine the Stages In Contract Placement	**K4**
CO5	Organize people in team and develop decision making skills	**K3**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	

PEC	SOFTWARE QUALITY ASSURANCE	3	0	0	3

Course Objective:

- To understand the quality management processes and to distinguish between various activities of quality assurance, quality planning and quality control.
- To know the importance of standards in the quality management process and their impact on the final product.
- To understand the SQA processes from planning till execution.

UNIT I : FUNDAMENTALS OF SOFTWARE QUALITY ASSURANCE 9

The Role of SQA: Objectives – Benefits – Goals – Role – Process - SQA Plan : Need and Content of SQA Plan – SQA considerations – SQA people : Roles and Responsibilities of SQA People – Characteristics of Good SQA Engineer – Quality Management – Software Configuration Management : SCM Plan – Roles – Activities – Baselines – Requirement Phase – Implementation Phase.

UNIT II : MANAGING SOFTWARE QUALITY 9

Managing Software Organizations: Commitment – Management System – Managing Software Quality: Measurement Criteria – Establishing a Software Quality Program – Estimating Software Quality – Removal Efficiency – Quality Goals and Plans – Tracking and Controlling Software Quality – Defect Prevention - Software Quality Assurance Management.

UNIT III : SOFTWARE QUALITY ASSURANCE METRICS 9

Software Quality : Views – Measuring Quality – Criteria - Total Quality Management (TQM) : Principles – Cost – TQM Implementation Approaches – Ways of Improving Quality – Methods for Generating Ideas – Advantages – Barriers – Software Quality Metrics: Product Quality – In-Process – Maintenance quality – Software Quality Metrics Analysis.

UNIT IV : SOFTWARE QUALITY PROGRAM 9

Software Quality Program Concepts – Establishment of a Software Quality Program: Tasks – Scope – Minimal Quality Assurance Effort – Quality Plan – Software Quality Assurance Planning: An Overview – Purpose & Scope: Management – Documentation – SPCM – Reviews and Audits – Validation, Verification and Testing – Problem Reporting.

UNIT V : SOFTWARE QUALITY ASSURANCE STANDARDIZATION 9

Software Standards–ISO 9000 Quality System Standards : Process Model - Capability Maturity Model and the Role of SQA in Software Development Maturity – SEI CMM Level 5 –Comparison of ISO 9000 Model with SEI's CMM : Model Orientation – ISO 9000 Weaknesses – CMM Weaknesses - SPICE (Software Process Improvement and Capability Determination).

TOTAL HOURS 45

TEXT BOOKS:

1. Mordechai Ben-Menachem / Garry S Marliss, "Software Quality", Vikas Publishing House, Pvt, Ltd., New Delhi.(UNIT III to V), 2007.
2. Watts S Humphrey, " Managing the Software Process", Pearson Education Inc. (UNIT I and II)

REFERENCE BOOKS:

1. Gordon G Schulmeyer, "Handbook of Software Quality Assurance", Third Edition, Artech House Publishers 2007.
2. Nina S Godbole, "Software Quality Assurance: Principles and Practice", Alpha Science International, Ltd, 2004.

Weblinks:

1.https://nptel.ac.in/courses/106101163

Course Outcomes

At the end of this course the students will be able to,

Course Outcome	Description	Knowledge Level
CO1	Identify the roles and responsibilities of SQA (software quality assurance)people	K3

CO2	Create and apply a software quality assurance plan for all software projects.	K5
CO3	Maintain appropriate metrics to measure and maintain quality	K6
CO4	Facilitate inspections, product reviews, walk-throughs, and audits.	K5
CO5	Discuss the roles of SQA in software development maturity models	K6

Mapping of course outcomes to program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	-	-	-	-	-	2	2	2	3	2
CO2	2	3	3	3	-	-	-	-	-	2	2	2	3	2
CO3	3	3	3	3	-	-	-	-	-	2	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	2	2	2	3	2
CO5	2	3	3	3	2	3	3	1	2	2	2	2	3	2
Avg	2.6	3	3	3	-	-	-	-	-	2	-	-	-	2

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	

PEC	SOFTWARE TESTING	3	0	0	3

Course Objectives

- To learn the principles of validation testing, defect testing, system and component testing
- To understand the strategies for generating system test cases
- To understand the essential characteristics of tool used for test automation

UNIT I : INTRODUCTION 9

Testing as an Engineering Activity – Role of Process in Software Quality – Testing as a Process – Basic Definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Defect Classes – The Defect Repository and Test Design – Defect Examples –

Developer/Tester Support for Developing a Defect Repository.

UNIT II : TEST CASE DESIGN 9

Introduction to Testing Design Strategies – The Smarter Tester – Test Case Design Strategies – Using Black Box Approach to Test Case Design Random Testing – Requirements based testing – positive and negative testing -— Boundary Value Analysis – decision tables - Equivalence Class Partitioning state- based testing– cause effect graphing – error guessing - compatibility testing – user documentation testing – domain testing Using White–Box Approach to Test design – Test Adequacy Criteria –static testing vs. structural testing – code functional testing - Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White–box Based Test Design – code complexity testing – Evaluating

Test Adequacy Criteria.

UNIT III : LEVELS OF TESTING 9

The Need for Levels of Testing – Unit Test – Unit Test Planning –Designing the Unit Tests. The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – scenario testing – defect bash elimination -System Testing – types of system testing - Acceptance testing –performance testing - Regression Testing – internationalization testing – ad-hoc testing -Alpha – Beta Tests – testing OO systems – usability and accessibility testing

UNIT IV : TEST MANAGEMENT 9

People and organizational issues in testing – organization structures for testing teams –testing services - Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process - Reporting Test Results – The role of three groups in Test Planning and Policy Development – Introducing the testspecialist – Skills needed by a test specialist – Building a Testing Group.

UNIT V : CONTROLLING AND MONITORING 9

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation- Test metrics and measurements –project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of reviews – Developing a review program – Components of Review Plans– Reporting Review Results. – evaluating software quality – defect prevention – testing maturity Model.

TOTAL HOURS : 45

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, " Software Testing – Principles and Practices", Pearson education, 2006.
2. Aditya P.Mathur, "Foundations of Software Testing", Pearson Education,2008.

REFERENCE BOOKS:

1. Boris Beizer, "Software Testing Techniques", Second Edition, Dreamtech, 2003
2. Elfriede Dustin, "Effective Software Testing", First Edition, Pearson Education, 2003.
3. Renu Rajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill,

Weblinks:

1. https://nptel.ac.in/courses/106101163

COURSE OUTCOMES

CO1	Identify the defects by applying the testing principles	**K3**
CO2	Develop test strategies and test cases to prioritize and execute them	**K6**
CO3	Apply the testing techniques in an effective manner	**K3**
CO4	Design and implement comprehensive test plans	**K6**
CO5	Assess the various test metrics and measurements.	**K5**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	

PEC	**SYSTEM SOFTWARE**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers, linkers and loaders.
- To understand the macroprocessors, system software tools and internal working of hardware and software interface of a typical system.

UNIT I : INTRODUCTION 9

System software and machine architecture – The Simplified Instructional Computer (SIC) Machine architecture: Memory- Registers-Data and instruction formats - addressing modes -instruction sets – Input / Output – SIC/XE Machine Architecture: Memory-Registers- Data and instruction formats - addressing modes -instruction sets – Input / Output – Programming examples.

UNIT II : ASSEMBLERS 8

Basic assembler functions : A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features : Instruction formats and addressing modes – Program relocation - Machine independent assembler features : Literals –Symbol-defining statements – Expressions – Assembler Design Options : One pass assemblers and Multi pass assemblers - Implementation example : MASM assembler.

UNIT III : LOADERS AND LINKERS 8

Basic loader functions: Design of an Absolute Loader – A Simple Bootstrap Loader -Machine dependent loader features: Relocation – Program Linking – Algorithm and Data Structures for a Linking Loader - Machine independent loader features: Automatic Library Search – Loader Options - Loader design options: Linkage Editors - Dynamic Linking – Bootstrap Loaders.

UNIT IV : MACRO PROCESSORS & VIRTUAL MACHINES 10

Basic macro processor functions : Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-Independent Macro Processor Features : Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters - Macro within Macro - Implementation example : MASM Macro Processor - Introduction to Virtual Machines (VM) – Computer Architecture- Virtual machine basics – Process virtual machines – System virtual machines

UNIT V : SYSTEM SOFTWARE TOOLS 10

Database Management Systems : Basic concept of a DBMS – Levels of Data Description – Use of a DBMS

- Text editors : Overview of the Editing Process - User Interface – Editor Structure - Interactive debugging systems: Debugging functions and capabilities – Relationship with other parts of the system – User Interface Criteria- Instruction Set Issues – Profiling – Code optimization.

TOTAL HOURS : 45

Text Books:

1: Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson education Asia, 2006.

2: John R. Levine, "Linkers & Loaders", Morgan Kauffman, 2003.

Reference Books:

1: John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2000.

2: D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw Hill, 2000.

3: John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000. 4:Srimanta Pal, "Systems Programming " ,Oxford University Press, 2011.

Weblinks:

1. https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs05/

COURSE OUTCOMES

After completion of course, students would be able to:

CO1	Demonstrate the machine architecture of SIC and SIC/XE.	**K4**
CO2	Identify the different assembler modes and features.	**K6**
CO3	Analyse different loaders with various linkage methods.	**K4**
CO4	Identify the functionalities of macro processing and analyse the virtual machine imeplementation.	**K6**
CO5	Apply the basic concepts of data base management systems with programming coding standards.	**K5**

Mapping Of Course Outcomes to Program Outcomes

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

CO4	3	3	3	3	3	-	-	-	-	-	1	3	3	3
CO5	3	2	3	3	2	-	-	-	-	-	3	3	3	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	USER INTERFACE DESIGN	3	0	0	3

Course Objectives

- To gain knowledge about how to create a User Interface, how to use different type of controls, Menu usage.
- To learn different types and components, different methodologies used to implement User Interface and how to use multimedia, prototypes and analyzing different types of testing

UNIT I : INTRODUCTION 9

Human Computer Interface – A brief History of Screen Design - Characteristics Of Graphics Interface – Direct Manipulation Graphical System – Web User Interface – Popularity –Characteristic of Web Interface Principles of User Interface Design

UNIT II : HUMAN COMPUTER INTERACTION 9

User Interface Design Process – Obstacles –Usability –Human Characteristics In Design – Human Interaction Speed–Business Functions and Requirement Analysis : Direct Methods and Indirect Methods – Basic Business Functions -Design Standards – System Training – Structures Of Menus – Functions Of Menus–Contents Of Menu– Formatting-Phrasing The Menu – Selecting Menu Choice–navigating Menus– Kinds of Graphical Menus.

UNIT III : WINDOWS 9

Window Characteristics– Components– Presentation Styles– Types– Managements– Organizations– Operations– Web Systems– Device Based Controls Characteristics–

Screen Based Controls Characteristics – Operate Control – Text Entry Controls – Selection Control–Combination Control– Custom Control– Presentation Control.

UNIT IV : MULTIMEDIA 9

Text For Web Pages – Providing the Proper Feedback– Guidance & Assistance– International Consideration – Accessibility– Icons– Image– Multimedia – Coloring.

UNIT V : WINDOWS LAYOUT– TEST 9

Prototypes – Kinds Of Tests – Analyze ,Modify and Retest – Evaluating the Working System - Information Search – Visualization –Hypermedia – Software Tools : Interface Design Tools, Software Testing Tools

TOTAL HOURS : 45

TEXT BOOKS:

1: Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley& Sons, 2007.

2: Ben Sheiderman, "Design The User Interface", Pearson Education, 2008.

REFERENCES:

1: Alan Cooper, "The Essential Of User Interface Design", Wiley – Dream Tech Ltd.,2002

Web Links:

L1: https://onlinecourses.nptel.ac.in/noc21_ar05/preview

L2: https://www.coursera.org/specializations/user-interface-design

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1	Identify the concept of Human Computer Interface and Direct Manipulation Graphical System.	**K4**
CO2	Discuss User Interface Design Process, Obstacles andUsability	**K6**
CO3	Compare Window Characteristics, Presentation Styles, Organizations andOperations	**K4**
CO4	Discuss International Consideration and Accessibility ofmultimedia	**K6**
CO5	Analyze the concept of Visualization and Hypermedia	**K5**

Mapping Of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO1	2	2	3	-	2	-	-	-	-	-	-	3	2	3
CO2	1	3	2	-	3	-	-	-	-	-	-	2	3	2
CO3	3	2	3	-	2	-	-	-	-	-	-	1	2	2
CO4	2	2	2	-	2	-	-	-	-	-	-	2	2	2
CO5	3	3	1	-	1	-	-	-	-	-	-	3	3	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	VIRTUAL REALITY	3	0	0	3

Course Objectives

- To understand geometric modeling and Virtual environment.
- To study about Virtual Hardware and Software
- To develop Virtual Reality applications

UNIT I : INTRODUCTION TO VIRTUAL REALITY 9

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics

–Flight Simulation – Virtual environments –requirement – benefits of virtual reality- Historical development of VR : Introduction-Scientific Landmark -3D Computer Graphics :Introduction – The Virtual world space – positioning the virtual observer

– the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modeling – Illumination models – Reflection models – Shading algorithms- Radiosity – Hidden Surface Removal – Realism- Stereographic image.

UNIT II : GEOMETRIC MODELLING 9

Geometric Modeling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances –Picking – Flying – Scaling the VE – Collision detection - A Generic VR system: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR Systems.

UNIT III : VIRTUAL ENVIRONMENT 9

Animating the Virtual Environment: Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – linear and nonlinear translation - shape & object inbetweening

– free from deformation – particle system- Physical Simulation : Introduction – Objects falling in a gravitational field – Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft.

UNIT IV : VR HARDWARES & SOFTWARES 9

Human factors : Introduction – the eye - the ear- the somatic senses - VR Hardware : Introduction – sensor hardware - Head-coupled displays –Acoustic hardware – Integrated VR systems-VR Software: Introduction –Modeling virtual world – Physical simulation- VR toolkits – Introduction to VRML.

UNIT V : VR APPLICATION 9

Virtual Reality Applications: Introduction – Engineering – Entertainment – Science – Training – The Future: Introduction – Virtual environments – modes of interaction.

TOTAL HOURS: 45

TEXT BOOK :

1: John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.

REFERENCE BOOKS:

1: Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.

2: Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Interscience, 2nd Edition, 2006.

3: William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 2008.

Web Links:

L1: https://nptel.ac.in/courses/106106138

L2: www.vresources.org

L3: www.vrac.iastate.edu

L4: www.w3.org/MarkUp/VRML

COURSE OUTCOMES

At the end of this course the students will be able to,

CO1	Assess the concept of Virtual Reality, Virtual Environment and 3D Computer Graphics Shading algorithms	**K4**
CO2	Explain Geometric Modelling Know ,Geometric Transformations and Generic VR system	**K6**
CO3	Appraise the details of Physical Simulation in Virtual Environment	**K4**
CO4	Explain Integrated VR systems, VR Software and VRML	**K6**
CO5	Develop a Virtual Reality Applications with different modes of interaction	**K5**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

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

CO5	2	3	2	3	2	2	3	-	-	3	-	3	1	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	AGILE METHODOLOGIES	3	0	0	3

Course Objectives

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

UNIT I : AGILE METHODOLOGY 9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II : AGILE PROCESSES 9

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III : AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making - Earl'S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV : AGILITY AND REQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V : AGILITY AND QUALITY ASSURANCE 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TOTAL HOURS : 45

Text Books:

T2: David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.

T3: Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

Reference Books:

R4: Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.

R5: Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

Web Links:

1. https://www.guru99.com/scrum-testing-beginner-guide.html
2. https://www.inflectra.com/Ideas/Whitepaper/Introduction%20to%20Agile%20Development%2 0 Methods.aspx

COURSE OUTCOMES

CO1	Realize the importance of interacting with business stakeholders in determining the requirements for a software system	**K4**
CO2	Perform iterative software development processes: how to plan them, how to execute them.	**K3**
CO3	Point out the impact of social aspects on software development success	**K1**
CO4	Develop techniques and tools for improving team collaboration and software quality.	**K6**
CO5	Perform Software process improvement as an ongoing task for development teams.	**K3**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	✓

PEC	**INFORMATION SECURITY**	**3**	**0**	**0**	**3**

Course Objective:

- To understand the basics of Information Security and to know the legal, ethical and professional issues in Information Security.
- To know the aspects of risk management and to become aware of various standards and the technological aspects of Information Security.

UNIT I : INTRODUCTION 9

Information security: Definition, History, Critical Characteristics of Information- NSTISSC Security Model- Components of an Information System- Securing the Components-Balancing Security and Access-The System Development Life Cycle-The Security System Development Life Cycle

UNIT II : SECURITY INVESTIGATION 9

Need for Security- Business Needs: protecting the functionality of an organization, enabling the safe operation of an application, protecting the data that organization collects and use, safeguarding technology assets in organization- Threats-Attacks-Legal, Ethical and Professional Issues: Law and ethics in Information security, relevant U.S Laws, International laws and legal bodies, ethics and information security, codes of ethics and professional organization.

UNIT III : SECURITY ANALYSIS 9

Risk Management: Introduction- Risk Identification: plan and organize the process, asset identification and inventory, classifying and prioritizing information assets, information assets valuation, identifying and prioritizing threats, vulnerability identification and Assessing Risk, Assessing and Controlling Risk

UNIT IV : LOGICAL DESIGN 9

Blueprint for Security- Information Security Policy, Standards and Practices-ISO17799/BS 7799-NIST Models-VISA International Security Model- Design of Security Architecture- Planning for Continuity: Business impact analysis, incident response planning, disaster recovery planning, business continuity planning, crisis management, model for a consolidated contingency plan, law enforcement involvement.

UNIT V : PHYSICAL DESIGN 9

Security Technology- IDS- Scanning and Analysis Tools-Cryptography: Foundation of cryptology, cipher methods, cryptographic algorithms, cryptographic tools, protocols for secure communications, attacks on cryptosystems- Access Control Devices- Physical Security-Security and Personnel

TOTAL HOURS : 45

TEXT BOOK:

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003

REFERENCE BOOKS:

1. Micki Krause, Harold F. Tipton, “ Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw- Hill, 2003
3. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002

Web Links:

1. http://web.cse.ohio-state.edu/~champion.17/4471/
2. https://slideplayer.com/slide/4409575/

COURSE OUTCOMES:

At the end of this course the students will be able to,

Course Outcome	Description	Knowledge Level
CO1	Discuss the development Life Cycle and components of the information security system	**K6**
CO2	Assess the protection of functionalities in an organization with Ethical and Professional Issues	**K5**
CO3	Examine the information assets Risk Assessment and Controlling of Risk	**K4**
CO4	Evaluate the Standards and Practices of various security models with Planning for Continuity	**K5**
CO5	Elaborate Scanning and Analysis Tools and cryptographic algorithms	**K6**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

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

CO4	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO5	2	3	3	3	3	-	-	-	-	-	2	2	3	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	SOFTWARE DEFINED NETWORKS	3	0	0	3

Course Objectives

- To learn about the use and application of SDN in Data centers
- To understand the separation of the data plane and the control plane

UNIT I : INTRODUCTION 9

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

UNIT II : OPEN FLOW & SDN CONTROLLERS 9

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

UNIT III : DATA CENTERS 9

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT IV : SDN PROGRAMMING 9

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.

UNIT V : SDN **9**

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

TOTAL HOURS : 45

Text Books:

1. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.
2. Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.

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.

Web Links:

1. https://opennetworking.org/wp-N_ARCH_1.0_06062014.pdfOnline
2. https://www.ciena.com/insights/what-is/What-Is-SDN.html

COURSE OUTCOMES

CO1	Integrating the conventional networking approaches with SDN	K3
CO2	Articulate the design of open flow specification of SDN via Hypervisor	K3
CO3	Hypothesizing the Virtualized Multitenant Data Center SDN and VxLAN	K5
CO4	Implementing the Composition of SDNs in python programming	K3
CO5	Mind mapping the view of IETF SDN Framework and Data Center Orchestration	K4

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**

CO1	3	2	3	2	3	-	-	-	1	1	-	-	2	2
CO2	3	2	2	2	2	-	-	-	1	1	-	-	2	2
CO3	2	2	2	2	3	-	-	-	1	1	-	-	2	2
CO4	2	2	2	2	2	-	-	-	1	1	-	-	2	2
CO5	2	2	3	2	3	-	-	-	1	1	-	-	2	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓			✓		

PEC	BLOCK CHAIN TECHNOLOGIES	3	0	0	3

Course Objectives

- To introduce Bit coin and other crypto currencies
- To study the algorithms and techniques in block chain
- To understand the practical aspects in the design of crypto currency
- To understand the function of Block chains as a method of securing distributed ledgers
- To design, code, deploy and execute a smart contract

UNIT I : Introduction to Block chain 9

Basics of blockchain-Public Ledgers-Block Chain as Public Ledgers-Types of Block chains- Pillars of Block chain-Government Initiatives of Block Chain-Bitcoin- Smart Contracts

UNIT II : Architecture and Conceptualization of Block Chain, Crypto Currencies 9

Block in a Block chain-find Transactions-Distributed Consensus-Proof of work,

Stake, Space-Attacks on POW-Ethereum-Pos/POW Hybrids-Crypto currency to block chain 2.0, Model of Blockchain-Algorand

UNIT III : Crypto Primitives, Securing and Interconnecting Public and Private Block Chains **9**

Hash Function and Merle Tree-Security Properties-Security Considerations for block chain-Digital Signature-Public Key Cryptography-Bit coin block chain incentive structures- Nash Equilibriums- evolutionary stable strategies,-and Pareto-efficiency (game theory) Weaknesses and news Points of Failure- Mitigation Methods-Redundancies and fall-back methods.

UNIT IV : Mining and Crypto Currencies - How to use and Interact 9

Mining-Pools-Impact of CPU and GPU-Transaction in Bit coin Network- Block Mining-Block propagation and block relay

UNIT V : Blockchain Use Cases-Applications in Different Areas 9

Industry applications of Blockchain - Blockchain in Government-Government use cases-Preventing Cybercrime through block chain-Block Chain in defense, tax payments

TOTAL HOURS : 45

Text Books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos O'Reilly, First Edition, 2014.
2. Blockchain by Melanie Swa, O'Reilly Media 2015
3. Zero to Block chain - An IBM Redbooks course, by Bob Dill, David Smits

Reference Books:

1. The Basics of Bitcoins and Blockchains: An Introduction to Crypto currencies and the Technology that Powers Them, 2018 by Antony Lewis
2. The Truth Machine: The Blockchain and the Future of Everything Paperback – 5 March 2019

Weblinks:

1. https://onlinecourses.nptel.ac.in/noc20_cs01/preview

COURSE OUTCOMES

CO1	Explain the structure of a block chain	**K5**

CO2	Analyze the incentive structure in a block chain based system	**K4**
CO3	Judge the scenario where “smart” contract is most appropriate	**K5**
CO4	Identify basic knowledge of Bitcoin, Ethereum	**K3**
CO5	Apply Blockchain in future use cases for security	**K3**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓		

PEC	**NATURAL LANGUAGE PROCESSING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To learn the fundamentals of natural processing
- To understand the way to measure one or more qualities of an algorithm or a system

- To gain knowledge of the linguistics concerned with the interactions between computers and human.

UNIT 1 : OVERVIEW AND LANGUAGE MODELLING 9

Overview: Origins and challenges of NLP Language and Grammar-Processing Indian Languages- NLP Applications Information Retrieval. Language Modeling: Various Grammar- based Language Models- Statistical Language Model.

UNIT 2 WORD LEVEL ANALYSIS 9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT 3 SYNTACTIC ANALYSIS 9

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT 4 INFORMATION RETRIEVAL AND LEXICAL RESOURCES 9

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

UNIT 5 DISCOURSE ANALYSIS AND LEXICAL RESOURCES 9

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC). Max.45 Hours

COURSE OUTCOMES

CO1	Understand NLP problems and survey the literature about that problem	**K5**
CO2	Understand language modeling	**K4**
CO3	Describe automated natural language generation and machine translation	**K5**
CO4	Learn the natural language generation.	**K3**
CO5	Analyse the logic and semantics of world knowledge	**K3**

TOTAL HOURS -45

TEXT / REFERENCE BOOKS

1. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
2. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition,Chapman and Hall/CRC Press, 2010.
3. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

Weblinks:

1. https://onlinecourses.nptel.ac.in/noc19_cs56/preview

Mapping Of Course Outcomes to Program Outcomes

	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	2	-	-	-	-	-	-	1	2	1
CO2	2	2	2	2	2	-	-	-	-	-	-	1	3	2
CO3	2	3	1	2	2	-	-	-	-	-	-	2	-	-
CO4	2	3	-	-	-	2	3	2	2	3	3	2	3	3
CO5	2	3	3	3	3	1	3	2	3	3	-	-	-	-

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓			✓		

PEC	APPLICATIONS OF AI	3	0	0	3

Course Objectives

- To give deep knowledge of AI and how AI can be applied in various fields to make the life easy

UNIT I : **9**

Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications of Artificial Intelligence (AI) in business.

UNIT II : **9**

Emotion Recognition using human face and body language, AI based system to predict the diseases early, Smart Investment analysis, AI in Sales and Customer Support

UNIT III : **9**

Robotic Processes Automation for supply chain management.

UNIT IV : **9**

AI-Optimized Hardware, Digital Twin i.e. AI Modelling, Information Technology & Security using AI.

UNIT V : **9**

Recent Topics in AI/ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Block chain and AI.

TOTAL :45 hours

Text Books:

T1: Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley & Sons.

T2: Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, published July 2018.

T3: Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari, published March 2017.

T4: Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

Reference Books:

R1: Somogyi, Zoltán. The Application of Artificial Intelligence: Step-by-Step Guide from Beginner to Expert. Switzerland, Springer International Publishing, 2022.

R2: Artificial Intelligence Applications in Information and CommunicationTechnologies. Germany, Springer International Publishing, 2015.

Weblinks:

1.https://nptel.ac.in/courses/106102220

COURSE OUTCOMES

CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	**K 3**
CO2	To apply the Basic Concepts of Machine Learning	**K4**
CO3	To build various machine learning algorithms using Linear models	**K5**
CO4	To apply ML techniques to application and evaluate the models	**K4**
CO5	Apply basic principles of AI and ML in solutions that require problem solving, inference, perception, knowledge representation, and learning.	**K4**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**

✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓		✓	✓

EC	**INFORMATION SECURITY ANALYSIS AND AUDIT**	**3**	**0**	**0**	**3**

Course Objectives

1. To introduce system security related incidents and insight on potential defenses, counter measures against common threat/vulnerabilities.
2. To provide the knowledge of installation, configuration and troubleshooting of information security devices.
3. To make students familiarize on the tools and common processes in information security audits and analysis of compromised systems.

UNIT 1 : Information Security Fundamentals 9

Definitions & challenges of security, Attacks & services, Security policies, Security Controls, Access control structures, Cryptography, Deception, Ethical Hacking, Firewalls, Identify and Access Management (IdAM).

Monitor systems and apply controls, security assessment using automated tools.

UNIT 2 : System Security 9

System Vulnerabilities, Network Security Systems, System Security, System Security Tools, Web Security, Application Security, Intrusion Detection Systems, backups of security devices, Performance Analysis, Root cause analysis and Resolution, Information Security Policies, Procedures, Standards and Guidelines.

UNIT 3 : Incident Management 9

Security requirements, Risk Management, Risk Assessment, Security incident management, third party security management, Incident Components, Incident Response Lifecycle, Record, classify and prioritize information security incidents using standard templates and tools.

UNIT 4 : Conducting Security Audits 9

Common issues in audit tasks, Infrastructure and networks, application hosting and content management, communication routes such as messaging, Features, configuration and specifications of information security systems and devices, Common audit techniques, Record and report audit tasks, Methods and techniques for testing compliance.

UNIT 5 : Information Security Audit Preparation 9

Establish the nature and scope of information security audits, Roles and responsibilities, Requirements of information security, Best Practices of a cybersecurity audit, self and work management skills, Self management skills importance, Why is self management important in the workplace.

Total Hours 45

Text Book(s)

1. William Stallings, Lawrie Brown, Computer Security: Principles and Practice, 3rd edition, 2014.
2. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2017
3. Nina Godbole, Sunit Belapure, Cyber Security- Understanding cyber-crimes, computer forensics and legal perspectives, Wiley Publications, 2016
4. Andrew Vladimirov Michajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko, Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O'Reilly, 2010.

Reference Books

1. Charles P. Pfleeger, Security in Computing, 4th Edition, Pearson, 2009. Christopher J. Alberts, Audrey J. Dorofee , Managing Information Security Risks, Addison-Wesley Professional, 2004
2. Peter Zor, The Art of Computer Virus Research and Defense, Pearson Education Ltd, 2005Lee Allen, Kevin Cardwell, Advanced Penetration Testing for Highly-Secur Environments - Second ed Edition, PACKT Publishers, 2016
3. Chuck Easttom , System Forensics Investigation and Response, Second Edition, Jones & Bartlett Learning, 2014
4. David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni, Metasploit The Penetration Tester's Guide, No Starch Press, 2014
5. Practical Malware Analysis by Michael Sikorski and Andrew Honig, No Starch Press, 2015

Web Links:

https://www.iso.org/isoiec-27001-information-security.html

https://csrc.nist.gov/publications/detail/sp/800-55/rev-1/final

https://www.sans.org/reading-room/whitepapers/threats/paper/34180

https://www.sscnasscom.com/qualification-pack/SSC/Q0901/

COURSE OUTCOMES

CO1	Contribute to managing information security	**K3**
CO2	Co-ordinate responses to information security incidents	**K6**
CO3	Develop knowledge, skills and competence in information security	**K3**
CO4	Contribute to information security audits.	**K6**
CO5	Support teams to prepare for and undergo information security audits	**K5**

Mapping Of Course Outcomes to Program Outcomes

	PO 1	**PO2**	**PO3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	2	2	1	0	2	2	-	-	-	-	-	-	2	1
CO 2	2	2	1	2	2	0	-	-	-	-	-	-	3	2
CO 3	2	3	1	2	2	0	-	-	-	-	-	-	3	2
CO 4	2	3	2	2	3	2	-	-	-	-	-	-	3	3
CO5	2	3	3	3	3	0	3	2	3	3	3	2	3	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✔	✔	✔	✔	✔	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✔	✔		✔	✔	

PEC	INTELLIGENT DATA BASE SYSTEM	3	0	0	3

Course Objectives

- To analyze learning systems.
- To study the Database installation and create databases by using SQL.
- To get exposure to many real-world control problems.
- To determine which type of intelligent system methodology would be suitable for a given type of application problem.
- To design and create small real time applications.

UNIT I : SEMANTIC DATA MODELS 9

Informal definition of the domain - General characteristics of IDBSs - Data models and the relational data model - A taxonomy of intelligent database systems. Nested and semantic data models – Introduction - The nested relational model - Semantic models - Hyper-semantic data models -

UNIT II : KNOWLEDGE BASED SYSTEMS - AI CONTEXT 9

Characteristics and classification of the knowledge based systems – Introduction - The resolution principle - Inference by inheritance - Deductive database systems - Basic concepts - DATALOG language - Deductive database systems and logic programming systems—differences - Architectural approaches - Research prototypes - Updates in deductive databases - Integration of deductive database and object database technologies - Constraint databases.

UNIT III : APPLICATIONS IN IDBS 9

Introduction - Temporal databases - Basic concepts - Temporal data models - Temporal query languages Internet indexing and retrieval - Basic indexing methods - Search engines or meta searchers - Internet spiders -

UNIT IV : SEMANTIC DATA MODELING 9

Object oriented approaches to semantic data modeling – Object oriented database systems – Basic concepts of a core object-oriented data model - Comparison with other data models.

UNIT V : DATA MINING 9

Data mining - Data mining tasks - Data mining tools - Medical and legal information systems – Medical information systems - Legal information systems. Case study: Design and develop a project using a medical information system

TOTAL HOURS : 45

Text Books:

1 Panos Alexopoulos, "Semantic Modeling For Data: Avoiding Pitfalls And Breaking Dilemmas", O'Reilly , 2020.

2 N.P. Padhy,"Artificial Intelligence and Intelligent Systems" Oxford Press, 2015.

Reference Books:

1 Elisa Bertino, Barbara Catania, GianPieroZarri, “Intelligent Database Systems”,Collection ACM Press, 2001.

2 Leondes CT, "Intelligent Knowledge-Based Systems", Kluwer Academic Publishers, 2005.

Weblinks:

1.https://nptel.ac.in/courses/106105219

COURSE OUTCOMES

CO1	Understand the basic artificial intelligence techniques	**K3**
CO2	Understand the concepts of knowledge-based systems and apply them with AI.	**K6**
CO3	Describe the attributes of knowledge-based systems and the situations to which they are well-suited	**K3**
CO4	Apply their knowledge to design solutions to different problems.	**K6**
CO5	Design and develop an intelligent system for a selected application.	**K5**

Mapping Of Course Outcomes to Program Outcomes

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

CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✔	✔	✔	✔	✔	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✔	✔		✔	✔	

PEC	RECOMMENDER SYSTEMS	3	0	0	3

Course Objectives

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement a recommender system..

UNIT I : INTRODUCTION 9

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

UNIT II CONTENT-BASED RECOMMENDATION SYSTEMS 9

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT III : COLLABORATIVE FILTERING 9

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based

and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT IV : ATTACK-RESISTANT RECOMMENDER SYSTEMS 9

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack

– Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

UNIT V : EVALUATING RECOMMENDER SYSTEMS 9

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

TOTAL HOURS : 45

TEXT BOOKS:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 1st ed, Springer (2011),
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

COURSE OUTCOMES:

CO1	Understand the basic concepts of recommender systems	**K3**
CO2	Implement machine-learning and data-mining algorithms in recommender systems data sets.	**K4**
CO3	Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.	**K5**
CO4	Design and implement a simple recommender system.	**K4**
CO5	Learn about advanced topics of recommender systems.	**K4**

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO1	3	2	2	2	-	2	2	-	-	2	-	2	3	2
CO2	2	2	2	2	-	2	2	-	-	2	-	2	3	3
CO3	3	2	2	2	-	2	2	-	-	2	-	2	2	2
CO4	2	2	3	3	-	3	3	-	-	3	-	2	3	2
CO5	2	3	2	3	-	3	2	-	-	3	-	3	1	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	✓

PEC	TEXT AND SPEECH ANALYSIS	3	0	0	3

Course Objectives

- Understand natural language processing basics
- Apply classification algorithms to text documents
- Build question-answering and dialogue systems
- Develop a speech recognition system
- Develop a speech synthesizer

UNIT I : NATURAL LANGUAGE BASICS 9

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization –

Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model.

UNIT II : TEXT CLASSIFICATION 9

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model –FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models

UNIT III: QUESTION ANSWERING AND DIALOGUE SYSTEMS 9

Information retrieval – IR-based question answering – knowledge-based question answering –language models for QA – classic QA models – chatbots – Design of dialogue systems -–evaluating dialogue systems

UNIT IV : TEXT-TO-SPEECH SYNTHESIS 9

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing -Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems

UNIT V : **AUTOMATIC SPEECH RECOGNITION 9**

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems

Total Hours : 45

TEXTBOOK

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022.

REFERENCES:

1. Dipanjan Sarkar, “Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data”, APress,2018.

2. Tanveer Siddiqui, Tiwary U S, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

3. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, “Fundamentals of Speech Recognition” 1st Edition, Pearson, 2009.

4. Steven Bird, Ewan Klein, and Edward Loper, “Natural language processing with Python”,O’REILLY.

COURSE OUTCOMES

CO1	Explain existing and emerging deep learning architectures for text and speech processing	**K3**
CO2	Apply deep learning techniques for NLP tasks, language modelling and machine translation	**K5**
CO3	Explain coreference and coherence for text processing	**K4**
CO4	Build question-answering systems, chatbots and dialogue systems	
CO5	Apply deep learning models for building speech recognition and text-to-speech systems	K3

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	2	2	2	-	2	2	-	-	2	2	2	3	2
CO2	2	2	2	2	-	2	2	-	-	2	2	2	3	3
CO3	3	2	2	2	-	2	2	-	-	2	2	2	2	2
CO4	2	2	3	3	-	3	3	-	-	3	3	2	3	2
CO5	2	3	2	3	-	3	2	-	-	3	2	3	1	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
	✓		✓	✓	

PEC	**BUSINESS ANALYTICS**	**3**	**0**	**0**	**3**

Course Objectives

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for Analytics.
- To apply analytics for different functions of a business

UNIT I : INTRODUCTION TO BUSINESS ANALYTICS 9

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT II : BUSINESS INTELLIGENCE 9

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions – Decision Making Process - Decision Support Systems – Business Intelligence – OLAP – Analytic functions

UNIT III : BUSINESS FORECASTING 9

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models –Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.

UNIT IV : HR & SUPPLY CHAIN ANALYTICS 9

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year.

UNIT V : MARKETING & SALES ANALYTICS 9

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning –Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.

TOTAL HOURS 45

TEXT BOOKS:

1. R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017
2. R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016
3. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016

4. VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.

5. Mahadevan B, "Operations Management -Theory and Practice",3rd Edition, Pearson Education,2018.

COURSE OUTCOMES

CO1:	Explain the real world business problems and model with analytical solutions.	**K5**
CO2:	Identify the business processes for extracting Business Intelligence	**K4**
CO3:	Apply predictive analytics for business fore-casting	**K5**
CO4:	Apply analytics for supply chain and logistics management	**K3**
CO5:	Use analytics for marketing and sales.	**K3**

MAPPING OF COURSE OUTCOMES TO PROGRAM OUTCOMES

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	2	2	2	-	2	2	-	-	2	2	2	3	2
CO2	2	2	2	2	-	2	2	-	-	2	2	2	3	3
CO3	3	2	2	2	-	2	2	-	-	2	2	2	2	2
CO4	2	2	3	3	-	3	3	-	-	3	3	2	3	2
CO5	2	3	2	3	-	3	2	-	-	3	2	3	1	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	

PEC	IMAGE AND VIDEO ANALYTICS	3	0	0	3

Course Objectives

- To understand the basics of image processing techniques for computer vision.
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms.

UNIT I : INTRODUCTION 9

Computer Vision – Image representation and image analysis tasks - Image representations –digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation – Traditional and Hierarchical image data structures.

UNIT II : IMAGE PRE-PROCESSING 9

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative – Scale in image processing - Canny edge detection - Parametric edge models – Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.

UNIT III : OBJECT DETECTION USING MACHINE LEARNING 9

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures

UNIT IV : FACE RECOGNITION AND GESTURE RECOGNITION 9

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-Deep Face solution by Facebook-FaceNet for Face Recognition-Implementation using FaceNet-Gesture Recognition.

UNIT V : VIDEO ANALYTICS 9

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3.

TOTAL HOURS : 45

TEXT BOOK:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4nd edition, Thomson Learning, 2013.
2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)

REFERENCES

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited,2011.
2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
4. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
5. E.R.Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.

COURSE OUTCOMES

CO1	Understand the basics of image processing techniques for computer vision and video analysis.	**K2, K3**
CO2	Explain the techniques used for image pre-processing.	**K3, K6**
CO3	Develop various object detection techniques.	**K4**
CO4	Understand the various face recognition mechanisms.	**K5**
CO5	Elaborate on deep learning-based video analytics.	**K6**

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	-	3	-	-	-	-	-	-	-	-	3
CO2	3	2	2	3	2	-	-	-	-	-	-	-	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	-	3
CO4	2	2	2	3	-	-	-	-	-	-	-	-	-	3
CO5	0	2	3	3	3	-	-	-	-	-	-	-	-	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓		✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓		

PEC	COMPUTER VISION	3	0	0	3

Course Objectives

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

UNIT I: INTRODUCTION TO IMAGE FORMATION AND PROCESSING 9

Computer Vision - Geometric primitives and transformations - Photometric image formation – The digital camera - Point operators - Linear filtering - More neighborhood operators – Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

UNITII : FEATUREDETECTION, MATCHING AND SEGMENTATION 9

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge – Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT III : FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 9

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration -Triangulation – Two-frame structure from motion - Factorization - Bundle adjustment – Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Opticalflow - Layered motion.

UNIT IV : 3D RECONSTRUCTION 9

Shape from X - Active rangefinding - Surface representations - Point-based representations-Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos..

UNIT V : IMAGE-BASED RENDERING AND RECOGNITION 9

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes -Video- based rendering-Object detection - Face recognition - Instance recognition – Category recognition – Context and scene understanding-Recognition databases and test sets.

TOTAL HOURS : 45

TEXT BOOKS:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Texts in Computer Science, Second Edition, 2022.

2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.

REFERENCES:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.

2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006. 3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

COURSE OUTCOMES:

CO1	To understand basic knowledge, theories and methods in image processing and computer vision.	**K3**
CO2	To implement basic and some advanced image processing techniques in OpenCV.	**K4**
CO3	To apply 2D a feature-based based image alignment, segmentation and motion estimations.	**K5**
CO4	To apply 3D image reconstruction techniques	**K4**
CO5	To design and develop innovative image processing and computer vision applications.	**K4**

Mapping Of Course Outcomes To Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓	✓	✓	✓	✓

PROFESSIONAL ELECTIVE COURSE (BLENDED)

PEC	DATA EXPLORATION AND VISUALIZATION	3	0	2	4

Course Objectives

- To understand the basics of Data Explorations and the concepts of Data visualization
- To explore and apply various data visualization techniques for a variety of tasks using R language

UNIT I : INTRODUCTION TO DATA EXPLORATION 12

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT II : INTRODUCING TWO VARIABLE AND THIRD VARIABLE 12

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatter plots and Resistant Lines – Transformations - Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data.

UNIT III : BASICS OF DATA VISUALIZATION 12

The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series - Connections and Correlations - Scatter plot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs – Acquiring Data – Parsing Data

UNIT IV: DATA EXPLORATION AND DATA VISUALIZATION IN R 12

Introduction to R and Studio - The Basics of Data Exploration - Loading Data into R - Transforming Data - Creating Tidy Data

UNIT V : TECHNIQUES AND APPLICATIONS OF DATA EXPLORATIONAND VISUALIZATION IN R 12

Basic Data Exploration Techniques – Basic Data Visualization Techniques - Visualizing Geographic Data with ggmap - R Markdown - Case Study – Wildfire Activity in the Western United States - Case Study – Single Family Residential Home and Rental Values

TOTAL HOURS : 60

Text Books:

1. Catherine Marsh, Jane Elliott, Exploring Data: An Introduction to Data

Analysis for Social Scientists, Wiley Publications, 2nd Edition, 2008.

2. Visualizing Data: Exploring and Explaining Data with the processing Environment, O Reily Publications, 2007

3. Claus.O.Wlike, Fundamentals of Data Visualization, A primer on making informative and compelling Figures, O'Reily Publications, 2019.

REFERENCE BOOKS:

1. Xiang Zhou, Sean, Yong Rui, Huang, Thomas S., Exploration of Visual Data, Springer Publications, 2003

2. Eric Pimple, Data Visualization and Exploration with R, Geo Spatial Training service, 2017

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_mg09/preview

2. www.geeksforgeeks.org/data-visualization-in-r/

COURSE OUTCOMES

CO1	Demonstrate the basic of Data Exploration	**K3**
CO2	Analyze the use of univariate and Multivariate Analysis for Data Exploration	**K4**
CO3	Identify the various Data Visualization methods	**K2**
CO4	Apply the concept of Data Visualization on various datasets	**K3**
CO5	Apply the data visualization techniques using R language	**K3**

Mapping Of Course Outcomes to Program Outcomes

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

CO5	3	3	2	3	3	-	-	-	-	-	-	-	3	3
AVG	2.6	2.6	2.6	2.4	2.4	-	-	-	-	-	-	-	2.6	2.2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓		✓

PEC	BIG DATA ANALYTICS	3	0	2	4

Course Objectives:

1. To understand the need of Hadoop framework to process the Big Data
2. Introduction to theoretical techniques and practical tools used in data analytics
3. Applications in various engineering and scientific domains.

UNIT I : Introduction Big Data and Hadoop Framework 12

Data Storage and Analysis - Characteristics of Big Data – Big Data Analytics - Typical Analytical Architecture – Requirement for new analytical architecture – Challenges in Big Data Analytics – Need of big data frameworks, Introduction to Hadoop ecosystems. Hadoop Framework: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system - Hadoop Components –Hadoop Daemon's – Working with HDFS Commands

UNIT II : Mapreduce Programming 12

Map Reduce working principle, Map Reduce types and formats, MapReduce features, Combiner optimization,Map side join, Reduce SideJoin, Secondary sorting, Pipelining MapReduce jobs.

UNIT III : R Programming 12

History and overview of R , Install and configuration of R programming environment , Basic language elements and data structures, Data input/output, Data storage formats , Subsettingobjects.

UNIT IV : Visualization Using R 12

Vectorization, Control structures, Functions, Scoping Rules, Loop functions, R Graphs and visualization using lattice, ggplot2

UNIT V : Spark Framework and Data Analysis Models 12

Overview of Spark – Hadoop vs Spark – Cluster Design – ClusterManagement – performance,Application Programming interface(API): Spark Context, Resilient Distributed Datasets, Creating RDD,RDD Operations, Saving RDD - Lazy Operation – Spark Jobs-spark ML library.Association and correlation analysis-regression models- Predictive analytics - Exploratory analysis. Prescriptive analysis.

TOTAL HOURS 60

Text Book(s)

1. Garrett Grolemund, “Hands-On Programming with R” , O'Reilly Media, Inc, 2014.
2. Seema Acharya, SubhashiniChellapan, “Big Data and Analytics”, Wiley, 2015.
3. Mike Frampton, “Mastering Apache Spark”, Packt Publishing, 2015.

Reference Books

1. Nick Pentreath, Machine Learning with Spark, Packt Publishing, 2015.
2. Donald Miner, Adam Shook, “MapReduce Design Pattern”, O’Reilly, 2012
3. Raj Kamal, PreetiSaxena ,”Big Data Analytics:Introduction to Hadoop, Spark, and Machine-Learning”, McGraw-Hill Education, 2019.

Web links:

W1:https://nptel.ac.in/courses/106104189

W2: https://nptel.ac.in/courses/106106142

Course Outcomes

At the end of this course the students will be able to,

Course Outcome	Description	Knowledge Level

CO1	Discuss the challenges and their solutions in Big Data and work on Hadoop Framework	k1
CO2	Understand the concepts of R programming and its applications.	k2
CO3	Implement different statistical methods on sample data using R Programming library.	k5
CO4	Analyse the Big Data using Map-reduce programming in Both Hadoop and Spark framework.	k4
CO5	Demonstrate spark programming with different programming languages	k5

ASSESSMENT METHODS:

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

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration**
			✓	✓

PEC	PYTHON FOR DATA SCIENCE	3	0	2	4

Course Objectives:

- To understand the basic concepts of Python
- To apply the knowledge to use advanced features of python
- To execute statistical analysis of data with NumPy and Pandas .
- To build data visualization in real-world scenarios.

UNIT I : PYTHON BASICS 12

Introduction to Python, Python Interpreter and its working, Syntax and Semantics- Data Types: Booleans – Numbers – Lists – Tuples – Set – Dictionaries – Comprehensions – Assignments and Expressions, Control Flow Statements – Fruitful functions

UNIT II : PYTHON: ADVANCED FEATURES 12

Handling text files - Reading and Writing files- format operator-command line arguments - Exception Handling -- Modules -Strings and Regular Expressions.

UNIT III : NUMPY IN PYTHON 12

Introduction to Numpy-Data Types-NumPy array in Python-NumPy Ndarray- Array indexing- NumPy String Functions-Numpy ufunc-Statistical Functions **Case Study**

UNIT IV : PANDAS IN PYTHON 12

Pandas Introduction-Pandas Data Structures- -Series-DataFrame- Accessing and Changing values of Data Frames- Pandas Data Operations-Indexing-Cleaning data-Pandas plotting –Case study

UNIT V : MATPLOTLIB: VISUALIZATION PYTHON 12

Introduction to Matplotlib-pyplot-plot types-Matplotlib Plotting-Subplot- Matplotlib Three Dimensional Plotting-**Case study**

TOTAL HOURS : 60

Text Books:

1. Mark Lutz, “Learning Python”, O Reily, 4thEdition, 2009, ISBN: 978-0-596 15806-4,5th edition, 2013
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley

Publications, 2017. (Chapters 1–7 for Units II and III)

3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016. (Parts of chapters 2–4 for Units IV and V)

4. **Fabio Nelli, “Python Data Analytics: With Pandas, NumPy, and Matplotlib”, Apress,2018.**

Reference Books

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.

2. Magnus Lie Hetland , “Beginning Python: From Novice to Professional”, 3rd Edition, 2013

Weblink

Numpy, Matplotlib and Pandas :

https://python- course.eu/books/bernd_klein_python_data_analysis_a4.pdf

https://python-course.eu/python_and_machine_learning.pdf

CO1:	Understand the basic concepts of Python	**K1**
CO2:	Apply the knowledge to use advanced features of python	**K3**
CO3:	Demonstrate the skills with statistical analysis of data using NumPy	**K4**
CO4:	Ability to analyse the data operations using Pandas	**K3**
CO5:	Build visualizations of many different kinds of datasets using MATPLOTLIB	**K5**

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**P O4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	1	1	-	-	-	-	-	-	2	3	-
CO2	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO3	3	1	3	2	2	-	-	-	-	-	-	2	3	2
CO4	3	2	3	3	2	-	-	-	-	-	-	2	3	2
CO5	1	2	1	2	2	-	-	-	-	-	-	2	3	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments
✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration / Presentation**
			✓	✓

PEC	NOSQL DATABASE	3	0	2	4

Course Objectives

- To explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems
- To understand the architectures and common features of the main types of NoSQL databases (key-value stores, document databases, column-family stores, graph databases)
- To discuss the criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases

UNIT I : NOSQL DATA ARCHITECTURE PATTERNS 12

NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model- Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication

to scale reads, Database distributed queries to Data nodes.

UNIT II : KEY VALUE DATA STORES 12

From array to key value databases, Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Architecture and implementation Terms, Designing Structured Values, Limitations of Key- Value Databases, Design Patterns for Key-Value Databases, Case Study: Key-Value Databases for Mobile Application Configuration

UNIT III : DOCUMENT ORIENTED DATABASE 12

Document, Collection, Naming, CRUD operation, querying, indexing, Replication, Sharding, Consistency Implementation: Distributed consistency, Eventual Consistency, Capped Collection, Case studies: document oriented database: Mongo DB and/or Cassandra

UNIT IV : COLUMNAR DATA MODEL 12

Data warehousing schemas: Comparison of columnar and row-oriented storage, Column-store Architectures: C-Store and Vector-Wise, Column-store internals and, Inserts/updates/deletes, Indexing, Adaptive Indexing and Database Cracking. Advanced techniques: Vectorized Processing, Compression, Write penalty, Operating Directly on Compressed Data Late Materialization Joins , Group-by, Aggregation and Arithmetic Operations, Case Studies

UNIT V : DATA MODELING WITH GRAPH 12

Comparison of Relational and Graph Modeling, Property Graph Model Graph Analytics: Link analysis algorithm- Web as a graph, Page Rank- Markov chain, page rank computation, Topic specific page rank (Page Ranking Computation techniques: iterative processing, Random walk distribution Querying Graphs: Introduction to Cypher, case study: Building a Graph Database Application- community detection

TOTAL HOURS : 60

Text 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.

Reference Books:

1 Guy Harrison, Next Generation Database: NoSQL and big data, Apress

Web Links:

1 https://www.mongodb.com/

2 https://university.mongodb.com/

3 https://www.ibm.com/cloud/learn/nosql-databases

4 https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp

COURSE OUTCOMES

CO1	Differentiate and identify right database models for real time applications	**K4**
CO2	Outline Key value architecture and characteristics	**K2**
CO3	Design Schema and implement CRUD operations, distributed data operations	**K6**
CO4	Compare data ware housing schemas and implement various column store internals	**K4**
CO5	Develop Application with Graph Data model	**K6**

Mapping Of Course Outcomes to Program Outcomes

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

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	✓

PEC	**GAME PROGRAMMING**	**3**	**0**	**2**	**4**

Course Objectives

- To provide an in-depth introduction to technologies and techniques currently used in the game industry

- To understand game design and development
- To understand the processes, mechanics, issues in game design, and game engine development
- To understand modeling, techniques, handling situations, and logic
- To build and then integrate technologies such as multimedia, artificial intelligence, and physics modeling into a cohesive, interactive game application.

UNIT I : Introduction to Game Programming & Game engine architecture 12

Overview of game programming -Structure of a typical game team - game industry - game engine history -Real Time Game Architecture - Engine Support: Subsystem Start-Up and Shut-Down - Memory Management - Containers and Strings - Resource Management: File System, Resource Manager.

UNIT II : Basics of 2D & 3D Graphics and Mathematics in Gaming & Rendering engine 12

2D Graphics: Sprites, Tiled Images and Backgrounds - 3D Graphics: 3D Graphics Pipeline, 3D Math, Coordinates and Coordinate Systems - Quaternion Mathematics - Transformations & Geometry - The Rendering Engine: Triangle Rasterization, The Rendering Pipeline

UNIT III : Lighting and Texturing Effects in game environment 12

Ray Tracing - Lighting in Computer Graphics - Types of Light Sources - Light Models - Materials: Lambert Diffuse, Phong - Bump Mapping - Lighting Technique: Point Lights, Bloom - Shadows in Games: Real- Time Versus Preprocessed Shadows, Types of Shadows, Texture mapping techniques - Special Effects: Blurring, Particle Systems, Weapon Effects

UNIT IV : Introduction to Artificial Intelligence in Game 12

Why Games for Artificial Intelligence - Why Artificial Intelligence for Games - Game AI Panorama: Methods (Computer) Perspective, End User (Human) Perspective, Player-Game Interaction Perspective.

UNIT V : Solving search problems for Game move prediction and optimization using AI 12

Tree Search: Uninformed Search, Best-First Search, Minimax, Monte Carlo Tree Search - Evolutionary Algorithms - Supervised Learning: Artificial Neural Networks, Support Vector Machines.

TOTAL HOURS : 60

TEXT BOOKS:

1: Game Engine Architecture, 3rd Edition, Jason Gregory, A K Peters, 2019. 2: Palmer G. Physics for game programmers. Berkeley: Apress; 2005

3: Artificial Intelligence and Games, Georgios N. Yannakakis and Julian Togelius, January 26, 2018, Springer

REFERENCES:

1: Sherrod A. Game Graphic Programming. Cengage Learning; 2008.

2: McShaffry M. Game coding complete. Nelson Education; 2014

3: Akenine-Mo, T., Haines, E. and Hoffman, N., 2018. Real-time rendering

Web Links:

1: https://onlinecourses.nptel.ac.in/noc19_ge32/preview

COURSE OUTCOMES

CO1	Understand the basics of Game Programming and Game Engine Architecture	**K2**
CO2	Develop 2D and 3D Images using Mathematical coordinates	**K4**
CO3	Apply various Lighting and Texturing Effects in game environment	**K3**
CO4	Extend the Game Programming using Artificial Intelligence	**K2**
CO5	Solve search problems for Game move prediction and optimization using AI	**K6**

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**P O4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	2	2	2	2	3	2	3	-	-	-	-	2	2	2
CO2	2	3	2	2	2	3	2	-	-	-	-	2	2	2
CO3	2	2	3	2	2	2	3	-	-	-	-	3	2	3
CO4	3	2	3	2	2	3	2	-	-	-	-	2	3	2
CO5	2	3	2	2	3	2	1	-	--	-	-	3	2	3

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**

PEC	ROBOTICS AND ITS APPLICATION	3	0	2	4

COURSE OBJECTIVES

1. To understand the basic concepts associated with the design, functioning, applications and social aspects of robots
2. To study about the electrical drive systems and sensors used in robotics for various applications
3. To learn about analyzing robot kinematics, dynamics through different methodologies and study various design aspects of robot arm manipulator and end-effector
4. To learn about various motion planning techniques and the associated control architecture
5. To understand the implications of AI and other trending concepts of robotics.

UNIT I : FOUNDATION 12

Introduction – Brief history – Definition – Anatomy – Types – Classification – Specification and need based applications – Role and need of robots for the immediate problems of the society – Future of mankind and automation-ethical issues – Industrial scenario local and global – Case studies on mobile robot research platform and industrial serial arm manipulator.

UNIT II : BUILDING BLOCKS OF A ROBOT 12

Types of electric motors : DC – Servo – Stepper; Specification – Drives for motors – Speed & direction control and circuitry – Selection criterion for actuators – Direct drives – Non-traditional actuators - Sensors for localization – Navigation – Obstacle avoidance and path planning in known and unknown environments – Optical – Inertial – Thermal – Chemical – Biosensor – Other common sensors – Case study on choice of sensors and actuators for maze solving robot and self driving cars.

UNIT III : KINEMATICS, DYNAMICS AND DESIGN OF ROBOTS & END-EFFECTORS 12

Robot kinematics – Geometric approach for 2R, 3R manipulators – homogenous transformation using D- H representation – Kinematics of WMR – Lagrangian formulation for 2R robot dynamics – Mechanical design aspects of a 2R manipulator, WMR – End-effector : Common types and design case study.

UNIT IV : NAVIGATION, PATH PLANNING AND CONTROL ARCHITECTURE 12

Mapping & Navigation – SLAM, Path planning for serial manipulators – Types of control architectures – Cartesian control – Force control and hybrid position/force control – Behaviour based control – Application of Neural network, fuzzy logic, optimization algorithms for navigation problems – Programming methodologies of a robot.

UNIT V : AI AND OTHER RESEARCH TRENDS IN ROBOTICS 12

Application of Machine learning – AI – Expert systems – Tele-robotics and Virtual reality – Micro &Nanorobots – Unmanned vehicles – Cognitive robotics – Evolutionary robotics – Humanoids.

TOTAL HOURS : 60

TEXT BOOKS

1. Saeed B Niku, “Introduction to Robotics, Analysis, System, Applications”, Pearson educations, 2002.
2. Roland Siegwart, Illah Reza Nourbakhsh, “Introduction to Autonomous Mobile Robots”, MIT Press, 2011.

REFERENCES

1. Richard David Klafter, Thomas A Chmielewski, Michael Negin, “Robotic engineering: An Integrated Approach”, Prentice Hall, 1989.
2. Craig, J J, “Introduction to Robotics: Mechanics and Control”, 2nd Edition, Addison-Wesley, 1989.
3. K S Fu, R C Gonzalez and C S G Lee, “Robotics: Control, Sensing, Vision and Intelligence”, McGraw-Hill, 1987.
4. Wesley E Snyder R, “Industrial Robots, Computer Interfacing and Control”, Prentice Hall International Edition, 1988.
5. Robin Murphy, “Introduction to AI Robotics”, MIT Press, 2000.

Weblinks: https://onlinecourses.nptel.ac.in/noc22_me39/preview

COURSE OUTCOMES

CO1	Understand the concepts of industrial robots	**K2**
CO2	Examine different sensors and actuators for applications like maze solving and self driving cars	**K2**
CO3	Design a 2R robot & an end-effector and solve the kinematics and dynamics of motion for robots	**K3**
CO4	Understand the navigation and path planning techniques for robot motion planning	**K2**
CO5	Understand the impact and progress of AI in the field of robotics	**K2**

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**P O4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-		3	-
CO4	3	2	-	-	-	-	-	-	-	3	-	3	3	-
CO5	3	2	-	-	-	-	-	-	-		-		3	3

ASSESSMENT METHODS:

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	✓
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
✓	✓		✓	✓	✓

PEC	CONCEPTS OF VIRTUAL AND AUGMENTED REALITY	3	0	2	4

Course Objectives

- To learn about the principles and multidisciplinary features of virtual reality.
- To study the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To teach students the technology for managing large scale VR environment f ramework devel opment tools in realtime.

UNIT I : Virtual reality and virtual environments: **12**

The historical development of VR, scientific landmarks computer graphics, real-time computer graphics, virtual environments, requirements for VR, benefits of virtual reality. Hardware technologies for 3D user interfaces: visual displays, auditory displays, hap tic displays, choosing output devices for 3D user interfaces.

UNIT II : 3D user interface input hardware and Software technologies: **12**

Input device characteristics, desktop input devices, tracking devices, 3d mice, special purpose input devices, direct human input, home - brewed input devices, choosing input devices for 3D interfaces. Software technologies: database - world space, world coordinate, world environment, objects - geometry, position / orientation, hierarchy, bounding volume, scripts and other attributes, VR environment - VR database, tessellated data, LODs, Cullers and Occluders, lights and cameras, scripts, VR toolkits, available software in the market.

UNIT III : 3D interaction techniques: **12**

3D manipulation tasks, interaction techniques for 3D manipulation, design guidelines – 3D travel tasks, travel techniques, design guidelines - theoretical foundations of wayfinding, user centered wayfinding support, environment centered wayfinding support, evaluating wayfinding aids, design guidelines - system control, classification, graphical menus, voice commands, Gestrual commands, tools, multimodal system control techniques, design guidelines.

UNIT IV : Advances in 3D user interfaces: **12**

3D user interfaces for the real world, AR interfaces as3D data browsers, 3D augmented reality interfaces, augmented surfaces and tangible interfaces, agents in AR, transitional AR-VR interfaces - 3d interaction techniques, 3d UI design and development, 3D UI evaluation and other issues.

UNIT V Virtual reality applications: **12**

Engineering, architecture, education, medicine, entertainment, science, training.

TOTAL HOURS : 60

Text Books:

1. Paul Mealy, Virtual & Augmented Reality for Dummies, John Wiley & Sons.
2. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual RealityApplications: Foundations of Effective Design", Morgan Kaufmann.

Reference Books:

1. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach".
2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D UserInterfaces, Theory and Practice", Addison Wesley, USA

Web Links:

1. https://edu.gcfglobal.org/en/thenow/understanding-virtual-reality-and-augmented-reality
2. https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented- reality.html

COURSE OUTCOMES

CO1	Articulate the historical development of VR and design of visual displays.	K3
CO2	Integrating the 3D user interface input hardware and Software technologies	K3
CO3	Hypothesizing the interaction techniques for 3D manipulation, design guidelines	K5
CO4	Implement the AR-VR interfaces in 3d UI interaction techniques	K3
CO5	Mind mapping the view of Virtual reality applications in Engineering, architecture, entertainment.	K4

Mapping Of Course Outcomes to Program Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**

CO1	3	2	3	2	3	-	-	-	1	1	2	1	2	2
CO2	3	2	2	2	2	-	-	-	1	1	2	1	2	2
CO3	2	2	2	2	3	-	-	-	1	1	2	1	2	2
CO4	2	2	2	2	2	-	-	-	1	1	2	1	2	2
CO5	2	2	3	2	3	-	-	-	1	1	2	1	2	2

ASSESSMENT METHODS:

CAT 1	CAT 2	Model Exam	End Semester Exams	Assignments	Case Studies
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
			✓		

PEC	EMBEDDED SYSTEMS FOR INTERNET OF THINGS	3	0	2	4

Course Objectives

- Comprehend the basic concepts, architecture and design components of embedded systems and IOT devices
- Synthesize design platforms used for an embedded system to incorporate IOT applications.
- Apply the concepts of embedded system design and IOT to resolve real time issues and develop new cloud based or web based IOT applications..

UNIT 1 : BASICS OF IOT 12

Purpose and requirement specification, IOT level specification, Functional view specification, Operational view specification, Device and component integration, Pillars of Embedded IOT and Physical Devices: The internet of devices.

UNIT 2 : DESIGN OF EMBEDDED SYSTEMS 12

Common Sensors, Actuators, Embedded Processors, Memory Architectures, Software architecture.

UNIT 3 : INPUTS AND OUTPUTS 12

Digital Inputs and Outputs, Digital Inputs, Digital Outputs, BusIn, BusOut, and BusInOut, Analog Inputs and Outputs, Analog Inputs, Analog Outputs, Pulse Width Modulation (PWM), Accelerometer and Magnetometer, SD Card, Local File System (LPC1768).

UNIT 4 : IOT ENABLING TECHNOLOGIES 12

Communications, RFID and NFC (Near- Field Communication), Bluetooth Low Energy (BLE), LiFi, 6LowPAN, ZigBee, Z- Wave, LoRa, Protocols, HTTP, WebSocket, MQTT, CoAP, XMPP, Node- RED, Platforms, IBM Watson IoT—Bluemix, Eclipse IoT, AWS IoT, Microsoft Azure IoT Suite, Google Cloud IoT, ThingWorx, GE Predix, Xively, macchina.io, Carriots, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces.

UNIT 5 : WEB OF THINGS AND CLOUD OF THINGS 12

Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Cloud of Things. IoT Physical Servers, Cloud Offerings and IoT Case Studies: Introduction to Cloud Storage Models, Communication API, Logical design using Python.

TOTAL HOURS : 60

Text Book(s)

1. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, Internet of Things, John Wiley and Sons.
2. Klaus Elk, “Embedded Software for the IoT”.

Reference Book(s)

1. Perry Xiao, “Designing Embedded Systems and the Internet of Things (IoT) with the ARM Mbed”.
2. Elizabeth Gootman et. al, “Designing Connected Products”, Shroff Publisher/O’Reilly Publisher.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O’Reilly (SPD), 2014, ISBN: 9789350239759

Weblinks:

1.https://nptel.ac.in/courses/128108016

COURSE OUTCOMES

CO1	Demonstrate the embedded system concepts and architecture of embedded systems	K3
CO2	Identify different software techniques for microcontroller-based embedded systems	K3
CO3	Analyze different hardware input and output methods in embedded systems	K5
CO4	Identify various techniques and methods used in IOT	K3
CO5	Develop novel IOT Applications in web/cloud based to solve real-time issues	K4

Mapping Of Course Outcomes to Program Outcomes

	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	2	2	3	-	-	-	-	-	-	-	-
CO 2	2	3	2	2	3	3	3	1	2	3	2	2	2	2
CO3	2	3	-	-	-	-	-	3	2	3	3	3	2	3
CO4	2	3	3	2	**3**	3	-	-	-	-	-	-	-	-
CO5	3	3	3	3	3	2	3	3	3	3	3	3	3	3

ASSESSMENT METHODS

CAT 1	**CAT 2**	**Model Exam**	**End Semester Exams**	**Assignments**	**Case Studies**
✓	✓	✓	✓	✓	
Quiz	**MCQ**	**Projects**	**Seminars**	**Demonstration/ Presentation**	**Open book test**
			✓		

EMBEDDED SYSTEMS 3 0 0 3

Course Objective:

- To introduce the difference between embedded systems and general purpose systems.
- To learn how to optimize hardware designs of custom single-purpose processors.
- To study the different approaches in optimizing general-purpose processors and to introduce different peripheral interfaces to embedded systems.
- To understand the design tradeoffs made by different models of embedded systems

UNIT I EMBEDDED COMPUTING 9

Challenges of Embedded Systems – Embedded system design process. Embedded processors – 8051 Microcontroller-Architecture-memory organization- ARM architecture-processor –product code description- main features of Instruction sets - programming.

UNIT II MEMORY AND INPUT / OUTPUT MANAGEMENT 9

Programming Input and Output – Issues in IO Management- IO Organization -Memory system mechanisms – Memory devices and Input and output devices- memory interfacing – Interrupts handling- Issues in Handling Interrupts- Identifying the source of interrupt.

UNIT III PROCESSES AND OPERATING SYSTEMS 9

Multiple tasks and processes – Context switching – Scheduling policies – Inter process communication-IPC unicast and multicast-message passing- Cooperating Processes – purpose of IPC-inter process methods-inter process mechanisms – Performance issues.

UNIT IV EMBEDDED SOFTWARE 9

Programming embedded systems in assembly and C – Meeting real time constraints – Multi-state systems and function sequences.-functional characteristics-functional description-Embedded software development tools – Emulators and debuggers.

UNIT V EMBEDDED SYSTEM DEVELOPMENT 9

Design issues and techniques – Control System Modeling and Design- embedded system development experience- Exemplary embedded system- Embedded system development methodology-Electronic Design and Analysis -Case studies – Complete design of example embedded systems.

TOTAL: 45 h

TEXT BOOKS:

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, Third Edition, 2012.

2. Michael J. Pont, "Embedded C", Pearson Education , Second Edition, 2008.

REFERENCE BOOKS:

1. Steve Heath, "Embedded System Design", Elsevier, Second Edition, 2005.

2. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second edition, 2007.

Course Outcome	Description	Knowledge Level
CO1	Explain the characteristics and components of Embedded systems, their design tools and applications.	K2
CO2	Apply the fundamentals of digital system design and programming skills to develop Microcontroller based embedded applications.	K3
CO3	Understand the design life cycle of embedded applications.	K2
CO4	Design real time embedded systems using the concepts of RTOS.	K2
CO5	Analyze various examples of embedded systems based on ATOM processor.	K3

ENGINEERING ECONOMICS 3 0 0 3

Course Objective:

To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.

UNIT I INTRODUCTION TO ECONOMICS 9

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING 9

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL: 45h

TEXT BOOK:

1. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCE BOOKS:

1. Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2011.

2. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg. Press, Texas, 2010.

3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 2011.

4. Zahid A khan: Engineering Economy, “Engineering Economy”, Dorling Kindersley, 2012

Course Outcome	Description	Knowledge Level
CO1	To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.	K5
CO2	Apply the appropriate engineering economics analysis method(s) for problem solving	K3
CO3	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.	K4,K5
CO4	Compare the cost effectiveness of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.	K3
CO5	Apply all mathematical approach models covered in solving engineering economics problems: mathematical formulas, interest factors from tables, Excel functions and graphs. Estimate reasonableness of the results.	K6

FUNDAMENTALS OF NANO SCIENCE 3 0 0 3

Course Objective:

- To learn the basic concepts of nano science and nanotechnology and their applications in various fields of Science and Engineering.

- To understand the scope of nano materials potential use in products manufactured by various industries.

UNIT I INTRODUCTION 9

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots,nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS 9

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES 9

Introduction to optical/UV electron beam and X-ray Lithography systems and processes-transmission of mask feture-lithography electron range-steps in the mask fabrication-steps in photo lithography- Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS 9

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARECTERISATION TECHNIQUES 9

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nano indentations.

TOTAL: 45 h

TEXT BOOKS:

1. A.S. Edelstein and R.C. Cammearata, eds., Nanomaterials: Synthesis, Properties and Applications, Institute of Physics Publishing, Bristol and Philadelphia, 1998.

2. N John Dinardo, Nanoscale charecterisation of surfaces & Interfaces, Second edition,

Weinheim Cambridge, Wiley-VCH, 2008

REFERENCE BOOKS:

1. G Timp (Editor), Nanotechnology, AIP press/Springer, 2012

2. Akhlesh Lakhtakia,The Hand Book of Nano Technology, "Nanometer Structure", Theory, Modeling and Simulations. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

Course Outcome	Description	Knowledge Level
CO1	Relate thermodynamic concepts of nanoparticles.	K1
CO2	Discuss properties of nanoparticles.	K2
CO3	Interpret applications of nanosystems.	K6
CO4	Illustrate characterization techniques used in nanosystem.	K3
CO5	Compare physical & chemical synthesis procedures of nanosystems.	K2

GEOGRAPHICAL INFORMATION SYSTEMS 3 0 0 3

Course Objective

- To identify, manipulate and analyze spatial data using state-of-the-art software
- To understand and interpret data in different ways that reveal relationships
- To analyse the patterns and trends in the form of maps, globes, reports, and charts.

UNIT I FUNDAMENTALS OF GIS 9

What is GIS – Introduction Defining GIS – Components of a GIS – Spatial data – Introduction - Maps and their influence on the character of spatial data – Other sources of spatial data

UNIT II SPATIAL DATA MODELING 9

Introduction – Entity definition – Spatial data models – Spatial data structures – Modeling surfaces – Modeling networks – Building computer networks – Modeling the third dimension –modeling the fourth dimension - **Attribute data management** - Introduction – Why choose a databaseapproach? - Database data models – Creating a database – GIS database applications – Developments in databases

UNIT III DATA INPUT AND EDITING 9

Introduction – Methods of data input –Data editing – Towards an integrated database - **Data analysis**: Introduction – Measurements in GIS – lengths, perimeters and areas – Queries – Reclassification – Buffering and neighborhood functions – Integrating data –map overlay – Spatial interpolation – Network analysis.

UNIT IV ANALYTICAL MODELING IN GIS 9

Introduction – process models – Modeling physical and environmental processes – Modeling human Processes –Modeling the decision – making process – Problems with using GIS to model spatial processes - **Output: from new maps to enhanced decisions:** Introduction – Maps as output – Non-cartographic output – Spatial multimedia – Mechanisms of delivery – GIS and spatial decision support

UNIT V ISSUES IN GIS 9

The development of computer methods for handling spatial data – Introduction – Handling spatial data manually – The development of computer methods for handling spatial data – The development of GIS - Data quality issues – Introduction –Describing data quality and errors sources of errors in GIS

TOTAL: 45 h

TEXT BOOK:

1. Ian Heywood, Sarah Cornelius and Steve carver, "*Introduction to geographical information systems*", Pearson Education, 4th Edition, 2012.

REFERENCE BOOKS:

1. DeMers, M.N., "*Fundamentals of Geographic Information Systems*", 3rdEdition, Wiley Press, 2009.

2. Lo C.P. and Yeung, A.K.W.,"*Concepts and Techniques of Geographic Information Systems",* Prentice Hall, 2002.

Course Outcome	Description	Knowledge Level
CO1	To identify, manipulate and analyze spatial data using state-of-the-art software	K4
CO2	To understand and interpret data in different ways that reveal relationships	K5
CO3	To analyse the patterns and trends in the form of maps, globes, reports, and charts.	K3
CO4	To explain the components and functionality of a GIS and the differences between GIS and other information systems	K4
CO5	To understand the nature of geographic information and explain how it is stored in computer (including map projection)	K6

HIGH SPEED NETWORKS 3 0 0 3

Course Objective:

- To understand the basis of ATM and Frame relay concepts.
- To learn the various types of LAN's and to know about their applications and techniques involved to support real-time traffic and congestion control in ATM.
- To understand the basis of ISA queuing discipline.

UNIT I HIGH SPEED NETWORKS 9

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fibre Channel – Wireless LAN's, WiFi and WiMax Networks applications, requirements – Architecture of 802.11.

UNIT II CONGESTION AND TRAFFIC MANAGEMENT 8

Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III TCP AND ATM CONGESTION CONTROL 11

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 8

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V PROTOCOLS FOR QOS SUPPORT 9

RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP – Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 45 h

TEXT BOOK:

1. William Stallings, “High speed networks and internet”, Second Edition, Pearson Education, 2002.

REFERENCE BOOKS:

1. Warland, Pravin Varaiya, “High performance communication networks”, Second Edition , Jean Harcourt Asia Pvt. Ltd., 2001.

2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003.

3. Abhijit S. Pandya, Ercan Sea, “ATM Technology for Broad Band Telecommunication Networks”, CRC Press, New York, 2004.

Course Outcome	Description	Knowledge Level
CO1	Understanding the basis of ATM and Frame relay concepts.	K6
CO2	To learn the various types of LAN’s and to know about their applications and techniques involved to support real-time traffic and congestion control in ATM.	K5
CO3	To understand the basis of ISA queuing discipline.	K5
CO4	Understanding the Integrated Services Architecture	K3
CO5	Analyzing the protocols for QoS support	K4

INTELLECTUAL PROPERTY RIGHTS 3 0 0 3

Course Objective:

- To know how to protect the rights of the university, its innovators, inventors, research sponsors and the public.
- To learn how to eliminate the infringement, improper exploitation and abuse of the university's intellectual assets.

UNIT I INTRODUCTION 9

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance –Need for

IPR- Protection of IPR - IPR in India – Genesis and Development IPR in abroad - some important examples of IPR – Basic types of property (i). Movable Property - Immovable Property and - Intellectual Property- Competing Rationales for Protection of Intellectual Property Rights

UNIT II APPLICATIONS OF IP 9

IP – Patents- Procedure for Opposition- Revocation of Patents - Ownership and Maintenance of Patents- Assignment and licensing of Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits –Protection of Geographical Indications at national and International levels – Application Procedures -

UNIT III IP ESSENTIALS 9

International convention relating to Intellectual Property – Establishment of WIPO –Mission and Activities – History – General Agreement on Trade and Tariff (GATT) –TRIPS Agreement- Copyright and Related Rights- Trademarks - Geographical Indications - Industrial Designs - Layout-Designs (Topographies) of Integrated Circuits - Protection of Undisclosed- The text of the TRIPS Agreement.

UNIT IV GLOBAL PERSPECTIVE 9

Indian Position Vs WTO and Strategies – Economics of intellectual property- Other intellectual property conventions - Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy –Present against unfair competition- TRIPS work in the WTO - WTO bodies - IPR Enforcement - Global Value of Digital Piracy.

UNIT V TRENDS IN IP 9

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications– Protection against unfair competition- India's IP regime –Development- Legislation- International Searching Authority and International Preliminary Examining Authority- IPR on Internet.

TOTAL: 45 h

TEXT BOOK:

1. Subbaram N.R. "Handbook of Indian Patent Law and Practice ", S. Viswanathan Printers and Publishers Pvt. 3rd Edition 2006.

REFERENCE BOOKS:

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, 2004.
2. Intellectual Property Today: Volume 8, No. 5, 2006, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.

Course Outcome	Description	Knowledge Level
CO1	Apply the basics of the four primary forms of intellectual property rights.	K4
CO2	Determine the compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.	K5
CO3	Analyze, assess and critique some basic theoretical justifications for each form of intellectual property protection.	K6
CO4	Identify, apply and assess principles of law relating to each of these areas of intellectual property	K6
CO5	Analyze the effects of intellectual property rights on society as a whole.	K6

MOBILE ADHOC NETWORKS 3 0 0 3

Course Objective:

- To understand the design issues in ad hoc networks.
- To learn the different types of MAC protocols.
- To be familiar with different types of ad hoc routing protocols.

UNIT I INTRODUCTION 9

Introduction to Adhoc networks – definition, characteristics advantages and disadvantages, features, applications. Characteristics of Wireless channel, nodes, power saving mechanism, Adhoc Mobility Models:– Indoor and outdoor models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols– with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV END TO END DELIVERY AND SECURITY 9

Transport layer: Issues in designing – Transport layer classification, Adhoc transport protocols. Security issues in Adhoc networks: issues and challenges, types of network security attacks, various, Types of secure routing protocols.

UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G 9

Introduction to Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective. Integration of adhoc with Mobile IP networks.

TOTAL: 45 h

TEXT BOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education, 2007
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

REFERENCE BOOKS:

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile adhoc networking, Wiley– IEEE press, 2004.
2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.

3. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network Research," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.

Course Outcome	Description	Knowledge Level
CO1	Assess the characteristics, advantages, disadvantages, features and applications of Mobile Adhoc networks	K5
CO2	Explain various MAC protocols used in adhoc networks, IEEE and MAC	K4
CO3	Distinguish the various types of routing protocols	K4
CO4	Classify Transport layer, Adhoc transport protocols and Security issues in Adhoc networks	K4
CO5	Explain cross layer optimization, parameter optimization techniques	K4

NEURAL NETWORKS 3 0 0 3

Course Objective:

- To understand the basics of ANN and comparison with Human brain
- To study about various methods of representing information in ANN
- To learn various architectures of building an ANN and its applications
- To understand the Pattern classification and Pattern Association techniques

UNIT I INTRODUCTION 9

Definition of ANN-Biological Neural Networks-Applications of ANN-Typical Architectures-Setting the weights-Common Activation functions-Development ofNeural Networks-McCulloch-Pitts Neuron

UNIT II SIMPLE NEURAL NETS FOR PATTERN CLASSIFICATION 9

General discussion - Hebb net – Perceptron- Adaline - Backpropagation neural net-Architecture- Delta Learning Rule Algorithm-Applications

UNIT III PATTERN ASSOCIATION 9

Training Algorithm for Pattern Association-Heteroassociative memory neural network applications-Autoassociative net-Iterative Autoassociative net- Bidirectional Associative Memory-Applications

UNIT IV NEURAL NETS BASED ON COMPETITION 9

Fixed Weights Competitve Nets- Kohonen's Self-Organizing Map –Applications-Learning Vector Quantization-Applications-Counter Propagation Network-Applications.

UNIT V ADAPTIVE RESONANCE THEORY AND NEOCOGNITRON 9

Motivation – Basic Architecture- Basic Operation-ART1-ART2-Architecture- Algorithm-applications-Analysis Probabilistic Neural Net-Cascade Correlation-Neocognitron: Architecture—Algorithm-Applications.

TOTAL: 45 h

TEXT BOOK:

1. LaureneV. Fausett, *"Fundamentals of Neural Networks-Architectures,Algorithms and Applications",* Pearson Education, 2011.

REFERENCE BOOKS:

1. James. A. Freeman and David.M.Skapura, *"Neural Networks Algorithms, Applications and Programming Techniques ",*Pearson Education, Sixth Reprint, 2011.

2. Simon Haykin, *"Neural Networks and Learning Methods",* PHI Learning Pvt.Ltd., 2011.

3. James A. Anderson, *"An Introduction to Neural Networks",* PHI Learning Pvt.Ltd., 2011.

Course Outcome	Description	Knowledge Level
CO1	Explain Biological Neural Networks and Applications of ANN	K4
CO2	Summarize various applications of pattern association and classification	K5
CO3	Classify Hetero associative memory neural network applications-Auto associative net-Iterative Auto associative	K4
CO4	Assess Kohonen's Self-Organizing Map –Applications-Learning Vector Quantization-Applications	K5
CO5	Construct Basic Architecture- Basic Operation-ART1-ART2-Architecture	K6

OPERATIONS RESEARCH 3 0 0 3

Course Objective:

To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS 15

The phase of an operation research study - Linear programming - Graphical method- Simplex algorithm - Duality formulation - Sensitivity analysis.

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS 8

Transportation Assignment Models Traveling Salesman problem-Networks models Shortest route Minimal spanning tree - Maximum flow models -Project network - CPM and PERT networks - Critical path scheduling Sequencing models.

UNIT III INVENTORY MODELS 6

Inventory models - Economic order quantity models - Quantity discount models - Stochastic inventory models - Multi product models - Inventory control models in practice.

UNIT IV QUEUEING MODELS 6

Queueing models – Queueing systems and structures - Notation parameter - Single server and multi server models - Poisson input - Exponential service - Constant rate service - Infinite population - Simulation.

UNIT V DECISION MODELS 10

Decision models - Game theory - Two person zero sum games - Graphical solution- Algebraic solution- Linear Programming solution - Replacement models - Models based on service life - Economic life- Single / Multi variable search technique - Dynamic Programming - Simple Problem.

TOTAL: 45 h

TEXT BOOK:

1. Taha H.A., Operations Research, eight Edition, Prentice Hall of India, 2016.

REFERENCE BOOKS:

1.Shennoy G.V. and Srivastava U.K., ¡§Operation Research for Management¡¨, Wiley Eastern,1996.

2. Bazara M.J., Jarvis and Sherali H., ¡§Linear Programming and Network Flows¡¨, John Wiley, 1990. 4th edition.

3. Philip D.T. and Ravindran A., ¡§Operations Research¡¨, John Wiley, 1992.

4. Hillier and Libeberman, ¡§Operations Research¡¨, Holden Day, 1986

5. Budnick F.S., ¡§Principles of Operations Research for Management¡¨, Richard D Irwin, 1990.

Course Outcome	Description	Knowledge Level
CO1	Understand the fundamentals of Linear model	K3
CO2	Solve the real time problems using optimization techniques	K3
CO3	Acquire knowledge on transportation assignment, network and sequencing models.	K3
CO4	Solve various problems such as Inventory models, Queuing model and Decision model.	K3
CO5	Understand the working principle of dynamic programming	K1,K2

OPTICAL NETWORKS 3 0 0 3

Course Objective:

- To facilitate the knowledge about optical fiber sources and transmission techniques.
- To enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
- To explore the trends of optical fiber measurement systems.

UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers – Loss & bandwidth, System limitations, Non–Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; SONET / SDH, Metropolitan – Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media – Access Control Protocols, Wavelength Routing Architecture, Single hop & Multi hop network.

UNIT III WAVELENGTH ROUTING NETWORKS 9

The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment, Various Routing algorithm, Virtual topology design, Wavelength Routing Test beds, Architectural variations in wavelength routing network..

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronizations, Broadcast OTDM networks, Switch–based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9

Transmission System Engineering – System model, Power penalty – transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL: 45 h

TEXT BOOKS:

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., third Edition .
2. Optical Switching Networks: Mayer & Martin, Cambridge University Press, 2008.

REFERENCE BOOKS:

1. C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks: Concept, Design and Algorithms”, Prentice Hall of India, Ist Edition, 2002.
2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.

Course Outcome	Description	Knowledge Level
CO1	To facilitate the knowledge about optical fiber sources and transmission techniques	K4
CO2	To enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA	K5
CO3	To explore the trends of optical fiber measurement systems	K3
CO4	Understanding different types of Architecture	K4
CO5	Analyzing the network design and management functions	K5

PERSONAL COMPUTER SYSTEMS 3 0 0 3

Course Objectives:

- To learn the Computer Basics: Data Representation, Input / Output Units, Computer Memory
- To understand the basics of Processor: Computer Architecture, Programming Languages
- To Describe the basic concept of Microcomputers, Computer Generations and Classifications

Unit – I Computer Basics 9

Algorithms, A Simple Model of a Computer, Characteristics of Computers, Problem Solving Using Computers. **Data Representation:** Representation of Characters in Computers, Representation of Integers, Representation of Fractions, Hexadecimal Representation of Numbers, Decimal to Binary Conversion, Error Detecting Codes. **Input / Output Units:** Description of Computer Input Units, Other Input Methods, Computer Output Units. **Computer Memory:** Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to Construct memories, Magnetic Hard Disk, Floppy Disk Drives, Compact Disk Read Only Memory (CDROM), Magnetic Tape Drive.

Unit – II Processor 9

Structure of Instructions, Description of a Processor, A Machine Language Program, An Algorithm to Simulate the Hypothetical Computer. **Computer Architecture:** Interconnection of Units, Processor to Memory Communication, I/O to Processor Communication, Interrupt Structures, Bus Architecture of Personal Computers, Multiprogramming, Processor Features, Reduced Instruction Set Computers (RISC), Virtual

Memory. **Programming Languages:** Why Programming Language?, Assembly Language, High Level Programming Languages, Compiling High Level Language Program, Some High Level Languages. Operating System: Why Do We Need an Operating System?, Batch Operating System, Multiprogramming Operating System, Time Sharing Operating System, Other Facilities Provided by Operating Systems, Personal Computer Operating System, The UNIX Operating System, Microkernel based Operating System, On – line and Real – time Systems.

Unit – III Microcomputers 9

An Ideal Microcomputer, An Actual Microcomputer, Memory Systems for Microcomputers, A Minimum Microcomputer Configuration, Evolution of Microcomputers, Special Purpose Microprocessors, Special Purpose Microcomputer Software, Special Purpose Applications of Microcomputers, Smart Cards and RFID. **Computer Generations and Classifications:** First Generation of Computers, The Second Generation, The Third Generation, The Fourth Generation, The Fifth Generation, Moore's Law, Classification of Computers, Distributed Computer System, Parallel Computers.

Unit – IV Voice and Data Communications 9

Types of Communications with and Among Computers, Characteristics of Communication Channels, Allocation of Channel, Physical Communication Media, Public Switched Telephone Networks, Multiplexing Techniques in Wireless Communication, Cellular Communication System, Establishing Communication Paths, ATM Networks. **Computer Networks:** Need for Computer Communication Networks, Internet and the World Wide Web, Communication Protocols, Local Area Networks, Token Ring Local Area Network, Interconnecting Networks, The Future of Internet Technology.

Unit –V Computer Graphics 9

Computer Graphics Applications, Display Devices, Overview of Display Method, Raster Scan Display Processing Unit, Input Devices for Interactive Graphics, Programmers' Model of Interactive Graphics Systems, Image Acquisition and Storage, Storage Formats for Pictures, Image Acquisition with a Digital Camera. **Multimedia Data Acquisition and Processing:** Capturing a Moving Image with a Video Camera, Compression of Video Data, MPEG Compression Standard, Acquiring and Storing Audio Signals, Audio Signal Processing, Speech Processing. **Emerging Computing Environments:** Current Computing Scenario, Peer to Peer Computing, Grid Computing, Cloud computing, Utility Computing.

Total: 45 h

TEXT BOOK:

1. Fundamentals of Computers, by V.Rajaraman, PHI, sixth Edition, 2015.

REFERENCE BOOK:

1. Fundamentals of computers, E.Balagurusamy, TMH, second reprint 2019.

Course Outcome	Description	Knowledge Level
CO1	Appraise the Representation of various data like Characters, Integers, Fractions, Hexadecimal, Numbers in Personal Computer Systems	K5
CO2	Sketch neatly about the computer architecture and Bus Architecture of Personal Computers	K3
CO3	Compare and contrast Generation of computers	K4
CO4	Explain the Characteristics of Communication Channels and Internet and the World Wide Web,	K4
CO5	Evaluate Multimedia Data Acquisition and Processing in Computer Graphics	K5

PRINCIPLES OF MANAGEMENT & PROFESSIONAL ETHICS 3 0 0 3

Course Objective:

- To have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling.
- To study the evolution of management
- To study the functions and principles of management
- To learn the application of the principles in an organization
- To learn the engineering ethics and human values

UNIT I OVERVIEW OF MANAGEMENT 9

Definition - Management - Role of managers - Evolution of Management thought – Organization and the environmental factors – Trends and Challenges of Management in Global Scenario.

UNIT II PLANNING & ORGANIZING 9

Nature and purpose of planning and Organizing - Planning process - Types of plans – Managing by objective (MBO) Strategies - Types of strategies - Policies - Decision Making - Types of decision - Decision Making Process - Rational Decision Making Process - Decision Making under different conditions. - Organization structure - Formal and informal groups I organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - Performance Appraisal.

UNIT III DIRECTING & CONTROLLING 9

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication – Organization Culture - Elements and types of culture - Managing cultural diversity. Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

UNIT IV ENGINEERING ETHICS & HUMAN VALUES 9

Definition - Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research - Ethical and Unethical practices – case studies – situational decision making - Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT V SAFETY RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination – Global issues - Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers

– Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 h

TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 14th Edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Third Edition, 2017.
3. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, Fourth Edition, 2014.

REFERENCE BOOKS:

1. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 11 th edition.
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 14th edition, 2013.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 9th edition, 2012.
4. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 4th edition, 2012.
5. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi 8th edition, 2014.

Course Outcome	Description	Knowledge Level
CO1	Formulate management roles, skills and evolution of the management in global scenario	K6
CO2	Design and analyze the concept of Principle of management.	K4,K6
CO3	Identify and analyze the ethical issue in the subject matter under investigation.	K2,K4,K6
CO4	Identify the ethical concerns in research and intellectual contexts including academic integrity.	K2
CO5	Demonstrate the importance of yoga and meditation for professional excellence and stress management	K3

REMOTE SENSING 3 0 0 3

Course Objective:

- To introduce the students to the basic concepts and principles of various components of remote sensing.
- To teach the concept of EMR interaction with atmosphere and earth materials.
- To introduce the students to the basic concepts of optical and microwave remote sensing.
- To teach the concept of geographic information system and application.

UNIT I REMOTE SENSING 9

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation – Planck's law – Stefan–Boltzman law.

UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non–selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces– Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface Imaging spectrometry and spectral characteristics.

UNIT III OPTICAL AND MICROWAVE REMOTE SENSING 9

Satellites – Classification – Based on Orbits and Purpose – Satellite Sensors – Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites – Radar – Speckle – Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics –Sonar remote sensing systems.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non–Spatial – Maps – Types of Maps – Projection – Types of Projection – Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of

Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

UNIT V MISCELLANEOUS TOPICS 9

Visual Interpretation of Satellite Images – Elements of Interpretation – Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification – Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications– Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems Introduction.- Global positioning system.

TOTAL: 45 h

TEXT BOOKS:

1. M.G. Srinivas, Remote Sensing Applications, Narosa Publishing House, 2001. (Units 1 & 2).
2. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001 (Units 3, 4 & 5).

REFERENCE BOOKS:

1. Jensen, J.R., Remote sensing of the environment, Prentice Hall, 2000.
2. Kang Tsung Chang, "Introduction to Geographic Information Systems", TMH, 2007

Course Outcome	Description	Knowledge Level
CO1	To introduce the students to the basic concepts and principles of various components of remote sensing.	K4
CO2	To teach the concept of EMR interaction with atmosphere and earth materials.	K3
CO3	To introduce the students to the basic concepts of optical and microwave remote sensing	K4, K5
CO4	To teach the concept of geographic information system and application.	K4
CO5	To develop technical skills and competence in data and information acquisition, extraction, management and analysis; spatial and statistical modelling; mapping and visualization.	K5

ROBOTICS 3 0 0 3

Course Objective:

- To study microcontroller operations for robotics and the different interfaces to implement in a microcontroller.
- To learn how Microchip PIC micro PIC16F627 can be erased and reprogrammed.
- To learn how different sensors, outputs, and peripherals can be wired to a microcontroller to work cooperatively and create a high-level control program.
- To design robots in a real time environment.

UNIT I SCOPE OF ROBOTS AND INTELLIGENCE 9

The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots - applications. Robot Intelligence – State Space Search – Problem Reduction – Use of Predicate – logic – means Ends Analysis – Problem Solving – Robot Learning – Robot Task Planning – Basic Problems in Task Planning.

UNIT II SOFTWARE DEVELOPMENT 9

Source files, object files, libraries, linkers and hex files – Assemblers – Interpreters – Compilers - Simulators and Emulators - Integrated development environments.

UNIT III THE MICROCHIP PIC micro (R) MICROCONTROLLER 9

Different PIC micro MCU devices and features - Application development tools - Basic circuit requirements - The PIC16F627 - EL cheapo PIC micro programmer circuit.

UNIT IV THE MICROCONTROLLER CONNECTIONS 9

Hardware interface sequencing- Robot C programming template – Protyping with the PIC micro microcontroller – Intercomputer communications- RS232 - HyperTerminal RS 232 terminal emulator- RS 232 interface example between PC and PIC micro MCU – Bidirectional synchronous interfaces – Output devices – LEDS – PWM power level control – Sensors – Whiskers for physical object detection – iR collision detection sensors- IR remote controls- Ultrasonic distance measurement- Light level sensors- Sound sensors- Odometry for motor control and navigation – Radio control servos.

UNIT V BRINGING ROBOTS TO LIFE 9

Real time operating system (RTOS) – Example application running in an RTOS – State machines – Randomly moving a robot application with IR remote control - Behavioral programming - Neural networks and Artificial intelligence.

Total: 45h

TEXT BOOK:

1. Myke Predko, “Programming Robot Controllers” – McGrawHill, 1st edition, 2003.

REFERENCE BOOKS :

1. Michael Slater, “Microprocessor – based design: A comprehensive Guide to Effective Hardware Design”, Prentice Hall, 1989.

2. Myke Predko, “Programming and customizing the 8051- micro-controller”, Tata McGraw-Hill, New Delhi, 2009.

3. Kenneth J. Ayala, “The 8051 micro-controller architecture, programming and applications”, Penram International publishers, Mumbai, 1997.

4. Murphy Robin R,” Introduction to AI Robotics”, MIT Press, 2000.

5. Siegwart R and Nourbakhsh I.R, “Introduction to Autonomous mobile Robots”, Prentice Hall India, 2005.

Course Outcome	Description	Knowledge Level
CO1	Analyzing the robot task planning and its limitations	K5
CO2	To study microcontroller operations for robotics and the different interfaces to implement in a microcontroller	K4
CO3	To learn how Microchip PIC micro PIC16F627 can be erased and reprogrammed	K3
CO4	To learn how different sensors, outputs, and peripherals can be wired to a microcontroller to work cooperatively and create a high-level control program.	K6
CO5	To design robots in a real time environment	K6

SATELLITE COMMUNICATION 3 0 0 3

Course Objective:

- Overview of satellite systems in relation to basic law and other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components.
- Study of satellite access by various users.
- Study of DTH and compression standards

UNIT I SATELLITE ORBITS 9

Introduction to satellite communication, Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo–stationary orbits – Look Angle Determination– Limits of visibility –eclipse–Sub satellite point –Sun transit outage– Launching Procedures –launch vehicles and propulsion.

UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN 9

Spacecraft Technology– Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation– performance impairments–system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations–System reliability and design lifetime.

UNIT III SATELLITE ACCESS 9

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Brocast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – Encryption

UNIT IV EARTH SEGMENT 9

Earth Station Technology— Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain,Transmission losses – Free–space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and Ionospheric losses .

UNIT V SATELLITE APPLICATIONS 9

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)– Direct to home Broadcast (DTH), Digital audio broadcast (DAB)– Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E–mail, Video conferencing, Internet

TOTAL: 45 h

TEXT BOOKS:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2017.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2009.

REFERENCE BOOKS:

1. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
2. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech House Bostan London, 1997.
3. Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.
4. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.
5. Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw–Hill Book Co., 1983.

Course Outcome	Description	Knowledge Level
CO1	Overview of satellite systems in relation to basic law and other terrestrial systems.	K6
CO2	Study of satellite orbits and launching.	K5
CO3	Study of earth segment and space segment components.	K4
CO4	Study of satellite access by various users.	K5
CO5	Study of DTH and compression standards	K4

TOTAL QUALITY MANAGEMENT 3 0 0 3

Course Objective:

To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION 9

Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Costs of quality.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Control Charts – Process Capability – Concepts of Six Sigma – Quality Function Development (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 – ISO 9001-2008 Quality System – Elements, Documentation, Quality Auditing – QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – TQM Implementation in manufacturing and service sectors.

TOTAL: 45h

TEXT BOOK:

1. Dale H. Besterfiled, et at., “Total quality Management”, Third Edition, Pearson Education Asia, Indian Reprint, 2006.

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, First Indian Edition, Cengage Learning, 2012.

2. Suganthi.L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006.

3. Janakiraman. B and Gopal .R.K., “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.

Course Outcome	Description	Knowledge Level
CO1	Explain the different Dimensions of product and service quality , Basic concepts of TQM and TQM Framework	K4
CO2	Appraise Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal	K5
CO3	Assess The seven traditional tools of quality New management tools and six sigma: Concepts	K5
CO4	Evaluate Quality Function Development (QFD) ,Taguchi quality loss function ,TPM Concepts, improvement needs	K5
CO5	Explain the Need for ISO 9000 Quality System	K4

DEVELOPMENT OF IOT BASED APPLICATIONS 3 0 0 3

Course Objective:

To understand the core concept, role and scope of smart sensors in IOT
To learn the fundamentals of Raspberry Pi and communication protocols between various IOT components

UNIT I INTERNET OF THINGS - AN INTRODUCTION 9

Internet of Things - An introduction, Sensors & Actuators- motion/temperature/light sensors and relays/stepper motors, Processing Elements - Raspberry Pi, Arduino, and Edison

UNIT II ON TREK WITH JAVASCRIPT 9

On Trek with JavaScript - JS and testing waters, Node.js, installation on a Raspberry Pi

UNIT III PROTOCOLS 9

Protocols - communication protocol between various IOT components – MQ Telemetry Transport, Node-RED – wiring various devices and API s.

UNIT IV IOT IN ACTION 9

IoT in Action – Developing IOT Applications on IBM Bluemix.

UNIT V IOT - WHAT'S BREWING 9

IoT - What's Brewing, Case studies – Real Life examples.

TOTAL: 45 h

TEXT BOOK:

1. IBM Career Education IBM CE - Development of IOT Based Applications, IBM Student Course Material.

Course Outcome:

At the end of this course, the Student will be able to

Course Outcome	Description	Knowledge Level
CO1	Understand the role of sensors and actuators in Internet of Things	K3
CO2	Acquire knowledge on Raspberry Pi, Arduino and Edison	K4
CO3	Understand the working of different communication protocols between various IOT components	K3
CO4	Develop IOT applications on IBM Bluemix	K6
CO5	Understand the need of IOT in different sectors	K4

Fundamentals of Enterprise Apps Development for Cloud Deployment 3 0 0 3

Course Objective:

- To learn the fundamentals of cloud computing
- To Understand the application development using DevOps Service on Bluemix
- To learn the Bluemix services in mobility and Bigdata.

UNIT I INTRODUCTION TO BLUEMIX 9

Cloud computing overview, Consumption View – IaaS (Soft Layer), PaaS (IBM Bluemix), Blue Mix Architecture, Blue Mix Overview and Dashboard Setup and installations - Eclipse and CF plugins, Case Study 1: Building an Application from a Boilerplate in the Bluemix UI, Case Study 2: Deploying a Java web app that uses the PostGreSQL service with the IBM Bluemix Eclipse tools, Case Study 3: Building and Deploying the Java version with the IBM Bluemix Eclipse tools.

UNIT II DEVELOPMENT OF APPS USING BLUEMIX SERVICES 9

Registering Services in BluemixTM, Deploying a Node.js app that uses the MySQL service with command line tools, Build a Twitter Influencer Application in Bluemix, Building and Deploying the Node.js version with the IBM Bluemix Eclipse tools, Deploying the Python version with command line tools.

UNIT III DEVELOPMENT OF APPS USING DEVOPS SERVICES ON BLUE MIX

Overview of Dev Ops, Overview Bluemix DevOps Services, Part 1: Importing and deploying the application from DevOps, Part 2: (Optional) Updating the application, JEE Cloud Trader Benchmark Application on Bluemix that use performance analysis capabilities.

UNIT IV BLUEMIX SERVICES IN MOBILITY & BIG DATA 9

Overview of Services in the areas of Mobile Apps Development & Big Data

UNIT V DATA MANAGEMENT SERVICES 9

Building an Application with Mobile Backend as a Service (MBaaS) on Bluemix platform, Data Management service - Build an BI application using Map Reduce Service to perform analytics for Big Data Sets .

TOTAL: 45h

TEXT BOOK:

1. IBM Career Education IBM CE - Development of IOT Based Applications, IBM Student Course Material.

Course Outcome:

Course Outcome	Description	Knowledge Level
CO1	Understand the Blue Mix Architecture and to exploit the Installation and setup procedures	K3
CO2	Acquire knowledge on Building, Deploying a web application using PostGreSQL and IBM Bluemix	K4
CO3	Explore the different techniques in Mobile Apps Development & Big Data	K4
CO4	Build an Application with Mobile Backend as a Service (MBaaS) on Bluemix platform	K6
CO5	Build an BI application using Map Reduce Service	K6