SYLLABUS
for
Four Year Undergraduate Programme (FYUGP)
Bachelor of Computer Application (BCA)

(Effective from Academic Session 2023-24)*

***till 2025-26 batch, updated file as on 21.04.2026(FA)**

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Contents:

1. Overview of NEP

The National Education Policy (NEP) 2020 is a comprehensive framework for transforming the Indian education system. It was approved by the Government of India on July 29, 2020, replacing the NEP 1986. The policy aims to make education more holistic, flexible, multidisciplinary, and skill-oriented, with an emphasis on critical thinking, creativity, and research.

Key Highlights of NEP 2020

1. **Foundational Principles of NEP 2020 :**NEP 2020 is based on the following principles:
   a. Flexibility: Choice-based learning across disciplines.
   b. Multidisciplinary: Integration of arts, science, and vocational education.
   c. Holistic Development: Focus on cognitive, emotional, and ethical development.
   d. Equity and Inclusion: Ensuring education for all, including marginalized sections.
   e. Skill-Based Learning: Emphasis on creativity, problem-solving, and vocational education.
   f. Technology Integration: Use of AI, online learning, and digital classrooms.
   g. Global Competitiveness: Aligning the Indian education system with global standards.
2. **Higher Education Reforms**

   New Undergraduate Structure: The three-year UG program has been replaced by a four year multidisciplinary program with multiple exit options:

Duration	**Exit Option**
1 Year	Certificate in Computer Applications
2 Years	Diploma in Computer Applications
3 Years	Bachelor's Degree in Computer Applications (BCA)
4 Years	BCA with Research / Honors

A Choice-Based Credit System (CBCS) allows students to study courses across disciplines. The Academic Bank of Credits (ABC) will store and transfer academic credits. Students can mix courses across disciplines, e.g., a science student can study music or humanities. Four-year UG programs will include research opportunities. Mandatory internships and apprenticeships for UG students.

2. NEP 2020 and Undergraduate Education

a. Multidisciplinary and Flexible Curriculum

NEP 2020 introduces a four-year undergraduate degree program with multiple entry and exit options.

The Choice-Based Credit System (CBCS) is emphasized to allow students to choose courses across disciplines (arts, science, commerce, and vocational).

b. Multiple Entry and Exit Options

Students can leave the program at different stages and receive the following:

After 1 year: Certificate

After 2 years: Diploma

After 3 years: Bachelor's degree**(major)**

After 4 years: Bachelor's degree **(Honours/ Honours with Research)**

The Academic Bank of Credits (ABC) will digitally store credits earned by students, allowing them to resume education later if they drop out.

c. Emphasis on Holistic Development

Focus on critical thinking, creativity, and problem-solving rather than rote learning. Internships, research projects, and hands-on learning will be encouraged. Incorporation of Indian knowledge systems, culture, and values into education.

d. Integration of Vocational Education

UG programs will include skill-based education and vocational training. At least one vocational course (e.g., coding, agriculture, AI, or other emerging fields) will be offered.

e. Use of Technology and Digital Learning

Increased use of online and hybrid learning models through platforms like SWAYAM, Diksha, and National Digital University.

f. Focus on Research and Innovation

Four-year UG programs will include a strong research component, allowing students to conduct research.

g. Interdisciplinary Education and Credit Transfer

Students can combine subjects from science, arts, commerce, and vocational courses in one degree. Seamless credit transfer between institutions will be possible.

h. Language and Medium of Instruction

More emphasis on regional languages in higher education.

i. Research and Innovation in the Fourth Year

The fourth-year specialization includes a research component where students can work on thesis projects, industry-based research, or innovative software solutions. Opportunities to collaborate with National Research Foundation (NRF) initiatives in areas like:

- Artificial Intelligence & Robotics
- Blockchain & Cryptography
- Cybersecurity & Ethical Hacking
- IoT & Smart Devices
- Big Data Analytics

j. Integration of Vocational and Industry-Relevant Courses

Vocational Courses (Mandatory as per NEP 2020). Vocational course may include but not limited to

- Cloud Computing & DevOps
- Blockchain Technology
- Digital Marketing & SEO
- Ethical Hacking & Cybersecurity
- Data Science & Machine Learning
- IoT & Smart Device Programming

k. Industry Collaboration

Internships and live projects to bridge the gap between academia and industry. Real life projects in the final year that focus on industry problems.

l. Use of Technology & Digital Learning

Blended learning model combining online and offline education. Use of MOOCs (SWAYAM, NPTEL, Coursera, Udemy, edX, etc.) to provide additional learning opportunities. Integration of AI-driven personalized learning platforms for adaptive education.

3. The Structure of the UG Programmes

The curriculum is drafted according to the 'UGC Curriculum and Credit Framework for Undergraduate Programmes (2022)' to equip students with knowledge, skills, values, and attitudes.

The curriculum consists of major stream courses, minor stream courses and courses from other disciplines, language courses, skill courses, and a set of courses on environmental education, understanding India, digital and technological solutions, health & wellness, yoga education, and sports and fitness. At the end of the second semester, students can decide to continue with their chosen 'major' or request a change in the 'major'. The minor stream courses will help the students to be equipped with job-oriented skills.

Overall, a three-year Degree course consists of three sections: Major (Core) Courses, Minor Courses, and Common Courses. While the Core Courses consist of Major and Departmental Electives, the Common Courses are divided into four sub-groups.

3.1 Major Courses

The Major Courses are divided into **Core Courses** and **Departmental Electives**.

Core Courses: A core course is a course that all students must study to complete the requirements for the undergraduate degree. These courses are designed to provide students with an in-depth knowledge of various areas of computer science. These courses include foundation or introductory, intermediate-level, and higher-level courses and will enable students to thoroughly understand fundamental principles, theories, and applications in computer science. Through programming exercises, the use and application of software tools, research projects, and hands-on training on computing technologies, students will enhance their academic prowess and develop a passion for advancing their understanding of computer science.

Departmental Elective Courses: A departmental elective course can be chosen from a pool

of courses. These specialised courses support the discipline of study, provide an extended scope, enable exposure to other domains, and nurture the candidate's proficiency/skill. Departmental Electives allow students to tailor their academic journey to their interests and career aspirations. These courses complement their major and provide insights into specialised knowledge and analytical skills for solving complex scientific challenges by exploring diverse topics.

The minimum number of credits to be earned from Major Courses for a 3-year UG Degree (Major) is 58 credits with 4 credits earned through a minor project. For a 4-year Bachelor's Degree (Honours) it is 86 credits with 4 credits earned through a minor project and 4 credits through a System project. while for a 4-year Bachelor's Degree (Honours with Research) it is 78 credits with 4 credits earned through a minor project and 12 credits earned through a research project.

3.2 Minor Courses

Students will have the option to choose minor courses from other disciplines. After exploring courses from different disciplines, students may declare their minor and vocational stream choice. The students must opt for at least four credits per semester throughout the 3-year /4-year undergraduate programmes. Students must choose minor courses from other disciplines until their third year of undergraduate study, from cognate disciplines. In the fourth year of UG, students can opt for online courses (MOOCs) from the SWAYAM platform. Students enrolling in a 4-year Bachelor's Degree (Honours with Research) may opt for courses on research methodology and ethics from the SWAYAM platform.

The minimum number of credits to be earned from Minor Courses for a 3-year UG Degree (Major) is 24 credits. For both 4-year Bachelor's Degree (Honours) and 4-year Bachelor's Degree (Honours with Research) is 32 credits.

3.3 Multi-Disciplinary Courses (MDC)

All undergraduate students must take three introductory-level courses relating to any of the broad discipline of computer Science. These courses are intended to broaden the intellectual experience. Students cannot choose MDC from courses already taken at the

higher secondary level (12th class) in the proposed Major and Minor stream.

3.4 Ability Enhancement Courses (AEC)

Students must achieve competency in the Modern Indian Language (MIL) and English, with special emphasis on language and communication skills. These courses aim to enable the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic writing skills, that help them articulate their arguments, present their thinking clearly and coherently, and recognise the importance of language as a mediator of knowledge and identity. These courses are compulsory and will have a total of 8 credits.

3.5 Skill Enhancement Courses (SEC)

These courses aim to impart practical skills, hands-on training, soft skills, etc. They are compulsory and will have a total of 9 credits. These courses will enhance the employability/entrepreneurship of students who wish to exit after the first or second year of the UG programmes and will have a total of 9 credits.

3.6 Value Added Courses (VAC)

These courses span over the following broad areas. These courses will have a total of 6 credits.

1. Understanding India,
2. Environmental Science,
3. Digital and Technological Solutions, and
4. Health & Wellness, Yoga Education, Sports and Fitness

The environmental science courses are based on the UGC '*Guidelines and Curriculum Framework for Environment Education at Undergraduate Level (2023)*'. A course on Indian Knowledge System (IKS) relating to ancient Indian chemistry is introduced as part of the broad area 'Understanding India'.

3.7 Summer Internship/Apprenticeship

A key aspect of the new UG programme is the introduction of internships/apprenticeships for the

students. All undergraduate students must undertake internships/apprenticeships of 2 credits in a firm, industry, or organisation or undergo laboratory training with faculty and researchers in their own or other HEIs/research institutions during the summer term to actively engage with the practical side of their learning and improve their employability.

3.8 Research Project/Dissertation

Students choosing a 4-Year Bachelor's degree (Honours with Research) must take up research projects under the guidance of a faculty member. The students are expected to complete the Research Project in the eighth semester. The research outcomes of their project work may be published in peer-reviewed journals or may be presented in conferences /seminars or may be patented.

3. Program Education Objective:

The main objectives of the Bachelor of Computer Application Programme are to:

PEO 1. To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
PEO 2. To develop the ability to use this knowledge to analyse new situations
PEO 3. To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
PEO 4. The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
PEO 5. To learn skills and tools like mathematics, statistics, physics and electronics to find the solution, interpret the results and make predictions for the future developments.
PEO 6. To develop abilities for data analysis and interpretation Using ICT.
PEO 7. To develop the basic programming skills to enable students to build Utility programs.
PEO 8. To develop the foundation for higher studies in the field of Computer Application.
PEO 9. To provide specialization in Management with technical, professional and communications skills.
PEO 10. To keep the students up-to-speed on all the latest and cutting-edge technologies.

4. Programme Outcomes:

After completing the programme the graduates will be able to:

PO-1: Engineering Knowledge: Apply computational knowledge and domain specific knowledge to design solutions, mathematical problem formulation and the computational implementation, algorithms formulation to the problems related to the field of computer applications.

PO-2: Problem Analysis: Identification of computational problems, formulation, research literature and finding solutions to complex computing problems using substantial principles of mathematics, computing sciences and discipline specific knowledge.

PO-3: Design/Development of solutions: Design of software programs/algorithms based solutions to the computational problems, discipline specific problems, evaluate systems and process that meet specific needs to engineering and sciences eco-system for directly or indirectly improving public life standards.

PO-4: Conduct Investigations of Complex Problems: Use research-based and experimental knowledge together with research and experimental methods including design of experiments, analysis and interpretation of data, analysis of process and synthesis of the information to provide valid conclusions.

PO-5: Modern tool usage: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO-6: Engineer and Society: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

PO-7: Ethics: Understand and commit to professional ethics ,cyber regulations, responsibilities, and norms of professional computing practice and problem solving.

PO-8: Individual and Team Work: Enable with adequate knowledge and skill to function as a cohesive and effective member in team or as a leader in diverse scenario irrespective of disciplines engaged in ranging from corporates, public institutes to entrepreneurship.

PO-9: Communication: Demonstrate the skills that shall enable them to express ideas and thoughts effectively to be accepted by others,construct logical arguments using appropriate discipline knowledge in the professional practices.

PO-10: Project management and Finance: Demonstrate knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects , team , institutions and organizations in multidisciplinary environments.

PSO-11: Innovation and Entrepreneurship: Apply domain knowledge in building applications and solutions that could eventually result into an innovation and a startup fostering employment and other opportunities together with wealth creation for the individual and the society at large.

PSO-12: Multidisciplinary Collaboration: Enable cross disciplines research and applications for different real life world problems that would benefit the society at large

5. Structure of Four Year Under-Graduate programme

Bachelor of Computer Application (BCA)

Outline of the BCA Course under FYUGP: The broad categories of courses and minimum credits offered by the University complying with the guidelines contained in the UGC document are as follows:

1. **Major (Discipline Specific Core Course): 62** credits up to 6th Semester (1 Core Course of 4 Credit is converted to System Project), & **20** credits in 7th-8th Semester.
2. **Minor: 24** credits up to 6th Semester, **8** credits in 7th & 8th Semester. Students from the CSE department are required to select minor offered by other departments. Students of CSE are not permitted to choose minor courses from their own department.
3. **Multidisciplinary Courses (MDC): 9** credits up to 6th Semester . Students from the CSE department are required to select MDC offered by other departments. Students of CSE are not permitted to choose MDC courses from their own department.
4. **Ability Enhancement Courses (AEC): 8** credits up to 6th Semester. These courses shall be offered as a pool of courses from the University.
5. **Skill Enhancement Courses (SEC): 9** credits up to 6th Semester . SEC courses are for CSE students only.
6. **Value Added Courses (VAC): 6** credits up to 6th Semester. These courses shall be offered as a pool of courses from the University.
7. **Summer Internship: 2** credits up to 6th Semester
8. **Research Project/ Dissertation: 12** credits in 7th and 8th semesters for Honours with Research Degree.

Minimum credits required for the complete four-year BCA programme:160

Course Structure: 4 year BCA Degree with Honors / 4 year BCA Degree with Research (as per NEP 2020) **Syllabus from Semester 1 to 7**								
Semester	**Discipline Specific Core (DSC)/Major And Discipline Specific Elective (DSE)**	**Minor**	**Generic Elective (GE)/ Multidisciplinary Course (MDC)**	**Ability Enhancement Course (AEC)**	**Skill Enhancement Course (SEC)**	**Internship/ Apprentice-ship/Project/ Community outreach (2)**	**Value addition course (VAC)**	**Total Credits**
I	Major 1(4): CSE-001-CC-1110 Fundamentals of Computers and Digital Logics (3-0-1)	Minor - 1(4): CSE-001-MC-1110 Introduction to Web Designing (3-0-1)	Choose one from a pool of courses MDC-1 (3) CSE-001-MD-1110 Basics Office Automation Tools (2-0-1)	Choose one from a pool of AEC courses AEC-1(4) XXX-001-AE-XXXX	Choose one from a pool of courses SEC-1 (3) CSE-001-SE-1110 Office Automation Tools (2-0-1)		Choose one from a pool of courses VAC-1 (2) XXX-001-VA-XXXX	20 credits
II	Major 2(4): CSE-001-CC-1210 Introduction to Programming (2-0-2)	Minor - 2(4) CSE-001-MC-1210 Information Security Fundamentals and Practices (2-0-2)	Choose one from a pool of courses MDC-2 (3) CSE-001-MD-1210 Basics of ICT Hardware (2-0-1)	Choose one from a pool of AEC courses AEC-2(4) XXX-001-AE-XXXX	Choose one from a pool of courses SEC-2 (3) CSE-SE-1210 ICT Hardware (2-0-1)		Choose one from a pool of courses VAC-2 (2) XXX-001-VA-XXXX	20 credits
Students passing and exiting the programme after learning 40 credits will be awarded UG certificate in the relevant discipline / subject provided they secure 4 credits in work based vocational courses offered during summer term or internship / Apprenticeship in addition to 6 credits from skill based courses earned during the first and second semester.								**Total = 40**
III	Major 3(4): CSE -001-CC-2110: Object Oriented Programming using Python (3-0-1) Major 4(4): CSE -001-CC-2120: Major 4(4) Operating System (3-0-1)	Minor - 3(4): CSE-001-MC-2110 : Python Programming (3-1-0)	MDC-3 (3) CSE-001-MD-2110 :Internet Technologies (3-0-0)		SEC-3(3): CSE-001-SE-2110: System Administration (3-0-0)		VAC-3 (2): CSE-001-VA-2110: :Vedic Mathematics (2-0-0 or CSE-001-VA-2120: Digital Empowerment (2-0-0)	20 credits

IV	Major 5(4): CSE -001-CC-2210: Blockchain Technology (3-0-1) Major 6(4): CSE -001-CC-2220: Data Communication and Computer Network (3-0-1) Major 7(4): CSE -001-CC-2230: Database Management System (3-0-1) Major 8(4): CSE -001-CC-2240: Data Science using Python (3-0-1)	Minor - 4(4): CSE-001-MC-2210 : Basics of Data Science (3-0-1)						20 credits
Students passing and exiting the programme after 80 credits will be awarded UG Diploma in the relevant Discipline / Subject provided they secure additional 4 credits in ski based vocational courses offered during the first year or second year summer term								**Total = 80**
V	Major 9(4): CSE -001-CC-3110: Web technology (3-0-1) Major 10(4): CSE -001-CC-3120: Algorithm design (3-0-1) Major 10(4): CSE -001-CC-3130: Wireless communication with ethical hacking (3-0-1) Major 12(4): CSE -001-CC-3140: Basics of JAVA programming (1-0-1)	Minor - 5(4): CSE-001-MC-3110 : Digital marketing (3-1-0)				CSE-001-IN-3110 Internship (0-0-2) * of one month during summer break prior to 5th semester		20 credits
VI	Major 13(4): CSE -001-CC-3210: Systems and Network Administration (3-0-1) Major 14(4): CSE -001-CC-3220: Software Engineering (3-0-1) Major 15(4): CSE -001-CC-3230: Computer Organization and Architecture (3-1-0)	Minor - 6(4): CSE-001-MC-3210 : Fundamentals of Cyber Crime and Legal Framework (3-1-0)				Major 16(4): CSE-001-PR-3210 Minor Project (0-0-4)		20 credits
Students who want to undertake a 3-year UG programme will be awarded UG Degree in the relevant Discipline /subject upon passing and exiting the programme after learning 120 credits. * Students who secure 75% marks and above in the first six semesters and wish to undertake research can choose BCA(research) stream in the fourth year. Students who secure less than 75% marks may opt for BCA(Hons) Reference: https://www.ugc.gov.in/pdfnews/7193743_FYUGP.pdf								**Total = 120**
VII	Major 17(4): CSE -001-CC-4110: Introduction to Machine Learning (3-0-1) Major 18(4): CSE -001-CC-4120: Data Analytics (3-0-1) Major 19(4): CSE -001-CC-4130: Internet of Things (3-0-1)	Minor - 7(4): CSE-001-RC-4110/ MOOCS subject code Research Methodology $ / MOOCS %						20 credits

	Major 20(4): CSE -001-CC-4140: Deep learning by mathematics (3-1-0)							
Total Credit (Sem 1 to 7)	**Major -Core =15 *4 + 1* 2 = 62 Major-Elective=3*4 =12**	**Minor=7*4= 28**	**GE/MDC= 3*3 =9**	**AEC= 2*4 =8**	**SEC= 3*3 =9**	**Internship =1*2 =2 Minor Project = 1*4 =4**	**VAC=3*2=6**	**140**

$ For **BCA Honors with Research** programme CSE-001-RC-4110 : Research Methodology course is compulsory

% for **BCA Honors** MOOCS course shall be selected

Course Structure: 4 year BCA Degree with Honors (as per NEP 2020) **Syllabus of Semester 8**								
VIII	Major 21(4): CSE -001-CC-4210: Artificial Intelligence (3-0-1)	Minor - 8(4): CSE-001-RC-4210: Research and Publication Ethics (3-1-0)				Major 24(4): Departmental Elective III: CSE-001-PR-4210 System Project (0-0-4) * other elective <subject code : subject name> will be suggested by the department based on the future trend of technology and industrial need		20 credits
	Major 22(4): Departmental Elective I: CSE -001-DE-42110: Cryptography Theory and Practice (3-0-1) CSE -001-DE-42120: Image and video processing (3-0-1) CSE -001-DE-42130: Computational neuroscience (3-0-1) CSE -001-DE-42140: Data Mining (3-0-1)							

	Major 23(4): Departmental Elective II: CSE -001-DE-42210: Speech and Natural Language Processing (3-1-0) CSE -001-DE-42220: Introduction to Mobile Application Development (3-1-0) CSE -001-DE-42230: Embedded System (3-1-0) CSE -001-DE-42240: Database Security (3-1-0)							
Total Credit (Sem 8)	***Major -Core =1 *4 = 4 Major-Elective=2*4 =8***	***Minor=1*4= 4***	***GE/MDC= 0*3=0***	***AEC= 0*4 =0***	***SEC= 0*3 =0***	***System Project = 1*4 =4***	***VAC=0*2=0***	***20***
Total Credit (Sem 1 to 7)	**Major -Core =15 *4 + 1* 2 = 62 Major-Elective=3*4 =12**	**Minor=7*4= 28**	**GE/MDC= 3*3 =9**	**AEC= 2*4 =8**	**SEC= 3*3 =9**	**Internship =1*2 =2 Minor Project = 1*4 =4**	**VAC=3*2=6**	**140**
Total Credit (Sem 1 to 8)	**Major -Core =16 *4 + 1* 2 = 66 Major-Elective=5*4 =20**	**Minor=8*4= 32**	**GE/MDC= 3*3 =9**	**AEC= 2*4 =8**	**SEC= 3*3 =9**	**Internship =1*2 =2 Minor Project = 2*4 =8**	**VAC=3*2=6**	**160**

Course Structure: 4 year BCA Degree with Research (as per NEP 2020) **Syllabus of Semester 8**								
VIII	Major 21(4): CSE -001-CC-4210: Artificial Intelligence (3-0-1)	Minor - 8(4): CSE-001-RC-4210: Research and Publication Ethics (3-1-0)				CSE-001-RP-4210 Research Project (0-0-12)		20 credits
Total Credit (Sem 8)	***Major -Core =1 *4 = 4***	***Minor=1*4= 4***	***GE/MDC= 0*3=0***	***AEC= 0*4 =0***	***SEC= 0*3 =0***	***Research Project = 1*12 =12***	***VAC=0*2=2***	***20***
Total Credit (Sem 1 to 7)	***Major -Core =15 *4 + 1* 2 = 62 Major-Elective=3*4 =12***	***Minor=7*4= 28***	***GE/MDC= 3*3 =9***	***AEC= 2*4 =8***	***SEC= 3*3 =9***	***Internship =1*2 =2 Minor Project = 1*4 =4***	***VAC=3*2=6***	***140***
Total Credit (Sem 1 to 8)	**Major -Core =16 *4 + 1* 2 = 66 *Major-Elective=3*4 =12***	**Minor=8*4= 32**	**GE/MDC= 3*3 =9**	**AEC= 2*4 =8**	**SEC= 3*3 =9**	**Internship =1*2 =2 Minor Project = 1*4 =4 Research Project = 1*12 =12**	**VAC=3*2=6**	**160**

Guideline for Opting MOOCS Subjects

1. At the time of selecting Departmental Elective or Open Elective, student can opt for a MOOC subject of same credit or one credit less.
2. Process for opting MOOC subject by the student:
3. Student identifies a MOOC subject on SWAYAM portal (https://swayam.gov.in).
4. Student informs Departmental Swayam Coordinator (DSC) about it.
5. DSC gives the code of the subject to the student.
6. Students will apply online through SMS or mobile app.
7. After the process the student enrol/register in the subject on SWAYAM portal (https://swayam.gov.in).
8. Student will inform DSC after registering and enrolling on SWAYAM portal and submits a screenshot of registration to DSC.
9. After the completion of the subject, a copy of the certificate of completion with the marks obtained is to be submitted to the DSC.
10. Credit Conversion :

    a. If credit for MOOC subject taken by the student matches with the credit of Departmental elective no conversion is needed and same breakup for CA (online assignments) and ESE (Proctored exam) will be taken.
    b. Conversion of 3 credit MOOC subject to 4 credit subject or 2 credit MOOC subject to 3 credit subject (Guideline for presentation 1 and presentation 2 will be provided by DSC)

Marks distribution	MOOCS End Semester Exam (ESE) 75 Marks		Continuous Assessment (CA) 25 Marks	
Pattern	Proctored Exam (as per MOOC mark sheet scaled to 50)	Online Assignments (as per MOOC mark sheet)	Presentation 1 (to be conducted by departmental committee)	Presentation 2 (to be conducted by departmental committee)
Max Marks	50	25	10	15
Marks required to Pass	ESE(out of 50) + Online assignment (out of 25)=30 marks		P1+P2=11 marks	

Semester-Wise Credit Structure

SEMESTER I										
Course Code	**Course Title**	**Type of Course**	**Course Component**	**Contact Hour**	**Maximum Marks**			**Credit Distribution (L:T:P)**	**Credit**	**Total Credit**
					End Semester Examination	**Internal Assessment**	**Total**			
CSE-001-CC-1110	Fundamentals of Computers and Digital Logics (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	20
			Practical	30	80	20	100			
XXX-001-AE-1110	AEC	AEC							4	
CSE-001-MC-1110	Introduction to Web Designing (3-0-1)	Minor	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE-001-MD-1110	Basics Office Automation Tools (2-0-1)	MDC	Theory	30	80	20	100	2:0:1	3	
			Practical	30	80	20	100			
CHE-001-SE-1110	Office Automation Tools (2-0-1)	SEC	Theory	30	80	20	100	2:0:1	3	
			Practical	30	80	20	100			
XXX-001-VA-XXXX	VAC 1	VAC		30	80	20	100	2:0:0	2	

SEMESTER II										
Course Code	**Course Title**	**Type of Course**	**Course Component**	**Contact Hour**	**Maximum Marks**			**Credit Distribution (L:T:P)**	**Credit**	**Total Credit**
					End Semester Examination	**Internal Assessment**	**Total**			
CSE-001-CC-1210	Introduction to Programming (2-0-2)	Major	Theory	30	80	20	100	2:0:2	4	
			Practical	60	80	20	100			

XXX-001-AE-XXXX	AEC	AEC							4	**20**
CSE-001-MC-1210	Information Security Fundamentals and Practices (2-0-2)	Minor	Theory	30	80	20	100	2:0:2	4	
			Practical	60	80	20	100			
CSE-001-MD-1210	Basics of ICT Hardware (2-0-1)	MDC	Theory	30	80	20	100	2:0:1	3	
			Practical	30	80	20	100			
CSE-001-SE-1210	ICT Hardware (2-0-1)	SEC	Theory	30	80	20	100	2:0:1	3	
			Practical	30	80	20	100			
XXX-001-VA-XXXX	VAC-2 (2-0-0)	VAC		30	80	20	100	2:0:0	2	

SEMESTER III										
Course Code	**Course Title**	**Type of Course**	**Course Component**	**Contact Hour**	**Maximum Marks**			**Credit Distribution (L:T:P)**	**Credit**	**Total Credit**
					End Semester Examination	**Internal Assessment**	**Total**			
CSE -001-CC-2110	Object Oriented Programming using Python (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	**20**
			Practical	30	80	20	100			
CSE -001-CC-2120	Operating System (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE-001-MC-2110	Python Programming (3-1-0)	Minor	Theory	45	80	20	100	3:1:0	4	
			Tutorial	15						
CSE-001-MD-2110	Internet Technologies (3-0-0)	MDC	Theory	45	80	20	100	3:0:0	3	
CSE-001-SE-2110:	System Administration (3-0-0)	SEC	Theory	45	80	20	100	3:0:0	3	
XXX-001-VA-XXXX	CSE-001-VA-2110: :Vedic Mathematics (2-0-0) or CSE-001-VA-2120: Digital Empowerment (2-0-0)	VAC		30	80	20	100	2:0:0	2	

SEMESTER IV										
Course Code	Course Title	Type of Course	Course Component	Contact Hour	Maximum Marks			Credit Distribution (L:T:P)	Credit	Total Credit
					End Semester Examination	Internal Assessment	Total			
CSE -001-CC-2210	Blockchain Technology (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	20
			Practical	30	80	20	100			
CSE -001-CC-2220	Data Communication and Computer Network (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE -001-CC-2230	Database Management System (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE -001-CC-2240	Data Science using Python (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE-001-MC-2210	Basics of Data Science (3-0-1)	Minor	Theory	45	80	20	100	3:1:0	4	
			Tutorial	15						

SEMESTER V										
Course Code	Course Title	Type of Course	Course Component	Contact Hour	Maximum Marks			Credit Distribution (L:T:P)	Credit	Total Credit
					End Semester Examination	Internal Assessment	Total			
CSE -001-CC-3110	Web technology (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	20
			Practical	30	80	20	100			
CSE -001-CC-3120	Algorithm design (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE -001-CC-3130	Wireless communication with ethical hacking (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE -001-CC-3140	Basics of JAVA programming (1-0-1)	Major	Theory	15	80	20	100	1:0:1	2	
			Practical	30	80	20	100			
CSE-001-MC-3110	Digital marketing (3-1-0)	Minor	Theory	45	80	20	100	3:1:0	4	
			Tutorial	15						
CSE-001-IN-3110	Internship (0-0-2)	Internship						0:0:2	2	

SEMESTER VI										
Course Code	Course Title	Type of Course	Course Component	Contact Hour	Maximum Marks			Credit Distribution (L:T:P)	Credit	Total Credit
					End Semester Examination	Internal Assessment	Total			
CSE -001-CC-3210	Systems and Network Administration (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			

CSE -001-CC-3220	Software Engineering (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	**20**
			Practical	30	80	20	100			
CSE -001-CC-3230	Computer Organization and Architecture (3-1-0)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE-001-MC-3210	Fundamentals of Cyber Crime and Legal Framework (3-1-0)	Minor	Theory	45	80	20	100	3:1:0	4	
			Tutorial	15						
CSE-001-PR-3210	Minor Project (0-0-4)	Minor Project						0:0:4	4	

SEMESTER VII

Course Code	Course Title	Type of Course	Course Component	Contact Hour	Maximum Marks			Credit Distribution (L:T:P)	Credit	Total Credit
					End Semester Examination	Internal Assessment	Total			
CSE -001-CC-4110	Introduction to Machine Learning (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	**20**
			Practical	30	80	20	100			
CSE -001-CC-4120	Data Analytics (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE -001-CC-4130	Internet of Things(3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE -001-CC-4140	Deep learning by mathematics(3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
			Practical	30	80	20	100			
CSE-001-RC-4110	Research Methodology (3-1-0)	Minor	Theory	45	80	20	100	3:1:0	4	
			Tutorial	15						

SEMESTER VIII (BCA Degree with Honors)

Course Code		Course Title	Type of Course	Course Component	Contact Hour	Maximum Marks			Credit Distribution (L:T:P)	Credit	Total Credit
						End Semester Examination	Internal Assessment	Total			
CSE -001-CC-4210		Artificial Intelligence (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	**20**
				Practical	30	80	20	100			
DE1	CSE -001-DE-42110	Cryptography Theory and Practice(3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
	CSE -001-DE-42120	Image and video processing(3-0-1)		Practical	30	80	20	100			
	CSE -001-DE-42130	Computational neuroscience(3-0-1)									
	CSE -001-DE-42140	Data Mining(3-0-1)									
D	CSE -001-DE-42210	Speech and Natural Language Processing (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	
				Practical	30	80	20	100			

E 2	CSE -001-DE-42220	Introduction to Mobile Application Development (3-0-1)									
	CSE -001-DE-42230	Embedded System(3-0-1)									
	CSE -001-DE-42240	Database Security(3-0-1)									
CSE-001-RC-4210		Research and Publication Ethics (3-1-0)	Minor	Theory	45	80	20	100	3:1:0	4	
				Tutorial	15						
System Project		CSE-001-PR-4210 System Project (0-0-4)	System Project					100	0:0:4	4	

SEMESTER VIII (BCA Degree with Research)										
Course Code	**Course Title**	**Type of Course**	**Course Component**	**Contact Hour**	**Maximum Marks**			**Credit Distribution (L:T:P)**	**Credit**	**Total Credit**
					End Semester Examination	**Internal Assessment**	**Total**			
CSE -001-CC-4210	Artificial Intelligence (3-0-1)	Major	Theory	45	80	20	100	3:0:1	4	**20**
CSE-001-RC-4210	Research and Publication Ethics (3-1-0)	Minor	Theory	45	80	20	100	3:1:0	4	
			Tutorial	15						
CSE-001-RP-4210	Research Project (0-0-12)	Dissertation	Dissertation				400	0:0:12	4	

Semester I

SEM I: Major 1:

CSE-CC-1110 : FUNDAMENTALS OF COMPUTERS AND DIGITAL LOGICS

Credit 4(L3-T0-P1)
Total Lectures: 75 (Theory -45, Tutorial -30)

Learning Objectives:

1. Bridge the fundamental concepts of computers with the present level of knowledge of the students.
2. Familiarise operating systems, programming languages, peripheral devices, networking, multimedia and internet
3. Understand binary, hexadecimal and octal number systems and their arithmetic.
4. Understand how logic circuits and Boolean algebra form as the basics of digital computer.
5. Demonstrate the building up of Sequential and combinational logic from basic Gates.

Course Outcomes:

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

CO1: Know the characteristics of various digital circuit components.
CO2:Understand the utilization of components.
CO3:Design and analyze small signal amplifier circuits.
CO4:Learn Postulates of Boolean algebra and to minimize combinational functions
CO5:Design and analyze combinational and sequential circuits

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO11	PSO12
CO1	3	1	2	-	1	-	-	1	2	-	1	1
CO2	2	3	2	1	1	-	-	-	2	1	1	-
CO3	3	1	2	-	1	-	2	-	-	1	-	-
CO4	3	1	2	-	1	-	2	-	-	1	-	-
CO5	3	2	3	2	3	3	2	2	2	3	3	3
Average	2.8	1.6	2.2	0.6	1.4	0.6	1.2	0.6	1.2	1.2	1	0.8

1:Low 2:Medium 3:High -:No Correlation

UNIT – I

Current trends in Computer System, current hardware and software. Functional units comprising a typical computer configuration: input/output, fixed and removable data storage, internal storage, memory hierarchy, control and arithmetic/logic unit. Operating Systems, Windows, Linux etc.System software, Application software.

(Lectures: 8Hrs + Practical: 4Hrs, CO1, CO2)

UNIT – II

Programming Concept: Flow charts and algorithms.Data communications concepts, transmission media; network concepts such as network types, network topologies and TCP/IP; Hardware essentials for a computer network; Internet, Multimedia, WWW, FTP, E-mail, Web pages.Concept of VPNs, Corporate Networks.Concept of Network security and management.

(Lectures: 10Hrs + Practical: 8Hrs, CO3)

UNIT – III

Data types and Number systems, Binary number system, Octal & Hexadecimal number system, 1's & 2's complement, Binary Fixed-Point Representation, Arithmetic operation on Binary numbers, Overflow & underflow, Floating Point Representation, Codes, ASCII, EBCDIC codes, Gray code, Exces-3 & BCD, Error detection & correcting codes.

(Lectures: 10Hrs + Practical: 6Hrs, CO3, CO1)

UNIT – IV

Logic Gates, AND, OR, NOT GATES and their Truth tables, NOR, NAND & XOR gates, Boolean Algebra, Basic Boolean Law's, Demorgan's theorem, MAP Simplification, Minimization techniques, K -Map, Sum of Product & Product of Sum.

(Lectures: 10Hrs + Practical: 6Hrs, CO2)

UNIT – V

Combinational & Sequential circuits, Half Adder & Full Adder, Full subtractor, Flip-flops - RS, D, JK & T Flip-flops, Shift Registers, RAM and ROM, Multiplexer, Demultiplexer, Encoder, Decoder, Idea about Arithmetic Circuits, Program Control, Instruction Sequencing.
(Lectures: 7Hrs + Practical: 6Hrs, CO4, CO5)

Recommended Books

1. ITL Education Solutions Limited,*Fundamentals of Computer*,Firstedition,Pearson Education (2010).
2. U K Singh, S Jain, AMaheshwari,*Fundamental of Computer Science and Information Technology*,1st Edition, SSDN Publication,2012.
3. Thomas Bartee,*Digital Computer Fundamentals*,*McGraw Hill Education*,2001.

Albert Malvino, Jerald Brown,*Digital Computer Electronics*, McGraw-Hill Education, 3rd edition,1992.

SEM I: Minor 1:

CSE-MC-1110: INTRODUCTION TO WEB DESIGNING

Credit: 4(L3–T0–P1)
Total Lectures: 75 (Theory – 45; Practical – 30)

Learning Objectives:

1. Get introduced to core parts of a web.
2. Analyze a webpage, identify its elements and attributes
3. Create webpage with HTML, XHTML and various cascading style sheets.
4. Build dynamic webpages using JavaScript (client-side programming).
5. Create XML documents and schemas.

Course Outcomes:

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

CO1: Analyze a web page and identify its elements and attributes.
CO2: Create web pages using XHTML and Cascading Style Sheets.
CO3: Build dynamic web pages using JavaScript (Client-side programming).
CO4: Create XML documents and Schemas.
CO5: Build interactive web applications using CSS2. Explain the principle of transaction management design.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO11	PSO12
CO1	3	2	1	-	2	1	-	-	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	1	2	1	1	-	-	1	1	1
CO4	1	2	3	2	-	-	-	-	-	-	-	2
CO5	3	2	2	1	2	1	1	2	2	2	2	2
Average	2.4	1.6	1.8	0.8	1.2	.6	0.4	0.4	0.4	0.6	0.8	1.2

1:Low 2:Medium 3:High -:No Correlation

UNIT – I

Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP, Web Design: Web site design principles, planning the site and navigation.

(Lectures: 10Hrs + Practical: 4Hrs, CO1, CO2)

UNIT – II

Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

(Lectures: 10Hrs + Practical: 8Hrs, CO1,CO2)

UNIT – III

Dynamic HTML: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2,CSS3.

(Lectures: 8Hrs + Practical: 6Hrs, CO3, CO4)

UNIT – IV

JavaScript:Client-side scripting, what is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

(Lectures: 8Hrs + Practical: 6Hrs, CO4, CO5)

UNIT – V

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

(Lectures: 09Hrs + Practical: 6Hrs, CO5)

Recommended Books

1. Steven Holzner,*HTML Black Book,* Dremtech press.
2. Jeffrey C. Jackson ,*Web Technologies: A Computer Science Perspective*, Prentice

Hall, 2006.
3. Craif Knuckles, David Yuen, *Web Applications: Concepts and Real-World Design*, Wiley India Pvt Ltd, 2006.

SEM I: MDC 1:

CSE-001-MD-1110 : BASICS OFFICE AUTOMATION TOOLS

Credit: 3(L2–T0–P1)
Total Lectures: 60 (Theory – 30; Practical – 30)

Learning Objectives:

1. Get introduced to core parts of a web.
2. Analyze a webpage, identify its elements and attributes
3. Create webpage with HTML, XHTML and various cascading style sheets.
4. Build dynamic webpages using JavaScript (client-side programming).
5. Create XML documents and schemas.

Course Outcomes:

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

CO1: Analyze a web page and identify its elements and attributes.
CO2: Create web pages using XHTML and Cascading Style Sheets.
CO3: Build dynamic web pages using JavaScript (Client-side programming).
CO4: Create XML documents and Schemas.
CO5: Build interactive web applications using CSS2. Explain the principle of transaction management design.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO11	PSO12
CO1	2	2	2	1	1	-	-	-	2	-	-	2
CO2	2	2	2	3	1	-	-	-	1	-	-	2
CO3	3	2	2	2	1	-	1	-	-	-	1	2
CO4	1	2	1	2	2	-	-	-	-	1	1	1
CO5	2	3	3	3	2	2	1	2	2	2	1	2
Average	2	2.2	2	2.2	1.4	0.4	0.4	0.4	1	0.6	0.6	2.2

1:Low 2:Medium 3:High -:No Correlation

UNIT – I

Introduction to Open Office, Microsoft Office and LibreOffice.Features, Creating, Saving and Opening Documents, Interface, Toolbars, Ruler, Menus, Keyboard Shortcut.

(Lectures: 6Hrs + Practical: 6Hrs, CO1, CO4)

UNIT – II

Word/writer: Editing, Previewing, Printing & Formatting a Document, Find& Replace, Using Thesaurus, Using Auto- Multiple Functions, Mail Merge, Handling Graphics, Tables & Charts, Converting a word document into various formats like- Text, Rich Text format, Word perfect, HTML, PDF etc.
(Lectures: 6Hrs + Practical: 6Hrs, CO2, CO3)

UNIT – III

Excel/Calc: Creating, Saving, closing, editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell, Copying and Moving from selected cells, entering formula, handling operators in Formula, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts, LOOKUP/VLOOKUP.
(Lectures: 6Hrs + Practical: 6Hrs, CO3)

UNIT – IV

PowerPoint/Impress: Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows using templates, Rehearse timing, Narration, Multimedia effects- Apply Transitions between Slides, Animate Slide Content, Set Timing for Transitions and Animations, Insert and Format Media, Encrypting presentations with a password, Running and Controlling a Slide Show, Printing Presentations.
(Lectures: 6Hrs + Practical: 6Hrs, CO4)

UNIT – V

Google Office Tools: Creating, saving, downloading, sharing files/folders from Google drive, creating and sharing Google docs, import and export docs, creating and sharing Google sheet, import and export Google sheet, Google forms and form responses, creating Google slides for presentation.
(Lectures: 6Hrs + Practical: 6Hrs, CO5)

Recommended Books :

1. Linda Foulkes, *Learn Microsoft Office 2019*, Packt Publishing Limited; Illustrated edition (29 May 2020)
2. Bittu Kumar, *Mastering MS Office*, V&S Publishers (1 January 2017)

3. Kevin Wilson, *Exploring Microsoft Office: The Illustrated, Practical Guide to Using Office and Microsoft 365*, Elluminet Press; 1st edition (30 November 2020)
4. Wallace Wang, *Microsoft Office 2019 For Dummies*, Wiley (1 January 2018)
5. Diane L. Martin, *Office in a Minute*, Createspace *Independent* Pub; 2nd Edition.
6. Firos A, Office Automation Tools, Notion Press Books, 2023, 1st Edition.

SEM I: SEC 1:

CSE-001-SE-1110: Office Automation Tools
Credit: 3 (L2-T0-P1)
Total Lectures: 60 (Theory: 30 , Practical:30)

Learning Objectives:

1. Bridge the fundamental concepts of computers with the present level of knowledge of the students.
2. Familiarise with the automation tools and software and different operations
3. Understand different short tricks of calculations and other necessary things of day to day life.
4. Understand how to use Excel, word power points etc. efficiently.
5. Web browser and how to browse for solutions of different problems.

Course Outcomes:

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

CO1: Know the applications of automation tools.
CO2: Understand the utilization of power points, ms office, access etc.
CO3: Different statistical analysis using different automation tools.
CO4: Learn formulas and short cuts to do the works in efficiently
CO5: Reducing the manual effort to complete mundane tasks, Cutting down on manual errors and Shrinking the processing time.

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

1:Low 2:Medium 3:High -:No Correlation

Unit-I

Introduction to Open Office, Microsoft Office and LibreOffice.Features, Creating, Saving and Opening Documents, Interface, Toolbars, Ruler, Menus, Keyboard Shortcut.

(Lectures: 06Hrs + Practical: 06Hrs, CO1, CO4, CO5)

Unit-II

Word/writer: Editing, Previewing, Printing & Formatting a Document, Find& Replace, Using Thesaurus, Using Auto- Multiple Functions, Mail Merge, Handling Graphics, Tables & Charts, Converting a word document into various formats like- Text, Rich Text format, Word perfect, HTML, PDF etc.

(Lectures: 06Hrs + Practical: 6Hrs, CO1, CO4, CO5)

UNIT-III

Excel/Calc: Creating, Saving, closing, editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell, Copying and Moving from selected cells, entering formula, handling operators in Formula, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts, LOOKUP/VLOOKUP.

(Lectures: 06Hrs + Practical: 6Hrs, CO2, CO3, CO5)

UNIT-IV

Introduction to MS Office-MS Power Point and Open Office-Impress:

PowerPoint/Impress: Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows using templates, Rehearse timing, Narration, Multimedia effects- Apply Transitions between Slides, Animate Slide Content, Set Timing for Transitions and Animations, Insert and Format Media, Encrypting presentations with a password, Running and Controlling a Slide Show, Printing Presentations.

(Lectures: 04Hrs + Practical: 6Hrs, CO1, CO3, CO4)

UNIT-V

Google Office Tools: Creating, saving, downloading, sharing files/folders from Google drive, creating and sharing Google docs, import and export docs, creating and sharing Google sheet, import and export Google sheet, Google forms and form responses, creating Google slides for presentation.

(Lectures: 08Hrs + Practical: 6Hrs, CO1, CO3)

Recommended Books :

1. Linda Foulkes, *Learn Microsoft Office 2019*, Packt Publishing Limited; Illustrated edition (29 May 2020)
2. Bittu Kumar, *Mastering MS Office*, V&S Publishers (1 January 2017)
3. Kevin Wilson, *Exploring Microsoft Office: The Illustrated, Practical Guide to Using Office and Microsoft 365*, Elluminet Press; 1st edition (30 November 2020)
4. Wallace Wang, *Microsoft Office 2019 For Dummies*, Wiley (1 January 2018)
5. Diane L. Martin, *Office in a Minute*, Createspace *Independent* Pub; 2nd Edition.
6. Firos A, Office Automation Tools, Notion Press Books, 2023, 1st Edition.

Semester II

CSE-001-CC-1210 : INTRODUCTION TO PROGRAMMING

Credit:4(L2–T0–P2)
Total Lectures: 90 (Theory – 30;Practical –60)

Learning Objectives:

1. Understanding foundation concepts of information and information processing in computer systems: a matter of information, data representation, coding systems.
2. Understanding of an algorithm and its definition.
3. Understanding of a programming language syntax and its definition by example of C language.
4. Knowledge of basic principles of imperative and structural programming
5. Ability to write simple programs in C language by using basic control structures (conditional statements, loops, switches, branching, etc.).

Course Outcomes:

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

CO1. Understanding foundation concepts of information and information processing in computer systems: a matter of information, data representation, coding systems.
CO2. Understanding of an algorithm and its definition.
CO3. Understanding of a programming language syntax and its definition by example of C language.
CO4. Knowledge of basic principles of imperative and structural programming.Write simple programs in C language by using basic control structures (conditional statements, loops, switches, branching, etc.).
CO5. Ability to create a programmable model for a problem given.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	1	2	1	1	1	-	-	2	2	1	1	1
CO2	1	2	2	2	1	2	2	1	2	2	2	-
CO3	2	2	3	1	2	2	2	2	2	3	2	-
CO4	3	1	1	1	2	-	2	3	2	3	2	-
CO5	1	1	1	2	1	2	-	1	-	3	1	1
Average	1.6	1.6	1.6	1.4	1.4	1.2	1	1.8	1.6	2.4	1.6	0.4

1:Low 2:Medium 3:High -:No Correlation

UNIT – I

The problem-solving process and strategies; programming paradigms – procedural, structured, object oriented and generic approaches; algorithms; programs (algorithmdata structure); data abstraction.

(Lectures: 06Hrs + Practical: 12Hrs, CO1)

UNIT – II

Basic data types and fundamental programming constructs (control structures); syntax and semantics of a higher-level language; variables, constants, operators, expressions, and assignment.

(Lectures: 06Hrs + Practical: 12Hrs, CO2)

UNIT – III

functions as building blocks of structured programming; recursions; searching and sorting algorithms. Array data type and use of arrays; character data type and text processing; functional and procedural abstraction; Pointer data type and simple applications of pointers.

(Lectures: 06Hrs + Practical: 12Hrs, CO3)

UNIT – IV

Principle of modeling (abstraction and decomposition); graphic models for structured programming; problems with structured programming; modular programming and abstract data types.

(Lectures: 06Hrs + Practical: 12Hrs, CO4)

UNIT – V

Program design and evaluation (module coupling and module strength); problem solving using structured programming - coding, debugging and testing using C.

(Lectures: 06Hrs + Practical: 12Hrs, CO5)

Recommended Books

1. Brian W. Kernighan, Dennis M. Ritchie,*The C Programming Language (ANSI C Version)*,PHI Learning.
2. Balaguruswamy,*Computing Fundamentals and C Programming*,McGraw Hill Education.

3. Doris Appleby, Julius J. VandeKopple,*Programming Language-Paradigm and Practice*,McGraw Hill Education.
4. J.B. Dixit,*Mastering C Programs,* Laxmi Publications; Reprint edition, 2013.

CSE-001-MC-1210: INFORMATION SECURITY FUNDAMENTALS AND PRACTICES

Credit:4(L2–T0–P2)
Total Lectures: 90 (Theory – 30;Practical –60)

Learning Objectives:

1. Learn fundamentals of cryptography and its application to network security. Understand network security threats, security services, and countermeasures.
2. Understand vulnerability analysis of network security. Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.
3. Gain hands-on experience with programming and simulation techniques for security protocols. Obtain background for original research in network security, especially wireless network and MANET security.
4. Understand the trade-offs and criteria/concerns for security countermeasure development. Apply methods for authentication, access control, intrusion detection and prevention.
5. Identify and mitigate software security vulnerabilities in existing systems

Course Outcomes:

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

CO1. Understand and explain the risks faced by computer systems and networks.
CO2. Identify and analyze security problems in computer systems and networks.
CO3. Explain how standard security mechanisms work.
CO4. Develop security mechanisms to protect computer systems and networks.
CO5. Write programs that are more secure.

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

CO5	3	1	2	3	3	2	1	1	3	2	3	1
Average	2.4	1.8	2.2	2.2	2.2	2.2	1.6	1.6	2.2	1.8	2.2	2

1:Low 2:Medium 3:High -:No Correlation

UNIT – I

Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Servicesand mechanisms. Conventional Cryptographic Techniques:Conventional substitution andtransposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography

(Lectures: 06Hrs + Practical: 12Hrs, CO1)

UNIT – II

Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos Program Security: Nonmalicious

(Lectures: 06Hrs + Practical: 12Hrs, CO2)

UNIT – III

Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos program Security: Nonmalicious

(Lectures: 06Hrs + Practical: 12Hrs, CO3)

UNIT – IV

Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, PersonaFirewalls, IDS, Email Security – PGP, S/MIME

(Lectures: 06Hrs + Practical: 12Hrs, CO4)

UNIT – V

Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels

(Lectures: 06Hrs + Practical: 12Hrs, CO5)

Recommended Books

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography And Network Security Principles And Practice, Fourth or Fifth

   Edition, William Stallings, Pearson

3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.
5. Linda Foulkes, *Learn Microsoft Office 2019*, Packt Publishing Limited; Illustrated edition (29 May 2020)

6. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
7. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

CSE-001-MD-1210 : BASICS OF ICT HARDWARE

Credit:4(L2–T0–P1)
Total Lectures: 60 (Theory – 30;Practical –30)

Learning Objectives:

1. To introduce the basic software and hardware components of a computer system.
2. To introduce the theory and practical implementation of SMPS, UPS in a computer system
3. To introduce the process of different types of OS installation and troubleshooting.
4. To introduce a fair idea and practices in computer assembling and hardware troubleshooting.

Course Outcomes:

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

CO1. Able to identify the different hardware parts of a computer system.
CO2. Understand the principles of SMPS/UPS and troubleshoot switch mode power supply.
CO3. Configure BIOS settings and their consequences.
CO4. Able to install and troubleshoot different types of Operating System.
CO5. Able to Create and configure a LAN network

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	1	2	2	1	2	1	3	3	3	1	1	3
CO2	2	2	1	3	1	2	3	2	1	2	1	1
CO3	2	1	3	2	3	3	3	3	3	1	1	2
CO4	3	1	3	1	3	3	2	1	2	1	1	2
CO5	2	3	2	3	1	3	1	1	1	2	3	1
Average	2	1.8	2.2	2	2	2.4	2.4	2	2	1.4	1.4	1.8

1:Low 2:Medium 3:High -:No Correlation

UNIT -1

Computer Fundamentals, Architecture of computer, System software, Application Software, Operating System basic concepts, Operating system types, software & hardware, Basic fundamentals of AC and DC, Converters.
Practical Components: Identification of different parts of a computer system, Color wires and power flow identification.
(Lectures: 06Hrs + Practical: 6Hrs, CO1)

UNIT- 2

SMPS & UPS: Features, Functions, Types, Circuit diagram of SMPS, UPS working principle.

Practical Components: SMPS installation, Isolated power testing, battery changing in UPS, Troubleshooting fuse, relay and circuits.
(Lectures: 06Hrs + Practical: 6Hrs, CO2)

UNIT- 3

BIOS introduction, CMOS introduction and setup, POST,

Practical Component: BIOS/CMOS setup, BIOS configuration, Dual booting implementation.
(Lectures: 06Hrs + Practical: 6Hrs, CO3)

UNIT -4

Operating System: Introduction, types, functions& features; Windows 10, Linux Ubuntu and Fedora, Android.

Practical Component: OS installation, DOS commands, Safe mode boot operations, Windows diagnostic tools, system restore, windows recovery, linux server and services configuration.
(Lectures: 06Hrs + Practical: 6Hrs, CO4)

UNIT -5

Networking: Introduction to LAN, MAN, WAN, Cables: CAT, STP and Fiber, STP cable color codes, RJ 45 and other LAN connectors, creating a LAN network, troubleshooting a LAN and Wifi 802.11 Network.
Practical Component: Create and configure a LAN network, configure and troubleshoot aadhoc and wifi network.
(Lectures: 06Hrs + Practical: 6Hrs, CO5)

Recommended Books

1. The Complete Reference PC Hardware, Craig Zacker, McGraw Hill
2. Learning PC Hardware, Ramesh Bangia, Khanna publishers.

CSE-001-SE-1210: ICT HARDWARE
Credit: 4(L2–T0–P1)
Total Lectures: 60 (Theory – 30; Practical –30)

Learning Objectives:

1. To introduce the basic software and hardware components of a computer system.
2. To introduce the theory and practical implementation of SMPS, UPS in a computer system.
3. To introduce the process of different types of OS installation and troubleshooting.
4. To introduce a fair idea and practices in computer assembling and hardware troubleshooting.

Course Outcomes:

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

CO1. Able to identify the different hardware parts of a computer system.
CO2. Understand the principles of SMPS/UPS and troubleshoot switch mode power supply.
CO3. Configure BIOS settings and their consequences.
CO4. Able to install and troubleshoot different types of Operating System.
CO5. Able to Create a LAN network, troubleshooting a LAN

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

CO5	2	2	2	1	2	2	1	1	3	3	1	2
Average	1.8	2.4	2	2	2.2	2.4	2.2	2	2.2	2.2	1.4	1.8

1:Low 2:Medium 3:High -:No Correlation

UNIT 1

Computer Fundamentals, Architecture of computer, System software, Application Software, Operating System basic concepts, Operating system types, softwares&hardwares, Basic fundamentals of AC and DC, Converters.

Practical Components: Identification of different parts of a computer system, Color wires and power flow identification.

(Lectures: 06Hrs + Practical: 6Hrs, CO1)

UNIT 2

SMPS & UPS: Features , Functions, Types, Circuit diagram of SMPS, UPS working principle.

Practical Components: SMPS installation, Isolated power testing, battery changing in UPS, Troubleshooting fuse, relay and circuits.

(Lectures: 06Hrs + Practical: 6Hrs, CO2)

UNIT 3: BIOS introduction, CMOS introduction and setup, POST,

Practical Component: BIOS/CMOS setup , BIOS configuration, Dual booting implementation.

(Lectures: 06Hrs + Practical: 6Hrs, CO3)

UNIT 4

Operating System: Introduction, types,functions& features; Windows 10 , Linux Ubuntu and Fedora, Android.

Practical Component: OS installation, DOS commands, Safe mode boot operations, Windows diagnostic tools, system restore, windows recovery, linux server and services configuration.

(Lectures: 06Hrs + Practical: 6Hrs, CO4)

UNIT 5

Networking : Introduction to LAN, MAN , WAN, Cables: CAT, STP and Fiber, STP cable color codes, RJ 45 and other LAN connectors, Creating a LAN network, troubleshooting a LAN and Wifi 802.11 Network.

Practical Component: Create and configure a LAN network, configure and troubleshoot adhoc and wifi network.

(Lectures: 06Hrs + Practical: 6Hrs, CO5)

Recommended Books:

1. The Complete Reference PC Hardware, Craig Zacker, McGraw Hill
2. Learning PC Hardware, Ramesh Bangia, Khanna publishers.

Semester III

CSE -001-CC-2110: OBJECT ORIENTED PROGRAMMING USING PYTHON
Credit 4(L3-T0-P1)
Total Lectures: 75 (Theory -45, Practical -30)

Learning Objectives

1: Describe OOPs concepts for designing class structure for solving real world problems.
2: Use functions ,operators, classes in python programming for reusability and granular programming.
3: Understand tokens, expressions, and control structures for better program design
4: Explain List, Dictionaries and Class sets and create programs using them for better data handling
5: Learn to Build python packages for reusability and deployment purposes.

Course Outcomes:
On Completion of the course the students will be able to

CO1: Build up programming, analytical and logical thinking abilities.
CO2: Define and demonstrate the use of built-in data structures and modular functions.
CO3: Design and implement python programs to solve a real-world problem through flow controls.
CO4: Design and implement GUI application and how to handle exceptions , files through appropriate programs.
CO5: Build python packages for reusability and deployment purposes.

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

CO4	3	1	-	-	3	-	-	-	-	2	2	3
CO5	1	1	2	-	3	-	-	-	-	2	1	2
Average	2.6	1	1.6	0.2	2	0	0	0	0	0.8	1	1.2

1:Low 2:Medium 3:High -:No Correlation

.

Unit -I

Python Programming Language:
Data Types in Python, Text, Integer, float, complex, Boolean, Built-in Data Types, Sequence Types: list, tuple, range, Mapping Type: dict, Set Types: set, frozenset, Binary Types: bytes, byte array, memoryview, Non Type Python Variables, Case-Sensitiveness, Multi Words Variable Names, Camel Case, Pascal Case, Snake Case, Python Variable Names Rules, Assign Many Values to Multiple Variables, Concatenation operation, type() Function, Comments, Input, Output functions, print(), input(),Type Casting, Simple Python Programs with input and out put operations

(Lectures: 5Hrs + Practical:3Hrs ,CO1)

Unit -II
String Management ,Python Operators, Flow Control
String, Multiline Strings, indexing, Slicing Strings, start index and the end index, Slice from the start, Slice to the end, Negative indexing, Modify Strings: upper(), lower(),Remove Whitespace: strip(), Replace Method: replace(), Split String: split() method, String Built-in Methods,Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators. Arithmetic Operations: Additions, Subtraction, Multiplication, Division, Modulus, Exponentiation, Floor division. Assignment Operators,Python Conditions and If statements, if statements, if-else statements, if –elif-else statements, Indentation and if , Short Hand if, Short Hand if ... else, multiple else statements on the same line, if and logical operator 'and' , if and logical operator 'or', Nested If, The pass Statement. Iterative statements in Python, While Loops, syntax, Working of while loop, indexing variable, statements block, increment / decrement, The break Statement, The continue Statement, The else Statement with while. Demonstration programs.

(Lectures :10Hrs + Practical:7Hrs,CO3)

Unit -III
Python Collections classes:
Sets, Characteristics of sets, unordered, unchangeable, and un-indexed, features of Set Items,Operations using sets,Python Dictionaries, syntax, key: value pairs, characteristics of Dictionary Items, ordered, changeable, and does not allow duplicates, Dictionary Length,operations using dictionaries.
(Lectures :10Hrs + Practical:8Hrs, CO2,CO4)

Unit -IV
Object Oriented programming python 1:

Classes and Objects in Python, properties and methods, 'class' key word, Instantiation, __init__() Function, self parameter, The pass Statement, Delete Object Properties, Demonstration of class, objects, member Methods and data.

(Lectures :10Hrs + Practical:7Hrs,CO4)

Unit -V

Object Oriented programming python 2:

Inheritance in Python, Parent / Base class, Child / derived class, inheritance syntax, __init__() Function and Inheritance, function over riding, super() method, self, Multi Level Inheritance, Demonstration examples.

(Lectures :10Hrs + Practical:5Hrs ,CO4,CO5)

Recommended Books:

1. Object Oriented Python -Irv Kalb.
2. Python Programming -Ryan Turner

CSE -001-CC-2120: OPERATING SYSTEM

Credit: 4(L3–T0–P1)
Total Lectures: 75 (Theory – 45; Practical –30)

Learning Objectives:

1: Understand how to control access to a computer and the files that may be shared
2: Demonstrate the knowledge of the components of computer and their respective roles in computing.
3: Ability to recognize and resolve user problems with standard operating environments.
4: Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively

Course Outcomes:

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

CO1: Understand the basics of operating systems like kernel, shell, types and views of operating systems.
CO2: Describe the various CPU scheduling algorithms and remove deadlocks.
CO3: Explain various memory management techniques and concept of thrashing.

CO4: Use disk management and disk scheduling algorithms for better utilization of external memory.
CO5: Recognize file system interface, protection and security mechanisms.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	1	2	1	1	1	-	-	2	2	1	1	1
CO2	1	2	2	2	1	2	2	1	2	2	2	-
CO3	2	2	3	1	2	2	2	2	2	3	2	-
CO4	3	1	1	1	2	-	2	3	2	3	2	-
CO5	1	1	1	2	1	2	-	1	-	3	1	1
Average	1.6	1.6	1.6	1.4	1.4	1.2	1	1.8	1.6	2.4	1.6	0.4

1:Low 2:Medium 3:High -:No Correlation

UNIT – I
Introduction: Operating System, Multiprocessor Systems, Distributed Systems, Parallel Systems, Real-Time System, Batch processing System, Computing Environments.
Computer- System Structures:Computer- System Operation, I/O Structure, Storage Structure, Storage Hierarchy, Hardware Protection, Network Structure.
Operating System Structures:System Components, Operating- System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation.
(Lectures 5Hrs + Practical 6Hrs,CO1)

UNIT – II
Processes and Multithreading: Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Communication in Client –Server Systems, Multithreading Models.
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation, Process Scheduling Models.
(Lectures 10Hrs + Practical 6Hrs,CO2)

UNIT – III
Memory Management:Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging.
(Lectures 10Hrs + Practical 6Hrs,CO3)

UNIT – IV
File System Interface: File-system interface, File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, Protection.
File System implementation: File- System Structure, File- System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and performance, Recovery. **(Lectures 10Hrs + Practical 6Hrs,CO4)**

UNIT – V
I/O Systems: I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, STREAMS, Performance.
Mass Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management
(Lectures 10Hrs + Practical 6Hrs,CO5)

Recommended Books

Tanenbaum, Modern Operating Systems, Prentice Hall India Learning Private Limited; 3rd edition, 2009
Milenkovic, Operating Systems: Concepts and Design, McGraw Hill.
Sillberschatz et. al, Operating Systems, Wiley India.

CSE-001-MC-2110: PYTHON PROGRAMMING
Credit 4(L3-T0-P1)
Total Lectures: 75 (Theory -45, Tutorial -30)

Learning Objectives

1:Interpret :To understand why Python is a useful scripting language for developers.
2:To learn how to use lists, tuples, and dictionaries in Python programs.
3:To learn how to write loops and decision statements in Python.
4:To learn how to write functions and pass arguments in Python.
5:To learn how to read and write files in Python and plot figures using python packages.

Course Outcomes:
On Completion of the course the students will be able to

CO1: Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
CO2: Express proficiency in the handling of strings and functions.
CO3: Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
CO4: Identify the commonly used operations involving file systems and regular expressions.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	3	1	1	-	-	1	1	2	1	1
CO2	2	2	3	1	1	-	1	2	1	3	1	2
CO3	3	2	3	2	2	-	1	3	2	3	1	2
CO4	3	2	3	2	3	-	-	3	2	3	1	2
Average	2.75	2	3	1.5	1.75	0	0.5	2.25	1.5	2.75	1	1.75

1:Low 2:Medium 3:High -:No Correlation

Unit -I
Parts Python Programming Language: Python Interpreter/Shell, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data types, Indentation, Comments, Reading Input, Print Output, Type Conversions, Control Flow Statements:The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The while Loop, The for Loop, The continue and break Statements. Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Life time of Variables, Default Parameters, Command Line Arguments. Strings: Creating and Storing

Strings, Basic String operations,Accessing Characters in String by Index Number, String Slicing and Joining, String methods.
(Lectures: 5Hrs + Practical 6Hrs, CO1,CO2)

Unit -II

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement.
Dictionaries: Creating Dictionary, Accessing and modifying key:value pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary methods, The del Statement.
(Lectures 10+ Practical 6Hrs,CO3)

Unit -III

Tuples and Sets: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples,Built-In Functions Used onTuples, Relations between Tuples and Lists.
(Lectures 10+ Practical 6Hrs,CO3)

Unit -IV
Files: Types of files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files,The Pickle module, Reading and writing CSV files.
(Lectures 10+ Practical 6Hrs,CO4)

Unit -V
Data Visualization: Generating Data-Installing Matplotlib, Plotting a Simple Line Graph, Random Walks, Rolling Dice with Plotly. Downloading Data- The CSV File Format, Mapping Global Data Sets: JSON Format.
(Lectures 10+ Practical 6Hrs,CO4)

Recommended Books

1. Python Programming, Adam Stewart
2. Python for Scientists , John M. Stewart.

CSE-001-MD-2110: INTERNET TECHNOLOGIES
Credit 3(L3-T0-P0)
Total Lectures: 45 (Theory -45)

Learning Objectives

1: To Know the evolution of the web from web 1.0 to web 3.0
2: To become aware of the Information Retrieval Techniques and Tools.
3: To acquaint with the web development frameworks and how to use them for building own site.
4: To understand the role of client side and server side technologies.

Course Outcomes:

On Completion of the course the students will be able to

CO1: Have a clear understanding of the Internet: the evolution of the Internet and the working of the internet

CO2: Develop working web pages using XHTML and to make enhancement by script languages such as JavaScript, image-map, etc.

CO3: Use advanced web authoring software to aid the development of webpage as well as maintenance of a web site.

CO4: Apply various Internet technologies in different business applications legally and ethnically.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	1	3	2	2	1	2	1	-	2	1	2
CO2	3	-	3	-	3	2	3	3	1	3	2	3
CO3	3	-	3	2	3	2	2	2	2	2	2	3
CO4	3	2	2	-	1	2	2	2	-	2	3	3
Average	3	0.75	2.75	1	2.25	1.75	2.25	2	0.75	2.25	2	2.75

1:Low 2:Medium 3:High -:No Correlation

Unit -I

Interconnected Network: Internet: The Giant Wide Area Network, Communicating over the Internet, Accessing the Internet, Internet Organisations, Cyber Ethics.

(Lectures 5Hrs,CO1)

Unit -II

Internet Applications: Internet services, Electronic Mail(E-Mail), File Transfer, Real-Time User Communication, Remote Login, Usenet,

World Wide Web: The Web, The Working Web, Web Terminology, Web Architecture, World Wide Web Challenges.

(Lectures 10Hrs,CO1)

Unit -III

Hypertext Transfer Protocol (HTTP):HTTP, HTTP Version, HTTP connections, HTTP Communication,Evolution of Web: The Generations of Web, Web 1.0, Web 2.0, Web 3.0, Big Data: A Special Discussion, Web IR: Information Retrieval on the Web: Web Information Retrieval, Web Information Retrieval Tools, Web Information Retrieval Architecture (Search Engine Architecture),

Web Information Retrieval Performance Metrics, Web Information Retrieval Models, Google PageRanK.
(Lectures 10Hrs, CO2)

Unit -IV
Web Development Basics: Elements of Web Development , Client-Side and Server-Side Scripting, Model-View-Controller Architecture for Web Application Development.

Client-Side Technologies: HTML: Hypertext Markup Language, CSS: Cascading Style Sheets, JavaScript
Server-Side Technologies: Server-Side Scripting, Personal Home Pages, javascript.

(Lectures 10Hrs, CO2,CO3)

Unit -V
Web Application Frameworks:Django ,Ruby on Rails.
Web Databases: Web Database, Structured Query Language: Relational Databases

(Lectures 10Hrs, CO4)

Recommended Books

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI, Learning, Delhi, 2013.
2. Web programming and Internet Technologies, Porter Scobey.

CSE-001-SE-2110: SYSTEM ADMINISTRATION
Credit 3(L2-T0-P1)
Total Lectures: 60 (Theory -30, Practical-30)

Learning Objectives

1: To understand the linux commands to handle and configure a linux server.

2: Observe the CPU behaviour of system and network process.
3: Learn Linux approaches for local storage configuration and system configuration.
4: Learn to perform cluster management and firewall configurations.

Course Outcomes:

On Completion of the course the students will be able to

CO1: Implement and administer a Linux Server.
CO2: Install and administer server services.
CO3: Manage Users and Groups.
CO4: Setup and manage policies.
CO5: Implement File Services.
CO6: Secure a Linux Server and Understand Virtualization;

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	1	3	2	3	2	-	1	-	3	1	2
CO2	3	1	3	2	2	2	-	2	2	3	1	2
CO3	3	1	2	2	2	2	3	2	2	3	1	2
CO4	3	2	2	2	2	2	3	2	2	3	1	2
CO5	3	2	2	1	2	1	2	2	-	3	1	2
CO6	3	2	2	1	3	1	-	-	-	1	-	1
Average	3	1.5	2.33	1.66	2.33	1.66	1.33	1.5	0.66	2.66	0.83	1.83

1:Low 2:Medium 3:High -:No Correlation

Unit -I

Understand and use essential tools:
Shell prompt, Input-Output redirection, Locate,read and use system documentation, file structure.
Shell Scripts:
Conditional execution, looping structures,shell commands processing.
(Lectures 2Hrs + Practical 6 Hrs, CO1,CO5)

Unit -II

Operating Running Systems:
Booting systems into different target, Interrupting the boot process to gain access, identifying cpu demand processes and kill, adjusting process scheduling, system logs, system journals,starting and halting network process.

Local Storage configuration:
Manipulating partitions on MBR and GPT disks, Modifying physical volumes,mounting file systems at boot.
(Lectures 7Hrs + Practical 6 Hrs,CO1,CO2)

Unit -III

Creating and Configuring Systems:
Working with different file systems - vfat,ext4,xfs etc, mounting and unmounting file system using NFS, Configuring disk compressions, Managing layered storage, troubleshooting file permission problems, users and policies management.
(Lectures 7Hrs + Practical 6 Hrs,CO3,CO4,CO5)

Unit -IV
Deploying and Configuring systems:
Start and stop services at boot, working with package module streams, modifying system bootloader, Cluster Management:Job management, Queue management.
(Lectures 7Hrs + Practical 6 Hrs,CO2)

Unit -V
Basic Networking:
Configuring IP addresses, configuring network services automatically at boot,restricting network access using firewall and IDS.
(Lectures 7Hrs + Practical 6 Hrs,CO1,CO6)

Recommended Books

1. Pro-linux system administration ,Dennis Matotek
2. Linux System Administration- A Hands on Guide, Tashi Wangchuk

CSE-001-VA-2110: VEDIC MATHEMATICS
Credit 2(L2-T0-P0)
Total Lectures: 30 (Theory -30)

Learning Objectives

1: To promote Indian Mathematics.
2: To enhance computation skills in students.
3: Improve clarity on mathematical concepts.
4: Develop analytical thinking through Vedic Mathematics.

Course Outcomes:
On Completion of the course the students will be able to

CO1: Perform calculations in Arithmetic through Vedic Maths, Algebra and even Trigonometry for that matter and simplify and speed up calculations.
CO2: Perform Factorization of simple and harder quadratics.
CO3: Understand cubic equations and solve problems related to cubic problems from the perspective of vedic mathematics.
CO4: Understand Factorization and Differential Calculus and solve from the perspective of vedic mathematics.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	1	-	2	2	-	-	-	3	2	2	2
CO2	3	2	-	1	-	-	-	1	1	3	3	3
CO3	3	2	-	3	2	-	-	2	3	3	2	2
CO4	3	2	-	3	2	-	-	2	3	3	2	3
Average	3	1.75	0	2.25	1.5	0	0	1.25	2.5	2.75	2.25	2.5

1:Low 2:Medium 3:High -:No Correlation

Unit -I

Introduction to Vedic Maths,Vedic Mathematical Formulae, Applications of Vedic Mathematics, theory of numbers.

(Lectures 5, CO1)

Unit -II

Algebric Operations, mathematical computation.Basic of calculus, coordinate system theory,Principles of vedic mathematics.

(Lectures 7,CO1)

Unit -III

16 sutras, high speed multiplications, faster division,Divisibility, calendars,algebra: linear, simultaneous, quadratic & miscellaneous equations.

(Lectures 7,CO2)

Unit -IV

Accelerated addition, instant subtractions,Squares, cubes, square roots, cube roots, digital roots.

(Lectures 6,CO3)

Unit -V

Pythagoras theorem,Reccurring decimal,Coordinate geometry,Calculus.

(Lectures 5,CO4)

Recommended Books

1. Vedic Mathematics Bharati Krishna Tirth Ji Maharaj
2. Vedic Mathematics for all Ages, Vandana Singhal

CSE-001-VA-2120: DIGITAL EMPOWERMENT

Credit 2(L2-T0-P0)

Total Lectures: 30 (Theory -30)

Learning Objectives

1. Familiarize learners with the concepts of digital inclusion and empowerment.
2. Enable effective communication and collaboration in cyberspace.
3. Build awareness of cybersecurity threats, privacy, and safety measures.
4. Inculcate ethical understanding and digital netiquette in online spaces.

Course Outcomes:

CO1:On Completion of the course the students will be able to

CO2:Understand the principles and challenges of digital inclusion and empowerment.

CO3:Use digital communication and collaboration tools effectively.

CO4:Recognize cybersecurity threats and adopt safe online practices.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	1	2	3	2	1	3	3	3	3	2
CO2	2	3	2	3	3	1	-	2	3	3	2	3
CO3	3	2	3	2	2	3	2	1	2	3	3	2
CO4	2	1	2	1	2	3	3	3	3	3	2	3
Average	2.5	2	2	2	2.5	2.25	1.5	2.25	2.75	3	2.5	2.5

1:Low 2:Medium 3:High -:No Correlation

Unit -I

Digital Inclusion and Digital Empowerment – Needs and challenges of digital inclusion – Vision of Digital India: DigiLocker, E-Hospitals, e-Pathshala, BHIM, e-Kranti (Electronic Delivery of Services), e-Health Campaigns – Public utility portals of Government of India: RTI, Health, Finance, Income Tax Filing, Education.

(Lectures 7, CO1)

Unit -II

Communication and Collaboration in Cyberspace – Electronic communication: email, blogs, social media – Collaborative digital platforms – Tools/platforms for online learning – Collaboration using file sharing, messaging, and video conferencing.

(Lectures 8,CO2)

Unit -III

Towards Safe and Secure Cyberspace – Online security and privacy – Threats in the digital world: data breaches and cyberattacks – Introduction to Blockchain technology – Security initiatives by the Government of India (CERT-In, Cyber Surakshit Bharat, Data Protection initiatives).

(Lectures 8,CO3)

Unit -IV

Ethical Issues in the Digital World – Netiquettes – Ethics in digital communication – Ethics in cyberspace: responsible use and digital footprint.

(Lectures 7, CO5)

Suggested Readings / Resources

1. Ministry of Electronics & Information Technology (MeitY): https://www.meity.gov.in
2. Digital India Portal: https://digitalindia.gov.in
3. CERT-In advisories and Cyber Surakshit Bharat resources.
4. UGC MOOC on “Digital Empowerment” (SWAYAM Platform).

Semester IV

CSE -001-CC-2210: **BLOCKCHAIN TECHNOLOGIES**
Credit 4(L3-T0-P1)
Total Lectures : 75 (Theory -45, Practical -30)

Learning Objectives

1: To understand the concepts of block chain technology.
2: To understand the consensus and hyper ledger fabric in block chain technology.
3: To understand the ways of applications of Blockchain Technologies in Financial Systems.
4: To know the basic methods of creating a blockchain in day to day applications.

Course Outcomes:
On Completion of the course the students will be able to

CO1: Describe the basic concepts and technology used for blockchain and implement them.
CO2: Describe the primitives of the distributed computing and cryptography related to blockchain.
CO3: Illustrate and analyze the concepts of Bitcoin/Blockchain and their usage.
CO4: Implement Ethereum block chain contract and analyze the operation.
CO5: Apply security features in blockchain technologies.
CO6: Use smart contract in real world applications.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	-	-	-	1	-	1	-	-	-	1	1
CO2	1	1	-	-	2	-	1	-	-	-	1	3
CO3	2	3	3	2	1	2	2	2	-	3	1	3
CO4	3	3	3	2	2	3	2	2	2	3	1	3
CO5	3	1	1	2	2	3	3	1	-	1	1	3
CO6	3	1	3	2	2	3	3	2	2	3	1	3
Average	2.5	1.5	1.6	1.3	1.6	1.8	2	1.16	0.66	1.6	1	2.6

1:Low 2:Medium 3:High -:No Correlation

Unit -I
Introduction to Cryptocurrency:
Evolution in trading units , Cryptography and Crypto-currency, Anonymity and Pseudonymity in Cryptocurrencies
Digital Signatures, Hash codes ,Different networks for cryptocurrency platform.
(Lectures 5Hrs + Practical 6Hrs,CO1)

Unit -II

Overview of Blockchain:
Block chain Architecture and Design-Basic crypto primitives: Hash, SignatureHash chain to Block chain-Basic consensus mechanisms,Requirements for the consensus protocols-Proof of Work (PoW).
(Lectures 10Hrs + Practical 6Hrs,CO2)

Unit -III
Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.
(Lectures 10Hrs + Practical 6Hrs,CO3,CO4)

Unit -IV
Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool
(Lectures 10Hrs + Practical 6Hrs,CO5)

Unit -V
Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-InsuranceBlock chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.
(Lectures 10Hrs + Practical 6Hrs,CO6)

Recommended Books

1. Mark Gates, “Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money”, Wise Fox Publishing and Mark Gates 2017
2. “Block chain Applications: A Hands-On Approach”, Arshdeep Bahga, Vijay Madisetti publishers 2017.

CSE-001-CC-2220: DATA COMMUNICATION AND COMPUTER NETWORK
Credit:4(L3–T0–P1)
Total Lectures: 75 (Theory – 45; Practical – 30)

Learning Objectives

1: Gain the knowledge of the basic computer network technology.
2: Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.

3: Obtain the skills of subnetting and routing mechanisms.
4: Familiarity with the essential protocols of computer networks, and how they can be applied innetwork design and implementation.

Course Outcomes

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

CO1: Understand ,explain and implement the concept of Data Communication and networks, layered architecture and their applications.
CO2: Analyze and Set up protocol designing issues for Communication networks.
CO3: Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
CO4: Apply various network layer techniques for designing subnets and supernets and analyse packet flow on basis of routing protocols.
CO5: Estimate the congestion control mechanism to improve quality of service of networking application
CO6: Understand and design application layer protocols and internet applications such as network security, Email and DNS.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	1	1	2	-	-	1	2	1	1	1
CO2	3	3	2	3	1	2	-	2	3	1	1	-
CO3	3	3	2	3	2	2	-	2	3	1	1	-
CO4	3	2	3	1	1	1	2	2	3	2	1	-
CO5	3	3	1	2	1	2	2	2	2	1	1	-
CO6	3	2	3	1	1	1	2	2	2	1	2	-
Average	3	2.5	2	1.8	1.3	1.3	1	1.8	2.5	1.1	1.1	0.16

1:Low 2:Medium 3:High -:No Correlation

UNIT – I

Data Communication –

Data Communication concepts and terminologies: Data representation; Data transmission; Transmission channels; Signal encoding; Transmission impairments. Transmission media: Guided transmission media - Twisted pair; Coaxial and Optical fiber, Wireless transmission - Terrestrial microwave; satellite microwave; Broadcast Radio and Infrared

Data communication interface: Asynchronous and Synchronous transmission; Baseband and Broadband transmission; Modulation methods; Modems; Multiplexing.

(Lectures 5Hrs + Practical 6Hrs,CO1)

UNIT – II

Evolution of computer networks:Circuit switching; Development of packet switching: 1961-1972; Proprietary networks and internetworking: 1972-1980; Proliferation of networks: 1980-1990; The internet explosion: 1990s.

Network standards and protocols:The IEEE standards, OSI 7-layer model, TCP/IP protocol suit.

(Lectures 10Hrs + Practical 6Hrs,CO2)

UNIT – III

OSI model implementation -
Data Link Layer: Frame design; Flow control; Error handling; HDLC; PPP; Sliding window protocol.
Network Layer: IPv6; X.25; Frame Relay; ATM; Routing; Queuing theory
Transport Layer: TCP; UDP; Congestion control; Flow control; Socket interface.
Application Layer: SNMP; Authentication; Encryption; Web and HTTP; FTP; Email; DNS; Network File System (NFS) and File sharing; Remote Procedure Calling (RPC).
(Lectures 10Hrs + Practical 6Hrs,CO3)

UNIT – IV

Local Area Network (LAN):Needs; Architecture and Technology
Ethernet: CSMA/CD operation; parameters and specifications
Cabling: 10Base5; 10Base2; 10BaseT; 10BaseF; Hubs; patch panels and wiring closets
Bridges; Switches; 100BaseT;Gigabit Ethernet ; FDDI; Token Ring; Wireless; ISDN; B-ISDN.
(Lectures 10Hrs + Practical 6Hrs,CO4,CO5)

UNIT – V

VSAT technology, Multimedia networks, Network Computing, Network security and management
(Lectures 10Hrs + Practical 6Hrs,CO6)

RecommendedBooks

1. Stallings, W.; *Data and Computer Communications*; Prentice Hall of India.
2. Tanenbaum A.S.; *Computer Networks*; Prentice Hall of India.
3. Kurose and Ross; *Computer Networking*; Addison Wesley
4. Prakash C. Gupta; *Data Communication*; Prentice Hall of India

CSE -001-CC-2230: DATABASE MANAGEMENT SYSTEM

Credit:4(L3–T0–P0)
Total Lectures: 75 (Theory – 45; Practical – 30)

Learning Objectives

1: Explain the features of database management systems and Relational database.
2: Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
3: Create and populate a RDBMS for a real-life application, with constraints and keys, using SQL.
4: Retrieve any type of information from a data base by formulating complex queries in SQL.
5: Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

Course Outcomes
On completion of this course the students will be able to:

CO1: Comprehend and evaluate the role of database management systems in information technology applications within organizations
CO2: Design and implement properly structured databases that match the standards based under realistic constraints and conditions.
CO3: Comprehend how to use Structured Query Language (SQL) to define and manipulate database information
CO4: Describe and develop Relational Algebra and Relational Calculus queries
CO5: Explain the principle of transaction management design.
CO6: Work in a group on the design, and implementation of a database system project.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	2	1	-	-	1	2	2	1	1	1	1
CO2	3	1	3	2	2	2	2	2	2	2	1	2
CO3	3	2	3	2	3	2	2	3	1	2	2	2
CO4	1	1	1	1	3	2	-	3	1	2	3	3
CO5	1	1	1	-	-	-	-	1	3	2	1	1
CO6	3	3	3	1	2	2	-	2	3	2	3	1
Average	2.3	1.6	2	1	1.6	1.5	1	2.1	1.8	1.8	1.8	1.6

1:Low 2:Medium 3:High -:No Correlation

UNIT – I
Overview: Concept of database, data independence, redundancy Control; Database architecture - ANSI model.
(Lectures 5Hrs + Practical 6Hrs,CO1)

UNIT – II
Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD
Issues, weak entity sets, Codd's rules, Relational Schemas
Relational database model: Logical view of data, keys, integrity rules.
Relational Database design: features of good relational database design, atomicdomain and Normalization (1NF, 2NF, 3NF, BCNF).
(Lectures 10Hrs + Practical 6Hrs,CO2)
UNIT – III
Relational data model: DDL, DML: relational algebra and calculus; functional dependencies, normal forms, decomposition, integrity rules; Query languages for relational systems: SQL, QBE, query optimization, embedded SQL
(Lectures 10Hrs + Practical 6Hrs,CO3)

UNIT – IV
What are constraints, types of constrains, Integrity constraints
Views: Introduction to views, data independence, security, updates on views,comparison between tables and views

SQL: data definition, aggregate function, Null Values, nested sub queries, Joined Relations, Triggers
(Lectures 10Hrs + Practical 6Hrs,CO4)

UNIT – V
Brief treatment of: Client-server models, distributed databases, object-oriented databases, deductive databases, multimedia databases, active databases.

(Lectures 10Hrs + Practical 6Hrs,CO5,CO6)

Recommended Books:

1. Silberschatz and Korth,Database system concepts; McGraw Hill.
2. Elmasri and Navathe,Fundamentals of database systems , Narosa Publishing
3. Rajesh Narang,Database Management System: PHI Pvt. Ltd.
4. NIIT,Database Development: An Overview, PHI Pvt. Ltd.

CSE -001-CC-2240: DATA SCIENCE USING PYTHON
Credit 4(L3-T0-P1)
Total Lectures: 75 (Theory -45, Practical -30)

Learning Objectives

1: Learn to develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics.
2: Learn to optimize learning models specific to different types of data in hand.
3: Learn to use python and python packages for accomplishing design and development of ML based models and statistical tools.

Course Outcomes:
On Completion of the course the students will be able to

CO1: Develop relevant programming abilities.
CO2: Demonstrate proficiency with statistical analysis of data.
CO3: Develop the ability to build and assess data-based models.
CO4: Execute statistical analyses with professional statistical software.
CO5: Demonstrate skill in data management.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	1	1	2	1	1	2	1	3	2	1	2
CO2	3	2	2	2	2	2	2	2	1	2	2	2
CO3	3	3	3	3	3	3	3	3	2	3	2	2
CO4	3	3	3	1	2	3	3	3	2	3	2	2
CO5	3	2	2	1	2	3	1	2	1	1	1	2
Average	3	2.2	2.2	1.8	2	2.4	2.2	2.2	1.8	2.2	1.6	2

1:Low 2:Medium 3:High -:No Correlation

Unit -I

Overview , Environment setup,Basic Concepts of Python-Operators,Lists, Strings,tuples, dictionary, Loops and Decision Making.

(Lectures 5Hrs + Practical 6Hrs,CO1)

Unit -II

Functions, Basic OOP Concepts,Pythom modules & packages,Decorator , Iterator and Generator, Errors and exception handling, Probability, Distributions, Statistics.

(Lectures 10Hrs + Practical 6Hrs,CO2)

Unit -III

Introduction to ANOVA, Chi Square Analysis,Introduction to Data Analysis using Numpy and Pandas, Python for data visualization, Geographical plotting,Time Series Analysis, EWMA theory, ARIMA theory, ACF and PACF, Stock Market Analysis, web scrapping , understanding tree and parsing tree.

(Lectures 10Hrs + Practical 6Hrs,CO2,CO4)

Unit -IV

Introduction to Machine Learning,scikit learn, supervised regression models, Knn, SVM,dimensionality reduction, pipeline,model persistence , model evaluation, NLP overview,NLP sentence analysis.

(Lectures 10Hrs + Practical 6Hrs,CO3,CO4)

Unit -V

Need for python and hadoop integration, mapreduce,apache spark, resilent distrubuted systems, pyspark.

USE CASE ANALYSIS:

Board game review prediction, credit card fraud detection, stock market prediction , stock market clustering.

(Lectures 10Hrs + Practical 6Hrs,CO5)

Recommended Books

1. Advanced Data Analytics using Python, Sayan Mukhopadhyay
2. Fundamentals of Data Science, Samuel Burns.

CSE-001-MC-2210: BASICS OF DATA SCIENCE
Credit 4(L3-T0-P1)

Total Lectures: 75 (Theory -45, Practical -30)

Learning Objectives

1: Understanding of the data operations.
2: Learn the overview of simple statistical models and the basics of machine learning techniques of regression.
3: Understand Machine Learning techniques for application to real life problems.
4: Skills in the use of tools such as python, IDE
5: Understanding of the basics of the Supervised learning

Course Outcomes:

On Completion of the course the students will be able to

CO1: Describe what Data Science is and the skill sets needed to be a data scientist and understand the role of python in data science.
CO2: Explain the significance of exploratory data analysis (EDA) in data science .
CO3: Ability to learn the supervised learning, SVM
CO4: Apply basic machine learning algorithms (Linear Regression)
CO5: Explore the Networks, PageRank

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	-	-	-	2	-	1	1	-	1	1	1
CO2	3	2	1	2	2	2	-	2	1	2	2	2
CO3	3	3	3	2	2	2	-	2	-	2	2	2
CO4	3	3	3	2	2	3	-	2	-	2	3	2
CO5	3	1	1	-	-	-	-	1	-	2	2	2
Average	3	1.8	1.6	1.2	1.6	1.4	0.2	1.6	0.2	1.8	2	1.8

1:Low 2:Medium 3:High -:No Correlation

Unit -I

Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.

(Lectures 5Hrs+ Practical 6 Hrs,CO1)

Unit -II

Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates, hypothesis testing using confidence intervals, using p-values.

(Lectures 10Hrs+ Practical 6 Hrs,CO2)

Unit -III

Supervised Learning: First step, learning curves, training-validation and test. Learning models generalities, support vector machines, random forest.

(Lectures 10Hrs+ Practical 6 Hrs,CO3)

Unit -IV

Regression analysis, Regression: linear regression simple linear regression, multiple & Polynomial regression, Sparse model. Unsupervised learning, clustering, similarity and distances, quality measures of clustering, case study.

(Lectures 10Hrs+ Practical 6 Hrs,CO4)

Unit -V

Network Analysis, Graphs, Social Networks, centrality, drawing centrality of Graphs, PageRank, Ego-Networks.

(Lectures 10Hrs+ Practical 6 Hrs,CO5)

Recommended Books

1. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igual, L;Seghi', S. Springer, ISBN:978-3-319-50016-4
2. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069.
3. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN: 9781787127487

V SEMESTER

CSE -001-CC-3110: WEB TECHNOLOGY

Credit: 4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Get introduced to core parts of a web.
2. Analyze a webpage, identify its elements and attributes
3. Create webpage with HTML, XHTML and various cascading style sheets.
4. Build dynamic webpages using JavaScript (client-side programming).
5. Create XML documents and schemas.

Course Outcomes

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

CO1. Analyze a web page and identify its elements and attributes.
CO2. Create web pages using XHTML and Cascading Style Sheets.
CO3. Build dynamic web pages using JavaScript (Client-side programming).
CO4. Create XML documents and Schemas.
CO5. Build interactive web applications using CSS2. Explain the principle of transaction management design.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	2	1	1	2	1	2	3	1
CO2	2	2	3	1	1	2	1	3	1	1	3	1

CO3	2	1	3	1	1	3	1	1	2	1	2	1
CO4	2	3	2	3	2	3	3	1	1	2	2	3
CO5	1	2	2	1	3	3	1	1	3	3	2	3
Average	2	1.8	2.4	1.4	1.8	2.4	1.4	1.6	1.6	1.8	2.4	1.8

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP, Web Design: Web site design principles, planning the site and navigation.

(10 Hours Lecture + 6 Hours Practical , CO1)

UNIT – II

Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

(5 Hours Lecture + 6 Hours Practical , CO2)

UNIT – III

Dynamic HTML: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models.

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2,CSS3

(10 Hours Lecture + 6 Hours Practical , CO3)

UNIT – IV

JavaScript:Client-side scripting, what is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

(10 Hours Lecture + 6 Hours Practical , CO4)

UNIT – V

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

(10 Hours Lecture + 6 Hours Practical , CO5)

Recommended Books

4. Steven Holzner,*HTML Black Book,* Dremtech press.
5. Jeffrey C. Jackson ,*Web Technologies: A Computer Science Perspective*, Prentice Hall, 2006.
6. Craif Knuckles, David Yuen, *Web Applications: Concepts and Real-World Design*, Wiley India Pvt Ltd, 2006.

CSE -001-CC-3120: ALGORITHM DESIGN

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Ability to write programs in java to solve problems using algorithm design techniques such as Divide and Conquer, Greedy, Dynamic programming, and Backtracking. Able to implement Quick sort, Merge sort algorithm, BFS and DFS algorithms.
2. Able to implement backtracking algorithm for the N-queens problem.
3. Able to implement greedy algorithm for job sequencing with deadlines.
4. Get awarded with Dijkstra's, Prim's algorithm, Kruskal's algorithm.
5. On spanning tree, Able to implement Floyd's algorithm for the all pairs shortest path problem.

Course Outcomes

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

CO1. Analyze algorithm correctness using inductive proofs and invariants.
CO2. Evaluate worst-case running times of algorithms through asymptotic analysis.
CO3. Apply divide-and-conquer paradigm to algorithmic design, including deriving and solving recurrences for performance analysis.
CO4. Utilize dynamic programming paradigm for algorithmic design, including synthesis and analysis of dynamic programming algorithms.
CO5. Apply greedy paradigm to algorithmic design, including synthesis and analysis of greedy algorithms.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	2	2	1	2	1	2	2	1
CO2	2	1	3	1	1	2	2	1	1	3	3	3
CO3	2	3	2	3	1	1	2	1	3	1	3	3
CO4	2	1	2	2	2	3	2	3	2	3	2	3
CO5	1	2	2	3	2	1	2	1	1	3	1	2
Average	1.8	1.8	2.2	2.4	1.6	1.8	1.8	1.6	1.6	2.4	2.2	2.4

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Review of basic data structures such as stack, queue, linked list, trees and graphs.
Algorithm Design Methods: General Consideration, Algorithm design paradigms.

(5 Hours Lecture + 6 Hours Practical , CO1)

UNIT – II

Divide and Conquer: Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers
Greedy Method: Minimal Spanning Tree, Shortest Paths, Knapsack.

(10 Hours Lecture + 6 Hours Practical , CO2)

UNIT – III

Dynamic Programming: Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths, Optimal Search Trees

Backtracking: 8-queens problem, Graph Coloring, Hamiltonian Cycles.

(10 Hours Lecture + 6 Hours Practical , CO3)

UNIT – IV

Branch and Bound: 0/1 Knapsack problem, Travelling Salesperson

Approximation: Graph Coloring, Task Scheduling, Bin Packing.

(10 Hours Lecture + 6 Hours Practical , CO4)

UNIT – V

Probabilistic Algorithms: Numerical Integration, Primality Testing.

(10 Hours Lecture + 6 Hours Practical , CO5)

Recommended Books

1. Aho, J. Hopcroft and J.Ullman, *The design and Analysis of Computer Algorithms*, Addison Wesley.
2. E. Horowitz and S. Sahani, *Fundamentals of Computer Algorithms*, Galgotia, New Delhi.
3. S.E. Goodman and S.T. Hedetniemi, *Introduction to the Design and Analysis of Algorithms*, McGraw Hill.
4. G. Brassard and P.Bratley, *Algorithmics*, PHI.
5. S.K. Basu, *Design Methods and Analysis of Algorithms*, PHI.
6. T.H. Coremen, et. al, *Introduction to Algorithm*, PHI

CSE -001-CC-3130:WIRELESS COMMUNICATION WITH ETHICAL HACKING

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Understand system design fundamentals in wireless communication, including frequency reuse, channel assignment, handoff strategies, interference management, and system capacity optimization.
2. Explore modulation and demodulation techniques in wireless transceivers, analyzing power spectrum and error performance in fading channels.
3. Learn ethical hacking processes, including hacker behavior, information gathering, sniffing methods, and physical security vulnerabilities.
4. Study common cyber attacks like DoS, SQL injection, buffer overflow, and client-side exploits, along with vulnerability analysis and exploitation techniques.
5. Investigate case studies on the vulnerability of cloud platforms and mobile devices, applying knowledge to address security risks effectively.

Course Outcomes

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

CO1. Understand fundamentals of wireless communications.
CO2. Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.
CO3. Understand the core concepts related to vulnerabilities and their causes.
CO4. Understand ethics behind hacking and vulnerability disclosure.
CO5. Acquire skills in identifying and mitigating common cyber threats such as Denial of Service (DoS) attacks, web server vulnerabilities, SQL injection attacks, buffer overflow attacks, and client-side browser exploits.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	2	3	2	2	1	1	1	1
CO2	1	1	3	3	3	1	2	3	2	1	1	3
CO3	2	3	3	3	2	1	3	1	1	2	1	2
CO4	2	2	3	2	1	1	3	3	3	2	1	1
CO5	2	2	3	1	1	1	2	3	3	3	3	2
Average	1.8	2	3	2	1.8	1.4	2.4	2.4	2	1.8	1.4	1.8

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

The Cellular Concept: System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trucking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

(5 Hours Lecture + 6 Hours Practical , CO1)

UNIT – II

Wireless Transceivers: Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying, Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels

(10 Hours Lecture + 6 Hours Practical , CO2)

UNIT – III

Ethical Hacking process: Hackers behaviour & mindset, Maintaining Anonymity, Hacking Methodology, Information Gathering, Active and Passive Sniffing, Physical security vulnerabilities and countermeasures. Internal and External testing. Preparation of Ethical Hacking and Penetration Test Reports and Documents.

(10 Hours Lecture + 6 Hours Practical , CO3)

UNIT – IV

DoS attacks. Web server and application vulnerabilities, SQL injection attacks, Vulnerability Analysis and Reverse Engineering, Buffer overflow attacks. Client-side browser exploits, Exploiting Windows Access Control Model for Local Elevation Privilege. Exploiting vulnerabilities in Mobile Application.

(10 Hours Lecture + 6 Hours Practical , CO4)

UNIT – V

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

(10 Hours Lecture + 6 Hours Practical , CO5)

Recommended Books

1. Andreas.F. Molisch , Wireless Communications , John Wiley
2. *Simon Haykin& Michael Moher, Modern Wireless Communications , Pearson Education*
3. *Baloch, R , Ethical Hacking and Penetration Testing Guide , CRC Press, 2015*
4. *Beaver, K. , Hacking for Dummies , John Wiley & sons*

CSE -001-CC-3140: BASICS OF JAVA PROGRAMMING

Credit:2(L1–T0–P1)
(Theory – 15 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Master core Java fundamentals: operators, data types, variables, control statements, methods, inheritance, exception handling, and more.
2. Develop proficiency in Java Swing for GUI development, including components like buttons, labels, menus, and layout managers.
3. Explore Java Beans and EJB concepts, including application building, JAR files, and remote method invocation for distributed applications.
4. Gain expertise in Java Servlets and JSP for dynamic web content generation, covering servlet basics, HTTP redirects, and cookies.
5. Learn JDBC for database connectivity, including JDBC/ODBC Bridge, java.sql package usage, and navigating through database records.

Course Outcomes

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

CO1. Gain comprehensive knowledge and proficiency in core Java concepts.
CO2. Develop expertise in Java Swing for graphical user interface (GUI) development.
CO3. Acquire a deep understanding of Java Beans and Enterprise Java Beans (EJB).
CO4. Master Java Servlets and JavaServer Pages (JSP) .
CO5. Become proficient in JDBC for database connectivity.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	2	1	3	2	1	3	1	3	2	3	3	2
CO2	1	3	2	3	2	1	2	2	1	3	3	2
CO3	1	2	1	3	3	3	1	1	3	3	2	2
CO4	1	3	1	1	2	1	2	1	1	2	1	3
CO5	2	3	2	2	2	1	1	3	1	1	3	3
Average	1.4	2.4	1.8	2.2	2	1.8	1.4	2	1.6	2.4	2.4	2.4

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Core Java: Introduction- Operators- Data types- Variables- Arrays- Control Statements-Methods & Classes- Inheritance- package and interface- Exception handling- Multithread programming- I/O- Java Applet- String handling- Networking- Event Handling-Introduction to AWT- AWT controls- Layout managers- Menus- Images- Graphics.

(3 Hours Lecture + 6 Hours Practical , CO1)

UNIT – II

Java swing: Creating a swing Applet and Application- Programming using Panes-Pluggable Look and feel- Labels- Text fields- Buttons- Toggle Buttons- Checkboxes-Radio Buttons- View Ports- Scroll Panes- Scroll Bars- List- Combo Box- Progress bars-Menus and Toolbars- Layered Panes- Tabbed Panes- Split Panes- Layouts- Windows-Dialog Boxes- Inner frame.

(3 Hours Lecture + 6 Hours Practical , CO2)

UNIT – III

Java Beans: Application Builder tools- The bean developer kit(BDK)- JAR files-Introduction- Developing a simple bean- using bound properties- The java Beans API-Session Beans- Entity Beans- Introduction to Enterprise Java Beans(EJB)- Introduction to RMI(Remote Method Invocation): A simple client-server application using RMI.

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(3 Hours Lecture + 6 Hours Practical , CO3)

UNIT – IV

Java Servlets: Servlet basic- Servlet API basic- Life cycle of a Servlet- Running Servlet-Debugging Servlet- Thread-safe Servlet- HTTP Redirects- Cookies- Introduction to Java server pages(JSP).

(3 Hours Lecture + 6 Hours Practical , CO4)

UNIT – V

JDBC: The connectivity Model- JDBC/ODBC Bridge- Java.sql package- connectivity to remote database- navigating through multiple rows retrieved from a database.

(4 Hours Lecture + 6 Hours Practical , CO5)

Recommended Books

1. *Margaret Levine Young, "The Complete Reference Internet", TataMc-Graw Hill 1999*

2. *Herbert Schidt, "The Complete Reference JAVA2", TataMc-Graw Hill 5th edition,2002*
3. *Balagurusamy E., "Programming with A Perimer 3e Java", TataMc-Graw Hill, 2007.*
4. *Dustin R. Callway, "Inside Servlets", Addison Wesley.,1999*
5. *Mark Watka "Using Java 2 Enterprise Edition", Que, 1st edition,2001*
6. *Setven Holzner, "Java2 Black Book"-Coriolis Group Books,2001*

CSE -001-MC-3110: DIGITAL MARKETING
Credit:4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15; Practical – 0 Hours)

Learning Objectives

1. Analyze the confluence of marketing, operations, and human resources in real-time delivery.
2. Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.
3. Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
4. Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked.
5. Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.

Course Outcomes

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

CO1. Understand Digital Marketing Foundations
CO2. Understand Application of Digital Marketing Mix
CO3. Get Proficiency in Search Engine and Display Advertising tools for effective campaign management.
CO4. Get Competence in Social Media Marketing
CO5. Able to Master Digital Marketing Tools and Techniques

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	1	3	2	1	2	1	2
CO2	1	2	3	2	1	3	2	1	2	1	2	2
CO3	1	3	3	3	3	3	2	2	2	1	1	2
CO4	2	2	1	1	3	1	2	1	2	2	2	2
CO5	3	1	2	1	2	3	1	1	1	2	3	3
Average	2	2	2.4	1.8	2.4	2.2	2	1.4	1.6	1.6	1.8	2.2

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction of the digital marketing, Digital vs. Real Marketing, Digital Marketing Channel, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis.

(5 Hours Lecture + 5 Hours Tutorial , CO1)

UNIT - II

Internet Marketing and Digital MarketingMix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on Integrated Marketing Communication (IMC).

(10 Hours Lecture + 5 Hours Tutorial , CO2)

UNIT - III

Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

(10 Hours Lecture + 5 Hours Tutorial , CO3)

UNIT - IV

Social Media Marketing –Introduction to social media platforms, penetration & characteristics; Building a successful social media marketing strategy Facebook Marketing: - Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools Linkedin Marketing: - Introduction and Importance of Linkedin Marketing, Framing Linkedin Strategy, Lead Generation through Linkedin, Content Strategy, Analytics and Targeting Twitter Marketing: - Introduction to Twitter Marketing, how twitter Marketing is different than other forms of digital marketing, framing content strategy, Twitter Advertising Campaigns Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing: - Mobile Advertising, Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics Introduction to social media metrics.

(10 Hours Lecture , CO4)

UNIT –V

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: - Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code.

(10 Hours Lecture , CO5)

Recommended Books

1. Seema Gupta, Digital Marketing ,McGraw Hill; Second edition (6 August 2020)
2. Puneet Bhatia, Fundamentals of Digital Marketing, Pearson, Second Edition 2019
3. Ian Dodson, The Art of Digital Marketing, Wiley; 1st edition (4 April 2016)
4. Vandana Ahuja, Digital Marketing, Oxford University Press; Illustrated edition (13 April 2015)
5. Philip Kotler, Marketing 4.0 - Moving from Traditional to Digital, Pan Macmillan,2017 edition

VI SEMESTER

CSE -001-CC-3210: SYSTEMS AND NETWORK ADMINISTRATION

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Design and configure peer-to-peer networks to share resources.
2. Analyze requirements and design network architecture for a given scenario.
3. Design and configure IP addressing schemes for a given scenario.
4. Design and configure a client-server network and required network services for a given scenario.
5. Evaluate and critique a design for a systems and network solution.

Course Outcomes

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

CO1. Design configuration, and optimization of networks administration
CO2. Formulation of technical solutions
CO3. Demonstrate and administration of operating systems
CO4. Applying analysis and design according to business requirements
CO5. Develop strategies for Information Security

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	3	2	1	3	1	2	2	1	1
CO2	1	2	3	2	2	2	2	1	3	3	1	1
CO3	1	3	3	3	1	3	1	1	1	2	3	2
CO4	3	3	3	1	2	3	3	3	1	2	2	3
CO5	2	3	1	3	1	2	3	1	3	3	2	2
Average	1.8	2.6	2.2	2.4	1.6	2.2	2.4	1.4	2	2.4	1.8	1.8

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Major components of the Linux operating systems. File system, setting user and group ownership of files and directories and access permissions, basic commands for starting and stopping processes, basic process attributes and their role in access control, mounting and unmounting file systems and partitions.

(5 Hours Lecture + 6 Hours Practical , CO1)

UNIT – II

Linux kernel program, starting and stopping a Linux system, setting up user and group accounts on single machines, the basics of backup and restore procedures.

Linux system monitoring and logging. Examining the list of running processes on the system and understand the data presented there. Monitoring memory usage and disk space usage on the system. Customizing system log configuration.

(10 Hours Lecture + 6 Hours Practical , CO2)

UNIT – III

The rules governing IP address classes and netmasks, Configuring the resolver library to arrange for TCP/IP name service, bringing interfaces up and down, and set their IP addresses and netmasks, Setting the default route in the kernel routing table. Understanding the significance of the /etc/services file and well-known port numbers, Configuring the inet daemon, Using telnet to contact servers directly, using the ping command to test network connectivity, netstat command to examine kernel tables pertaining to networking, traceroute command to discover network paths, tcpdump to examine all network traffic. Methods used to bring interfaces up and down.

(10 Hours Lecture + 6 Hours Practical , CO3)

UNIT – IV

Basics of configuring and using the Domain Name Service, sendmail, the Network Information System, Network File System: Structure and function of the Domain Name Service (DNS), Setting up a Linux machine to function as a DNS server, Configuring and using sendmail, Setting up an NIS domain with an NIS master server and NIS clients.

(10 Hours Lecture + 6 Hours Practical , CO4)

UNIT – V

Basic network security issues and solutions, setting up a Linux machine to act as an NFS server, setting up a Linux machine to act as an NFS client Incremental back up. Monthly back. Mail server setup.

(10 Hours Lecture + 6 Hours Practical , CO5)

Recommended Books

1. Proffitt,*Red Hat Linux X Fast and Easy (Fast & Easy),* PHI
2. Stevens,*UNIX Network Programming- Vol-I and Vol-II*: Stevens, PHI
3. Firos A, *Systems and Network Administration: A handbook for beginners*, Notion Press; ISBN: 1639041486, 1st edition, 2021

CSE -001-CC-3220: SOFTWARE ENGINEERING

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
2. An ability to work in one or more significant application domains
3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Course Outcomes

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

CO1. Translate end-user requirements into system and software requirements, using UML.
CO2. structure the requirements in a Software Requirements Document (SRD).
CO3. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
CO4. Will have experience and/or awareness of testing problems and will be able to develop simple testing report.
CO5. Identify and apply appropriate Software verification and validation.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	1	1	1	1	1	2	2	3	2
CO2	2	2	1	2	2	2	1	1	1	1	1	1
CO3	3	2	3	1	2	3	2	2	1	1	3	2
CO4	1	1	3	1	3	2	1	1	2	2	1	3
CO5	1	3	2	3	2	2	3	2	1	3	3	3
Average	1.6	1.8	2.4	1.6	2	2	1.6	1.4	1.4	1.8	2.2	2.2

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction to software engineering: Concept of a software project, size factor, quality and productivity factor different phases of Software development life cycle.

(5 Hours Lecture + 6 Hours Practical , CO1)

UNIT – II

Software Requirements: Functional and non-functional requirements, user requirements, system, requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

System models: Context models, behavioral models, data models, object models, structured methods.

(10 Hours Lecture + 6 Hours Practical , CO2)

UNIT – III

Software design: Design process and design quality, design concepts, the design mode, function oriented, object-oriented approaches, user interfaces.

Software programming: Structured coding techniques, coding styles, standards, software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

(10 Hours Lecture + 6 Hours Practical , CO3)

UNIT – IV

Software verification and validation: theoretical foundation, black box and white box approaches, integration and system testing.

Software reliability: definition and concept of reliability, software faults, errors, repair and availability.

(10 Hours Lecture + 6 Hours Practical , CO4)

UNIT – V

Metrics for Process and Products: Software measurement, metrics for software quality.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, riskprojection, risk refinement, RMMM, RMMM plan.

(10 Hours Lecture + 6 Hours Practical , CO5)

Recommended Books

1. Jalote, P., *An Integrated approach to software engineering*, Narosa Publishing House.
2. Pressman, R. S., *Software Engineering: A practical Approach*; McGraw-Hill.
3. Humphery, W. S., *Managing software Procedures*, Addission-Wesley

CSE -001-CC-3230: COMPUTER ORGANIZATION AND ARCHITECTURE

Credit:4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15; Practical – 0 Hours)

COURSE OUTCOME:

1. Describe basic organization of computer and the architecture of 8086 microprocessor.
2. Implement assembly language program for given task for 8086 microprocessor.
3. Demonstrate control unit operations and conceptualize instruction level parallelism.
4. Demonstrate and perform computer arithmetic operations on integer and real numbers.
5. Categorize memory organization and explain the function of each element of a memory hierarchy.

Course Outcomes

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

CO1. Understand the fundamentals of Instruction Set Architecture (ISA), including types, formats, and addressing modes, enabling effective assembly language programming.

CO2. Gain knowledge of processor organization, including register set, register organization, and stack organization, facilitating understanding of data path organization and control unit design.

CO3. Develop proficiency in computer arithmetic, covering addition, subtraction, multiplication (e.g., Booth's algorithm), division (e.g., restoring and non-restoring), and floating-point arithmetic.

CO4. Acquire insights into memory organization, including interfacing memory with the processor, memory hierarchy, cache memory, and virtual memory systems.

CO5. Learn about input/output organization, including synchronization of data transfer, I/O mapping and control mechanisms (e.g., program controlled, interrupt driven, DMA), and the role of interrupt and DMA mechanisms and controllers in efficient data transfer.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3	1	1	3	2	2	3	3	2
CO2	1	1	2	2	3	3	2	1	1	1	1	3
CO3	1	3	2	2	2	3	2	1	3	3	2	3
CO4	1	3	3	2	1	2	2	2	1	3	1	2
CO5	3	3	3	2	3	1	3	3	3	2	2	2
Average	1.4	2.4	2.4	2.2	2	2	2.4	1.8	2	2.4	1.8	2.4

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Instruction set architecture- types, formats, addressing modes; Register set; Processor organization, Register organization and stack organization. Assembly language programming. Data path organization, Control unit design - Hardwired control, Microprogramming.

(5 Hours Lecture + 5 Hours Tutorial , CO1)

UNIT – II

Computer arithmetic- Review of addition and subtraction; Multiplication- Booth's, Array; Division- Restoring and non-restoring; Floating point arithmetic. ALU.

(10 Hours Lecture + 5 Hours Tutorial , CO2)

UNIT – III

Memory Organization: Interfacing of memory with processor, Memory hierarchy, Multiple-module memory, Cache memory, Virtual memory. Memory Devices.

(10 Hours Lecture + 5 Hours Tutorial , CO3)

UNIT – IV

Input/ output Organization: Synchronization of data transfer- strobed and handshaking; I/O mapping and control- Program controlled, Interrupt driven, DMA, Interrupt and DMA mechanisms and controllers.

(10 Hours Lecture , CO4)

UNIT – V

CISC and RISC architecture, Instruction pipelining. Concept of parallel processing.

(10 Hours Lecture , CO5)

Recommended Books

1. Computer organization and architecture: Williams Stallings, PHI Pvt. Ltd.
2. Structured Computer organization: Tanenbaum, PHI Pvt. Ltd.
3. Computer organization: Carl Hamachar, ZvonkoVranesic and SafwatZaky, McGraw Hill International/Tata McGraw Hill.

CSE -001-MC-3210: FUNDAMENTALS OF CYBER CRIME AND LEGAL FRAMEWORK

Credit:4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15; Practical – 0 Hours)

Learning Objectives

1. understand the basics of cyber-crime and to apply theoretical concepts to different cybercrimes
2. understand the needs of security and various threats to it.
3. Understand the investigation of cyber frauds and crimes with various techniques.
4. Cyber Crime – Sociological and Criminological Perspectives
5. Understand the legal and related issues in cyber cases and learn the Indian laws related to cyber security

Course Outcomes

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

CO1. Understand Cybercrime Landscape
CO2. Recognize Security Needs
CO3. Get Proficiency in Cybercrime Investigation:
CO4. Get Awareness of Information Warfare and Terrorism
CO5. Understand Legal Framework and Enforcement

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	3	2	3	2	1	2	3	2
CO2	1	3	3	3	1	2	1	2	1	1	1	3
CO3	1	1	3	1	2	3	1	3	3	2	1	3
CO4	2	2	2	3	2	3	3	2	3	1	3	3
CO5	1	2	3	1	2	1	1	2	3	1	1	3
Average	1.4	1.8	2.8	1.8	2	2.2	1.8	2.2	2.2	1.4	1.8	2.8

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Overview of Cybercrime, Computer Intrusions and Attacks (Unauthorized Access) Computer Viruses, Time Bombs, Trojans, Malicious Code (Malware), Online Fraud and Identity Theft; Intellectual Property Theft; Virtual Crime, Online Vice, International Aspects and Jurisdiction

(5 Hours Lecture + 5 Hours Tutorial , CO1)

UNIT – II

Security Needs: The Need for Security, Business Needs, needs to protect against Threats and Attacks, Security in Emails. Secure Software Development

(10 Hours Lecture + 5 Hours Tutorial , CO2)

UNIT – III

Investigating Cybercrime: Digital Evidence and Computer Forensics, Interception, Search and Seizure, and Surveillance

(10 Hours Lecture + 5 Hours Tutorial , CO3)

UNIT – IV

Information Warfare, Cyber terrorism and Hacktivism, Terrorism, Radicalization, and The War of Ideas, Trade Secret Theft and Economic Espionage, National Security

(10 Hours Lecture , CO4)

UNIT – V

Legal Framework: Indian legal system, federalism and constitutionalism, Legislation, Enforcement of laws and Adjudication, Judicial system in India and hierarchy of courts, Criminal and Civil legal and justice system, Concept of Jurisdiction, Regulatory tribunals and their functions, Principles of administrative law, Alternative dispute resolution mechanism.

(10 Hours Lecture , CO5)

Recommended Books

1. Nilakshi Jain and Ramesh Menon, Cyber Security and Cyber Laws, Wiley India, 2020
2. Nina Godbole and Sunit Belapure, Cyber Security, Wiley India, 2011
3. Sushila Madan, Cyber Crime and Cyber Laws, Scholar Tech Press, 2020

VII SEMESTER

CSE -001-CC-4110: INTRODUCTION TO MACHINE LEARNING
Credit: 4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Understand the fundamentals of machine learning, including its definition, evaluation methods for networks, and the handling of datasets, encompassing concepts like feature sets, dataset division into test, train, and validation sets, and techniques like cross-validation.
2. Explore the basics of machine learning, including its applications and underlying processes, and gain insight into various machine learning techniques such as supervised learning, unsupervised learning, and reinforcement learning, through real-life examples.
3. Develop proficiency in supervised learning techniques such as classification and regression, including algorithms like K-Nearest Neighbor, Linear Regression, Logistic Regression, and Support Vector Machine (SVM), and learn evaluation measures like SSE, MME, R2, confusion matrix, precision, recall, F-Score, and ROC-Curve.
4. Gain expertise in unsupervised learning techniques, including clustering methods such as Hierarchical, Agglomerative Clustering, Divisive clustering, and Partitional Clustering with

K-means clustering, to discover patterns and structures in data.

5. Explore miscellaneous topics including dimensionality reduction techniques like PCA, LDA, ICA, introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing (NLP), and Computer Vision, expanding knowledge and understanding of advanced machine learning concepts and applications.

Course Outcomes

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

CO1. Develop a comprehensive understanding of machine learning fundamentals.
CO2. Gain practical knowledge of machine learning techniques.
CO3. Acquire proficiency in handling datasets and feature sets.
CO4. Explore advanced topics in machine learning, including dimensionality reduction techniques like PCA, LDA, and ICA.
CO5. Develop practical problem-solving skills through real-life examples and applications of machine learning techniques.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	3	1	2	1	1	2	2	3
CO2	3	3	3	3	2	2	1	3	3	2	2	2
CO3	2	2	2	3	2	3	3	2	2	3	2	3
CO4	3	3	2	2	3	3	3	1	1	2	1	2
CO5	3	2	1	1	2	3	3	2	2	2	3	2
Average	2.8	2.2	1.8	2.2	2.4	2.4	2.4	1.8	1.8	2.2	2	2.4

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction : What Is Machine Learning?, How Do We Define Learning?, How Do We Evaluate Our Networks?, How Do We Learn Our Network?, What are datasets and how to handle them?, Feature sets, Dataset division: test, train and validation sets, cross validation.

(10 Hours Lecture + 6 Hours Practical ,CO1)

UNIT – II

Basics of machine learning: Applications of Machine Learning, processes involved in Machine Learning.
Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning.

(10 Hours Lecture + 6 Hours Practical ,CO2)

UNIT – III

Supervised learning : Classification and Regression: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve.

(10 Hours Lecture + 6 Hours Practical ,CO3)

UNIT – IV

Unsupervised learning : Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering - K-means clustering.

(10 Hours Lecture + 6 Hours Practical ,CO4)

UNIT – V

Miscellaneous: Dimensionality reduction techniques: PCA, LDA, ICA. Introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing, Computer Vision.

(5 Hours Lecture + 6 Hours Practical ,CO5)

Recommended Books

1. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies,2016.
3. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.
4. Machine Learning: The New AI, By Ethem Alpaydin, The MIT Press, 2016.
5. Machine Learning, Tom M. Mitchell, McGraw Hill Education, 2017.
6. https://www.udacity.com/course/intro-to-machine-learning--ud120
7. https://www.coursera.org/learn/machine-learning-duke

CSE -001-CC-4120: DATA ANALYTICS

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Understand the fundamentals of social network and web data analysis, including graph theory concepts and basic measures for individuals and networks, to effectively analyze complex social and web structures.
2. Learn to utilize web analytics tools and methodologies, such as click stream analysis and A/B testing, to assess website performance, user behavior, and engagement metrics for optimization.
3. Develop proficiency in web search and retrieval techniques, including search engine optimization (SEO) and web crawling, indexing, and ranking algorithms, to enhance web visibility and search engine rankings.
4. Explore advanced topics in network analysis, such as link analysis and network evolution, to understand the dynamics of network connectivity and evolution over time in social and web contexts.
5. Gain insights into social connections and their dynamics, including affiliation, identity, and diffusion of innovation, to analyze patterns of social involvement and information dissemination in online networks.

Course Outcomes

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

CO1. Develop an understanding of social network and web data, including methods for data collection and analysis.

CO2. Gain proficiency in web analytics tools and techniques, such as click stream analysis, A/B testing, and online surveys, enabling the evaluation of website performance and user behavior for optimization and improvement.

CO3. Acquire knowledge of web search and retrieval mechanisms.

CO4. Explore advanced topics in network analysis, including link analysis, random graphs, and network evolution.

CO5. Understand the dynamics of social connections, including affiliation and identity, as well as connection search, collapse, robustness, and diffusion of innovation.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	3	1	3	2	1	1	3	3
CO2	1	3	3	2	1	1	3	3	3	3	1	2
CO3	1	3	1	3	3	3	1	2	1	3	2	1
CO4	1	1	2	1	1	3	3	1	2	3	2	3
CO5	1	3	2	1	1	1	1	1	3	1	3	2
Average	1.2	2.2	2.2	1.8	1.8	1.8	2.2	1.8	2	2.2	2.2	2.2

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction – Social network and Web data and methods, Graph and Matrices, Basic measures for individuals and networks, Information Visualization.

(5 Hours Lecture + 6 Hours Practical ,CO1)

UNIT – II

Web Analytics tools: Click Stream Analysis, A/B testing, Online Surveys.

(10 Hours Lecture + 6 Hours Practical ,CO2)

UNIT – III

Web Search and Retrieval: Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic models.

(10 Hours Lecture + 6 Hours Practical ,CO3)

UNIT – IV

Making Connection: Link Analysis, Random Graphs and Network evolution.

(10 Hours Lecture + 6 Hours Practical ,CO4)

UNIT – V

Social Connects: Affiliation and identity

Connection: Connection Search, Collapse, Robustness Social involvements and diffusion of innovation.

(10 Hours Lecture + 6 Hours Practical ,CO5)

Recommended Books

1. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011. Analyzing Social Media Networks with NodeXL: Insights from a Connected World. Morgan Kaufmann, 304.
2. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.
3. Easley, D. & Kleinberg, J. (2010). Networks, Crowds, and Markets: Reasoning About a Highly Connected World. New York: Cambridge University Press. http://www.cs.cornell.edu/home/kleinber/networks-book/
4. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press.

CSE -001-CC-4130: INTERNET OF THINGS

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. Understand the definition and significance of the Internet of Things
2. Discuss the architecture, operation, and business benefits of an IoT solution
3. Examine the potential business opportunities that IoT can uncover
4. Explore the relationship between IoT, cloud computing, and big data
5. Identify how IoT differs from traditional data collection systems.

Course Outcomes

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

CO1. Learn the concepts of Sensors, Wireless Network and Internet
CO2. Learn and implement use of Devices in IoT technology.
CO3. Learn the different IoT Technologies like Micro-controller, Wireless communication like Bluetooth, GPRS, Wi-Fi and Storage and embedded systems
CO4. Understand how to program on embedded and mobile platforms including different Microcontrollers like ESP8266 and Raspberry Pi
CO5. Understand Arduino and Android programming

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	3	2	3	3	3	3	3
CO2	3	1	3	2	1	1	3	2	3	2	3	1
CO3	3	1	1	1	1	2	3	2	3	2	3	1
CO4	1	1	1	2	1	2	1	2	2	3	1	2
CO5	2	2	1	3	2	1	3	2	1	2	3	1
Average	2.4	1.6	1.6	1.8	1.4	1.8	2.4	2.2	2.4	2.4	2.6	1.6

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction to IoT, Sensors and Actuators: Introduction to IoT: Definition, Characteristics, Applications, Evolution, Enablers, Connectivity Layers, Addressing, Networking and Connectivity Issues, Network Configurations, Multi-Homing, Sensing: Sensors and Transducers, Classification, Different Types of Sensors, Errors, Actuation: Basics, Actuator Types- Electrical, Mechanical Soft Actuators.

(5 Hours Lecture + 6 Hours Practical ,CO1)

UNIT – II

Introduction to Networking, Communication Protocols and Machine-to-Machine Communication : Basics of Networking, Communication Protocols, Sensor Network, Machine to Machine Communication (IoT Components, Inter-Dependencies, SoA, Gateways, Comparison Between IoT& Web, Difference Protocols, Complexity of Networks, Wireless Networks, Scalability, Protocol Classification, MQTT & SMQTT, IEEE 802.15.4, Zigbee).

(10 Hours Lecture + 6 Hours Practical ,CO2)

UNIT – III

Arduino Programming: Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators With Arduino (Python Programming and Raspberry Pi) Introduction to Python Programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Implementation of IoT with Raspberry Pi.

(10 Hours Lecture + 6 Hours Practical ,CO3)

UNIT – IV

Data Analytics and Cloud Computing: Data Handling and Analytics, Cloud Computing Fundamentals, Cloud Computing Service Model, Cloud Computing Service Management and Security, Sensor-Cloud Architecture, View and Dataflow.

(10 Hours Lecture + 6 Hours Practical ,CO4)

UNIT – V

FOG Computing and Case Studies: FOG Computing: Introduction, Architecture, Need, Applications and Challenges. Industrial IoT, Case Studies: Agriculture, Healthcare, Activity Monitoring.

(10 Hours Lecture + 6 Hours Practical ,CO5)

Recommended Books

1. Pethuru Raj and Anupama C. Raman,The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.
2. A.Bahga and Vijay Madisetti, Internet of Things: A Hands-on Approach, Universities Press
3. Adrian McEwen, Designing the Internet of Things, Wiley Publishers, 2013,
4. Daniel Kellmereit, The Silent Intelligence: The Internet of Things. 2013.

CSE -001-CC-4140: DEEP LEARNING BY MATHEMATICS

Credit: 4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. To present the mathematical, statistical and computational challenges of building neural networks
2. To study the background mathematical concepts of deep learning
3. To enable the students to know deep learning techniques to support real-time applications
4. To educate the students on how mathematical formulations can be optimized for changing the deep learning model performance.
5. To visualize in graphical form the changes in the gradients and loss function performance of deep learning models.

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

CO1. Able to understand the mathematics behind functioning of artificial neural networks.
CO2. Able to perform the matrix operations for finding the feature reduction set.
CO3. Able to identify the mathematical flow in computing the gradients in the backpropagation in feedforward multi layer network models.
CO4. Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems
CO5. Able to understand how mathematical formulations can be optimized for changing the deep learning model performance

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	3	2	2	2	1	3	1	1
CO2	2	2	3	3	2	2	3	1	3	1	1	2
CO3	2	2	1	3	1	1	2	2	1	1	2	3
CO4	2	2	2	3	3	2	3	2	1	3	2	1
CO5	3	3	3	2	3	3	1	2	3	1	1	2
Average	2.2	2.4	2.4	2.6	2.4	2	2.2	1.8	1.8	1.8	1.4	1.8

1: Low 2: Medium 3: High -: No Correlation

UNIT -I

Applied Math and Machine Learning Basics: Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span , norms, special matrices and vectors. (Lecture 10)

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT -II

Eigen decompositions. Numerical Computation: Overflow and under flow, poor conditioning, Gradient Based Optimization, Constraint optimization.

(10 Hours Lecture + 5 Hours Tutorial ,CO2)

UNIT -III

Vector Norms, L-Norms and Distance Matrix, Covariance matrices, Mahalanobis distance,Kullback-Leibler divergence,Principal component analysis, Singular value decomposition and pseudoinverse. (Lecture 15)

(10 Hours Lecture + 5 Hours Tutorial ,CO3)

UNIT -IV

Differential Calculus: Rules for exponential and logarithms,minima & maxima, partial derivatives,chain rule for partial derivatives, Gradients: Calculating and visualizing.

Matrix Calculus: Vector and Scalar function, Jacbobians and Hessians, Matrix Calculus derivatives.

(10 Hours Lecture ,CO4)

UNIT -V

Data flow in Neural Networks, Backpropagation, Gradient Descent: Stochastic,momentum,Adaptive gradient descent. (Lecture 10)

(10 Hours Lecture ,CO5)

Recommended Books:

1. Math for Deep Learning, Ronald T. Kneusel

CSE-RC-4710 : RESEARCH METHODOLOGY
Credit:4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. To develop understanding of the basic framework of research process, publication and patent scopes.
2. To develop an understanding of various research designs and techniques.
3. To identify various sources of information for literature review and data collection.
4. To develop an understanding of the ethical dimensions of conducting applied research.
5. Appreciate the components of scholarly writing and evaluate its quality.

Course Outcomes

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

CO1. explain key research concepts and issues
CO2. read, comprehend, and explain research articles in their academic discipline.
CO3. understand the basic framework of research process
CO4. understand the publication and patent process
CO5. understand ethical dimensions of conducting applied research

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	3	1	1	2	3	1	3	3	1
CO2	3	2	1	2	1	2	1	3	3	2	1	1
CO3	1	3	1	1	1	3	2	1	1	3	2	1
CO4	3	3	1	1	3	1	1	1	1	3	2	2
CO5	2	2	2	1	1	1	1	1	3	1	3	3
Average	2.4	2.6	1.2	1.6	1.4	1.6	1.4	1.8	1.8	2.4	2.2	1.6

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT – II

Effective literature studies approaches, analysis, Plagiarism, Research ethics.

(10 Lecture ,CO2)

UNIT – III

Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal. A presentation and assessment by a review committee.

(10 Lecture+ 5 Hours Tutorial ,CO3)

UNIT – IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

(10 Lecture ,CO4)

UNIT – V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc.

(10 Lecture+ 5 Hours Tutorial ,CO5)

Recommended Books

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.
6. Niebel, “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Dse-3

1. Cryptography theory and practice

2. Image and video processing
3. Computational neuroscience
4. Deep learning by mathematics

VIII SEMESTER

CSE -001-DE-4210: ARTIFICIAL INTELLIGENCE

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Course Objective

1. Students will learn the basic concepts and techniques of Artificial Intelligence.
2. They should be able to develop AI algorithms for solving practical problems.
3. They should be able to understand Problem solving techniques of AI
4. They should be able to understand Knowledge Representation schemes and reasoning
5. They should be able to understand the Planning problem of AI

Course Outcomes

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

CO1. Understand the basic concepts and techniques of Artificial Intelligence.
CO2. Apply AI algorithms for solving practical problems
CO3. Describe human intelligence and AI
CO4. Explain how intelligent system works.
CO5. Apply basics of Fuzzy logic and neural networks.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	1	3	2	2	3	3	2	3
CO2	3	1	2	1	1	3	3	1	2	3	1	1
CO3	2	2	3	2	3	1	2	2	2	2	1	1
CO4	2	2	2	2	3	3	3	1	2	2	1	2
CO5	1	2	1	1	2	1	1	2	2	3	3	3
Average	2.2	1.6	2	1.6	2	2.2	2.2	1.6	2.2	2.6	1.6	2

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction: Artificial Intelligence and its applications, Artificial Intelligence Techniques, Level of models, criteria of success, Intelligent Agents, Nature of Agents, Learning Agents. AI Techniques, advantages, and limitations of AI, Impact and Examples of AI, Application domains of AI. The AI Ladder - The Journey for Adopting AI Successfully, Advice for a career in AI, Hotbeds of AI Innovation.

(5 Hours Lecture + 6 Hours Practical ,CO1)

UNIT – II

Problem solving techniques: State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, Constraint satisfaction problem, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Additional refinements, Iterative Deepening.

(10 Hours Lecture + 6 Hours Practical ,CO2)

UNIT – III

Logic: Propositional logic, predicate logic, Resolution, Resolution in proportional logic and predicate logic, Clause form, unification algorithm.

(10 Hours Lecture + 6 Hours Practical ,CO3)

UNIT – IV

Knowledge Representation schemes and reasoning: Mapping between facts and representations, Approaches to knowledge representation, procedural *vs* declarative knowledge, Forward *vs* Backward reasoning, Matching, conflict resolution, Nonmonotonic reasoning, Default reasoning, statistical reasoning, fuzzy logic Weak and Strong filler structures, semantic nets, frame, conceptual dependency, scripts.

(10 Hours Lecture + 6 Hours Practical ,CO4)

UNIT – V

Planning: The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

(10 Hours Lecture + 6 Hours Practical ,CO5)

Recommended Books

1. A Classical Approach to Artificial Intelligence, M.C. Trivedi, Khanna Book Publishing, 2019.
2. Artificial Intelligence: A modern approach by Stuart Russel, Pearson Education, 2010.
3. Artificial Intelligence by Rich and Knight, The McGraw Hill, 2017.
4. Artificial Intelligence: A new synthesis by Nils and Nilson, Elsevier, 1997.
5. Artificial Intelligence by Luger, Pearson Education, 2002.
6. Artificial Intelligence by Padhy, Oxford Press, 2005.
7. https://www.edx.org/course/artificial-intelligence-ai
8. https://www.udemy.com/course/artificial-intelligence-az/

DEPARTMENT ELECTIVE-I:

CSE -001-DE-42110: Cryptography Theory and Practice (3-1-0)

CSE -001-DE-42120: Image and video processing (3-1-0)

CSE -001-DE-42130: Computational neuroscience (3-1-0)

CSE -001-DE-42140: Data Mining (3-0-1)

CSE -001-DE-42110: CRYPTOGRAPHY THEORY AND PRACTICE

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. To understand the mathematics behind Cryptography.
2. To understand the security concerns and vulnerabilities
3. To familiarize with different types of cryptosystems
4. To create an awareness for the design of various cryptographic primitives
5. To analyze different types of attacks on various cryptosystems

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

CO1. Implement the concepts of number theory in designing crypto systems.
CO2. To design public and private key cryptosystems.
CO3. To do cryptanalysis of various cryptosystems.
CO4. To do vulnerability assessments of tools using cryptosystems.
CO5. Test different types of attacks on various cryptosystems

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	3	3	3	1	3	3	1	1
CO2	1	3	1	1	2	3	1	2	1	1	3	2
CO3	2	2	1	1	1	2	2	2	1	3	2	3
CO4	2	2	1	1	1	3	1	2	3	2	2	1
CO5	2	2	2	1	1	1	3	2	3	1	3	3
Average	1.8	2.4	1.4	1	1.6	2.4	2	1.8	2.2	2	2.2	2

1: Low 2: Medium 3: High -: No Correlation

UNIT –I

Basics of Algebra and Number Theory: Integer Arithmetic Modular Arithmetic- Algebraic structures – Prime Numbers - Fermat's and Euler's Theorem – Factorization - Chinese Remainder Theorem - Linear and Quadratic Congruence - Discrete Logarithms.

(5 Hours Lecture + 6 Hours Practical,CO1)

UNIT –II

Introduction to Security:-Security Goals – Security services (Confidentiality, Integrity, Authentication, Non-repudiation, Access control) – Security Mechanisms (Encipherment, Data Integrity, Digital Signature, Authentication Exchange, Traffic Padding, Routing Control, Notarization, Access control) -Security Principles. Introduction to Cryptography:- Kerckhoff's Principle -Classification of CryptosystemsCryptanalytic attacks- Cipher Properties (Confusion, Diffusion).

(10 Hours Lecture + 6 Hours Practical,CO2)

UNIT –III

Traditional Secret Key Ciphers:- Substitution Ciphers (mono alphabetic ciphers, poly alphabetic ciphers)-Transposition Ciphers-Stream and Block Ciphers. Modern Secret Key Ciphers:- Substitution Box-Permutation Box-Product Ciphers

(10 Hours Lecture+ + 6 Hours Practical ,CO3)

UNIT –IV

Data Encryption Standard (DES) (Fiestel and Non-Fiestel Ciphers, Structure of DES, DES Attacks, 2-DES, 3-DES) - Advanced Encryption Standard (AES) (Structure, Analysis)- Cryptographic Hash Functions– Properties - Secure Hash Algorithm-Message Authentication Code (MAC).

(10 Hours Lecture + 6 Hours Practical,CO4)

UNIT –V

Public Key Cryptosystems (PKC): - Types of PKC –Trapdoor - one way functions -RSA Cryptosystem (Integer Factorisation Trapdoor, Key Generation, Encryption, Decryption) - El Gamal Cryptosystem (Discrete Logarithm Trapdoor, Key Generation, Encryption, Decryption) - Diffie-Hellman Key Exchange Protocol, Man in the Middle attack on Diffie-Hellman Protocol.

(10 Hours Lecture ++ 6 Hours Practical,CO5)

Recommended Books

1. Douglas R. Stinson, “Cryptography: Theory and Practice”, Third Edition, CRC Press.
2. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Fourth Edition, 2006.

CSE -001-DE-42120: IMAGE AND VIDEO PROCESSING

Credit: 4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. To provide the basic understanding of the digital image formation and visualization.
2. To provide the visualization of relationships between spatial and frequency.
3. To provide the understanding of mapping the signal processing techniques to the digital image.
4. To provide an idea of multimedia data (image, video).
5. To provide an exposure to various image and video compression standards.

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

CO1. The students shall be able to apply the knowledge gained during the course to solve various real-time problems.

CO2. The students shall be able to develop new state of the art image and video processing method.

CO3. The students shall be able to develop generic tools using different image filtering techniques.

CO4. The students shall be able to enhance the biomedical images for better information retrieval from the images.

CO5. The students shall be able to understand various image and video compression standards

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	1	3	2	3	1	3	2	1
CO2	2	2	3	3	1	2	3	1	1	1	3	1
CO3	2	3	2	1	3	3	1	3	3	1	2	1
CO4	3	2	1	2	2	1	1	2	1	2	3	3
CO5	3	1	2	1	2	3	3	3	1	2	3	1
Average	2.6	2	1.8	2	1.8	2.4	2	2.4	1.4	1.8	2.6	1.4

1: Low 2: Medium 3: High -: No Correlation

UNIT -I

Basics of digital image processing, Structure of the Picture Information, luminance and chrominance components, RGB components, Transform Coding, Discrete Cosine Transforms – 1 D and 2D. Energy compaction.

(5 Hours Lecture + 6 Hours Practical,CO1)

UNIT -II

Image Enhancement - Spatial Domain Processing: Digital Negative, Contrast Stretching, Thresholding, Gray Level Slicing, Bit Plane Slicing, Log Transform and Power Law Transform. Neighborhood Processing: Averaging filters, Order statistics filters,High pass filters and High boost filters, Filtering in frequency domain: Smoothing and Sharpening filters, Image Segmentation, Image Restoration & Construction, Morphological Image Processing, Image quality assessments.

(10 Hours Lecture + 6 Hours Practical,CO2)

UNIT -III

Digital Video Sampling and Interpolation, Video Frame Classifications, I, P and B frames, Notation, Motion Estimation and compensation, Application of motion estimation in video coding, Video Enhancement and Restoration, Video quality Assessment.

(10 Hours Lecture + 6 Hours Practical,CO3)

UNIT -IV

Data Compression: Lossless Compression and Lossy Compression, Optimal codes, Construction algorithms of source codes - Huffman Codes, Error Resilient Codes–types, construction and applications, Basics of Image Compression, Joint Photographic Expert Group (JPEG) compression, Basics of Video Compression, Inter-frame and Intraframe redundancy, Video Coding Standard – H.263++.

(10 Hours Lecture + + 6 Hours Practical,CO4)

UNIT -V

Image and Video Segmentation, Biomedical Image Processing, Image Annotation, Video Annotation, Video surveillance.

(10 Hours Lecture + + 6 Hours Practical,CO5)

Recommended Books

1. K. Sayood, Introduction to data compression, Elsevier, 5 th edition, 2017.
2. Digital Image Processing (3rd Edition) by Willam K. Pratt, John Willey & Sons

CSE -001-DE-42130: COMPUTATIONAL NEUROSCIENCE

Credit: 4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. To introduce the biological and mathematical perspective of neurons and neuron signals.
2. To understand the various models and their mechanism of actions.
3. To introduce the application of Hebian Plasticity.
4. To understand the functions of the neuroscience models through case studies.
5. To understand the basis of using the principles of neuroscience in modeling multi layer perceptros networks.

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

CO1. Explain the principles of the working of neurons and neurons signaling models in relation to computational neuroscience.
CO2. Explain and use different computational neuroscience models in solving real world problems.
CO3. Formulate mathematical functions corresponding to the neuroscience models for performance optimizations in the applications.
CO4. Optimize and design new architecture perceptron models for performance evaluation.
CO5. design multi-layer perceptros networks

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2	2	2	3	3	3	2	1
CO2	1	3	1	2	3	2	2	3	1	3	3	1
CO3	2	3	2	2	3	1	3	3	3	3	3	3
CO4	3	2	3	2	3	1	3	3	1	3	2	2
CO5	1	1	3	2	1	3	1	3	1	2	2	1
Average	2	2.4	2.2	2.2	2.4	1.8	2.2	3	1.8	2.8	2.4	1.6

1: Low 2: Medium 3: High -: No Correlation

UNIT -I

History of neuroscience,History of computational neuroscience,mathematical modeling of neuroscience.

(5 Hours Lecture + 6 Hours Practical,CO1)

UNIT -II

Linear algebra - eigenvalues and eigenvectors for symmetric matrices,Quadratic forms, solving a system of linear equations - 3 cases,Dynamical systems - types of fixed pts, bifurcation map in terms of trace and determinant,Phase plane analysis - null clines - Hopf bifurcation and limit cycles.

(10 Hours Lecture + 6 Hours Practical,CO2)

UNIT -III

Neuron - axons, dendrites etc, the four components of Neural Signaling,Electrophysiology - Nernst potential, resting potential, Goldman-HodgkinKatz voltage equation, outline of the Hodgkin Huxley model,modeling ion channel kinetics, activation and inactivation gates.

(10 Hours Lecture + 6 Hours Practical,CO3)

UNIT -IV

Derivation of the cable equation - defining axial, radial resistance and membrane capacitance, defining quantities in terms of per unit length,Solution for Finite cable: sealed end, killed end and arbitrary boundary conditions,Time-dependent solution for impulse input. Propagation delay, pseudovelocity. Relation between cable diameter and conduction velocity.Modeling synaptic transmission.

(10 Hours Lecture + 6 Hours Practical,CO4)

UNIT -V

Fitzhugh-Nagumo neuron model - phase-plane analysis, showing excitability, bistability and oscillations,Cellular correlates of learning. Hebbian learning, Long-term Potentiation (LTP) and Long-term Depression (LTD),Case studies: Past tense learning, NetTalk, biological plausibility of backpropagation algorithm.

(10 Hours Lecture+ 6 Hours Practical ,CO5)

Recommended Books

1. Computational Neuroscience, Edited by Eric Schwartz.
2. Thomas Trappenberg, Fundamentals of Computational Neuroscience, oxford University Press, June 2002
3. Dayan, Peter, and L. F. Abbott.Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems. Cambridge, MA: MIT Press, 2001. ISBN: 9780262041997.

CSE -001-DE-42140: DATA MINING

Credit:4(L3–T0–P1)
(Theory – 45 Hours; Tutorial: 0 Hours; Practical – 30 Hours)

Learning Objectives

1. To introduce students to the basic concepts and techniques of Data Mining.
2. To introduce a wide range of clustering, estimation, prediction, and classification algorithms.
3. To introduce mathematical statistics foundations of the Data Mining Algorithms.
4. To introduce basic principles, concepts and applications of data warehousing.
5. To introduce Applications and other DM Techniques

Course Outcomes

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

CO1. Identify the key processes of data mining, data warehousing and knowledge discovery process.

CO2. Understand the basic principles and algorithms used in practical data mining and their strengths and weaknesses.

CO3. Apply data mining techniques to solve problems in other disciplines in a mathematical way.

CO4. Apply clustering, estimation, prediction, and classification algorithms.

CO5. Apply concepts and applications of data warehousing

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	3	1	3	2	2	2	2	3	1
CO2	1	2	3	1	1	2	3	3	3	1	3	2
CO3	3	1	1	3	2	1	1	1	3	3	2	2
CO4	2	2	3	1	1	2	3	3	1	2	2	2
CO5	3	2	3	3	2	3	1	3	2	2	3	3
Average	2	1.6	2.6	2.2	1.4	2.2	2	2.4	2.2	2	2.6	2

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective.

(5 Hours Lecture + 6 Hours Practical,CO1)

UNIT – II

Classification: Statistical-Based Algorithms, Decision Tree -Based Algorithms, Neural Network - Based Algorithms, Rule-Based Algorithms, Combining Techniques.

Clustering: Similarity and Distance Measures, Hierarchical Algorithms, Partitioned Algorithms, Clustering Large Databases, Clustering with Categorical Attributes.

(10 Hours Lecture + 6 Hours Practical,CO1)

UNIT – III

Association Rules: Basic Algorithms, Advanced Association Rule Techniques, Measuring the Quality of Rules.

(10 Hours Lecture + 6 Hours Practical ,CO2)

UNIT – IV

Introduction to Data Warehousing: Definition, difference between database system and data warehouse, multidimensional data model, data
cubes, process architecture.

(10 Hours Lecture + 6 Hours Practical ,CO3)

UNIT – V

Applications and other DM Techniques: Mining Event Sequences, Visual DM, Text Mining, Web Mining.

(10 Hours Lecture + 6 Hours Practical ,CO4)

Recommended Books

1. Ville, Decision Trees for Business Intelligence and Data Mining: Using SAS Enterprise Miner, SAS, 2006.
2. Pang-Ning Tan, Introduction to Data Mining, Addison Wesley, 2006.
3. J. Han and M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufman, 2001.
4. Tom Soukup, Davidson, Visual Data Mining: Techniques and Tools for Data Visualization and Mining, Wiley, 2002.
5. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining, and OLAP, MGH, 1998.

DEPARTMENT ELECTIVE-II:

CSE -001-DE-42210: Speech and Natural Language Processing (3-1-0)
CSE -001-DE-42220: Introduction to Mobile Application Development (3-1-0)
CSE -001-DE-42230: Embedded System (3-1-0)
CSE -001-DE-42240: Database Security (3-1-0)

CSE -001-DE-42210: SPEECH AND NATURAL LANGUAGE PROCESSING

Credit: 4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. Teach students the leading trends and systems in natural language processing.
2. Make them understand the concepts of morphology, syntax, semantics and pragmatics of the language and that they are able to give the appropriate examples that will illustrate the above mentioned concepts.
3. Teach them to recognize the significance of pragmatics for natural language understanding.
4. Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.
5. Enable students to be capable to describe the application based on Speech Coding

Course Outcomes

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

CO1. Understand approaches to syntax and semantics in NLP.
CO2. Understand approaches to discourse, generation, dialogue and summarization within filters.
CO3. Understand current methods for statistical approaches to machine translation.
CO4. Understand machine learning techniques used in NLP, including Hidden Markov Models and probabilistic context-free grammars
CO5. Understand clustering and unsupervised methods, log-linear and discriminative models, and the EM algorithm as applied within NLP.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2	1	2	3	2	3	1	3
CO2	1	3	1	1	1	2	3	3	1	2	3	3
CO3	3	3	2	1	1	2	2	1	1	2	3	2
CO4	3	3	2	3	3	2	1	3	1	2	2	2
CO5	1	3	2	1	2	1	1	3	2	2	2	1
Average	2.2	3	1.6	1.6	1.8	1.6	1.8	2.6	1.4	2.2	2.2	2.2

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Discrete Signals and Systems: A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Filtering methods based on DFT – FFT Algorithm – Decimation in time algorithm, Decimation in frequency algorithm – z-transform – Filter Design : FIR and IIR.

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT – II

Analogy and Physiology of Speech Production mechanism: Lungs, Larynx, vocal Tract – Categorization of Speech Sounds – Elements of a language: vowels, Nasals, Fricatives, plosives. Speech perception; Voiced and Unvoiced sounds.

(10 Hours Lecture + 5 Hours Tutorial ,CO2)

UNIT – III

Spectral Analysis of Speech: Formant Frequency, Fundamental Frequency, Power spectral analysis, PSD, Energy Spectra – Analysis and Synthesis of Pole-Zero Speech Models, Linear Prediction of Speech Signal – Cepstral Frequency, Mel-cepstra, Homomorphic signal Processing-Homomorphic Filtering.

(10 Hours Lecture + 5 Hours Tutorial ,CO3)

UNIT – IV

Speech Coding: Optimum scalar and vector quantization, waveform coding, vecoders – Speech recognition – Dynamic time warping, Hidden Markov Model – Speaker verification and Identification – Speech synthesis: Text-to-speech system, synthesizer techniques, HMM-based synthesis, sine-wave synthesis.

(10 Hours Lecture ,CO4)

UNIT – V

Brief Review of Regular Expressions and Automata; Finite State Transducers; Word level Morphology and Computational Phonology; Basic Text to Speech; Part of Speech Tagging; Parsing with CFGs.

(10 Hours Lecture ,CO5)

Recommended Books

1. John G. Proakis, Dimitris K Manolakis, Digital Signal Processing, Pearson Education
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, DigitalSignal Processing, TMH
3. Lawrence Rabiner and Biing-Hwang Juang, Fundamentals of Speech Recognition, Pearson Education.
4. T.E.Quatieri, Speech Signal Processing, Pearson Education
5. Ben Gold , Nelson Morgan and Dan Ellis, Speech and Audio Signal Processing: Processing and Perception of Speech and Music, WILEY Publication

CSE -001-DE-42220: INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT

Credit: 4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. understanding of the Android platform, including its architecture, components, and development environment setup.
2. necessary skills to set up and utilize essential development tools such as the Android SDK and Eclipse IDE for building Android applications.
3. develop their first Android application from scratch, demonstrating proficiency in building and deploying basic Android applications.
4. comprehend the structure and components of Android applications, including the Android

Manifest file, which governs various aspects of application behavior and settings.

5. groundwork for further exploration into Android programming, providing students with a solid understanding of Object-Oriented Programming (OOP) principles in Java, essential for Android app development.

Course Outcomes

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

CO6. Understanding of Android Building Blocks

CO7. Mastery of Object-Oriented Programming (OOP) Principles

CO8. Apply Design and Terminology Proficiency

CO9. Integrate various Android components seamlessly, leveraging intents, intent filters, and permissions to enhance the functionality and user experience.

CO10. Design intuitive and visually appealing user interfaces using layouts, screen elements, animations, and other UI design principles specific to Android applications.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	3	3	1	1	3	3	2
CO2	3	2	3	3	2	2	1	2	3	3	3	2
CO3	2	2	3	3	2	1	3	1	1	2	2	1
CO4	1	3	3	2	1	1	2	1	3	1	1	3
CO5	1	2	2	3	2	3	2	1	3	2	3	1
Average	2	2.2	2.6	2.6	1.6	2	2.2	1.2	2.2	2.2	2.4	1.8

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Introduction and Basics of Android, android Versions, Features of android, architecture of android, the android market, Setting up development environment -android studio, android sdk, Android Virtual Device (AVD)

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT – II

Basic Building blocks Activities, Fragments, and Intents: understanding Activities, Activity Lifecycle, Application Manifest, Activity Example, Intents, Intent example, Fragments, life Cycle of a Fragment

(10 Hours Lecture + 5 Hours Tutorial ,CO2)

UNIT – III

Introduction to Android User Interface: Styles & Themes, Views and View groups, Types of Layout: Frame Layout, Linear Layout, Relative Layout ,Table Layout, scroll View, Grid Layout ,constraint layout, units of measurement, display orientation, action bar.

(10 Hours Lecture + 5 Hours Tutorial ,CO3)

UNIT – IV

Basic UI Design: Text View ,Edit Text ,Button , Image Button , Check Box , Toggle Button , Radio Button , Radio Group, Toggle Button, Progress Bar ,AutoComplete Text Box ,timepickerView,DatepickerView,listViewView,spinnerView,Specialized fragment types, Alert Dialogs & Toast, Image View, Image Switcher view, Grid View, Web View, using menus With Views.

(10 Hours Lecture ,CO4)

UNIT – V

Data Persistence: saving and loading user preferences, persisting data to files, Creating and using databases, Introducing SQLite. Content Providers: sharing Data in android, using a Content provider. Web Services: Receiving HTTP Response (XML, JSON), Parsing JSON and XML, Using Web View. Messaging: SMS Messaging, sending email, Location: Based Services- Displaying Maps, Google API for Maps, getting location Data

(10 Hours Lecture ,CO5)

Recommended Books

1. Beginning Android Programming with Android Studio 4th Edition, J.F. DiMarzio, Wiley &Son s.
2. Android Programming for Beginners, John Horton, Packt Publishing.
3. Professional Android 4 Application Development by Reto Meier.

CSE -001-DE-42230: EMBEDDED SYSTEM

Credit: 4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

1. Provide students the concepts of various processors used in embedded system
2. Familiarize students with the concepts of I/O programming and memory management in embedded systems
3. Train students to design new embedded applications.
4. Familiarize students with the idea of different embedding techniques.

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

CO1. Analyze different embedded processor architecture such as 8085, 8051, 8086.
CO2. Distinguish different Concurrency control and Scheduling methodologies used in embedded technology.
CO3. Explain different I/O programming.
CO4. Design of systems on RTOS based embedded software in developing a complex embedded system product.
CO5. understand Scheduling in Embedded Systems

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	1	3	3	1	1	3
CO2	3	1	3	3	3	3	1	1	1	2	1	2
CO3	2	3	1	1	3	3	3	2	3	1	3	1
CO4	1	2	3	1	1	2	1	3	3	3	3	3
CO5	3	2	2	1	1	3	3	3	3	3	1	3
Average	2.4	2	2.2	1.6	2	2.6	1.8	2.4	2.6	2	1.8	2.4

1: Low 2: Medium 3: High -: No Correlation

UNIT -I

Processors for embedded systems: Definition of embedded system, Types of processor used in embedded systems, 8 bit processors 8085, 8051 and PIC 18FXX: - Architecture and instruction set. 16 bit: - 8086 32 bit: - 80386 architecture and instruction set, ARM based processor architecture and instruction set.

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT -II

I/O programming: Operating systems for embedded systems, Real time operating systems Issues Synchronization, transfer rate and latency.Polled I/O issues. Interrupt driven I/O. ISR. Response time interrupt controller. Software interrupts and exceptions. Buffering of data and queuing of interrupt requests.

(10 Hours Lecture + 5 Hours Tutorial ,CO2)

UNIT -III

Concurrency control: Foreground/Background systems, Thread state and serialization, latency, prevention of interrupt overruns. Concurrent execution of threads, context switch, non-preemptive multitasking, preemptive multitasking. Critical sections:- disabling interrupts, disabling ask switch, spin lock, mutex and semaphore.

(10 Hours Lecture + 5 Hours Tutorial ,CO3)

UNIT -IV

Scheduling in Embedded Systems: Conventional scheduling, deadline driven scheduling, rate monotonic scheduling, deadlock, watchdog timer.

(10 Hours Lecture ,CO4)

UNIT -V

Memory Management: Static allocation, dynamic allocation. Recursion and dynamic allocation. shared memory, reentrant functions.

(10 Hours Lecture ,CO5)

Recommended Books

1. Daniel W Lewis; Fundamentals of Embedded Software; Pearson Education
2. David E. Simon; An Embedded Software Primer; Pearson Education

CSE -001-DE-42240: DATABASE SECURITY

Credit: 4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Learning Objectives

CO1: Understands the application of security concepts to database technology and demonstrate the ability to work hands-on.
CO2: To understand the fundamentals of cybersecurity, and how it relates to database systems.
CO3: To learn to implement administration policies for users
CO4: To describe database security models and their advantages or disadvantages.
CO5: TO discuss auditing fundamentals and implement auditing. Implement access controls for database use, including virtual private database.

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

1. Avoid unauthorized data observation.
2. Avoid unauthorized data modification.
3. Ensure the data confidentiality.
4. Prove that the data integrity is preserved.
5. Prove that, only authorized user has access to the data.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	3	2	2	3	2	3	3
CO2	1	2	1	3	3	2	3	2	3	2	1	3
CO3	2	3	1	2	3	3	3	2	3	3	1	1
CO4	1	1	3	2	2	2	3	1	2	1	3	1
CO5	2	2	1	2	2	3	1	2	3	1	1	3
Average	1.8	2	1.4	2.2	2.4	2.6	2.4	1.8	2.8	1.8	1.8	2.2

1: Low 2: Medium 3: High -: No Correlation

UNIT -I

Security Fundamentals: Introduction to Cybersecurity, Cyberattacks, Basic concepts:Threats, Risks,Vulnerability,threat model, thrust model,security model,bug, worm, virus, rootkits.

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT -II

Database Hardening techniques, Web and user privacy,Privacy protecting techniques,Anti theft models and algorithms, Web server security, Host security for servers and securing web applications.

(10 Hours Lecture + 5 Hours Tutorial ,CO2)

UNIT -III

Database Security:Advances in access control, access control for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems.Injection Attacks: Injecting into Interpreted Contexts, SQL Injection, NoSQL Injection, XPath Injection, LDAP Injection, XML Injection, Http Injection, Mail Service Injection.

(10 Hours Lecture + 5 Hours Tutorial ,CO3)

UNIT -IV

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, User Attacks: Inducing User Actions, Capturing Cross-Domain Data, Client-Side Injection Attacks, Local Privacy Attacks, ActiveX Control attacks, Browser Attacks.

(10 Hours Lecture ,CO4)

UNIT -V

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy enhanced Location-based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment.

(10 Hours Lecture ,CO5)

Recommended Books

1. Web Security, Privacy and Commerce Simson GArfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia
3. Michael Gertz and Sushil Jajodia (Editors), Handbook of Database Security: Applications and Trends , ISBN-10: 0387485325. Springer, 2007

CSE-001-RC-4210: RESEARCH AND PUBLICATION ETHICS
Credit:4(L3–T1–P0)
(Theory – 45 Hours; Tutorial: 15 Hours; Practical – 0 Hours)

Course Objective

1. Provide students with the fundamental knowledge of basics of philosophy of science and ethics, research integrity, publication ethics.
2. Hands-on sessions are designed to identify research misconduct and predatory publications.
3. Indexing and citation databases, open access publications, research metrics (citations, h index, Impact Factor etc).
4. Guide and mentor students in presenting plagiarism tools for a valid and ethical research report.
5. Using various Research metrics

Course Outcomes

On the completion of this course students will be able to perform the following tasks:

CO1. To be able to describe and apply theories and methods in ethics and research ethics
CO2. To acquire an overview of important issues in research ethics, like responsibility for research, ethical vetting, and scientific misconduct.
CO3. To acquire skills of presenting arguments and results of ethical inquiries.
CO4. Understand various Research metrics
CO5. To use plagiarism tools for a valid and ethical research report.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	3	2	3	3	1	1	1	3	1
CO2	2	1	1	1	1	1	1	1	3	1	2	1
CO3	1	2	1	1	1	1	3	1	2	3	2	1
CO4	2	3	3	2	2	3	1	2	1	3	2	1
CO5	2	3	2	1	1	3	3	1	3	3	1	1
Average	1.6	2	1.6	1.6	1.4	2.2	2.2	1.2	2	2.2	2	1

1: Low 2: Medium 3: High -: No Correlation

UNIT – I

Philosophy and Ethics: Introduction to Philosophy: definition, nature, scope, concept, branches Ethics: definition, moral philosophy, nature of moral judgment and reactions.

(5 Hours Lecture + 5 Hours Tutorial ,CO1)

UNIT – II

Scientific Conduct: Ethics with respect to science and research; Intellectual honesty and research integrity, copyright, Scientific misconduct: falsification, fabrication and Plagiarism (FFP); Redundant Publication: duplication and overlapping publication, salami slicing; Selective reporting and misrepresentation of data.

(10 Hours Lecture + 5 Hours Tutorial ,CO2)

UNIT – III

Publication Ethics: definition, introduction and importance Best practice/standard setting initiative and guidelines: COPE, WAME, etc. Conflict and interest

Publication misconduct: definition, concept, problems that leads to unethical behaviour and vice versa, type Violation of publication ethics, authorship and contributorship, Identification of publication misconduct, complaint and appeals Predatory publisher and journals Avoiding Plagiarism. Preparing documents for MoUs, Confidentiality Agreements.

(10 Hours Lecture + 5 Hours Tutorial ,CO3)

UNIT – IV

Open access publishing: Open access publication and initiatives SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies Software tool to identify predatory publication developed by SPPU Journal finder/journal suggestion tools viz. JANE, Elsevier Journal finder, Springer, Journal Suggester, etc.

(10 Hours Lecture ,CO4)

UNIT – V

Group Discussion: Subject Specific Ethical Issues FFP, authorship Conflict interest, Complaints and appeals: examples and fraud from India and abroad

Software tools: Use of plagiarism software like turnitin, Urkund and other open source software tools

Database: Indexing database, Citation database: web of science, scopus, etc.

Research metrics: Impact factor of Journal as per journal citation report, SNIP,SJR,IPP, Cite Score Metrics: h-index, g-index, i-10 index, altmetrics

(10 Hours Lecture ,CO5)

Recommended Books

1. Nicholas H. Steneck. Introduction to the Responsible Conduct of Research. Office of Research Integrity. 2007. Available at: https://ori.hhs.gov/sites/default/files/rcrintro.pdf
2. The Student's Guide to Research Ethics By Paul Oliver Open University Press, 2003
3. Responsible Conduct of Research By Adil E. Shamoo; David B. Resnik Oxford University Press, 2003
4. Ethics in Science Education, Research and Governance Edited by KambadurMuralidhar, Amit Ghosh Ashok Kumar Singhvi. Indian National Science Academy, 2019.