

# **CURRICULUM & SYLLABUS**



**CHOICE BASED CREDIT SYSTEM (CBCS)**

**FOR**

**BACHELOR OF TECHNOLOGY (B.Tech.)**

**(4 Year Undergraduate Degree Programme)**

**IN**

**COMPUTER SCIENCE & ENGINEERING WITH  
SPECIALIZATION IN CLOUD ENGINEERING &  
DEVOPS AUTOMATION IN ASSOCIATION WITH  
XEBIA**

**(In Alignment with National Education Policy  
2020)**

**[w. e. f. 2024-2025]**

**FACULTY OF ENGINEERING AND TECHNOLOGY**

**SRM UNIVERSITY DELHI-NCR, SONEPAT**

**39, Rajiv Gandhi Education City,  
Sonapat Haryana-131029**



## ENGINEERING GRADUATES EMPLOYABILITY ATTRIBUTES

Sound Knowledge and Skills of Basic Sciences & Engineering Sciences	An Engineer should be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
Problem Formulation, Analysis & Solving	An Engineer should be able to identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences, and engineering sciences.
Design and Development of a Solution	An Engineer must be able to design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
Investigation	An Engineer should use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
Modern Tools Usage	An Engineer should be able to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
The Engineer and the Society	An Engineer should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.

Environment and Sustainability	An Engineer must understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
Ethics	An Engineer should be able to apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practices.
Individual and Teamwork	An Engineer should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
Effective Communication	An Engineer should be able to communicate effectively on complex Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project Management and Finance	An Engineer must demonstrate knowledge and understanding of the engineering and management principles and apply these to Engineering work environment, as a member and leader in a team, to manage projects and in multidisciplinary environments.
Lifelong Learning	An Engineer must recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

# **SRM UNIVERISTY DELHI-NCR, SONEPAT**

## **FACULTY OF ENGINEERING AND TECHNOLOGY**

### **FACULTY OF ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES (FEPEOs)**

- Advancement to a professional position by virtue of their knowledge, skills and attitude.
- Recognition for solving engineering problems and developing design solutions that considers safety and sustainability.
- Work as successful professionals in diverse engineering disciplines and enterprises.
- Increasing responsibilities of technical and managerial leadership in their work organizations.
- Professional development through a commitment to career-long learning.

### **FACULTY OF ENGINEERING PROGRAM LEARNING OUTCOMES (FEPLOs)**

- An ability to identify, formulate, and solve real time engineering & socio-economic problems by applying principles of engineering, science, mathematics, humanities and social sciences
- An ability to use the advanced skill enhancement techniques and modern engineering tools as per industry 4.0 necessary for engineering practice.
- An ability to apply engineering design to produce solutions that meet specified needs with realistic considerations of environmental, ethical, health & safety and sustainability.
- An ability to adapt and work with multidisciplinary teams and communicate effectively.
- An ability to function effectively on a team whose members together provide leadership, to create a collaborative environment, to establish goals and to execute plan tasks.
- An understanding of professional and ethical responsibility.
- An ability to acquire and apply new knowledge using appropriate learning strategies with inner quest to learn, unlearn and relearn.

**MAPPING OF FACULTY OF ENGINEERING PROGRAM**  
**EDUCATIONAL OBJECTIVES AND FACULTY OF ENGINEERING**  
**PROGRAM LEARNING OUTCOMES**

<b>FACULTY OF ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES</b>	<b>FACULTY OF ENGINEERING PROGRAM LEARNING OUTCOMES</b>
Advancement to a professional position by virtue of their knowledge, skills and attitude.	<ul style="list-style-type: none"> <li>• An ability to identify, formulate, and solve real time engineering and socio-economic problems by applying principles of engineering, science, mathematics, humanities and social sciences</li> <li>• An ability to use the advanced skill enhancement techniques and modern engineering tools as per industry 4.0 necessary for engineering practice.</li> </ul>
Recognition for solving engineering problems and developing design solutions that consider safety and sustainability	<ul style="list-style-type: none"> <li>• An ability to use the advanced skill enhancement techniques and modern engineering tools as per industry 4.0 necessary for engineering practice.</li> <li>• An ability to apply engineering design to produce solutions that meet specified needs with realistic considerations of environmental, ethical, health &amp; safety and sustainability</li> </ul>
Work as successful professionals in diverse engineering disciplines	<ul style="list-style-type: none"> <li>• An ability to apply engineering design to produce solutions that meet specified needs with realistic considerations of environmental, ethical, health &amp; safety and sustainability</li> <li>• An ability to adapt and work with multidisciplinary teams and communicate effectively;</li> </ul>

Increasing responsibilities of technical and managerial leadership in their work organizations.	<ul style="list-style-type: none"> <li>• An ability to adapt and work with multidisciplinary teams and communicate effectively;</li> <li>• An ability to function effectively on a team whose members together provide leadership, to create a collaborative environment, to establish goals and to execute plan tasks.</li> <li>• An understanding of professional and ethical responsibility;</li> </ul>
Professional development through a commitment to career- long learning.	<ul style="list-style-type: none"> <li>• An understanding of professional and ethical responsibility;</li> <li>• An ability to acquire and apply new knowledge using appropriate learning strategies with inner quest to learn, unlearn and relearn.</li> </ul>

**TABLE 1: MAPPING MATRIX OF FACULTY OF  
ENGINEERING PROGRAM EDUCATIONAL  
OBJECTIVESAND FACULTY OF ENGINEERING  
PROGRAM LEARNING OUTCOMES (TABULAR  
FORMAT)**

MAPPING	FEPELO 1	FEPLO 2	FEPLO 3	FEPLO 4	FEPLO 5	FEPLO 6	FEPLO 7
<b>FEPE01</b>	✓	✓					
<b>FEPE02</b>		✓	✓				
<b>FEPE03</b>			✓	✓			
<b>FEPE04</b>				✓	✓	✓	
<b>FEPE05</b>						✓	✓

**B.TECH - COMPUTER SCIENCE& ENGINEERING WITH  
SPECIALIZATION IN CLOUD ENGINEERING & DEVOPS  
AUTOMATION IN ASSOCIATION WITH XEBIA GRADUATES  
EMPLOYABILITY ATTRIBUTES**

EA 1: Sound Knowledge & Skill of Domain Area: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program

**EA 2: Problem solving skills:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.

**EA 3: Cognitive and Analytical skills:** Cognitive& Analytical skills help engineering graduates interpret data, remember team goals. These skills help them recall previous information that may relate to their organization's goals and help them make important connections between old and new information so that they can work more effectively.

**EA 4: Design Thinking:** An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations.

**EA 5: Transferrable Skills:** Transferable skills are skills and abilities that are relevant and helpful across different areas of life: socially & professionally.

**EA 6: Interpersonal skills to work in diverse group:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.

**EA 7: Communication Skills:** An ability to communicate complex



engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.

**EA 8: Positive attitude and thinking:** An ability to have positive attitude and thinking in challenging situations.

**EA 9: Adaptability:** Adapts learning strategies to new conditions. Recognizes parallels, analogies or similarities of new situations to more familiar situations.

**EA 10: Learn to Learn:** Learn → Unlearn → Relearn: An ability to identify and to address their own educational needs in a changing world, sufficiently to maintain their competence and contribute to the advancement of knowledge.

**EA11: Information technology skills:** An ability to create, select, adapt, and extend appropriate techniques, resources, and modern ICT tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.

**EA12: Sustainable Consumption and Production:** the demands for system upgrades (domestic and commercial) as well as the move to continuous provision of service (e.g. domestic devices that are always powered and available) needs to be balanced with the views of sustainable consumption and production. Server based solutions – such as Google Docs (Google Docs, 2009) 0– can be considered as one way of addressing such concerns where individuals need not upgrade their own machines as regularly and install local applications (with subsequent updates).

**B.TECH - COMPUTER SCIENCE& ENGINEERING WITH  
SPECIALIZATION IN CLOUD ENGINEERING & DEVOPS  
AUTOMATION IN ASSOCIATION WITH XEBIA PROGRAMME  
EDUCATIONAL OBJECTIVES**

**PEO1.** To nurture strong understanding in logical, mathematical and analytical reasoning among students coupled with problem solving attitude that prepares them to productively engage in research and higher learning.

**PEO2.** To build strong foundation in the field of Computer Science and Engineering among students to be creative and innovative.

**PEO3.** To prepare students capable of designing and developing real-world computing applications with high societal influence and impact.

**PEO4.** To provide students with academic environment that enables them to understand the significance of life-long learning in varied situations and teams in global perspective.

**PEO5.** To inculcate ethical practices, professionalism and environmental awareness for sustainable development among students enabling them for prospective employment in their chosen line of profession globally.

**PEO6.** To instill communication and management skill that generates entrepreneurship and / or leadership qualities.

**B.TECH - COMPUTER SCIENCE& ENGINEERING WITH  
SPECIALIZATION IN CLOUD ENGINEERING & DEVOPS  
AUTOMATION IN ASSOCIATION WITH XEBIA PROGRAMME  
LEARNING OUTCOMES (PLOs)**

PLO1-Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and IC design and technology concepts towards modelling and prototyping Integrated systems.

PLO2-Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PLO3-Design/development of solutions: Design methodology to offer hardware solutions to public health, safety and agriculture, consumer electronics along with cultural, societal, and environmental considerations.

PLO4-Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PLO5-Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PLO6-The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PLO7-Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PLO8-Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PLO9-Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PLO10-Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PLO11-Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PLO12-Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**TABLE 2: MAPPING MATRIX OF PROGRAM EDUCATIONAL OBJECTIVES (PEO) AND PROGRAM LEARNING OUTCOMES (PLO)**

[illegible]

## **B.TECH COMPUTER SCIENCE& ENGINEERING WITH SPECIALIZATION IN CLOUD ENGINEERING & DEVOPS AUTOMATION IN ASSOCIATION WITH XEBIA PROGRAMME STRUCTURE**

The Computer Science and Engineering curriculum is geared towards providing the student with a strong foundation in the discipline and the tools and competence to address new and challenging problems that they have not seen before. In order to earn a B. Tech. degree in Computer Science and Engineering, a student should secure a minimum of 186 credits in the course of their study. The credit requirements for their program of study are comprised of the following Programme Structure:

### **1. Basic Applied Sciences (BAS) and Engineering Science (ES):**

The purpose of Basic Applied Sciences in Engineering study is to lay a strong foundation of basic principles of various disciplines such as Mathematics, Physics, and Chemistry in the mind of the learners so that they proceed to the rest of their years of study with up to date knowledge and training of basic engineering skills. The Engineering Sciences requirements support multiple objectives: first, the courses provide a strong foundation in the basic tools and methodologies common to all engineering disciplines; second, all students are exposed to basics of each discipline allowing for cross-disciplinary competencies; last, there is a multi-disciplinary project component where students from different engineering disciplines come together on a design project, allowing for practice in collaborative teamwork.

### **2. Professional Core Courses (PC):** The Professional core courses are aimed at providing the student with a solid foundation in their chosen field of study as per Industry 4.0 skills and knowledge.

### **3. Practicals (P):** The labs are fully furnished and well equipped with latest software's to conduct practical as per the requirement of the University

## Curriculum.

4. **Professional Electives (PE):** Programme-specific Specialization Electives: The Professional electives, on the other hand, provide the student with an option to gain exposure to different specializations within the discipline, or an opportunity to study one of the subfields in some depth.
5. **Ability Enhancement Courses (AEC):** Students are required to achieve competency in a Modern Indian Language (MIL) along with English language with special emphasis on language and communication skills. The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and academic writing skills. The focus is on imparting students with necessary skills to articulate their arguments and present their thoughts clearly and coherently and recognize the importance of language as a mediator of knowledge and identity.
6. **Value Added Courses (VAC):** Course components relating to skills, attitudes, and values required to take appropriate actions for mitigating the effects of environmental degradation, climate change, and pollution, effective waste management, conservation of biological diversity, management of biological resources, forest and wildlife conservation, and sustainable development and living health and wellness seek to promote an optimal state of physical, emotional, intellectual, social, spiritual, and environmental well-being of a person, the constitutional obligations with special emphasis on constitutional values and fundamental rights and duties.
7. **Skill Enhancement Courses (SEC)-Technical & Soft Skills:**
  - **Technical Skills:** Under Technical Skills Broad categories of training to be imparted to Engineering Graduates of various disciplines with common nomenclature. The training is categorized into three categories: Elementary, Intermediate & Advanced keeping in view of interdisciplinary approach. (One Credit Each from 3<sup>rd</sup> semester to 6<sup>th</sup> semester)
  - **Soft Skills:** Under Soft skills training five soft skill courses with defined nomenclature and course content common to all Engineering disciplines introduced to inculcate Group Dynamics, Teamwork & Leadership Traits by engaging students in interactive sessions

through Role Play, Group Discussions, and improve presentation & Communication skills of engineering graduates. (One Credit Course from 3<sup>rd</sup> Semester to 7<sup>th</sup> semester).

**8. Live Projects (LP) and Summer Internship (SI):**

- **Live Projects** is being introduced for all Engineering disciplines from 4<sup>th</sup> semester - 7<sup>th</sup> semester to develop an ability in engineering graduates to apply skills and knowledge attained to solve real life complex problems. (One Credit each semester). A student may create live project as an internship project. In that case, the student will be monitored on periodic basis, both by the Industry Expert and the Faculty In-charge. The Industry In-charge will submit the Mid-Term and End-Term Evaluation report. However, the faculty In-charge will take periodic presentation to keep a check on the progress of Student. A student may also create live project under the supervision of Institutional faculty (in-house or other institutes of repute). Six step comprehensive approach is introduced for Identification of Projects, Allocation & Monitoring of projects through digital platform.
- **Summer Internship (SI):** Students will be monitored on periodic basis, both by the Faculty Mentor from the Industry and the Faculty in-charge from the department. The Faculty Mentor from the Industry will submit the Mid-Term and End-Term Evaluation report. However, the faculty in-charge from the department will monitor and take periodic review to keep a check on the progress of the students. Students are provided with the internship-related document which helps them to prepare a report. In addition to this, it provides details to students about internship/project evaluation parameters.

**9. Multidisciplinary Courses (Humanities and Social Sciences Courses) (MDC):** The open elective subject courses provide the student with wide latitude to pursue their interests, be it in humanities, management, arts, or their own chosen field of study to have a multidisciplinary approach.



**B.TECH COMPUTER SCIENCE & ENGINEERING WITH  
SPECIALIZATION IN CLOUD ENGINEERING & DEVOPS  
AUTOMATION IN ASSOCIATION WITH XEBIA**

**TABLE 3: PROGRAMME STRUCTURE**

Category of Courses	Category	No. of Courses	
Basic Applied Sciences	BAS	06	
Engineering Sciences	ES	10	
Professional Core Courses	PC	16	
Professional Electives - Program Specific Specialization Electives	PE	09	
Ability Enhancement Courses	AEC	04	
Skill Enhancement Courses (Technical & Soft Skills)	SEC	Technical Skills	4
		Soft Skills	5
Value Added Courses	VAC	03	
Practical/ Workshops	P/W	12	
Live Projects & Industrial Visit	LP	Live Project and Industrial Visit	5 <sup>th</sup> -7 <sup>th</sup> Semester (3)
		Minor Project	7 <sup>th</sup> Semester (1)
		Major Project	8 <sup>th</sup> Semester (1)
Multi-Disciplinary Courses (Humanities & Social Sciences courses)	MDC	3	
<b>TOTAL</b>		<b>77</b>	

**BACHELOR OF TECHNOLOGY**  
**(COMPUTER SCIENCE & ENGINEERING WITH SPECIALIZATION**  
**IN CLOUD ENGINEERING & DEVOPS AUTOMATION IN**  
**ASSOCIATION WITH XEBIA)**  
**DEGREE COURSE**  
**PROGRAMME CREDIT STRUCTURE ALONG WITH CREDITS**

**Table 4**

<div> <div>SEMESTERS →</div> <div>COURSES ↓</div> </div>	CATEGORY	I	II	III	IV	V	VI	VII	VIII	TOTAL	%AGE
BASIC APPLIED SCIENCE	BAS	09	09	-	-	-	-	-	-	18	9.73
ENGINEERING SCIENCE	ES	09	09	-	-	-	-	-	-	18	9.73
PROFESSIONAL CORE	PC	-	-	13	09	14	06	07	03	52	27.75
PROGRAM ELECTIVE	PE	-	-	03	04	03	11	07	03	31	16.76
ABILITY ENHNACEMENT COURSES	AEC	05	02	-	-	-	-	-	-	7	3.78
SKILL ENHANCEMENT COURSES (TECHNICAL &SOFT SKILLS)	SEC	-	-	02	02	02	02	01	-	9	4.86
VALUE ADDED COURSES	VAC	02	02	02	-	-	-			6	3.24
PRACTICALS/WORKSHOPS	P/W	-	-	03	03	02	02	02	-	12	6.49
LIVE PROJECT & INDUSTRIAL VISIT	LP	-	-	-	01	01	01	05	12	20	10.81
MULTI-DISCIPLINARY (HUMANITIES AND SOCIAL SCIENCES COURSES) COURSES	MDC	-	-	-	03	03	03	-	-	9	4.86
<b>TOTAL</b>		<b>25</b>	<b>22</b>	<b>23</b>	<b>22</b>	<b>25</b>	<b>25</b>	<b>22</b>	<b>18</b>	<b>182</b>	<b>100</b>

\* If the students opted 25 credits in I semester, then II semester must to be opting 22 credits and vice versa.

**COURSE CURRICULUM**  
**BACHELOR OF TECHNOLOGY**  
**(COMPUTER SCIENCE& ENGINEERING WITH SPECIALIZATION IN**  
**CLOUD ENGINEERING & DEVOPS AUTOMATION IN**  
**ASSOCIATION WITH XEBIA) DEGREE COURSE**  
**PROGRAMME COURSES SRUCTURE SEMESTERWISE**  
**SEMESTER-I**

COURSE CODE	COURSE	CATEGORY	Hours per week				Credits
			L	T	P	Total Hours	
THEORY							
24AS101	Engineering Mathematics-I	BAS	3	1	0	4	4
OR							
24AS104	Elementary Mathematics-I (For BME students)	BAS	2	0	0	2	2
24AS105	Elementary Biology (For BME students)	BAS	1	1	0	2	2
24AS102/ 24AS103	Engineering Physics/ Engineering Chemistry	BAS	3	1	0	4	4
24EE101/ 24EC101	Basic Electrical Engineering / Basic Electronics Engineering	ES	3	0	0	3	3
23ME101/ 23CS101	Engineering Mechanics / Fundamentals of Computer & C Programming	ES	3	0	0	3	3
24HS101	Communicative English (*50% of students will be offered)	AEC	2*	0	0	2*	2*
24HIN-101-I / 24FLGR101-I / 24FLFR101-I	Hindi-I/German-I/French-I	AEC	2	0	0	2	2
23ESEB101/ 23VAC102	Environmental Bioengineering / Indian Constitution and Polity	VAC	2	0	0	2	2
Total Credits (Theory)			16/18	2	0	18/20	18/20
PRACTICAL							
24AS152/ 24AS153	Engineering Physics Lab/Engineering Chemistry Lab	BAS	0	0	2	2	1
23EE151/ 24EC151	Basic Electrical Engineering Lab / Basic Electronics Engineering Lab	ES	0	0	2	2	1
23ME151/ 23CS151	Basic Mechanical Engineering Lab/ C Programming Lab	ES	0	0	2	2	1
23ME152/23M E153	Mechanical Workshop Lab/Engineering Graphics & Design Lab	ES	0	0	2	2	1

24HS151*	Communicative English Lab (50% of students will be offered)	AEC	0	0	2*	2*	1*
<b>Total Credits (Practical)</b>			<b>0</b>	<b>0</b>	<b>8/ 10</b>	<b>8/10</b>	<b>4/5</b>
<b>TOTAL CREDITS (THEORY + PRACTICAL)</b>			<b>16/18</b>	<b>2</b>	<b>8/ 10</b>	<b>26/30</b>	<b>22/25</b>

\*\* 1 credit practical i.e. 24CAM101- INDUSTRIAL SESSION – I will be offered to IBM Specialization students.

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

## SEMESTER-II

COURSE CODE	COURSE	CATEGORY	Hours per week				Credits
			L	T	P	Total Hours	
THEORY							
24AS201	Engineering Mathematics-II	BAS	3	1	0	4	4
OR							
24AS204	Elementary Mathematics II (For BME students)	BAS	2	0	0	2	2
24AS202/ 24AS203	Engineering Physics/ Engineering Chemistry	BAS	1	1	0	2	2
24EE201/ 24EC201	Basic Electrical Engineering / Basic Electronics Engineering	ES	3	1	0	4	4
23ME201/ 23CS201	Engineering Mechanics / Fundamentals of Computer & C Programming	ES	3	0	0	3	3
24HS201	Communicative English (*50% of students will be offered)	AEC	3	0	0	3	3
24HIN-201-II / 24FLGR201- II/ 24FLFR201-II	Hindi-II/German-II/French-II	AEC	2*	0	0	2*	2*
23ESEB201/ 23VAC 202	Environmental Bioengineering / Indian Constitution and Polity	VAC	2	0	0	2	2
Total Credits (Theory)			16/18	2	0	18/20	18/20
PRACTICAL							
24AS252/ 24AS253	Engineering Physics Lab/Engineering Chemistry Lab	BAS	0	0	2	2	1
23EE251/ 24EC251	Basic Electrical Engineering Lab / Basic Electronics Engineering Lab	ES	0	0	2	2	1
23ME251/ 23CS251	Basic Mechanical Engineering Lab/ C Programming Lab	ES	0	0	2	2	1
23ME252/ 23ME253	Mechanical Workshop Lab/Engineering Graphics & Design Lab	ES	0	0	2	2	1
24HS251*	Communicative English Lab (50% of students will be offered)	AEC	0	0	2*	2*	1*
Total Credits (Practical)			0	0	8/ 10	8/10	4/5
TOTAL CREDITS (THEORY + PRACTICAL)			16/18	2	8/ 10	26/30	22/25

\*\* 1 credit practical i.e. 24CAM201- INDUSTRIAL SESSION –II will be offered to IBM Specialization students.

L= Lecture, T = Tutorials, P = Practical's & C = Credits

## **SEMESTER – III**

COURSE CODE	COURSE	CATEGORY	HOURS PER WEEK				CREDITS
			L	T	P	TOTAL HOURS	
Theory							
24CD203	Advanced Linux	PC	2	0	1	3	3
24CS2001	Data Structures	PC	3	0	0	3	3
23CS2005	Database Management Systems	PC	3	0	0	3	3
24CSPExxx	Professional Elective – I	PE	3	0	0	3	3
23CD201	Source Code Management & Development Automation	PC	3	1	0	4	4
Total Credits (Theory)			14	2	1	16	16
Practical							
23CS2111	Database Management Systems Lab	P	0	0	2	2	1
24CS2113	Data Structures Lab	P	0	0	2	2	1
23CD215	Source Code Management & Development Automation Lab	P	0	0	2	2	1
23VAC301	Sports, Yoga and Fitness	VAC	1	0	2	3	2
Total Credits (Practical)			1	0	8	9	5
Skill Enhancement Course							
24CS0201C	Digital Marketing	SEC	0	0	2	2	1
23SS351	Effective Communication Skills	SEC	0	0	2	2	1
Total Credits (Skill Enhancement)			0	0	4	4	2
Total Credits (Theory + Practical+ Skill Enhancement)			15	2	13	29	23

**NOTE: At the end of the semester, students will undergo a training and create a project which will be evaluated in the next semester (Live Project-I)**

## **SEMESTER – IV**

COURSE CODE	COURSE	CATEGORY	HOURS PER WEEK				CREDITS
			L	T	P	TOTAL HOURS	
Theory							
24MDCxxx	Multidisciplinary Elective-I	MDC	3	0	0	3	3
23CSPExxx	Professional Elective – II	PE	3	1	0	4	4
24CS2006	Operating Systems	PC	3	0	0	3	3
24CSPE2008	Analysis and Design of Algorithms	PC	3	0	0	3	3
23CD204	Build and Release Management	PC	3	0	0	3	3
Total Credits (Theory)			15	1	0	16	16
Practical							
23CS2114	Operating Systems Lab	P	0	0	2	2	1
24CSPE2118	Algorithms Lab	P	0	0	2	2	1
23CD214	Build and Release Management Lab	P	0	0	2	2	1
Total Credits (Practical)			0	0	8	8	4
Skill Enhancement Course							
24CS0202A	Design thinking and Augmented Virtual Reality	SEC	0	0	2	2	1
23SS452	Teamwork & Interpersonal Skills	SEC	0	0	2	2	1
Total Credits (Skill Enhancement)			0	0	4	4	2
Total Credits (Theory + Practical+ Skill Enhancement)			15	01	12	28	22

NOTE: At the end of the semester, students will undergo a training and create a project which will be evaluated in the next semester (Live Project-II).

## **SEMESTER – V**

COURSE CODE	COURSE	CATEGORY	HOURS PER WEEK				CREDITS
			L	T	P	TOTAL HOURS	
Theory							
24MDCxxx	Multidisciplinary Elective-II	MDC	3	0	0	3	3
23CDPExx	Professional Elective – III	PE	3	0	0	3	3
24CSPE3001	Compiler Design	PC	3	1	0	4	4
24CSPE3003	Computer Networks	PC	3	1	0	4	4
23CD301	Continuous Integration and Continuous Deployment	PC	3	0	0	3	3
23CD303	Agile Practices	PC	3	0	0	3	3
Total Credits (Theory)			18	2	0	20	20
Practical							
24CSPE3117	Compiler Design Lab	P	0	0	2	2	1
23CD311	Continuous Integration and Continuous Deployment Lab	P	0	0	2	2	1
23CS0303A	Live Project – I & Industrial Training	LP**	0	0	2	2	1
Total Credits (Practical)			0	0	6	6	3
Skill Enhancement Course							
24CS0301A	Wearable Technology	SEC	0	0	2	2	1
23SS553	Presentation Skills	SEC	0	0	2	2	1
Total Credits (Skill Enhancement)			0	0	4	4	2
Total Credits (Theory + Practical+ Skill Enhancement)			18	02	10	30	25

**NOTE: At the end of the semester, students will undergo a training and create a project which will be evaluated in the next semester (Live Project-III)**

**\*\* To be evaluated in current semester.**



## **SEMESTER – VI**

COURSE CODE	COURSE	CATEGORY	HOURS PER WEEK				CREDITS
			L	T	P	TOTAL HOURS	
Theory							
23CD302	Test Automation	PC	3	0	0	3	3
23CD304	Application Containerization	PC	3	0	0	3	3
23CDPExxx	Professional Elective-IV	PE	3	0	0	3	3
24CDPExxx	Professional Elective-V	PE	3	1	0	4	4
23CSPExxx	Professional Elective-VI	PE	3	1	0	4	4
24MDCxxx	Multidisciplinary Elective-III	MDC	3	0	0	3	3
Total Credits (Theory)			18	2	0	20	20
Practical							
23CD312	Test Automation Lab	P	0	0	2	2	1
23CD314	Application Containerization Lab	P	0	0	2	2	1
23CS0304A	Live Project – II & Industrial Visit	LP**	0	0	2	2	1
Total Credits (Practical)			0	0	6	6	3
Skill Enhancement Course							
24CS0302D	Data Analytics Tools	SEC	0	0	2	2	1
23SS551A	Professional Skills	SEC	0	0	2	2	1
Total Credits (Skill Enhancement)			0	0	4	4	2
Total Credits (Theory + Practical + Skill Enhancement)			18	0 2	10	30	25

**NOTE: At the end of the semester, students will undergo a training and create a project which will be evaluated in the next semester (Live Project-IV)**

**\*\* To be evaluated in current semester**

## **SEMESTER – VII**

COURSE CODE	COURSE	CATEGORY	HOURS PER WEEK				CREDITS
			L	T	P	TOTAL HOURS	
Theory							
23CD401	System Provisioning and Configuration Management	PC	3	0	0	3	3
24CS4003	Cloud Computing	PC	3	1	0	4	4
23CDPExxx	Professional Elective – VII	PE	3	0	0	3	3
23CDPExxx	Professional Elective – VIII	PE	3	1	0	4	4
Total Credits (Theory)			12	2	0	14	14
Practical							
23CS4113	Cloud Computing Lab	P	0	0	2	2	1
23CS4115A	Live Project – III & Industrial Training	LP	0	0	2	2	1
23CD411	System Provisioning and Configuration Management Lab	P	0	0	2	2	1
23CS4117A	Minor Project	LP	0	0	10	10(8)	5
Total Credits (Practical)			0	0	14	14	8
Skill Enhancement Course							
23AR755	Aptitude and Reasoning	SEC	0	0	2	2	1
Total Credits (Skill Enhancement)			0	0	2	2	1
Total Credits (Theory + Practical+ Skill Enhancement)			12	02	16	30	23

## **SEMESTER – VIII**

COURSE CODE	COURSE	CATEGORY	HOURS PER WEEK				CREDITS
			L	T	P	TOTAL HOURS	
Theory							
24CD402	Applied DevOps & System Monitoring	PC	3	0	0	3	3
23CDPE4xx	Professional Elective – IX	PE	3	0	0	3	3
Total Credits (Theory)			6	0	0	6	6
Practical							
23CS4114	Major Project	LP	0	0	24	24 (12)	12
Total Credits (Practical)			0	0	24	12	12
Total Credits (Theory + Practical+ Skill Enhancement)			06	00	24	18	18

# LIST OF PROFESSIONAL ELECTIVES

## SPECIALIZATION-I

Subject Code	Course	Category	L	T	P	C
<b>Professional Elective -I</b>						
24CSPE2007	Computer Architecture and Organization	PE	3	0	0	3
<b>Professional Elective -II</b>						
23CSPE2004	Theory of Computation	PE	3	0	0	3
<b>Professional Elective -III</b>						
23CDPE321	Python Programming	PE	3	0	0	3
23CDPE323	Big Data Overview	PE	3	0	0	3
<b>Professional Elective -IV</b>						
23CDPE322	Supervised Learning	PE	3	0	0	3
23CDPE324	Domain-Driven Approach to Design And Implement Microservices	PE	3	0	0	3
<b>Professional Elective -V</b>						
24CSPE3002	AI and Expert Systems	PE	3	0	0	3
<b>Professional Elective -VI</b>						
23CSPE3020	Distributed Operating System	PE	3	1	0	4
23CSPE3032	Cyber Security	PE	3	1	0	4
23CSPE3028	Object Oriented Analysis & Design	PE	3	1	0	4
23CSPE3030	Neural Networks & Fuzzy Logic	PE	3	1	0	4
<b>Professional Elective -VII</b>						
23CDPE421	Digital Product Engineering and Design Thinking	PE	3	0	0	3
23CDPE423	Software Craftsmanship Overview	PE	3	0	0	3
<b>Professional Elective -VIII</b>						
23CS4019	Network Security & Cryptography	PE	3	1	0	4
23CS4023	Wireless Adhoc and Sensor Network	PE	3	1	0	4
23CS4035	Advanced Java Programming	PE	3	1	0	4
23CS4025	Data Warehousing & Data Mining	PE	3	1	0	4

Subject Code	Course	Category	L	T	P	C
<b>Professional Elective -IX</b>						
23CDPE422	Modern Architecture Patterns	PE	3	0	0	3
23CDPE424	Modern Web and Mobile Frameworks	PE	3	0	0	3

### SPECIALIZATION-II

Subject Code	Course	Category	L	T	P	C
<b>Professional Elective - I</b>						
23CSPE2007	Computer Architecture and Organization	PE	3	0	0	3
<b>Professional Elective - II</b>						
23CSPE2004	Theory of Computation	PE	3	0	0	3
<b>Professional Elective - III</b>						
23CDPE321	Python Programming	PE	3	0	0	3
23CDPE323	Big Data Overview	PE	3	0	0	3
<b>Professional Elective - IV</b>						
23CDPE322	Supervised Learning	PE	3	0	0	3
23CDPE324	Domain-Driven Approach to Design And Implement Microservices	PE	3	0	0	3
<b>Professional Elective - V</b>						
23CSPE3002	AI and Expert Systems	PE	3	0	0	3
<b>Professional Elective - VI</b>						
23CSPE3026	Grid Computing	PE	3	1	0	4
23CSPE3036	Predictive Analytics	PE	3	1	0	4
23CSPE3038	Business Intelligence	PE	3	1	0	4
23CSPE3040	Internet of Things	PE	3	1	0	4
<b>Professional Elective - VII</b>						
23CDPE421	Digital Product Engineering and Design Thinking	PE	3	0	0	3
23CDPE423	Software Craftsmanship Overview	PE	3	0	0	3
<b>Professional Elective - VIII</b>						
23CSPE4027	Mobile Computing	PE	3	1	0	4
23CSPE4031	Open Source Software	PE	3	1	0	4
24CSPE4041	Advanced Internet of Things	PE	3	1	0	4
23CSPE4047	Advanced Block Chain	PE	3	1	0	4

Subject Code	Course	Category	L	T	P	C
<b>Professional Elective - IX</b>						
23CDPE422	Modern Architecture Patterns	PE	3	0	0	3
23CDPE424	Modern Web and Mobile Frameworks	PE	3	0	0	3

### LIST OF ABILITY ENHANCEMENT COURSES

Course Code	Course	Category	L	T	P	Credits
24HS101/24HS201/ 24HS151/24HS251	Communicative English/ Communicative English Lab	AEC	2	0	2	3
24HIN-101- I /24FLFR101-I /24FLGR101-I	Hindi-I/French-I/ German-I	AEC	2	0	0	2
24HIN-201- II /24FLFR201-II /24FLGR201-II	Hindi-II/French-II/German-II	AEC	2	0	0	2

### LIST OF SKILL ENHANCEMENT COURSES

Course Code	Course	Category	L	T	P	Credits
<b>TECHNICAL TRAINING</b>						
24CS0201C	Digital Marketing	SEC	0	0	2	1
24CS0202A	Design thinking and Augmented Virtual Reality	SEC	0	0	2	1
24CS0301A	Wearable Technology	SEC	0	0	2	1
24CS0302D	Data Analytics Tools	SEC	0	0	2	1
<b>SOFT SKILL</b>						
23SS351	Effective Communication Skills	SEC	0	0	2	1
23SS452	Teamwork & Interpersonal Skills	SEC	0	0	2	1
23SS553	Presentation Skills	SEC	0	0	2	1
23SS654	Professional Skills	SEC	0	0	2	1
23AR755	Aptitude and Reasoning	SEC	0	0	2	1



### LIST OF VALUE-ADDED COURSES

Course Code	Course	Category	L	T	P	C
23VACXX	Environment BioEngineering	VAC	2	0	0	2
23VACXX	Indian Constitution and Polity	VAC	2	0	0	2
23VACXX	Sports, Yoga and Fitness	VAC	2	0	0	2

### LIST OF MULTIDISCIPLINARY COURSES (HUMANITIES & SOCIAL SCIENCES COURSES) (HSS)

Total: 9 (3*3) Credits						
Code	Category	Course	L	T	P	C
23MDC101/ 24MDC101A/ 24MDC101B/ 24MDC101C/ 24MDC101D	(MDC-I)	Statistical Methods/ Computer-Based Numerical and Statistical Technique/ Probability and Random Process/ Biostatistics/ Numerical Methods	3	0	0	3
23MDC102		Environmental Geosciences & Disaster Management	3	0	0	3
23MDC301		IPR in Business	3	0	0	3
23MDC302		Library Information Sciences & Media Literacy	3	0	0	3
23MDC401		Management Process & Organizational Behaviour	3	0	0	3
23MDC103	(MDC-II)	Photonics	3	0	0	3
23MDC104		Chemistry & Society	3	0	0	3
23MDC303		Psychology and Emotional Intelligence	3	0	0	3
23MDC304		Indian Economy	3	0	0	3

23MDC402		Creating an Entrepreneurial Mind	3	0	0	3
24MDC 106A/ 24MDC 106B		Numerical Methods in BME/ Discrete Mathematics	3	0	0	3
23MDC105	(MDC- III)	Life Sciences & Public Health	3	0	0	3
23MDC305		Electoral Literacy in India	3	0	0	3
23MDC403		Personal Financial Planning	3	0	0	3
23MDC404		Interior Design	3	0	0	3
24MDC107		Probability & Statistics	3	0	0	3

**Note**

1. These courses will be of introductory level and shall have 3 credits.
2. Student will not be allowed to choose or repeat the courses already gone through in class XII and present in Program core and specialization.
3. Student will have option to choose any 3 out of the pool.

\*Course shall be based on applications, tools and techniques.

## Semester – I and II

<b>ENGINEERING MATHEMATICS-I</b> (COMMON TO ALL BRANCHES EXCEPT BIO MEDICAL ENGINEERING)	
<b>Course Code:</b> 24AS101	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 4	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 3 1 0	
<b>Prerequisite:</b> 12 <sup>th</sup> Mathematics	

### COURSE OBJECTIVES (COs)

1. To introduce the concept of Matrices and its applications
2. To introduce the concept of Differentiation-Ordinary & Partial differentiation and their applications.
3. To understand the calculation of Multiple Integrals with their Applications.
4. To get the knowledge that illustrate the concepts of Vector Calculus to understand solenoidal and irrotational vectors with inter dependence of line, surface and volume integral.
5. To familiarize with the concept of sequence & series and their convergence.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Develop the essential tool of matrices to compute inverse, eigenvalues and eigenvectors.
2. Apply the knowledge of differentiation, partial differentiation, Maxima and minima of two variables for analyzing engineering problems.
3. Apply the multiple integrals in engineering applications.
4. Understand differentiation and integration of vectors with knowledge of Green's, Gauss divergence and Stroke's theorems.
5. Demonstrate the convergence of sequence & series.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CLO CO	CLO-01	CLO-02	CLO-03	CLO-04	CLO-05
CO-01	✓				
CO-02		✓			
CO-03			✓		
CO-04				✓	
CO-05					✓

### COURSE CONTENTS

#### Unit-1 : Matrices

Introduction, Types of Matrices, Elementary Transformations, Inverse of a square matrix by elementary transformation, Rank of a matrix (Echelon and Normal forms), Linear Dependence & Independence of vectors, Solution of system of linear equations ( $AX = 0$  and  $AX = B$ ), Eigenvalues and Eigenvectors, Cayley Hamilton theorem, Diagonalization of Matrices, Simple applications.

#### Unit – 2: Differentiation

Successive differentiation, nth order derivatives of standard functions, Leibnitz's theorem, Partial Derivatives, Homogenous function, Euler's theorem for homogenous functions, Deductions from Euler's theorem, Total Derivatives, Chain Rule, Composite function of two variables, Differentiation of implicit

functions, Applications of Partial Derivatives- Taylor's theorem for two variables, Maxima and minima for two variables, Jacobians.

### **Unit-3: Multiple Integral**

Introduction, Evaluation of Double integrals, Change of Order of Integration, Double integration in polar coordinates, Change of Variables, Triple integrals - Evaluation of triple integrals over a given region, Simple Applications of Multiple Integrals – Area (Cartesian Coordinates). Beta and Gamma functions and their properties.

### **Unit-4: Vector Calculus**

Introduction, Differentiation of vectors, Scalar and vector point functions, Gradient, Divergence, Curl, Directional derivatives, Vector Integration- Line, Surface and Volume integrals, Green's Theorem, Gauss' divergence theorem and Stroke's theorem (without proof), Simple Applications.

### **Unit-5: Sequence and Series**

Introduction, Sequence & Series, Convergence, divergence and oscillation of a series, Geometric Series, General properties of series, Test of convergence – Comparison test, Integral test, Comparison of Ratios, D'Alembert's Ratio test, Cauchy root test.

### **TEXT BOOKS/ REFERENCE BOOKS**

1. Grewal B.S, Higher Engineering Mathematics, Khanna Publications, 44<sup>th</sup> Edition, 2017.
2. Jain R. K., Iyengar S. R. K., Advanced Engineering Mathematics, 6<sup>th</sup> Edition, Narosa Publishing House, 2019.
3. Kreyszig. E, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, John Wiley & Sons. Singapore, 2015.
4. Bali N.P., Goyal M, Advanced Engineering Mathematics, Laxmi Publications, New Delhi, 2018.
5. Dass H. K., Advanced Engineering Mathematics, Sultan Chand Publication, Delhi, 2018.

ENGINEERING PHYSICS	
<b>Course Code:</b> 24AS102/24AS202	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 4	<b>End Semester Examination:</b> 60 Marks
<b>L T P : 3 1 0</b>	
<b>Prerequisite:</b> Nil	

### COURSE OBJECTIVES (COs)

1. To provide students with the knowledge of variety of important concepts of Physics and their applications in Engineering and Technology
2. To enhance the understanding of the concepts found in Mechanics, Harmonic Oscillations, wave Optics, Lasers, Fiber Optics.
3. To familiarize the quantum mechanical approach and its application in engineering.
4. To develop necessary understand on semiconductors and their applications in devices; Apply theory learnt to correlate with the environmental issues such as the use of solar cells

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. The student is expected to be familiar with broader areas of Physics such as mechanics of solids, optics, mechanical and electromagnetic waves oscillations and their relevance in Engineering.
2. An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to new innovations and improvements.
3. The student would be able to learn the fundamental concepts on Quantum behavior of matter in its micro state.
4. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure to semiconductor devices such as solar cell.

### MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES:

Course Objectives	CLO 1	CLO 2	CLO 3	CLO 4
CO1	✓		✓	
CO2	✓	✓		
CO3			✓	
CO4				✓

### COURSE CONTENTS

**Unit- 0:** Fundamentals: Newtonian mechanics, Moment of Inertia, Friction, Work-Power-Energy, Conservation Laws, Thermodynamic Laws, Electro-Magnetic Spectrum, Huygen wave theory, Intrinsic and Extrinsic semiconductors.

#### Unit-1: WAVES AND OSCILLATIONS:

Oscillations: Simple Harmonic Motion (SHM), Differential Equation of SHM and its Solutions, Conservation of Energy. Mass-string System. Damped Harmonic Oscillator-Overdamped, Critically Damped, Under Damped motions, Relaxation Time, Forced vibrations. Resonance & Quality Factor.

#### Unit-2 : ELECTROMAGNETIC THEORY AND FIBER OPTICS:

Mathematical Background: Gradient, Divergence, curl (Physical Significance), Irrotational & Solenoidal Field, Gauss Divergence and Stoke's Theorem, Maxwell's Equation in Integral & Differential forms.

Wave equation for Electromagnetic (EM) Waves-Propagation in free space, Characteristic Impedance, Poynting theorem (only definition). **Fiber optics:** Structure of optical Fiber, Principle of propagation and numerical aperture, acceptance angle and classification of optical fiber (single mode and multimode).

### **Unit-3: OPTICS AND LASER:**

Interference: Superposition Principle, Division of Amplitude-Interference in Thin Films, Application: Interference in Wedge shaped Film, Application: Newton's Ring. Diffraction: Fraunhofer Vs Fresnel Diffractions, Fraunhofer Diffraction in Single & Multiple slits/Grating, Resolving power & Dispersive power of grating and prism. Laser: Spontaneous and stimulated emission, Einstein's coefficients, Characteristics of laser, Ruby Laser.

### **Unit-4: STATISTICAL MECHANICS AND QUANTUM MECHANICS:**

Qualitative treatment of Maxwell-Boltzman, Fermi-Dirac and Bose-Einstein statistics, Black body problem, Photoelectric effect and Compton scattering (For concept), de Broglie Hypothesis of matter waves, de-Broglie waves-Phase & Group Velocities, Davison-Germer experiment, Uncertainty Principle, Application of Uncertainty Principle, Significance of Wave Functions, Postulates of Quantum Mechanics, Schrodinger equation-Time dependent and time independent equation Application: Particle in a box (1-D).

### **Unit-5 : SEMICONDUCTOR AND OPTOELECTRONIC DEVICES**

Fermi level in intrinsic and extrinsic semiconductors, Effect of temperature and carrier concentration (qualitative), Direct and indirect bandgap semiconductor, LED, Photodiode, LDR, Photovoltaic effect, and Solar Cell. Hall Effect: Hall coefficient and its applications.

### **TEXT BOOKS**

1. Beiser A, Concepts of Modern Physics, 5th Ed., McGraw Hill International, 2003.
2. AjoyGhatak, Optics, 5th Ed., Tata McGraw Hill, 2012.
3. David J. Griffiths, Introduction to Electrodynamics, Pearson Education Limited, London, 2015.
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
5. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
6. Engineering Mechanics (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill

### **REFERENCE BOOKS**

1. Arumugam, M., Engineering Physics, 2<sup>nd</sup> edition, Anuradha Publishers, KumbaKonam, 2003.
2. Gaur and Gupta, Engineering Physics, 7<sup>th</sup> edition, Dhandapani and Sons, New Delhi, 1997.
3. N. Subrahmanyam and Brij Lal, Waves and Oscillations.
4. David J. Griffiths, Introduction to Quantum Mechanics, Pearson Education Limited.

ENGINEERING CHEMISTRY	
Course Code: 24AS103 /24AS203	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. The knowledge of water quality parameters and the treatment of water.
2. Explain states of matter, phase diagram and related applications.
3. To learn various types of fuels and their properties, and to understand the basics of spectroscopy.
4. To understand the fundamental concepts of corrosion chemistry.
5. To learn an introductory idea about new materials.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand to identify the quality of water and how to improve the quality of water.
2. Explain states of matter, phase diagram, related applications and polymers.
3. Analyze the quantitative aspects of fuel combustion, spectroscopy
4. Explain the mechanism of corrosion.
5. Get preliminary understanding on introductory idea about nano materials.

### MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES:

COURSE LEARNING OUTCOME COURSE OBJECTIVES	CLO 01	CLO 02	CLO 03	CLO 04	CLO 05
CO 01	✓				
CO 02		✓			
CO 03			✓		
CO 04				✓	
CO 05					✓

### COURSE CONTENTS

#### Unit-0 : General Introduction: Importance and scope of Chemistry:

Atomic and molecular masses, mole concept and molar mass, percentage composition, redox reactions, Chemical and ionic equilibrium; Acid & bases.

#### Unit-1 : Water Technology :-

Reasons for hardness-units of hardness-determination of hardness and alkalinity-Water for steam generation-Boiler Troubles-Scale, Sludge formation, Boiler corrosion, Caustic Embrittlement-Internal

Treatments-Softening of Hard water- Ion Exchange process -Water for drinking purposes-Purification-Sterilization and disinfection: Chlorination, Reverse Osmosis and Electro Dialysis.

### **Unit-2: The Phase rule:**

Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system-water system, Condensed phase rule, Phase diagram of two component system-Eutectic, Pb-Ag system.

**Polymer:** Terminologies, Classification of polymer, Preparation of special polymer-Nylon 6, 6, Polyethylene, Polystyrene, Teflon, Polymethyl-methacrylate, Bakelite.

### **Unit-3 :Fuels:**

Classification of fuels, calorific value. G.C.V. and N.C.V., Solid fuels, Analysis of coal. Liquid fuels: Classification of petroleum, refining of petroleum, Cracking, Knocking and anti-knocking, cetane and octane numbers.

**UV Spectroscopy:** Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, effect of conjugation on chromophores.

### **Unit-4: Corrosion:**

Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting, metal coatings- Galvanizing and Timing, Corrosion inhibitors, protection.

### **Unit-5: New Materials:**

Introduction to nanomaterials, classification (0D, 1D, 2D) with examples, size dependent properties, Top-down and Bottom-up approaches of nanomaterial synthesis. Introductory idea on synthesis of nanomaterials via green synthetic route.

### **TEXT BOOKS**

1. Engineering Chemistry (NPTEL web-book) by B. L. Tembe, Kamaludddin and M. S. Krishan.
2. Fundamentals of Molecular Spectroscopy by Banwell, Tata McGraw Hill Education.
3. Textbook of nanoscience and Nanotechnology, McGraw Hill Education (India) Pvt. Ltd., 2012.
4. Engineering Chemistry by Jain and Jain, DhanpatRai Publication.
5. Engineering Chemistry by Prasanta Rath, Cenage Learning India Private Ltd., 2015.
6. A text book of Engineering Chemistry by Shashi Chawla, DhanpatRai& Co. 2020
7. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, Third Edition.
8. Molecular Spectroscopy, Ira N. Levine, John Wiley and Sons.

### **REFERENCE BOOKS**

1. Inorganic Chemistry by W. Overton, Rounk and Armstrong, Oxford Univesity Press, 6th edition.
2. Advanced Engineering Chemistry by M. R. Senapati, University Science Press, India.
3. A Text book of Engineering Chemistry by S.S. Dara, 10th Edition, S. Chand & Company Ltd., NewDelhi, 2003



<b>BASIC ELECTRICAL ENGINEERING</b>	
<b>Course Code:</b> 24EE101/24EE201	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 3	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 3 0 0	
<b>Prerequisite:</b> Nil	

### **COURSE OBJECTIVES (COs)**

The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electrical Engineering.

1. Students will gain knowledge regarding the various laws and principles associated with electrical systems.
2. Students will gain knowledge regarding electrical machines and apply them to practical problems.
3. Students will acquire knowledge in using the concepts in the field of electrical engineering.

### **COURSE LEARNING OUTCOMES (CLOs)**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of the course, students would be able to:

1. To explain the strong basics of electrical engineering and practical implementation of electrical fundamentals.
2. To identify different applications of commonly used electrical machinery.
3. To define various renewable resources available in the power generation.
4. To understand the basic concept of a poly-phase system.

### **Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)**

<b>Course Objectives</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO 3</b>	<b>CLO4</b>
CO1	✓			
CO2			✓	
CO3		✓	✓	✓

### **COURSE CONTENTS**

#### **Unit-1: DC CIRCUITS AND ELECTROMAGNETISM (8 Hrs.)**

Ohm's Law and Kirchhoff's Laws, Analysis of Series, parallel, and series-parallel circuits excited by independent voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem. Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF; Concepts of self-inductance, mutual inductance, and coefficient of coupling; Energy stored in magnetic fields

#### **Unit-2: Single Phase A.C. Circuits:**

Sinusoidal signal, instantaneous and peak values, RMS and average values, crest and peak factor, Concept of phase, representation-polar & rectangular, exponential and trigonometric forms, Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series-parallel circuits.

#### **Unit-3: Transformers:**

Principle of operation and construction of single-phase transformers (core and shell types). EMF equation, losses, efficiency, and voltage regulation.

**Poly-phase System:**

Advantages of 3-phase system, Generation of 3-phase voltages, Voltage, current, and power in a star and delta connected systems, 3-phase balanced and unbalanced circuits, Power measurement in 3-phase circuits.

**Unit-4: Three-Phase Induction Motors:**

Concept of rotating magnetic field; Principle of operation, types and constructional features, Slip and its significance; Applications of squirrel cage and slip ring motors; Necessity of a starter, star-delta starter.

**Unit-5: Renewable Sources:**

Sources of Electrical Power, Introduction to Wind, Solar, Fuel cell, Tidal, Geothermal, Hydroelectric, Thermal-steam, diesel, gas, nuclear power plants; Concept of cogeneration, and distributed generation, Introduction to Earthing

**TEXT BOOKS**

1. Fundamental of Electric Circuits by Charles K Alexander and Matthew N. O.Sadiku, TMH Publication.
2. Electrical Engineering Fundamentals by Vincent Del Toro, PHI Publication.
3. Basic Electrical Engineering by V N Mittal & Arvind Mittal, TMH Publication.
4. Basic Electrical Technology by A.E. Fitzgerald, McGraw Hill Publication.

**REFERENCE BOOKS**

1. Kothari D P and Nagrath I J, "Basic Electrical Engineering ", Tata McGraw Hill, 1991

<b>BASIC ELECTRONICS ENGINEERING</b>	
<b>Course Code:</b> 24EC101/24EC201	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 3	<b>End Semester Examination:</b> 60 Marks
<b>L T P : 3 0 0</b>	
<b>Prerequisite:</b> Nil	

### **COURSE OBJECTIVES (COs)**

1. To impart the knowledge of the passive and active electronic components
2. To understand the basic characteristics of Field Effect Transistors
3. To introduce the MOS devices
4. To gain knowledge of integrated circuit fabrication techniques
5. To introduce the digital logic gates and systems
6. To understand the principle of microprocessors

### **COURSE LEARNING OUTCOMES (CLOs)**

The syllabus has been prepared in alignment with National Education Policy (NEP). After completion of the course, students would be able to:

1. To learn the fundamental concepts of semiconductor devices
2. An ability to apply the concept of diode in clipper and clamper circuits
3. Acquire the skills of constructing the different transistor configurations
4. To learn the basic concepts of integrated circuits
5. To Compile the different building blocks in digital electronics using logic gates and implement simple logic functions using basic universal gates
6. To acquire the knowledge of microprocessors.

### **Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)**

<b>Course Objectives</b>	<b>CLO 1</b>	<b>CLO 2</b>	<b>CLO 3</b>	<b>CLO 4</b>	<b>CLO 5</b>	<b>CLO 6</b>
CO1	✓	✓				
CO2		✓	✓			
CO3			✓	✓		
CO4			✓	✓		
CO5					✓	
CO6						✓

### **COURSE CONTENTS**

**Unit – 1:** Semiconductor Diodes and Applications: p-n junction diode, Characteristics and Parameters, Half-wave rectifier, Full-wave rectifier, center tap and Bridge rectifier, and clipper, clamper, Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator and Numerical examples as applicable.

**Unit –2:** Bipolar Junction Transistor: Transistor Operation, Current Equation in n-p-n & amplifier; p-n-p transistors, CB, CE, CC Configurations and their Characteristics, Load line Analysis, BJT as Switch and amplifier, DC Biasing (Fixed bias and Voltage Divider), stability Factor.

**Unit –3:** Field Effect Transistor: JFET-types and their parameters, Operations, and their Characteristics, MOSFETs- types, Operations and their Characteristics, Secondary effects in MOSFET operation and

Numerical.

**Unit -4:** Introduction to Operational Amplifiers: Ideal OPAMP, Inverting, and Non-Inverting OPAMP circuits, OPAMP applications: voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable.

**Unit -5:** Digital Electronic Principles: Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic Logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic, Logic Gates, Boolean algebra and Combinational Logic Circuits: Boolean operations and expressions, Laws and Rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits, Standard forms of Boolean expressions, Boolean expression and truth table. Basic combinational logic circuits, Implementation of combinational logic, the universal properties of NAND and NOR gates, Half Adder adders, and full Adder.

### **TEXT BOOKS**

1. Electronic Devices and Circuit Theory - by Rober L. Boylestad 11th Edition, Pearson Publication, 2014
2. Digital Design by M. Morris Mano, 5th Edition, Pearson Publication, 2016
3. Floyd T.L., Buchla D.L., "Electronics Fundamentals: Circuits, Devices and Applications", 8th 2010 Edition
4. Stallings, W., "Computer Organization and Architecture", 5th Ed., 2001 Pearson Education

### **REFERENCE BOOKS**

1. Millman J., Halkias C.C., Jit S., "Electronic Devices and Circuits", Tata McGraw-Hill, 2nd 2007 Edition
2. Muthusubramanian.R, Salivahanan.S, Muraleedharan.K.A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw - Hill, 1999.
3. Microelectronic Circuits by A. S. Sedra and Kenneth C. Smith 7th Edition, Oxford University Press. 2017

ENGINEERING MECHANICS	
Course Code: 23ME101/23ME201	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
L T P : 3 0 0	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. To familiarize students with basic concepts of force and moments in equilibrium.
2. To impart students with the knowledge of mechanics for structural analysis.
3. To familiarize students with the centroids and MOI.
4. To make students aware of rigid body kinetics and kinematics.
5. To acquaint students with mechanics of deformable bodies.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in alignment with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the concepts of force and moments in equilibrium.
2. Apply principles of mechanics to real engineering problems.
3. Understand the basics of Centroids and MOI.
4. Grasp the elements of rigid body kinematics and kinetics.
5. Understand the mechanics of deformable bodies.

### Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)

Course Objectives	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓

### COURSE CONTENTS

#### UNIT-I FORCE SYSTEMS:

- Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors.
- Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces
- Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem
- Couple, Vector representation, Resolution of a force into a force and a couple.
- Force Systems: Coplanar Concurrent Force system and Coplanar Non-Concurrent force systems, Resultant of coplanar force system.
- Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.

#### FRICITION:

- Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.

## **UNIT –II: BASIC STRUCTURAL ANALYSIS**

- Plane Truss, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss, Method of joints, Method of section, Zero force members.

## **UNIT –III- CENTROID AND MOMENT OF INERTIA:**

- Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies.
- Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas.
- Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.

## **UNIT –IV- KINEMATICS OF RIGID BODY:**

- Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity

## **UNIT- V - KINETICS OF RIGID BODY:**

- Introduction, Force, Mass and Acceleration, Newton's law of motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion.
- Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy,
- Linear Impulse and Momentum, Conservation of linear momentum.

## **TEXT BOOKS**

1. Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
2. Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
3. Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
4. Engineering Mechanics " , Bhavikatti , New Age

<b>FUNDAMENTALS OF COMPUTER &amp; C PROGRAMMING</b>	
<b>Course Code:</b> 23CS101/23CS201	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 3	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 3 0 0	
<b>Prerequisite:</b> Nil	

### **COURSE OBJECTIVES (COs)**

1. To familiarize and understand the basic concepts of digital computers and computer programming.
2. To impart adequate knowledge on the need of programming languages and problem solving techniques.
3. To analyse and construct effective algorithms.
4. To develop problem solving ability using programming.
5. To employ good programming practices such as incremental development, data integrity checking and adherence to style guidelines.

### **COURSE LEARNING OUTCOMES (CLOs)**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the fundamental concepts of computers, both hardware and software.
2. Learn and understand the major system software's that help in developing of an application.
3. Apply and analyse the basic programming constructs in context of C programming language.
4. Analyse and evaluate the derived datatypes (array) and the operations that can be performed on them, along with the concept of modularity through functions
5. Create and manipulate a database or data storage through files.
6. Learn a programming approach to solve problems.

### **Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)**

<b>Course Objectives</b>	<b>CLO 1</b>	<b>CLO 2</b>	<b>CLO 3</b>	<b>CLO 4</b>	<b>CLO5</b>	<b>CLO6</b>
C01	✓	✓				
C02		✓	✓			
C03			✓	✓		
C04					✓	
C05						✓

### **COURSE CONTENTS**

#### **UNIT-1: INTRODUCTION OF COMPUTER SYSTEM**

Anatomy of a digital Computer, Different Units of Computer, System, Hardware & Software, Classification of Computer Systems, Number systems, Operating System: Definition, working & its functions, Basic concepts of Computer Networks, Network Topologies.

#### **UNIT-2: INTRODUCTION TO SYSTEM SOFTWARE**

Programming language- Definition, types; Syntax & Semantics, Type of programming errors, Assembler, Linker, Loader, Compiler, Interpreter, debuggers, Algorithms, flowcharts and their symbols.

#### **UNIT-3 : BASICS OF 'C' LANGUAGE**

C Fundamentals, Basic data types, variables and scope, operators and expressions, formatted input/output, expressions, selection statements, loops and their applications.

#### **UNIT-4: ARRAY & FUNCTION**

Arrays, functions, recursive functions, pointers and arrays. Strings literals, arrays of strings; applications. Storage Classes and Pre-processor Directives.

#### **UNIT-5 : STRUCTURE & FILE SYSTEM**

Structures, Declaring a Structure, Accessing Structure Elements, Storing Structure elements, Array of Structures, Unions and Enumerations.

File Input/Output, Data Organization, File Operations, Opening a File, Reading from a File, Closing the File, Writing to a File, File Opening Modes.

#### **TEXT BOOKS**

1. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
2. Computer System & Programming in C by S Kumar & S Jain, Nano Edge Publications, Meerut.
3. Fundamentals of Computing and C Programming, R. B. Patel, Khanna Publications, 2010, New Delhi.
4. Let Us C, Yashwant Kanetkar, 14th Edition, BPB Publications.
5. Computer Fundamentals and Programming in C, Reema Theraja, Oxford

#### **REFERENCE BOOKS**

1. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH.
2. Theory and problem of programming with C, Byron C Gottfried, TMH.



ENGINEERING PHYSICS LAB	
Course Code: 24AS152/24AS252	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES

1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory
2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Use the different measuring devices and meters to record the data with precision
2. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
3. Apply the mathematical concepts/equations to obtain quantitative results

### MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES:

Course Objectives	CLO 1	CLO 2	CLO 3
C01	x	x	
C02		x	
C03			x

### LIST OF EXPERIMENTS

(Students are required to complete/perform any 10 experiments from the list below)

**Experiment 1:** To determine the moment of inertia of the disc and rigidity modulus of the wire by torsional pendulum.

**Experiment 2:** To determine the wavelength of sodium light by Newton's ring experiment.

**Experiment 3:** To determine the wavelength of the given laser source using standard grating.

**Experiment 4:** To determine the attenuation, numerical aperture and acceptance angle of the given optical fiber.

**Experiment 5:** To study the resonance characteristics of LCR series circuit.

**Experiment 6:** To determine Planck's constant.

**Experiment 7:** To study the I-V characteristics of a PN junction diode. **Experiment**

**8:** To determine the energy band gap by four-probe method.

**Experiment 9:** To determine the Hall coefficient of the given n-type or p-type semiconductor.

**Experiment 10:** To study the solar cell characteristic.

**Experiment 11:** To determine the dispersive power of a given prism.

**Experiment 12:** To determine the width of a single slit by diffraction.

**Experiment 13:** To study the characteristic of LDR and finding the dark resistance.

**Experiment 14:** To determine the acceleration due to gravity by bar pendulum.

**Experiment 15:** To verify the laws of vibration of string using sonometer.

**Experiment 16:** To study the resonance characteristics of LCR parallel circuit

### **TEXT BOOKS**

1. Chattopadhyay, D., Rakshit, P. C and Saha, B., "An advanced Course in Practical Physics", 2<sup>nd</sup> edition, Books & Allied Ltd, Calcutta, 1990.
2. Chauhan and Singh, "Advanced practical physics", Revised edition, Pragati Prakashan Meerut, 1985.

### **REFERENCE BOOKS**

1. Thiruvadigal. J. D., Ponnusamy S. Vasuhi, P. S. and Kumar. C, "Hand Book of Practical physics", 5<sup>th</sup> edition, Vibrant Publication, Chennai, 2007.
2. Engineering Practical Physics, by S. Panigrahi and B. Mallick, (CENGAG ELearning).

ENGINEERING CHEMISTRY LAB	
<b>Course Code:</b> 24AS153/24AS253	<b>Continuous Evaluation:</b> 60 Marks
<b>Credits:</b> 1	<b>End Semester Examination:</b> 40 Marks
<b>L T P :</b> 0 0 2	
<b>Prerequisite:</b> Nil	

### LIST OF EXPERIMENTS

(A Student is supposed to complete/perform minimum 8-10 of experiments)

1. Determination of total hardness of water by EDTA method.
2. Determination of dissolved oxygen in a sample of water.
3. Determination of percentage of available chlorine in a sample of bleaching powder.
4. Standardization of  $\text{KMnO}_4$  using sodium oxalate. Determination of ferrous iron in Mohr's salt by potassium permanganate.
5. Determination of Viscosity of addition polymer by Ostwald Viscometer.
6. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
7. Estimation of calcium in limestone.
8. Acid-Base Titration by Potentiometry.
9. Preparation of Silver/Iron nano particles.
10. Preparation of Bakelite.
11. Preparation of Urea formaldehyde resin.
12. To record UV-Spectrum of  $\text{KMnO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$ .
13. Estimation of nickel in given sample solution
14. Estimation of nitrite in given sample solution.

BASIC ELECTRICAL ENGINEERING LAB	
Course Code: 23EE151/23EE251	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (CO)

1. To impart basic knowledge of electrical quantities such as current, voltage, power, energy etc.
2. To familiarize students with basic circuit components and their connections.
3. To explain working principle of transformer and electrical measuring instruments such as ammeter, voltmeter, wattmeter, energy meter, digital storage oscilloscope etc.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in alignment with National Education Policy (NEP). After completion of course, students would be able to:

1. Verify fundamental laws like Ohm's Law, KCL, KVL, etc.
2. Understand the calibration of energy meter.
3. Understand open circuit and short circuit test of single-phase transformer.
4. Analyse RLC series and parallel circuits

### Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)

SEM	SUB CODE	Course name	Course Objectives	CLO 1	CLO 2	CLO 3	CLO 4
I/II	23EE151/251	Basic Electrical Engineering Lab	CO1	x	x		x
			CO2	x			x
			CO3	x	x	x	x

### COURSE CONTENTS

#### LIST OF EXPERIMENTS

(A Student is supposed to complete/perform minimum **10** experiments)

1. To verify Kirchhoff's voltage and Current Laws
2. To verify Superposition Theorem
3. To verify Thevenin's Theorem
4. To verify Maximum Power Transfer Theorem
5. To verify Norton's Theorem
6. To measure power and power factor in single phase AC circuit.
7. To verify Series and parallel RLC circuit
8. To conduct open circuit and short circuit test on a single-phase transformer
9. To perform Load test on single phase transformer
10. Calibration of Single Phase & Three Phase Energy Meter
11. To study Digital Storage Oscilloscope
12. To study the balanced three phase system for star and delta connected load
13. To study about earthing and their types.

#### TEXT BOOKS

1. Handbook of Laboratory Experiments in Electronics and Electrical Engineering by A M Zungeru, J M Chuma, H U Ezea
2. Electrical Measurements & Measuring Instruments by E.W. Golding & F.C. Widdis

3. Electronic Measurement & Instrumentation by H.S. Kalsi
4. Electrical & Electronic Measurement & Instrumentation by A.K. Sawhney ,E. Fitzgerald, C. Kingsley and S. Umans, Electric Machinery, McGraw-Hill Co. Inc.
5. D. P. Kothari and I. J. Nagrath, Electrical Machines, Tata McGraw-Hill.

**REFERENCE BOOKS**

1. M.G. Say, Alternating Current Machines, Pitman Publishing.
2. Alexander S. Langsdorf, Theory of Alternating Current Machinery, Tata McGraw-Hill.

BASIC ELECTRONICS ENGINEERING LAB	
Course Code: 24EC151/24EC251	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. To study the different types of electronic components and equipment
2. To observe the characteristics of electronic devices
3. To acquire the basic knowledge of digital logic levels and application of knowledge

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in alignment with National Education Policy (NEP). After completion of the course, students would be able to:

1. Measure the voltage, frequency, and phase of any waveform using CRO.
2. Generate sine, square, and triangular waveforms with required frequency and amplitude using function generator.
3. Analyze the characteristics of different electronic devices such as diodes, transistors, and operational amplifiers
4. To develop skills to build and verify digital circuits.

### Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)

SEM	SUB CODE	Course name	Course Objectives	CLO 1	CLO 2	CLO 3	CLO 4
I/II	24EC151/251	Basic	CO1	x	x		
		Electronics	CO2			x	
		Engineering Lab	CO3				x

### LIST OF EXPERIMENTS

1. (a). To study active and passive electronic components and function generators.  
(b). To study the Digital Cathode Ray Oscilloscope (CRO) and operation of multi-meters.
2. Study of the V-I characteristics of P-N junction diode & Calculate DC & AC resistance.
3. Study of the V-I characteristics of Zener diode.
4. Construction of half-wave rectifier (with & without filter) and calculation of efficiency and ripple factor.
5. Construction of full wave rectifier circuits (with & without filter) and calculation of efficiency and ripple factor.
6. Design of inverting amplifiers using Op-Amp for a given gain with the help of a breadboard and distinct components.
7. Design of non-inverting amplifiers using Op-Amp for a given gain with the help of breadboard and distinct components.
8. Design of summer amplifiers using Op-Amp for a given gain with the help of a breadboard and distinct components.

9. Study of the input and output characteristics of Transistor.
10. Study and realization of digital logic gates with truth table verification

#### **TEXT BOOKS**

1. "Electronics Lab Manual", K.A. Navas ,Volume 1, Fifth Edition. 2015 by PHI Learning Private Limited, Delhi.

#### **REFERENCE BOOKS**

1. Electronic Devices and Circuit Theory - by Rober L. Boylestad 11th Edition, Pearson Publication, 2014
2. Millman J., Halkias C.C., Jit S., "Electronic Devices and Circuits", Tata McGraw-Hill, 2nd 2007 Edition

BASIC MECHANICAL ENGINEERING LAB	
Course Code: 23ME151/23ME251	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. To acquaint students with the laws of parallelogram and equilibrium of forces acting on an object.
2. To make students understand the concepts and principles of friction.
3. To apply engineering sciences through learning-by-doing project work.
4. To provide a framework to encourage creativity and innovation. To develop team work and communication skills through group-based activity.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP).

After completion of course, students would be able to demonstrate:

1. The principle of equilibrium of forces and parallelogram.
2. The effects of friction on the motion.
3. The working and application of engineering components.
4. Develop group working, including task sub-division and integration of individual contributions from the team.

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES	COURSE LEARNING OUTCOMES			
	CLO1	CLO2	CLO3	CLO4
CO1			✓	
CO2	✓			
CO3				✓
CO4		✓		

### LIST OF EXPERIMENTS

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To find reaction at the supports of a simply supported beam with different types of loading using Computation method.
4. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
5. To study functioning of belt pulley systems.
6. To find the coefficient of friction between belt and pulley using belt pulley system.
7. To find forces in members of a truss for different load conditions.
8. To determine the mass moment of inertia of a rotating disc
9. To find center of gravity of different geometrical objects using computation method.
10. To verify the law of conservation of energy.



11. Demonstration for centrifugal forces.
12. Engineering Design Project- Students in groups of 4/5 will do a project related to the course.

**Note:** At least **8 experiments** must be carried out.

#### **TEXT BOOKS**

1. Laboratory Manual

#### **REFERENCE BOOKS**

1. Strength of Materials. Timoshenko & Young
2. Engineering Mechanics: Statics and Dynamics, R. C. Hibbler, Pearson
3. Mechanics of Solids, A. Mubeen, Pearson

C PROGRAMMING LAB	
Course Code: 23CS151/23CS251	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. To develop problem solving ability using programming.
2. To impart adequate knowledge on the need of programming languages and problem solving techniques.
3. To develop a methodological way of problem solving
4. To learn a programming approach to solve problems.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in alignment with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the Typical C Program Development Environment, compiling, debugging, Linking and executing.
2. Introduction to C Programming using Control Statements and Repetition Statement
3. Apply and practice logical formulations to solve some simple problems leading to specific applications.
4. Design effectively the required programming components that efficiently solve computing problems in real world.
5. Employ good programming practices such as incremental development, data integrity checking and adherence to style guidelines.

### Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)

SEM	SUB CODE	Course name	Course Objectives	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
I/II	23CS151/ 251	C Programming Lab	CO1	x				
			CO2		x	x		
			CO3				x	
			CO4					x

### LIST OF EXPERIMENTS

1. Write a program to find the largest of three numbers. (if-then-else)
2. Write a program to find the largest number out of ten numbers (for-statement)
3. Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
4. Write a program to find roots of quadratic equation using functions and switch statements.
5. Write a program using arrays to find the largest and second largest no. out of given 50 nos.
6. Write a program to multiply two matrices.
7. Write a program to sort numbers using the sorting Algorithm.
8. Represent a deck of playing cards using arrays.
9. Write a program to check that the input string is a palindrome or not.
10. Write a program to read a string and write it in reverse order.
11. Write a program to concatenate two strings.
12. Write a program which manipulates structures (write, read, and update records).
13. Write a program which creates a file and writes into it supplied input.

Write a program which manipulates structures into files (write, read, and update records).

**Note: At least 5 to 10 more exercises to be given by the teacher concerned.**

**TEXT BOOKS**

1. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
2. Computer System & Programming in C by S Kumar & S Jain, Nano Edge Publications, Meerut.
3. Fundamentals of Computing and C Programming, R. B. Patel, Khanna Publications, 2010, New Delhi.

**REFERENCE BOOKS**

- Let Us C, Yashwant Kanetkar, 14th Edition, BPB Publications.
- Computer Fundamentals and Programming in C, Reema Theraja, Oxford
- Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH.

MECHANICAL WORKSHOP LAB	
Course Code: 23ME152/23ME252	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. Study and practice on machine tools and their operations.
2. Practice on manufacturing of components using workshop trades including fitting,
3. To study basics of carpentry, foundry and welding.
4. Identify and apply suitable tools for machining processes including turning, facing.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Use different manufacturing (Fitting, carpentry, sheet metal, welding, smithy working etc.) processes required to manufacture a product from the raw materials.
2. Use different measuring, marking, cutting tools used in the workshop.
3. Be aware of the safety precautions while working in the workshop.

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES	COURSE LEARNING OUTCOMES		
	CLO1	CLO2	CLO3
CO1	✓	✓	✓
CO2	✓	✓	✓
CO3	✓	✓	
CO4			✓

### LIST OF EXPERIMENTS

#### Fitting Practice:

Use of hand tools in fitting, preparing a male and female joint of M.S. or making a paperweight of M.S.

#### Carpentry Practice:

Study of Carpentry Tools, Equipment and different joints.

Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

#### Smithy

Tools and Equipments –Simple exercises base on smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging, Making simple parts like hexagonal headed bolt, chisel

#### Welding Practice (Basic Theory to be explained prior to practice):

Gas Welding & Electric Arc welding Practice.

A joint such as a Lap joint, a T-joint or a Butt joint is to be prepared or to make furniture.

#### Machining (Basic Theory to be explained prior to practice):

(i) Stepped cylindrical Turning of a job and Thread-cutting in lathe. (ii) Shaping (iii) Milling

### TEXT BOOKS

1. Laboratory Manual
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice –Theory, practice and workbook", Suma Publications, 2005

**REFERENCE BOOKS**

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

ENGINEERING GRAPHICS & DESIGN LAB	
Course Code: 23ME153/23ME253	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. Draw orthographic projections of lines, planes and solids.
2. Construct isometric scale, isometric projections and views.
3. Draw sections of solids including cylinders, cones, prisms and pyramids.
4. Draw projections of lines, planes, solids, isometric projections

### COURSE LEARNING OUTCOMES (CLOs)

Once the course is completed, the students will be able to

1. Understand orthographic projections of points and lines in any position through AutoCAD.
2. Imagine and convert isometric view into orthographic projections and vice versa.
3. Should be able to understand the simple machine components and draw its projections
4. Familiarize with projections of lines, planes, solids, isometric projections.

### Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLO)

SEM	SUB CODE	Course name	Course Objectives	CLO 1	CLO 2	CLO 3	CLO4
I/II	23ME153/252	Engineering Graphics & Design Lab	CO1	x			
			CO2		x		
			CO3			x	
			CO4				x

### COURSE CONTENTS:

S.No	LIST OF EXPERIMENTS
1	<b>Introduction: Auto CAD</b> Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning Line Conventions layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Coordinate points, axes, poly lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. 2 – Sheets
2	<b>Orthographic Projections:</b> Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes. 2 – Sheets
3	<b>Orthographic Projections of Plane Surfaces (First Angle Projection Only):</b> Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method, <b>only 1-Sheet</b>
4	<b>Projections of Solids (First Angle Projection Only):</b> Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. 2-Sheets

5	<b>Sections and Development of Lateral Surfaces of Solids</b> Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. 2 – Sheet
6	<b>Isometric Projection (Using Isometric Scale Only):</b> Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. 2-Sheets

#### TEXT BOOKS:

- 1.Engineering Drawing - N.D. Bhatt & V.M. Panchal, Charotar Publishing House,Gujarat.
- 2.Computer Aided Engineering Drawing - S. Trymbaka Murthy, 4th Ed, University Press
- 3.Engineering Drawing by N.S.Parthasarathy and Vela Murali Oxford University Press

#### REFERENCE BOOKS

1. Engineering Graphics - K.R. Gopalakrishna, Subash Publishers Bangalore.
2. Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Computer Aided Engineering drawing, Prof. M. H. Annaiah, New Age International Publisher, New Delhi

#### REFERENCE BOOKS

- a. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.
- b. Communication skill by Sanjay Kumar & Puspa Lata, Oxford University Press 2nd Edition.
- c. Business Communication Today by Courtland L Bovee and Thill, Pearson.

## SEMESTER II

ENGINEERING MATHEMATICS-II (COMMON TO ALL BRANCHES EXCEPT BIO MEDICAL ENGINEERING)	
Course Code: 24AS201	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	
Prerequisite: Engineering Mathematics-I	

### COURSE OBJECTIVES (COs):

1. To enable students to have skills that will help them to solve real-world problems based on different types differential equations.
2. To familiarise the students for the Special function-Series Solutions, Bessel's & Legendre's Differential Equations and their properties.
3. To describe Laplace and inverse Laplace transforms with their properties.
4. To understand Analytic functions, Construction of Analytic Functions and Conformal Mapping.
5. To equip the students with concept of Complex Integration, Tayler's and Laurent's Expansions, Residues and Singularities.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate various physical models through higher order differential equation and solve such linear ordinary differential equation.
2. Obtain series solution of differential equation and explain applications of Bessel's and Legendre's Differential Equations.
3. Apply Laplace transforms to find the solution of initial value and boundary value problems.
4. Demonstrate the concept of Analytic functions & its constructions, Conformal Mapping
5. Evaluate Complex Integration, Taylor's and Laurent's Expansion, Singularities and Residues.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CLO \ CO	CLO-01	CLO-02	CLO-03	CLO-04	CLO-05
CO-01	✓				
CO-02		✓			
CO-03			✓		
CO-04				✓	
CO-05					✓

### COURSE CONTENTS

#### Unit-1: Linear Differential Equations

Linear differential equation with constant Coefficient , Complimentary Functions, Particular Integrals,



Euler – Cauchy differential equations, Second order linear differential equations –One part of CF is known, Reduction to Normal form, Variation of Parameters & Method of undetermined coefficient.

### **Unit-2: Series Solutions**

Power series method, validity of series method, Frobenius Method. Bessel's Equation, Bessel's function, Generating Function, Recurrence Relations, Orthogonal properties of Bessel's functions, Transformation of Bessel's Equation., Legendre's Equation, Legendre Polynomials, Generating Function, Recurrence Relations, Rodrigue's formula, Orthogonal properties of Legendre's polynomials.

### **Unit-3: Laplace Transforms**

Laplace Transforms, Existence theorem, Standard Properties, Laplace transforms of Derivatives and Integrals, Unit Step Function, Laplace Transform of Periodic functions, Inverse Laplace Transforms, Convolution theorem, Simple Applications of Laplace transforms for solving IVP.

### **Unit-4: Complex Variable - I**

Introduction, Limit, continuity, Differentiability and Analyticity of functions, Cauchy-Riemann Equations (Cartesian and polar), Harmonic functions, Construction of Analytic Function, Determination of Harmonic conjugate, Milne-Thomson's method.

### **Unit-5: Complex Variable - II**

Line integral, Cauchy's Integral Theorem, Cauchy's Integral Formula, Cauchy's Integral Formula for Derivatives, Cauchy's Inequality, Taylor's and Laurent's Expansions (statements only), Singularities, Poles and Residues, Cauchy's residue Theorem and Simple Applications.

### **TEXT BOOKS/REFERENCE BOOKS**

1. Grewal B.S, Higher Engineering Mathematics, Khanna Publications, 44th Edition, 2017
2. J.W. Brown and R.V. Churchill, Complex Variables and Applications, McGraw Hill, edition, 2013.
3. E. Kreyszig, Advanced Engineering Mathematics, Wiley-India, 10th Edition, 2017
4. Kandasamy P et al. Engineering Mathematics, S. Chand & Co., New Delhi, revised edition.
5. Dass H. K., Advanced engineering Mathematics, Sultan Chand Publication, Delhi, 2013.

ELEMENTARY MATHEMATICS-II (For BME only)	
Course Code:24AS204	Continuous Evaluation: 40 Marks
Credits: 4	End Semester Examination: 60 Marks
L T P : 3 1 0	
Prerequisite: Elementary Mathematics-I	

### COURSE OBJECTIVES (COs)

1. To introduce the concept of Differentiation of several variables.
2. To introduce the concept of Vector Calculus, Gradient, Divergence and Curl.
3. To introduce the concept of Second order differential equations and their applications.
4. To get the knowledge that illustrate the complex numbers.
5. To familiarize with the concept of complex variables.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Develop the essential tool of differentiation of several variables.
2. Apply the knowledge of vector calculus in real life applications.
3. Apply the knowledge of Second order differential equations in solving simple problems.
4. Understand the complex number system and their uses.
5. Apply the knowledge to construct analytic functions.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CO \ CLO	CLO-01	CLO-02	CLO-03	CLO-04	CLO-05
CO-01	✓				
CO-02		✓			
CO-03			✓		
CO-04				✓	
CO-05					✓

### COURSE CONTENTS

#### Unit-1: Complex Numbers

Complex numbers and their properties, Complex plane, Polar form of complex numbers, Powers and Roots, Sets of Points in the Complex plane, De-Moivre's theorem and its simple applications.

#### Unit-2: Successive Differentiation

Successive differentiation,  $n^{\text{th}}$  order derivatives of standard functions, Leibnitz theorem (without proof).

**Unit-3: Differential Calculus of Several Variables**

Introduction, Limit & Continuity, Partial derivatives, Homogeneous functions and Euler's theorem, Total derivatives, Jacobians, Properties of Jacobians.

**Unit-4: Vector Calculus**

Introduction, Scalar and vector point functions, differentiation formulae, Level surface, Gradient, Divergence, Curl, Directional derivatives, Simple Applications.

**Unit-5: Linear Differential Equations**

Linear differential equation with constant Coefficient, Complimentary Functions, Particular Integrals, Euler – Cauchy differential equations, Second order linear differential equations – Variation of Parameters & Method of undetermined coefficient.

**TEXT BOOKS/ REFERENCE BOOKS**

1. Grewal B.S, Higher Engineering Mathematics, Khanna Publications, 44<sup>th</sup> Edition, 2017.
2. Jain R. K., Iyengar S. R. K., "Advanced Engineering Mathematics", 6<sup>th</sup> Edition, Narosa Publishing House, 2019.
3. Bali N.P., Goyal M, Advanced Engineering Mathematics, Laxmi Publications, New, Delhi.2018.
4. Dass H. K., Advanced Engineering Mathematics, Sultan Chand Publication, Delhi, 2018.

## SEMESTER – III

ENGINEERING MATHEMATICS – III	
Course Code: 23AS301	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVE

To familiarize the students with partial differential equations and their solution, Boundary value problem, Fourier transforms, z- transforms and basic concepts of Linear algebra.

To solve boundary value problems, Heat and Wave equations.

To gain good knowledge in the application of Fourier transform.

To demonstrate understanding Z-transform and analyzing Discrete signals by using Z-transform.

To understand Vector spaces, and Linear Transformation with its properties.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Solve different types of partial differential equations.

Find solutions of boundary value problems including heat and wave equations.

Apply and analyze Fourier transforms with different applications.

Evaluate the problems using z-transforms.

Understand linear algebra and its application to Engineering.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CO \ CLO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>	<b>CLO5</b>
<b>CO1</b>	✓				
<b>CO2</b>		✓			
<b>CO3</b>			✓		
<b>CO4</b>				✓	
<b>CO5</b>					✓

### COURSE CONYENTS

UNIT NUMBER	CONTENTS
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<b>UNIT-I</b>	Formation of partial differential equation by eliminating arbitrary constants and arbitrary functions. Formation of partial differential equation by eliminating arbitrary functions of the form $\phi(u, v) = 0$ . Solution of standard types of first order equations. Solution of standard types of first order equations. Lagrange's linear equation of first order. Linear Homogeneous partial differential equations of second and higher order with constant coefficients. Formation - Solution of standard types of first order equations - Lagrange's equation - Linear homogeneous partial differential and second and higher order with constant coefficients.
<b>UNIT-II</b>	Classification of partial differential equations. Method of separation of variables. One dimensional Wave Equation and its possible solutions. Initial and Boundary value Problems with zero velocity – related problems and Non-zero velocity- related problems. One dimensional heat equation and its possible solutions. Steady state conditions and zero boundary conditions related problems. Introduction to two dimensional heat equation and its possible solutions in steady state. Two dimensional heat equation - Steady state heat flow equation
<b>UNIT-III</b>	Fourier Transforms- Elementary properties of Fourier transforms. Fourier Transforms and related problems- Fast Fourier Transform. Fourier Sine Transforms and their properties-problems. Fourier Cosine Transforms and their properties-problems. Convolution Theorem (without proof)-applications. Parseval's Identity (without proof)-applications.
<b>UNIT-IV</b>	Z Transforms: Definition and properties of Z- Transforms, Inverse Z- Transforms, and Application of Z- Transforms to difference equations.
<b>UNIT-V</b>	Vectors in two dimensional space and n-dimensional space, Vectors addition and scalar multiplication of Vectors, Vector Spaces: Definition and Examples General properties of vector spaces, Linear combination of Vectors, Linear independence and Linear dependence of Vectors. Linear transformations, linear operators, Properties of Linear Transformation, Algebra of Linear transformation, Matrix Representation of linear transformation, Linear map Associated with Linear Transformation.

#### TEXT BOOKS

E. Kreyszig, Advanced Engineering Mathematics, Wiley-India, 10th Edition, 2017.

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

Gilbert Strang, Introduction to Linear Algebra, Fifth Edition (2016)

#### REFERENCE BOOKS

R.V. Churchill and J. Brown.: "Fourier Series and Boundary Value Problems" McGraw-Hill Book Company 8th edition-2017.

M.D. Raisinghania: "Advanced Differential Equations" S. Chand Publishing 2018

Loknath Debnath, Integral Transforms and their applications, Chapman and Hall/CRC; 2

DATA STRUCTURES	
Course Code: 24CS2001	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	
edition, 2014	

### COURSE OBJECTIVE

1. To understand the concepts of ADTs.
2. To Learn linear data structures – lists, stacks, and queues.
3. To understand non-linear data structures – trees and graphs.
4. To understand sorting, searching and hashing algorithms.
5. To apply Tree and Graph structures.

### COURSE LEARNING OUTCOMES (CLO's)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Define linear and non-linear data structures.
2. Implement linear and non-linear data structure operations.
3. Use appropriate linear/non-linear data structure operations for solving a given problem.
4. Apply appropriate graph algorithms for graph applications.
5. Analyze the various searching and sorting algorithms.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CL01	CL02	CL03	CL04	CL05
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>LISTS</b> Introduction to data structure - Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial ADT – Radix Sort – Multilists.
UNIT-II	<b>STACKS AND QUEUES</b> Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues.
UNIT-III	<b>TREES</b> Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Priority Queue (Heaps) – Binary Heap.
UNIT-IV	<b>MULTIWAY SEARCH TREES AND GRAPHS</b> B-Tree – B+ Tree – Graph Definition – Representation of Graphs – Types of Graph - Breadth-first traversal – Depth-first traversal -- Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm.
UNIT-V	<b>SEARCHING, SORTING AND HASHING TECHNIQUES</b> Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing –Rehashing – Extendible Hashing.

#### TEXT BOOKS

- Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2005.
- Kamthane, Introduction to Data Structures in C, 1st Edition, Pearson Education, 2007.

#### REFERENCE BOOKS

- Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.
- Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022.
- Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft ,Data Structures and Algorithms, 1st edition, Pearson, 2002.
- Kruse, Data Structures and Program Design in C, 2nd Edition, Pearson Education, 2006.

DATABASE MANAGEMENT SYSTEMS	
Course Code: 23CS2005	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

COURSE OBJECTIVE
Understand the basic concepts and the applications of database systems.
Master the basics of SQL and construct queries using SQL.
Understand the relational database design principles.
Familiar with the basic issues of transaction processing and concurrency control.
Understand the several database concepts like Object Database, Distributed Database, Mobile Database, Temporal Database.

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the Information Systems as socio-technical systems, its need and advantages as compared to traditional file based systems.
Design the database schema with the use of appropriate data types for storage of data in database
Apply relational database theory and be able to describe relational algebra expression, tuple and domain relation expression for queries.
Apply and create Relational Database Design process with Normalization and Denormalization of data. Also, formulate SQL queries on the respect data into RDBMS and on the data.
To understand and apply the concept of transaction, concurrency control and recovery in database.
Understand the some current advance trends including Object DBMS, Distributed Database, Mobile database, Data Warehousing and Data Mining.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO \ CO</b>	CL01	CL02	CL03	CL04	CL05	CL06
CO1	✓	✓				
CO2			✓			
CO3				✓		
CO4					✓	
CO5						✓

#### COURSE CONTENTS



UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION</b> DBMS, Structure Advantages & disadvantages, Models: -Data, Network, Hierarchical, Relational Model, Levels of abstraction, Data Independence, Instances and schemes, Data independence Application Programmers & Data Base administrators – their function, Entity Relationship Model: Entities, Attributes and Entity Sets, Relation and Relationships sets, mapping and participation constraints, Aggregation, Specialization and Generalization.
UNIT-II	<b>E-R MODEL</b> Relational Model: Features, Integrity constraints over relations, Enforcing Data Integrity, Integrity Constraints, Relational Data, Logical Data Base Design, E-R diagram Symbols, Reduction of E-R Diagrams to relations, Keys. Relational Algebra and Relational Calculus, Operations on Relational Algebra, Operations on Relational Calculus.
UNIT-III	<b>NORMALIZATION</b> Database Design, Data Redundancy, Introduction to Schema Refinement, Functional Dependencies, Normal Forms <b>SQL</b> Structured Query Language: Basic SQL Queries, Nested Queries, Aggregate operator, Null Values, implementation of Various Relational Algebra operations, Embedded SQL
UNIT-IV	<b>TRANSACTIONS &amp; RECOVERY</b> Transaction management: ACID Properties, Transaction states, Concurrency control: Concurrency Control –Overview, Concurrency control problems, Locks, Locking Protocols, Deadlocks, Serializability, Recovery System: Types of Failures, Recovery Techniques.
UNIT-V	<b>CURRENT TRENDS</b> Object DBMS- Distributed Database- Parallel Database- Mobile database- Geographic Information system-Multimedia Database- Temporal Database- Data Warehousing and Data Mining.

#### TEXT BOOKS

1. S.K. Singh, Database Systems: Concepts, Design and Applications, Pearson Education India, 2009
2. Thomas Connolly, Carolyn Begg. Database Systems, 3<sup>rd</sup> Edition – Pearson Education.
3. Korth, Silberschatz, Database System Concepts, 4th Ed., TMH, 2000.
4. Date C. J., An Introduction to Database Systems, 7th Ed., Narosa Publishing, 2004.

#### REFERENCE BOOKS

- Elmasri Navathe, Fundamentals of Database Systems, 5th Edition Pearson Education.

• M.Tamer Ozsü , Patrick Ualduriel, “Principles of Distributed Database Systems”, Second Edition, Pearson Education, 2003.
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• Vipin.C.Desai , An introduction to Database System , West Pub. Co
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ADVANCED LINUX	
Course Code: 24CD203	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

#### COURSE OBJECTIVE

1. The main objective of this course is to impart knowledge on Linux system administration among the participants.
2. The course describes the role of a Linux system administrator and the tasks performed by them.
3. To teach the participants about the Linux file system hierarchy in detail.
4. To describe the Linux packaging systems and Linux configuration, maintenance and Linux monitoring tools

#### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
1. Understand the role of a Linux system administrator and the tasks performed by them.
2. Understand the Linux file system hierarchy in detail.
3. Understand the Linux package management systems and Linux configuration and maintenance.
4. Participants will learn about Linux monitoring tools.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO</b> <b>CO</b>	CL01	CL02	CL03	CL04
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

#### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
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<b>UNIT-I</b>	<b>ROLE OF ADMINISTRATOR</b> Introduction to Linux, Different Types of Linux, What is GPLv2, Run Levels in Linux, Role of Linux Administrator, Developer vs Administrator, Critical Tasks of Linux Administrator, Requirements for Installing Linux, Installing Linux, Download ISO Image, Install Linux Using Oracle Virtualbox, Installation Completed, Booting in Linux
<b>UNIT-II</b>	<b>DELVING DEEP INTO FILESYSTEM HIERARCHY</b> Linux File System Hierarchy, Structure of Linux File System, Why a Linux File System is Unique?, Everything is a File, An Overview of Top Level Directories, Essential Commands in /bin and /sbin, Permissions in Linux, GRUB, MBR
<b>UNIT-III</b>	<b>PACKAGE MANAGEMENT SYSTEMS</b> Introduction to Package Management, Linux Package Managers, RPM, Yum, Package in Yum, Listing Available, Installed and Group Packages, Installing, Updating and Removing Group Packages, yum shell, APT, Debian Package Management System, Using apt, APT-get and APT-cache, apt-cache Mounting Disks, Using the mount Command, Unmounting Devices, Automating Mounts with /etc/fstab, Checking File System Integrity
<b>UNIT-IV</b>	<b>CONFIGURATION &amp; MAINTENANCE</b> Managing Public and Private Groups, Linux Group Management, Group Management Commands, Adding a New User in Linux, Modifying Existing Groups and Users, Adding a User to Groups, Ownership of Linux Files, Private Groups Usage, /etc/groups file, Setting Default Permissions for New Files Using umask, Security in Linux, Working with Access Control Lists
<b>UNIT-V</b>	<b>MONITORING IN LINUX</b> Introduction to Monitoring in Linux, Linux Monitoring Metrics, Linux In-built Performance Monitoring Tools, Other Monitoring Tools, Linux Monitoring using SNMP, Third Party Monitoring Tools

#### TEXT BOOKS

- Running Linux – Book by Matthias Kalle Dalheimer, Matt Welsh, O'Reilly Media, Inc, ISBN: 9780596007607, 2005.
- Linux System Administration – Book by Tom Adelstein, Bill Lubanovic, O'Reilly Media, Inc, ISBN: 9780596009526, 2007
- Linux Bible – Book by Christopher Negus, Wiley; 10th edition, 2020

#### REFERENCE BOOKS

- How Linux Works – Book by Brian Ward, No Starch Press, 2<sup>nd</sup> edition, ISBN: 978-1593275679, 2014.
- The Ultimate Linux Newbie Guide by Alistair J. Ross <https://linuxnewbieguide.org/wp-content/uploads/2016/07/The-Ultimate-Linux-Newbie-Guide-eBook-Edition-January-2017.pdf>
- Shell Scripting – Expert Recipes For Linux, Bash And More [https://losst.ru/wp-content/uploads/2016/08/w\\_wile48.pdf](https://losst.ru/wp-content/uploads/2016/08/w_wile48.pdf)

<b>SOURCE CODE MANAGEMENT &amp; DEVELOPMENT AUTOMATION</b>	
Course Code: 23CD201	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

<b>COURSE OBJECTIVE</b>
The Objective of this course is to give a strong foundation of the Source Code Management & Development Automation
To introduce the various version control systems.
To teach the fundamental techniques and principles in GIT.
To enable students to have skills that will help them to understand the need of Source Code Management.
To teach the basic Linux Environment.
To teach the rapid application development and the advantage of automation.
To enable students to have skills that will help them to understand the need of Development Automation.

<b>COURSE LEARNING OUTCOMES (CLO)</b>
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the traditional toolkit for DevOps.
Learn the history and overview of source code management.
Learn the Control systems of DevOps.
Understand the Automation.
Learn to interact with Linux Environment.
To understands the make and makefiles.
To understand the advantage of Automation in database backups.

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CL01	CL02	CL03	CL04	CL05	CL06	CL07
C01	✓						
C02		✓					
C03			✓				
C04				✓	✓		
C05						✓	
C06							✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<p><b>Typical Toolkit of DevOps</b> - DevOps: An Overview, Achieving DevOps, Continuous Practices, CI Working, Continuous Integration Practices, Commit Code Frequently, maintain a Single Source Repository, Don't commit code, Keep the Build Fast, Every Commit Should Build the Mainline, Fix Broken Builds Immediately, Write Automated Developer Tests, Automated deployment helps, Benefits of Continuous Integration, Continuous Delivery, Continuous Delivery Process, Benefits of continuous delivery practices</p> <p><b>Continuous Deployment</b> - Continuous Deployment, Continuous Deployment Process, Benefits of Continuous Deployment, Version Control System (VCS), Repository and Working Copy, Types of version control systems, Benefits of Version Control Systems</p>
UNIT-II	<p><b>Version Control System &amp; Variants</b> - Brief History of Version Control Systems, Basic Operations in a VCS, Create, Checkout, Commit, Update, Add, Edit, Delete, Rename, Move, Revert, Merge, Resolve, Lock, Branch, Examples of Version Control Systems, Concurrent Versions System (CVS), Subversion (SVN), Features of SVN, Limitations, Mercurial, Features of Mercurial, Git, The Making - History of Linux and Git, Advantages of Git, Local Repository, Centralized Version Control System (CVCS)</p> <p><b>Version Control System vs Distributed Version Control System</b> - Distributed Version Control System (DVCS), Advantages of Distributed Version Control System, Private Workspace, Easier Merging, Easy to Scale Horizontally, Disadvantages of Distributed Version Control System, vs Distributed Version Control Systems, Comparison of CVCS and DVCS, Multiple Repositories Model, Multiple Repositories for Different Services, Resetting the Local Environment, Revert - Cancelling out the Changes</p>
UNIT-III	<p><b>Introduction to Automation</b>- The Software Delivery Pipeline, Overview of the Continuous Delivery Pipeline, Fully Automated Software Delivery Process, The Build Process, Automated build, Automated Test, Automated Deployment, Benefits of Automated Deployment, Automated Deployment and DevOps Adoption, Automated Deployment and DevOps Adoption, Overview of Rapid Application Development (RAD), Phases in RAD, Essential Aspects of RAD, Code generation, Categories of Code Generators</p>
UNIT-IV	<p><b>Advantages of Automation</b> - Advantages of Automation, Automation Scenarios, Archiving Logs, Auto-Discard Old Archives, MySQL (RDBMS) Backups, Email Web Server Summary, Ensure Web Server is Running, User Command Validation, Disk Usage Alarm, Sending Files to Recycle Bin, Restoring Files from Recycle Bin, Logging Delete Actions, File Formatter, Decrypting Files,</p>

	<p>Bulk File Downloader, System Information, Install LAMP Stack, Get NIC's IP, Scenarios Where Automation Prevents Errors</p> <p><b>Interacting with Linux Environment</b> - The Linux System, Linux File System, Partitions, Common System Directories, Shell, User Groups and Permissions, User Accounts, The Password File, Creating User Accounts, File Ownership, File Permissions, Working with Bash, Shell Features</p>
<b>UNIT-V</b>	<p><b>Scripting Development Tasks</b> - Writing Automation Scripts, Task Scheduling Using Cron, Basic Linux Commands, Best Practices for Scripting, Make use of Shell's Built-In Options, Naming Conventions, Annotations Make the Logic Clean, Command Substitution, Always Begin with a Shebang, Variable Substitution, Conditionals, Regular Expressions</p> <p><b>Understanding Make and Makefiles</b> - Why "Make"? Why not Others?, Why not use "Bash Script" instead of "Makefile"?, features of "Make", Various versions and Variants of "Make", Structure of a "Makefile", What is a Rule?, Structure of a "Makefile" Rule, Targets, Some Special Built-in Target Names, Automatic Variables, Suffix Rules, Pattern Rules, The "Make" command, "Make" arguments, recursive makefile, Building Binary from Source Code, Conditionals in "Makefile", Best Practices in writing "Makefiles"</p>

#### TEXT BOOKS

Pro Git – Book by Scott Chacon and Ben Straub (available at <https://git-scm.com/book/>).

Running Linux – Book by Matthias Kalle Dalheimer, Matt Welsh, O'Reilly Media, Inc, ISBN: 9780596007607, 2005.

Mastering Linux Shell Scripting – Book by Andrew Mallett Mokhtar Ebrahim, Ingram short title; 2nd edition, 2018.

#### REFERENCE BOOKS

Introducing GitHub – Book by Peter Bell and Brent Beer.

Pragmatic Version Control Using Git.pdf - The Swiss Bay – Book by P de Bie  
<https://theswissbay.ch/pdf/>

Linux Command Line and Shell Scripting Bible – Book by Richard Blum, Christine Bresnahan, Wiley, 3<sup>rd</sup> edition, 2015

Advanced Bash-Scripting Guide – Book by M Cooper <https://tldp.org/LDP/abs/abs-guide.pdf>

## DATABASE MANAGEMENT SYSTEMS LAB

Course Code: 23CS2111	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### COURSE OBJECTIVE

To explain basic database concepts, applications, data models, schemas and instances.

To demonstrate the use of constraints and relational algebra operations. And describe the basics of SQL and construct queries using SQL.

To emphasize the importance of normalization in databases.

To facilitate students in Database design

To familiarize issues of concurrency control and transaction management

### COURSE LEARNING OUTCOMES (CLO)

After completion of course, students would be able to:

**Transform** an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.

**Use** an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.

**Formulate** query, using SQL, solutions to a broad range of query and data update problems.

Design and implement database applications on their own.

Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.

Analyze and Select storage and recovery techniques of database system.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO</b> <b>CO</b>	CL01	CL02	CL03	CL04	CL05	CL06
CO1	✓					
CO2		✓	✓			
CO3			✓			
CO4				✓		
CO5					✓	✓

### LIST OF EXPERIMENTS:

1. Introduction to SQL.
2. To study Basic SQL commands (create database, create table, use, drop, insert) and execute the queries using these commands.
3. To study the viewing commands (select, update) and execute the queries using these commands.
4. To study the commands to modify the structure of table (alter, delete, drop, add, modify) and execute the queries using these commands.
5. To study the commands that involve compound conditions (and, or, in, not in, between, not between, like, not like) and execute the queries using these commands.



6. To study the aggregate functions (sum, count, max, min, average) and execute the queries using these commands.
7. To study the grouping commands (group by, order by) and execute the queries using these commands.
8. To study the commands involving data constraints and execute the queries using these commands.
9. To study the commands for aliasing and renaming and execute the queries using these Commands.
10. To study the commands for joins (cross join, inner join, outer join) and execute the queries using these commands.
11. Study of Integrity Constraints in SQL.
12. Study of Use of Group By and Having Clause.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

<b>TEXT BOOKS</b>
<ol style="list-style-type: none"><li>1. Laboratory Manual.</li><li>2. S.K. Singh, Database Systems: Concepts, Design and Applications, Pearson Education India, 2009</li><li>3. Thomas Connolly, Carolyn Begg. Database Systems, 3<sup>rd</sup> Edition – Pearson Education.</li><li>4. Korth, Silberschatz, Database System Concepts, 4th Ed., TMH, 2000.</li><li>5. Date C. J., An Introduction to Database Systems, 7th Ed., Narosa Publishing, 2004.</li></ol>



<b>REFERENCE BOOKS</b>
<ul style="list-style-type: none"><li>• Elmasri Navathe, Fundamentals of Database Systems, 5th Edition Pearson Education.</li><li>• M.Tamer Ozsu , Patrick Ualduriel, “Principles of Distributed Database Systems”, Second Edition, Pearson Education, 2003.</li><li>• Vipin.C.Desai , An introduction to Database System , West Pub. Co</li></ul>

DATA STRUCTURES LAB	
Course Code: 24CS2113	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### COURSE OBJECTIVE

1. To demonstrate array implementation of linear data structure algorithms.
2. To implement the applications using Stack & Queue.
3. To implement Binary search tree and AVL tree algorithms.
4. To implement Prim's algorithm
5. To implement Sorting, Searching and Hashing algorithms.

### COURSE LEARNING OUTCOMES (CLO's)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Implement Linear data structure algorithms.
2. Implement applications using Stacks and Linked lists
3. Implement Binary Search tree and AVL tree operations.
4. Implement graph algorithms.
5. Analyze the various searching and sorting algorithms.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

### LIST OF EXPERIMENT:

1. Implementation of Singly Linked List
2. Implementation of Polynomial Manipulation using Linked list
3. Linked list implementation of Stack and Linear Queue ADTs

4. Array implementation of Stack, Queue and Circular Queue ADTs
5. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Implementation of Dijkstra's Algorithm
10. Implementation of Prim's Algorithm
11. Implementation of Linear Search and Binary Search
12. Implementation of Insertion Sort and Selection Sort
13. Implementation of Merge Sort

<b>TEXT BOOK:</b>
<ul style="list-style-type: none"><li>• Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson, Education, 2005.</li><li>• Kamthane, Introduction to Data Structures in C, 1st Edition, Pearson Education, 2007</li></ul>
<b>REFERENCE BOOKS</b>
<ul style="list-style-type: none"><li>• Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.</li><li>• Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, McGraw Hill/ MIT Press, 2022.</li><li>• Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Data Structures and Algorithms, 1st edition, Pearson, 2002.</li><li>• Kruse, Data Structures and Program Design in C, 2nd Edition, Pearson Education, 2006.</li></ul>

### ADVANCED LINUX LAB

Course Code: 24CD212	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

#### COURSE OBJECTIVE

1. The Objective of this course is to give a strong foundation of the Advance Linux.
2. The course describes the role of a Linux system administrator and the tasks performed by them.
3. To teach the participants about the Linux file system hierarchy in detail.
4. To describe the Linux packaging systems and Linux configuration, maintenance and Linux monitoring tools.

#### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the need of Linux environment.
2. Understand the role of administrator.
3. Understand Linux file system hierarchy.
4. Learn package management system, configuration and maintenance.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

#### LIST OF PROGRAMS

1. Performing Scripting & the Shell
  - a. Performing Scripting & Shell Operations
  - b. Writing a Shell Script to Automate System Maintenance Tasks
  - c. Developing a Shell Script to Monitor System Resources and Generate Reports
  - d. Identifying the Shell and Shell Configuration
2. Identifying the Default Shell for a User and System-wide Configuration
3. Exploring Shell Configuration Files (.bashrc, .bash\_profile, etc.)
4. Identifying the shell, which shell

5. Adding new users, Backups and Syslog Files
6. Configuration of dNS Server
7. DNS Redundancy and DNS Testing
8. Working with Network File System
9. Performing Network Troubleshooting
10. Perform Ping-Check to see if Host is Alive
11. Work with Traceroute, Netstat, tcpdump
12. Implement Use Case - What Happens if we Type google.com in the Browser?  
(Use case)
13. Enabling Firewall Through iptables
14. Creating Encrypted Backups Using gpg and tar

**TEXT BOOKS**

- Running Linux – Book by Matthias Kalle Dalheimer, Matt Welsh, O'Reilly Media, Inc, ISBN: 9780596007607, 2005.
- Linux System Administration – Book by Tom Adelstein, Bill Lubanovic, O'Reilly Media, Inc, ISBN: 9780596009526, 2007
- Linux Bible – Book by Christopher Negus, Wiley; 10th edition, 2020

**REFERENCE BOOKS**

- How Linux Works – Book by Brain Ward, No Starch Press, 2<sup>nd</sup> edition, ISBN: 978-1593275679, 2014.
- The Ultimate Linux Newbie Guide by Alistair J. Ross <https://linuxnewbieguide.org/wp-content/uploads/2016/07/The-Ultimate-Linux-Newbie-Guide-eBook-Edition-January-2017.pdf>
- Shell Scripting – Expert Recipes For Linux, Bash And More [https://losst.ru/wp-content/uploads/2016/08/w\\_wile48.pdf](https://losst.ru/wp-content/uploads/2016/08/w_wile48.pdf)

<b>SOURCE CODE MANAGEMENT &amp; DEVELOPMENT AUTOMATION LAB</b>	
Course Code: 23CD215	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### **COURSE OBJECTIVE**

This fundamental course will enable the students to learn the concepts of Source Code Management & Development Automation.

To introduce the various version control systems.

To teach the fundamental techniques and principles in GIT.

To enable students to have skills to work in GIT tool that will help them to understand the need of Source Code Management.

To introduce the shell scripting.

To teach the data backup and working with makefiles.

To enable students to have skills that will help them to understand the need of Development Automation.

### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand and Install the version control systems.

Learn the Git operations.

Learn on the Git configuration, History, Merge Resolution, and Branching.

Apply Git concepts and techniques for implementation in various Operating Systems.

Understand the concepts of Automation.

Learn to interact with Linux Environment.

To understands the make and makefiles.

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7
C01	✓	✓					
C02			✓				
C03				✓			
C04					✓		
C05						✓	
C06							✓

## LIST OF PROGRAMS

### Source Code Management:

1. Introducing Version Control System -Installing Git CLI on Linux, Mac & Windows
2. Setting up a Git Repository & Initialization
3. Cloning an Existing Repository
4. Introducing GitHub & Exploring GitHub
5. Fork and Push an Existing Repository
6. Working with Git- File States, Project Section, Workflow
7. Working with Git Operations- git status, git add, git commit, git stage
8. Git Configuration Files -.gitattributes
9. Identifying Binary Files, Diffing Binary Files
10. Working with Git History
11. Merge Resolution in Git
12. Working with Git Branching

### Development Automation:

1. Introduction to Bash & Shell Scripting
2. Conditional Statement & Loop
3. Working with Automation Scripts that save Time & Effort
4. Automatically delete archive files that are older than two days.
5. Take MySQL Backups every 12 hours and move them to the backup directory.
6. Continuously monitor and Restart the web server if it is not running
7. Continuously monitor and Restart the web server if it is not running
8. Block executing the forbidden commands.
9. Monitor the disk usage and alert if it is beyond the given threshold.
10. Moves the deleted files/folders to the recycle bin
11. Working with Cron
12. Working with Make and MakeFiles

## TEXT BOOKS

- Pro Git – Book by Scott Chacon and Ben Straub (available at <https://git-scm.com/book/>).
- Running Linux – Book by Matthias Kalle Dalheimer, Matt Welsh, O'Reilly Media, Inc, ISBN: 9780596007607, 2005.
- Mastering Linux Shell Scripting – Book by Andrew Mallett Mokhtar Ebrahim, Ingram short title; 2<sup>nd</sup> edition, 2018.

## REFERENCE BOOKS

- Introducing GitHub – Book by Peter Bell and Brent Beer.
- Pragmatic Version Control Using Git.pdf - The Swiss Bay – Book by P de Bie <https://theswissbay.ch/pdf/>
- Linux Command Line and Shell Scripting Bible – Book by Richard Blum, Christine Bresnahan, Wiley, 3<sup>rd</sup> edition, 2015
- Advanced Bash-Scripting Guide – Book by M Cooper <https://tldp.org/LDP/abs/abs-guide.pdf>

ESSENTIALS OF BLOCKCHAIN & IOT	
<b>Course Code:23CS0201</b>	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination: 30 Marks
L T P : 0 0 2	
Credits: 1	

## TRAINING OBJECTIVE

Familiarise the functional/operational aspects of cryptocurrency ECOSYSTEM.
Understand emerging abstract models for Block chain Technology.
Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain.
To analyze various protocols of IoT.

## TRAINING LEARNING OUTCOMES (TLOS): -

1. To understand and learn how bitcoin and other coins work in real world.
2. Understand the vision of IoT and communication protocols from a global context.
3. To evaluate the applications of IoT in agriculture, healthcare, smart grid, factory.
4. Design portable IoT using appropriate boards.

MODULE	CONTENTS	STUDENTS ENGAGEMENT ACTIVITY
I	<b>CRYPTOGRAPHY</b> cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography	Perform Mapping of coins and Blockchain Models
II	<b>BITCOIN</b> Bitcoin Introduction, Wallet - Blocks - Merkle Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.	To identify the type of wallet used in a specific application.
III	<b>Introduction to IoT:</b> Definition, Characteristics, Applications, Connectivity Layers, Addressing, Networking, Sensing: Sensors and Transducers, Sensor Classes, Sensor Types, Actuation: Actuator Basics, Actuator Types. <b>Connectivity Technologies:</b> IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART, NFC, Bluetooth, Zwave, ISA100.11a.	To identify the types and characteristics of Sensors



IV	<b>Introduction to Arduino:</b> Basic Concepts of Arduino Platform, Examples of Arduino Programming, Integration of Sensors and Actuators with Arduino, <b>Introduction to Raspberry Pi,</b> Implementation of IoT with Raspberry, Software Defined Networking, Software Defined IoT Networking	To design a simple application of LED lightning using Arduino and Raspberry Pi.
V	<b>HANDS ON ACTIVITY</b> The students will design an application for smart irrigation system, smart healthcare system. In this activity students will identify the major components required for building a smart application and design the architecture and application accordingly.	Complete the Assigned Activity

### Learning Resources

Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

<https://eprint.iacr.org/2014/349.pdf>

<https://eprint.iacr.org/2012/718.pdf>

<https://github.com/ElementsProject/lightning/blob/master/doc/deployable-lightning.pdf>

<https://www.hyperledger.org/use/tutorials>

<https://docs.soliditylang.org/en/latest>

<https://github.com/ethereum/wiki/wiki/White-Paper>

<http://gavwood.com/paper.pdf>

Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective" -- CRC Press-2012

0. Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.

1. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 9789352133895

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

## SEMESTER – IV

### OPERATING SYSTEMS

Course Code: 24CS2006	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVES

1. To understand the main components of an OS & their functions.
2. To study the process management and scheduling.
3. To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
4. To understand the concepts and implementation Memory management policies and virtual memory.
5. To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course, students will be able to:

1. Understand the basic operating system concepts such as overall architecture, interrupts, APIs, user mode and kernel mode.
2. Understand the process management policies and scheduling of processes by CPU .
3. Distinguish between concepts related to concurrency including synchronization primitives, race conditions, critical sections and multi-threading.
4. Describe and analyze the memory management and its allocation policies.
5. Identify use and evaluate the storage management policies with respect to different storage management technologies.

### MAPPING BETWEEN COURSE OBJECTIVES (COS) AND COURSE LEARNING OUTCOMES (CLOS)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓	✓		
C03		✓	✓		
C04				✓	✓
C05					✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION</b> <b>Operating System Overview</b> -Definition and functions, Types of Operating Systems, Various Operating system services. <b>Operating System Structure</b> - Layered structure approach, kernel Approach and Virtual machine approach.
UNIT-II	<b>PROCESSES &amp; SCHEDULING</b> <b>Process concept</b> - Process State Diagram- PCB, Concept of Threading and Multithreading, Operation on processes, Scheduling criteria, CPU scheduling algorithms- FCFS, SJF, SRTF, RR, PRIORITY, HRRN. Process Synchronization- Critical Section Problem, Classical Synchronization Problem.
UNIT-III	<b>CONCURRENCY</b> Principles of concurrency - mutual exclusion, semaphores, monitors, Readers/Writers problem, Producers/Consumers problem. Deadlocks – Prevention, Avoidance, Detection.
UNIT-IV	<b>MEMORY MANAGEMENT STRATEGIES</b> Address Binding, Logical-Physical Address Space, swapping, contiguous memory allocation, non- contiguous memory allocation technique, Virtual Memory Management - Demand Paging & Page-Replacement Algorithms, Demand Segmentation.
UNIT-V	<b>FILE SYSTEMS</b> File system Concepts, Disk scheduling Algorithms, File management – organization, Directories, file sharing, Record blocking, Secondary storage management, Disk Management- I/O Systems, System Protection and management.

**TEXT BOOKS**

- William Stallings, “Operating Systems – internals and design principles”, Prentice Hall India, 5<sup>th</sup> Edition, 2005.
- Design of the Unix Operating System By Maurice Bach, PHI.
- Silberschatz, Peter Galvin, “Operating System Concepts”, AWL 6<sup>th</sup> Edition, 2002.

**REFERENCE BOOKS**

- Andrew S. Tannenbaum & Albert S. Woodhull, “Operating System Design and Implementation”, Prentice Hall India, 2<sup>nd</sup> Edition, 1998.
- Ida M. Flynn, Ann McIver McHoes, “Understanding Operating Systems”, 3<sup>rd</sup> Edition, Thomson Learning 2001s.
- Gary Nutt, “Operating System - A Modern Perspective”, Pearson Education Asia, 2<sup>nd</sup> Edition 2000. Harvey .M. Deitel, “Operating Systems”, 2<sup>nd</sup> Edition , 2000.

### ANALYSIS AND DESIGN OF ALGORITHMS

Course Code: 24CS2008	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

#### COURSE OBJECTIVES (CO's)

6. To analyze the asymptotic performance of algorithms and to write rigorous correctness proofs for algorithms.
7. To demonstrate a familiarity with major Divide and conquer algorithms and data structures.
8. To apply important Dynamic programming design paradigms and methods of analysis.
9. To demonstrate through examples greedy design paradigm.
10. To Synthesize efficient algorithms in common engineering design situations

#### COURSE LEARNING OUTCOMES (CLO's)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

6. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.
7. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
8. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
9. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
10. For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.

#### COURSE LEARNING OUTCOMES (CLO's)-COURSE OBJECTIVES (CO's) MAPPING

<b>CLO's CO's</b>	CL01	CL02	CL03	CL04	CL05
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION</b> <b>Algorithm analysis:</b> Time and space complexity - Asymptotic Notations and its properties Best case, Worst case and average case analysis – Recurrence relation: substitution method - Lower bounds – <b>searching:</b> linear search, binary search and Interpolation Search, Pattern search: The naïve string-matching algorithm - Rabin-Karp algorithm - Knuth-Morris-Pratt algorithm. <b>Sorting:</b> Insertion sort – heap sort.
UNIT-II	<b>GRAPH ALGORITHMS</b> <b>Graph algorithms:</b> Representations of graphs - Graph traversal: DFS – BFS - applications - Connectivity, strong connectivity, bi-connectivity - Minimum spanning tree: Kruskal's and Prim's algorithm- Shortest path: Bellman-Ford algorithm - Dijkstra's algorithm - Floyd-Warshall algorithm <b>Network flow:</b> Flow networks - Ford-Fulkerson method – Matching: Maximum bipartite matching.
UNIT-III	<b>ALGORITHM DESIGN TECHNIQUES</b> <b>Divide and Conquer methodology:</b> Finding maximum and minimum - Merge sort - Quick sort <b>Dynamic programming:</b> Elements of dynamic programming — Matrix-chain multiplication - Multi stage graph — Optimal Binary Search Trees. Greedy Technique: Elements of the greedy strategy - Activity-selection problem – Optimal Merge pattern — Huffman Trees.
UNIT-IV	<b>STATE SPACE SEARCH ALGORITHMS</b> <b>Backtracking:</b> n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Graph colouring problem Branch and Bound: Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem
UNIT-V	<b>NP-COMPLETE AND APPROXIMATION ALGORITHM</b> <b>Tractable and intractable problems:</b> Polynomial time algorithms – Venn diagram representation -NP-algorithms - NP-hardness and NP-completeness– Bin Packing problem - Problem reduction: TSP – 3-CNF problem. <b>Approximation Algorithms:</b> TSP - <b>Randomized Algorithms:</b> concept and application - primality testing - randomized quick sort - Finding kth smallest number

### TEXT BOOKS

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.
- Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran "Computer Algorithms/C++" Orient Blackswan, 2nd Edition, 2019.
- Richard Johnsonbaugh , Marcus Schaefer , " Algorithms " , Pearson Education, 2006

3<sup>rd</sup> edition

#### REFERENCE BOOKS

- Aho, Ullman & Hopcraft, "*The Design and Analysis of Algorithms*", Pearson Education, 2001
- S.E.Goodman , S.T.Hedetniemi , "*Introduction to the Design and Analysis of Algorithms*", McGraw Hill , 2002
- Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
- Sara Baase , "*Computer Algorithms - Introduction to design and analysis*", Pearson.
- S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

<b>BUILD and RELEASE MANAGEMENT</b>	
Course Code: 23CD204	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

<b>COURSE OBJECTIVE</b>
The main objective of this course is to impart knowledge on Build and Release Management among the participants.
To teach the participants about dependency management and associated concepts like dependency identification and scope, using repositories and the associated tools.
To describe the detailed note on documentation and reporting and the process of generating unit test and code coverage reports.
To demonstrate the Test Framework and a release cycle.

<b>COURSE LEARNING OUTCOMES (CLO)</b>
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the dependency management.
Learn a repository and its associated tools.
Understands documentation and reporting.
Understands Test Framework and a release cycle

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CO \ CLO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>
<b>CO1</b>	✓			
<b>CO2</b>		✓		
<b>CO3</b>			✓	
<b>CO4</b>				✓

### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>INTRODUCTION TO BUILD AND RELEASE MANAGEMENT</b> Build, Introduction—Build and Release Management, Build Management, Build Reporting – Sample Sonarqube Report, Build Reporting – Build status, Release Planning, Packaging, Authorization, Redeployment, Declarative Dependency Management
<b>UNIT-II</b>	<b>DEPENDENCY MANAGEMENT</b>



	Build Tools – Ant, Maven, Gradle, Using Repositories, Maven Repository – Local, Central, Remote, Maven Dependency Search Sequence, Dependency Management, Example of Dependency Management: Parent POM, Example of Dependency Management: Child POM-a, Example of Dependency Management: Child POM-b, Dependency Identification, Dependency Scope, Transitive Dependencies, Features of Transitive Dependencies
<b>UNIT-III</b>	<b>DOCUMENTATION AND REPORTING</b> Documentation Overview, Different types of documentation, Reporting, Maven Site Plugin, Maven Site Lifecycle, Maven site Configuration in pom.xml, Advanced Site Reports, Unit Testing, Unit Testing Techniques
<b>UNIT-IV</b>	<b>TEST FRAMEWORK</b> Unit Testing Framework – Java, Junit, Code Coverage, How is Code Coverage Calculated, Code Coverage Tools, Comparison of Code Coverage Tools, Sample Code Coverage Report, Code Coverage – Pros and Cons
<b>UNIT-V</b>	<b>UNDERSTANDING A RELEASE CYCLE</b> Project Release Lifecycle, Different Stages of a Release Cycle, Source Code Repository, Different Types of Source Code Repositories, How to Install GitHub, First Time Git Setup, How to Create an Organization in GitHub, How to Create a Repository in GitHub, How to Create a Branch in Github, How to Check-in Code to Github, Deploying Build to Production, Maven Prepare Goal, Perform Goal, Clean Goal, Maven Rollback Goal

#### **TEXT BOOKS**

Maven: The Definitive Guide – Book by Sonatype Company, O'Reilly Media, Inc, ISBN: 9780596517335, 2008.

Apache Maven Cookbook –Book by Raghuram Bharathan, Ingram Short Title, ISBN: 9781785286124, 2015.

#### **REFERENCE BOOKS**

Introducing Maven – Book by Balaji Varnasi, Apress, ISBN: 9781484254103, 2019

Maven: The Complete Reference <https://books.sonatype.com/mvnref-book/pdf/mvnref-pdf.pdf>

### OPERATING SYSTEMS LAB

Course Code: 23CS2114	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

#### COURSE OBJECTIVE

1. To understand the operating system principles and its implementations.
2. To understand the main components of an OS & their functions.
3. To provide necessary skills for developing and debugging programs in order to optimize performance of OS.
4. To study the process management and scheduling.

#### COURSE LEARNING OUTCOME

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate the various operations of file system.
2. Understand and Implement Memory management schemes, Thread and synchronization
3. Implement Deadlock algorithms and page replacement algorithms.
4. Apply the process synchronous concept using message queue, shared memory, semaphore for given situation.
5. Implement Scheduling algorithms.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓				
CO2		✓			
CO3			✓	✓	
CO4					✓

#### LIST OF PROGRAMS

1. Write a program to implement CPU scheduling for first come first serve.
2. Write a program to implement CPU scheduling for shortest job first.
3. Write a program to perform priority scheduling.
4. Write a program to implement CPU scheduling for Round Robin.
5. Write a program for page replacement policy using a LRU
6. Write a program for page replacement policy using FIFO
7. Write a program for page replacement policy using Optimal.
8. Write a program to implement first fit, best fit and worst fit algorithm for Memory management.
9. Write a program to implement reader/writer problem using semaphore.
10. Write a program to implement Banker's algorithm for deadlock avoidance.

### **TEXT BOOKS**

1. Abraham Silberschatz Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley 8th Edition, 2008.
2. Garry. J. Nutt, Operating Systems: A Modern Perspective, Addison-Wesley
3. Andrew S. Tanenbaum and Herbert Bros, Modern Operating Systems (4th Edition), Pearson

### **REFERENCE BOOKS**

1. William Stallings, "Operating Systems – internals and design principles", Prentice Hall India, 5 th Edition, 2005.

ALGORITHMS LAB	
Course Code: 24CSPE2118	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

COURSE OBJECTIVE
11. To understand and apply the algorithm analysis techniques on searching and sorting algorithms. 12. To critically analyze the efficiency of graph algorithms. 13. To understand different algorithm design techniques. 14. To solve programming problems using state space tree. 15. To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms.

COURSE LEARNING OUTCOMES (CLO's)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to: <ul style="list-style-type: none"> <li>11. Analyze the efficiency of algorithms using various frameworks.</li> <li>12. Apply graph algorithms to solve problems and analyze their efficiency.</li> <li>13. Implement various techniques like divide and conquer, dynamic programming and greedy techniques to solve problems.</li> <li>14. Analyze &amp; Use the state space tree method for solving problems.</li> <li>15. Apply problems solving using approximation algorithms and randomized algorithms.</li> </ul>

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<div>CLO</div> <div>CO</div>	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓

LIST OF EXPERIMENT:
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1. Write a program to Sort a given set of elements using the Insertion sort and Heap sort methods and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
2. Implement recursive Binary Search. Determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.
3. Develop a program to implement graph traversal using Breadth First Search.
4. Develop a program to implement graph traversal using Depth First Search.
5. Develop a program to find the shortest paths to other vertices using Dijkstra's algorithm.
6. Find the minimum cost spanning tree of a given undirected graph using Prim's algorithm.
7. Develop a program to find out the maximum and minimum numbers in a given list of n numbers using the divide and conquer technique.
8. Write a program to perform Quick Sort for the given list of integer values.
9. Write a Program to perform Merge Sort on the given two lists of integer values.
10. Implement N-Queens problem using Backtracking.
11. Write a program to solve Sum of subsets problem for a given set of distinct numbers.
12. Implement fractional knapsack problem using Greedy Strategy.
13. Implement Travelling Salesman Problem.
14. Implement randomized algorithms for finding the  $k^{\text{th}}$  smallest number.

#### **TEXT BOOK:**

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.
- Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran "Computer Algorithms/C++" Orient Blackswan, 2nd Edition, 2019.
- Richard Johnsonbaugh, Marcus Schaefer, " Algorithms ", Pearson Education, 2006 3rd edition

#### **REFERENCE BOOKS**

- Aho, Ullman & Hopcraft, "The Design and Analysis of Algorithms", Pearson Education, 2001
- S.E.Goodman, S.T.Hedetniemi, "Introduction to the Design and Analysis of Algorithms", McGraw Hill , 2002
- Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
- Sara Baase, "Computer Algorithms - Introduction to design and analysis", Pearson.
- S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

**BUILD and RELEASE MANAGEMENT LAB**

Course Code: 23CD214	Continuous Evaluation: 60 Marks
Pre-Requisite: NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

**COURSE OBJECTIVE**

The main objective of this course is to impart knowledge on Build and Release Management among the participants.

To teach the participants about dependency management and associated concepts like dependency identification and scope, using repositories and the associated tools.

To demonstrate the Build and Release cycle.

To describe the detailed note on documentation and reporting.

To describe the process of generating unit test and code coverage reports.

**COURSE LEARNING OUTCOMES**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand the dependency management.

Learn a release cycle.

Understand documentation and reporting.

Understand the process of various testing and code coverage report generation.

**COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO\CO</b>	CL01	CL02	CL03	CL04
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

## LIST OF PROGRAMS

1. Setting Up Maven and Understanding POM Hierarchy
2. Creating a Project Using Maven & Understanding POM Files
3. Using a Repository Manager in Maven Configuration
4. Nexus Requirements in pom.xml
5. Working with Password Encryption
6. Deploying Artifacts to Nexus Repository
7. Using Mirrors for Repository
8. Using the Maven Surefire Plugin to Run Unit Tests
9. Using the Maven Clean plugin & Compiler Design
10. Using the Maven Resources Plugin
11. Using Eclipse to Run Maven Goals
12. Using Maven Assembly

### TEXT BOOKS

- Maven: The Definitive Guide – Book by Sonatype Company, O'Reilly Media, Inc, ISBN: 9780596517335, 2008.
- Apache Maven Cookbook –Book by Raghuram Bharathan, Ingram Short Title, ISBN: 9781785286124, 2015.

### REFERENCE BOOKS

- Introducing Maven – Book by Balaji Varnasi, Apress, ISBN: 9781484254103, 2019
- Maven: The Complete Reference <https://books.sonatype.com/mvnref-book/pdf/mvnref-pdf.pdf>

## SEMESTER - V

### COMPILER DESIGN

Course Code: 24CS3001	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVES

1. To introduce the major concept areas in compiler design and know the various phases of the compiler
2. To understand the various parsing algorithms and comparison of the same
3. To provide practical programming skills necessary for designing a compiler
4. To gain knowledge about the various code generation principles
5. To understand the necessity for code optimization.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adheres to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students will be able to:
1. Apply the knowledge of LEX & YACC tool to develop a scanner and parser
2. Design and develop software system for backend of the compiler
3. Suggest the necessity for appropriate code optimization techniques
4. Conclude the appropriate code generator algorithm for a given source language
5. Design a compiler for any programming language.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CLOs COs	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	Compilers - Analysis of the source program - Phases of a compiler - Cousins of the Compiler - Grouping of Phases - Compiler construction tools - Lexical Analysis - Role



UNIT NUMBER	COURSE CONTENTS
	of Lexical Analyzer - Input Buffering - Specification of Tokens..
UNIT-II	Role of the parser - Writing Grammars - Context-Free Grammars - Top Down parsing - Recursive Descent Parsing - Predictive Parsing - Bottom-up parsing - Shift Reduce Parsing - Operator Precedent Parsing - LR Parsers - SLR Parser - Canonical LR Parser - LALR Parser
UNIT-III	Intermediate languages - Declarations - Assignment Statements - Boolean Expressions - Case Statements - Back patching - Procedure calls.
UNIT-IV	Introduction - Principal Sources of Optimization - Optimization of basic Blocks - DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis - Runtime Environments - Source Language issues - Storage Organization - Storage Allocation strategies - Access to non-local names - Parameter Passing - Error detection and recovery
UNIT-V	Issues in the design of code generator - The target machine - Runtime Storage management - Basic Blocks and Flow Graphs - Next-use Information - A simple Code generator - DAG based code generation - Peephole Optimization

#### TEXT BOOKS

- Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012.
- Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005.
- Dhamdhere, D. M., "Compiler Construction Principles and Practice", Second Edition, Macmillan India Ltd., New Delhi, 2008.
- D.M.Dhamdhere, "*System Programming and Operating Systems*", 2nd Edition., Tata Mcgrav Hill,1995

#### REFERENCE BOOKS

- Kenneth C. Loudon, Compiler Construction, Principles and Practice, Thomson Books, 2007.
- Aho. A.V & Ullman J.D, "Principles of Compiler Design", Narosa publications, 1985.
- S.S. Muchnick Harcourt Asra," Advanced Compiler Design implementation", Morgan Kauf1man, 1997.
- Anrew W. Appel, "Modern Compiler Implementation in JAVA", Cambridge University Press, 2003.

## COMPUTER NETWORKS

Course Code: 24CS3003	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVE

1. To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
2. To study data link layer concepts, design issues, and protocols.
3. To gain core knowledge of Network layer routing protocols and IP addressing.
4. To study Session layer design issues, Transport layer services, and protocols.
5. To acquire knowledge of Application layer and Presentation layer paradigms and protocols.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course, students will be able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Describe the functions of data link layer and explain the protocols.
3. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
4. Describe the Session layer design issues and Transport layer services.
1. Explain the functions of Application layer and Presentation layer paradigms and Protocols.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENT
UNIT-I	<p><b>INTRODUCTION</b></p> <p><b>Internet:</b> A brief History; Internet Standards and Standards organization; OSI Reference Model; TCP/IP Model; Types of Networks : Local Area Networks, Metropolitan Area Networks, Wide Area Network; Topologies: Bus, Star, Ring, Hybrid, Tree, Complete, Irregular - Topology; Addressing.</p> <p><b>Physical Layer</b> – Analog and digital signal properties: Sinewave, phase, wavelength, Bit rate, Transmission Impairment, Performance measures: Bandwidth, Throughput, Latency, Jitter; Guided and unguided transmission media; Circuit Switching, Packet Switching.</p>

UNIT NUMBER	COURSE CONTENT
<b>UNIT-II</b>	<b>DATA LINK LAYERS</b> Data link Layer design issues: Framing, Error Detection & Correction: Byte and Bit stuffing, Checksum, CRC, Hamming codes; Elementary Data link Protocols- Sliding window Protocols; Media access control – Random Access: Aloha, CSMA, CSMA/CD; Controlled Access: Token Passing, Polling, Reservation; Channelization: TDMA, FDMA, CDMA; Ethernet Standard;
<b>UNIT-III</b>	<b>NETWORK LAYERS PROTOCOLS</b> IPV4 Addressing – classful and classless, Network Address Translation, IPV4 Packet format- IPV6 Addressing, IPV6 Packet format; ARP, RARP, DHCP, ICMP and IGMP.
<b>UNIT-IV</b>	<b>NETWORK ROUTING</b>  LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways; Routing and Forwarding, Routing Table, Intra- and inter-domain routing, Distance vector routing, DVR Instability problem and solutions, RIP, Link State Routing, OSPF, Path Vector Routing, BGP; Virtual Private Networks;  Routing-Link State and Distance Vector Routing Protocols- Implementation-Performance Analysis- Packet Tracer TCP and UDP-Congestion Control-Effects of Congestion-Traffic Management-TCP Congestion Control-Congestion Avoidance Mechanisms-Queuing Mechanisms-QoS Parameters. ;
<b>UNIT-V</b>	<b>TRANSPORT &amp; APPLICATION LAYER</b> Transmission Control Protocol; User Datagram Protocol; Congestion control mechanisms; Application Layer: Email – SMTP, POP, IMAP; FTP, NNTP, HTTP, DNS, WWW , Firewall.

#### TEXT BOOKS

- Andrew S. Tanenbaum, “Computer Networks”, Pearson Fourth Edition, 2005

#### REFERENCE BOOKS

- Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 2004.
- James F. Kurose and Keith W. Ross, “Computer Networking:A Top-Down Approach Featuring the Internet”, Pearson Education, Third Edition 2003.
- William Stallings, “Data and Computer Communication”, Seventh Edition, Pearson Education, 2003.

## COMPUTER NETWORKS LAB

Course Code: 24CS3113	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### COURSE OBJECTIVES

1. To learn about packet sniffing.
2. To observe and explore various network protocols by “seeing them in action”.
3. To learn about client server programming approach for network communication.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course, students will be able to:

1. Understand and learn how to determine the network statistics of their machines.
2. Learn about the working of a packet sniffer that is Wireshark.
3. Understand the in-depth working and role of network protocols.
4. Design and understand the working of TCP three way handshaking protocol.
5. Design and understand UDP based applications.

### MAPPING BETWEEN COURSE OBJECTIVES (COS) AND COURSE LEARNING OUTCOMES (CLOS)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓	✓			
C02			✓		
C03				✓	✓

### LIST OF PROGRAMS

- 1 Study of Basic Network Commands, Demo session of all networking hardware and Functionalities .
- 2 Observing Packets across the network and Performance Analysis of Routing protocols
- 3 Basic Router Configuration ( Creating Passwords, Configuring Interfaces)
- 4 Flow control mechanisms
- 5 Implementing an IP Addressing Scheme
- 6 Simulation of Transport layer Protocols and analysis of congestion control techniques in network
- 7 Develop a DNS client server to resolve the given host name or IP address.
- 8 Single-Area OSPF and Multi-Area Link Costs and Interface.
- 9 Configuring WEP on a Wireless Router
- 10 Configuring Ethernet and Serial Interfaces
- 11 Planning Network-based Firewalls 25 Configuring a Cisco Router as a DHCP Server

#### Note:

1. Students can use any programming language for writing the programs.
2. 5 or more exercises can be given by the Faculty.

### TEXT BOOKS

1. Andrew S. Tanenbaum, “Computer Networks”, Pearson Fourth Edition, 2005.

2. Computer Networking: A Top-Down Approach Featuring the Internet, 5th Ed. (2010), by James F. Kurose and Keith W. Ross. Covers similar material to Peterson and Davie.

#### **REFERENCE BOOKS**

1. Computer Networks: A Systems Approach, 4th Ed. (2007), by Larry Peterson and Bruce Davie. Covers background networking material with which students should have familiarity.

**CONTINUOUS INTEGRATION AND CONTINUOUS DEPLOYMENT**

Course Code: 23CD301	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

**COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of the Continuous Integration and Continuous Deployment/ Incl of Engineering Practices.

1. To introduce the Continuous Integration and Continuous Deployment work flow.
2. To teach the fundamental techniques and principles in the stages of continuous integration and continuous delivery, and continuous testing.
3. To enable students to have skills that will help them to understand the need of Development and Operations.
4. To teach the Continuous Testing.

**COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with

National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the Integration and Continuous deployment.
2. Understands static code analysis.
3. Learn anatomy of continuous delivery pipeline.
4. Learn the Continuous Testing.

**COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

CLO CO	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

**COURSE CONTENTS**

UNIT NUMBER	COURSE CONTENTS

<b>UNIT-I</b>	<b>OVERVIEW</b> Introduction to CI, Continuous Integration Workflow, Benefits of Continuous Integration, How CI Benefits Distributed Teams, Continuous Delivery, Steps Involved in CICD, Pipelines, Prerequisites, Checklist, Business Drivers for Continuous Deployment, Benefits of Continuous Deployment, CD – The HP Laserjet Case Study
<b>UNIT-II</b>	<b>STAGES OF CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY</b> Core CI Process, VCS, Merging Local Changes to Integration Branch, Fork & Pull, Code Review, Automated code builds – Key metrics, Static Code Analysis, Snapshot, Sample Bug Report, Automated Unit Testing- JUNIT, Test Frameworks, Automated Unit Testing Process
<b>UNIT-III</b>	<b>STAGES EXTENDED</b> Code Coverage analysis, Code Coverage Methods, Condition Coverage, Line Coverage, Publishing Code Coverage reports to Jenkins, Uploading build artifact to a repository, Advanced CI process, Automated Functional Testing, Publish Report to the Development Team, Google Canary release Case study
<b>UNIT-IV</b>	<b>ANATOMY OF A CONTINUOUS DELIVERY PIPELINE</b> Simple Delivery Pipeline, Continuous Deployment Pipeline, Releasing an application to Production, Zero-Downtime Releases, Rolling back deployments, Blue-Green Deployments, Canary Releasing, Emergency Fixes, Continuous Delivery engineering practices, Continuous Development/Integration
<b>UNIT-V</b>	<b>CONTINUOUS TESTING</b> Deploying and Promoting your Application, Modeling Your Release Process and Promoting Builds, Continuous Deployment to successive environments until before Production, Continuous monitoring for the delivery pipeline, Nagios sampler report, Continuous Feedback rules

#### TEXT BOOKS

- Continuous Delivery and DevOps A Quickstart Guide - Book by Paul Swartout, Packt Publishing Limited, 2<sup>nd</sup> edition, ISBN: 9781784399313, 2014.
- Jenkins: The Definitive Guide –Book by John Ferguson Smart, O'Reilly Media, Inc, 1<sup>st</sup> edition, ISBN: 9781449305352, 2011.
- Continuous Delivery –Book by Jez Humble and David Farley, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780321601919, 2010.

## REFERENCE BOOKS

- Continuous Delivery – Book by Eberhard Wolff, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780134691473, 2017.
- Jenkins User Handbook : <https://www.jenkins.io/user-handbook.pdf>
- Jenkins: The Definitive Guide: John Ferguson Smart
- [https://www.bogotobogo.com/DevOps/Jenkins/images/Intro\\_install/jenkins-the-definitive-guide.pdf](https://www.bogotobogo.com/DevOps/Jenkins/images/Intro_install/jenkins-the-definitive-guide.pdf)



AGILE PRACTICES	
Course Code: 23CD303	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

#### COURSE OBJECTIVE

The Objective of this course is to give a strong knowledge of Agile Practices.

1. To enable students to have skills that will help them to understand the need of Agile Practices.
2. To introduce the Digital transformation and Product management.
3. To teach the fundamental techniques and principles in Agile and Scrum methodologies.
4. To teach the fundamental techniques and principles in Kanban.

#### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with

National Education Policy (NEP). After completion of course, students would be able to:

1. Understand common Agile Practices in DevOps.
2. Understand test driven development.
3. Learn its programming.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓		
C03			✓	
C04				✓

## COURSE CONTENTS

UNIT NUMBE R	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION TO DIGITAL TRANSFORMATION</b> Introduction, Challenges of Traditional Business Model, Why Digital Transformation, Design Thinking, Different Phases of Design Thinking, Divergence, Emergence and Convergence of Design Thinking, Design Thinking vs. Agile vs. Lean, Agile Practices, Design Sprint and its Phases, Design Thinking Vs Design Spirit,
UNIT-II	<b>INTRODUCTION TO PRODUCT MANAGEMENT</b> Introduction to Product Management & Service Mindset, Product Manager, Building Products and services, Product lifecycle and phases, product development & Methodology; systems thinking, value chain, Introduction of Capability Optimization and Capability Maturity Model, Business Integration methods, Agile methodology, Product Marketing; User Experience Design
UNIT-III	<b>AGILE PRACTICES</b> Agile Methodology, Software, History of Software Engineering and Software, Development Methodologies, Traditional Software Development Models, Waterfall Model, Classical Waterfall Model, Traditional IT Organizations, Developers vs IT Operations Conflict, Birth of Agile, Four Values of the Agile Manifesto, Agile and Lean
UNIT-IV	<b>AGILE &amp; SCRUM METHODOLOGY</b> Scrum, Scrum Theory, Scrum Values, Scrum Roles, Scrum Master Scrum Sprints, Benefits of Scrum, Planning and Estimation, Agile Planning, Levels of Agile Planning, Conditions of Satisfaction, Velocity, Estimating Techniques, Soft Skills in Agile, Kanban Model.
UNIT-V	<b>KANBAN PRINCIPLES</b> Kanban Principle, Kanban Board, Kanban Core Practices, Make work visible, Limit work in progress (WiP), Manage flow, Make progress policies explicit, Implement feedback mechanisms, Improve collaboratively (using methods and models).

### TEXT BOOKS

- Agile Project Management with Kanban - Book by Eric Brechner, Microsoft Press, 1<sup>st</sup> edition, ISBN: 9780735698956, 2015.
- Agile Foundations: Principles, Practices and Frameworks – Book by Peter Measey and Radtac, BCS-The Chartered Institute for IT, 1<sup>st</sup> edition, ISBN: 1780172540, 2015.

## REFERENCE BOOKS

- Agile Project Management with Scrum - Book by Roman Pichler, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780321605788, 2010.
- Project Management the Agile Way Making It Work in the Enterprise- John C. Goodpasture<http://projanco.com/Project%20Management%20the%20Agile%20Way%20Making%20It%20Work%20in%20the%20Enterprise,%202nd%20Edition.pdf>

Live Project – I & Industrial Training	
Course Code: 23CS0303A	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### **COURSE OBJECTIVE:-**

To provide hands-on experience at site where Computer Science and engineering projects are executed.

### **LIVE PROJECT-I**

Students have to undergo six weeks practical training at the end of fourth semester in Computer Science and Engineering related project sites or with the faculty members of parent or any other institute of repute. At the end of the training they have to submit a report together with a certificate in the format prescribed and make a power point presentation which shall be evaluated.

### **LEARNING OUTCOME:**

1. To enable the students to gather a first-hand experience on sites.
2. They will be able to apply the concepts learnt to design and create a applicatio

### COMPILER DESIGN LAB

Course Code: 24CS3117	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 0 0 2	

#### COURSE OBJECTIVES

1. To be practically exposed to the compiler writing tools.
2. To be able to design and analyze the compiler.
3. To design a symbol table.
4. To implement various Parsing techniques.
5. To understand the basic steps for designing a compiler.

#### COURSE LEARNING OUTCOMES (CLOs):-

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course the students will be able to:

1. Acquire the generic skills to design and implement a compiler along with analysis of practical aspects.
2. Learn application of different compiler writing tools to implement the different Phases of compiler.
3. Work in the development phase of new computer languages in industry and designing symbol tables.
4. Design Top-down, Bottom-up parsing Techniques.
5. Learn the process of translating a modern high-level language to executable code

#### MAPPING BETWEEN COURSE OBJECTIVES (COS) AND COURSE LEARNING OUTCOMES (CLOS)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

#### LIST OF PROGRAMS

1. Implementation of Symbol Table.
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using Lex Tool.

4. Design a lexical analyzer for a given language and the lexical analyzer should ignore redundant spaces, tabs and newlines.
5. Simulate First and Follow of a Grammar.
6. Develop an operator precedence parser for a given language.
7. Construct a recursive descent parser for an expression.
8. Construct a LL(1) parser for an expression.
9. Design predictive parser for the given language.
10. Implementation of shift reduce parsing algorithm.
11. Design a LALR bottom up parser for the given language.
12. Implement the lexical analyzer using JLex, flex or lex or other lexical analyzer generating tools
13. Write a program to perform loop unrolling.
14. Implementation of LEXR using LLVM.
15. Implementation of handwritten parser using LLVM
16. Generating code with the LLVM backend.
17. Recursive descent parser for the CFG language and implement it using LLVM.
18. LR parser for the CFG language and implement it in the using LLVM

**Note: At least 5 more exercises to be given by the teacher concerned.**

<b>TEXT BOOKS</b>
<ul style="list-style-type: none"> <li>Compilers Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., Pearson.</li> </ul>



<b>REFERENCE BOOKS</b>
<ul style="list-style-type: none"> <li>Engineering a Compiler, Second Edition, Keith D. Cooper &amp; Linda Torczon., Morgan Kaufmann, Elsevier.</li> <li>Compiler Design, Sandeep Saxena, Rajkumar Singh Rathore., S.Chand publications</li> </ul>

<b>CONTINUOUS INTEGRATION AND CONTINUOUS DEPLOYMENT LAB</b>	
Course Code: 23CD311	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

#### **COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of the Continuous Integration and Continuous Deployment/ Incl of Engineering Practices.

1. To enable students to have skills that will help them to understand the need of Development and Operations.
2. To teach the fundamental techniques and principles in the stages of continuous integration and continuous delivery, and continuous testing.
3. To introduce the Continuous Integration and Continuous Deployment work flow.
4. To demonstrate the Backup process in Jenkins

#### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand Installation of Jenkins/Java/Maven
2. Creating Pipelines
3. Using Plugins in Jenkins
4. Understand Jenkins Backup Process

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

### LIST OF PROGRAMS

1. Introduction to Jenkins and setup/configuration
2. Installation and Configuration of git/Java/maven on Build server (Windows)
3. Jenkins job, parameters, build, post-build actions and Pipeline
4. Jenkins Agent/Slave configuration with Windows/Ubuntu master hosts
5. Configuring Jenkins with git plugin
6. Create a new Jenkins pipeline
7. Merging local changes to the version control system (Git)
8. Use Jenkins as a Continuous Integration server
9. Deploying the application to staging/prod environment
10. Merging feature branch code (V 2.0) to existing application
11. Uploading plugins manually in Jenkins
12. Backup Management in Jenkins Server

### TEXT BOOKS

- Continuous Delivery and DevOps A Quickstart Guide - Book by Paul Swartout, Packt Publishing Limited, 2<sup>nd</sup> edition, ISBN: 9781784399313, 2014.
- Jenkins: The Definitive Guide –Book by John Ferguson Smart, O'Reilly Media, Inc, 1<sup>st</sup> edition, ISBN: 9781449305352, 2011.
- Continuous Delivery –Book by Jez Humble and David Farley, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780321601919, 2010.



## REFERENCE BOOKS

- Continuous Delivery – Book by Eberhard Wolff, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780134691473, 2017.
- Jenkins User Handbook : <https://www.jenkins.io/user-handbook.pdf>
- Jenkins: The Definitive Guide: John Ferguson Smart
- [https://www.bogotobogo.com/DevOps/Jenkins/images/Intro\\_install/jenkins-the-definitive-guide.pdf](https://www.bogotobogo.com/DevOps/Jenkins/images/Intro_install/jenkins-the-definitive-guide.pdf)

## SEMESTER – VI

TEST AUTOMATION	
Course Code: 23CD302	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVE

The Objective of this course is to give a strong foundation of Test Automation.

1. To enable students to have skills that will help them to understand the need of software testing life cycle.
2. To teach the fundamental techniques and principles in selenium test tool.
3. To introduce the concepts of software testing, Manual testing and Automated testing.
4. To Knowledge in the Test Case Design

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with

National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the Testing in DevOps.
2. Understand to the Design Test Cases.
3. Learn various approaches to Test the Software.
4. Understand the Test Case Design.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓		
C03			✓	
C04				✓

### COURSE CONTENTS

UNIT NUMBE R	COURSE CONTENT
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<b>UNIT-I</b>	<b>INTRODUCTION TO SOFTWARE TESTING</b> Seven principles of Software Testing, SDLC vs STLC, Testing Life Cycle, Usability Testing, Why do we need Usability Testing, How to do Usability testing, Advantages & Disadvantages, Functional Testing, End to End Testing, Methods, Advantages & Disadvantages, Compatibility Testing, Types GUI testing, Techniques API testing, Advantages
<b>UNIT-II</b>	<b>TEST AUTOMATION: SELENIUM</b> Selenium components, Selenium Architecture, TestNG Installing TestNg in Eclipse, TestNG annotations – Understanding usage, Setting priority of execution for test cases, Hard Assertion, Soft Assertion, TestNG Reports, ANT-Downloading & Configuring, XSLT report generation generation using TestNg and Ant
<b>UNIT-III</b>	<b>INTRODUCTION TO SELENIUM 3.X</b> Describe Selenium 3.x advantages and implementation, Define drivers for Firefox, IE, chrome, Iphone, Android etc, Analyse first Selenium Code, Differentiate between Close and Quit, Describe Firepath and firebug Add-ons installation in Mozilla, Inspect elements in Mozilla, Chrome and IE, Identifying WebElements using id, name, class, Generate own CssSelectors. Differentiate between performance of CssSelectors as compared to Xpaths, Define class attribute, Handle Dynamic objects/ids on the page, Analyse whether object is present on page or not
<b>UNIT-IV</b>	<b>MANUAL TESTING</b> Manual Testing, Manual Testing – How to Approach?, Manual Testing – Myth and fallacy, Defect Life Cycle, Qualities of a good Manual Tester, Manual Testing vs Automation Testing, Types, System Testing, Acceptance Testing, Unit Testing, Techniques, Integration Testing, Smoke- Sanity Testing
<b>UNIT-V</b>	<b>INTRODUCTION TO TEST DESIGN</b> Test Scenario, When not to use test scenarios, Test Case Design, Best Practices in Test Case Design, Test Basis, Traceability Matrix

#### TEXT BOOKS

- Flexible Test Automation –Book by Vitaliano Inglese, Pasquale Arpaia, Momentum Press, ISBN: 9781606503836, 2014.
- Experiences of Test Automation: Case Studies of Software Test Automation –Book byMark Fewster, Dorothy Graham, Addison Wesley, 1<sup>st</sup> edition, ISBN: 9780321754066, 2012.

## REFERENCE BOOKS

- Selenium Testing Tools Codebook – Book by Unmesh Gundecha, Packt Publication Limited, ISBN: 9781849515740, 2012.
- A Course on Software Test Automation Design [http://www.testingeducation.org/course\\_notes/hoffman\\_doug/test\\_automation/auto8.pdf](http://www.testingeducation.org/course_notes/hoffman_doug/test_automation/auto8.pdf)
- Complete Guide to Test Automation Techniques, Practices, and Patterns for Building and Maintaining Effective Software Projects — Arnon Axelrod <http://tisten.ir/wp-content/uploads/2019/01/Complete-Guide-to-Test-Automation-Techniques-Practices-and-Patterns-for-Building-and-Maintaining-Effective-Software-Projects-Apress-2018-Arnon-Axelrod.pdf>

APPLICATION CONTAINERIZATION	
Course Code: 23CD304	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

COURSE OBJECTIVE
The Objective of this course is to give a strong foundation of Containers for development & Deployments.
1. To introduce the Containerization and its application.
2. To teach the fundamental techniques and principles in virtualization and orchestration tools.
3. To enable students to have skills in Aws Kubernetes that will help them to understand the need of Development and Deployment.
4. To teach the Virtualization and Linux Containers.

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
1. Understand Containers in DevOps.
2. Understand Orchestration tools.
3. Understand and implement in AWS and KUBERNETES
4. Understand the Linux Containers and Virtualization.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓		
C03			✓	
C04				✓

#### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENT
UNIT-I	<b>APPLICATION CONTAINERIZATION</b> Understanding Containers: Transporting Goods Analogy, Problems in Shipping Industry before Containers, Shipping Industry Challenges, Container: The Saviour, Solution by Containers in the Shipping Industry, Challenges in the Software Industry, Problems in Software Industry Before Containers, Put that in Container! Solution by containers in the Software Industry

<b>UNIT-II</b>	<b>VIRTUALIZATION</b> Introduction, Hypervisor, Scope of Virtualisation, Containers vs Virtual Machines, Understanding Containers, Containerisation Platform, Runtime and Images, Container Platform, Container Runtime, The Chroot System, FreeBSD Jails, Linux Containers (LXC), Docker
<b>UNIT-III</b>	<b>INTRODUCTION TO CONTAINERIZATION</b> Docker architecture, Docker Daemon (Container Platform), Docker Rest API , CLI different environments: (Dev, QA and Prod), Overcoming issues with different environments, Development Environment , Testing Environment, Staging Environment, Production Environment, Virtual machines for dev/deployments, Containers for dev/deployments, Advantages and drawbacks of containerization

<b>UNIT-IV</b>	<b>ORCHESTRATION TOOLS</b>  What is orchestration?, Need of orchestration, Case study: Need of Orchestration , Need of Orchestration: Container and Microservices, Orchestration Tools, Docker Swarm, Docker Swarm Architecture Kubernetes, Kubernetes Architecture
<b>UNIT-V</b>	<b>AWS KUBERNETES</b>  Amazon Web Services, AWS (ECS,EKS), AWS Elastic Container Services Architecture, EKS Architecture, Azure Kubernetes Services, Openshift, Google Kubernetes Engine, KUBERNETES ON CLOUD, Need for Monitoring of container, Elements Monitored, Log Monitoring Infrastructure Monitoring, Application Performance Monitoring, How to Monitor, Tool to Monitor

#### **TEXT BOOKS**

- Developing with Docker –Book by Jarosław Krochmalski, Packt Publication Limited, 1<sup>st</sup> edition, ISBN: 9781786469908, 2016.
- Orchestrating, Clustering, and Managing Containers –Book by Adrian Mouat, O'Reilly Media, ISBN: 9781491966112, 2016

#### **REFERENCE BOOKS**

- The Docker Book: Containerization is the new virtualization – Book by James Turnbull, 2014.
- Cloud Native DevOps with Kubernetes by John Arundel & Justin Domingus<https://get.oreilly.com/rs/107-FMS-070/images/Next-Architecture.pdf>

MANAGEMENT AND ORGANISATIONAL BEHAVIOUR	
Course Code: 23BS301	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### Course Educational Objectives:

The objective of this course is:

- The conceptual framework of management and organizational behaviour and correlate them to manage 21st century organizations.
- Develop understanding about management and Applicability in the corporate world.
- Enhancing and developing the skills and competencies to understand the complexities of business problems.
- Students will be able to understand, retain and recall the basics of management.
- To make them aware about the current scenario and identify themselves in terms of adaptability.
- To develop their skills in analysing and understanding the human behaviour in an organization.

### Course Learning Outcomes:

On completion of the course, it is expected that students will be able to:

- Understand the concept of management
- Learn about different management skills requirements for the corporate world.
- Demonstrate application of previous knowledge testing of Principles of Management in solving business problems.
- Understand the human behaviour and its contribution at work place
- Understand the competitiveness in businesses.

## COURSE CONTENT

UNIT	CONTENTS
UNIT-I	<b><i>Fundamentals of Management and Evolution of Management Thought:</i></b> Concepts of Management, Meaning of Management, Nature and Characteristics of Management, Scope of Management; Levels of Management; Approaches and contributions of Management thinkers in the field of management, Social and Ethical issues in an organisation. Understanding an organisation: Introduction, Organisational Process- Vision, Mission, Strategy, Structure, System and Job task.
UNIT-II	<b><i>Managerial Functions and Social Responsibility of Managers:</i></b> Planning -concept, significance, types; Planning, Organizing -concept, types of organizations, authority, responsibility, power, delegation, Centralization and Decentralization; Staffing concept and HR management; Directing; Coordinating; Control -nature, process, and techniques. The nature of CSR and Business ethics for engineers, Functional areas of management



<b>UNIT-III</b>	<b><i>Introduction to Organisational Behaviour:</i></b> The nature and determinants of organisational behaviour, need for knowledge of OB, contributing disciplines to the field, OB Model, individual differences, Learning, Values, attitudes, Personality, Emotional Intelligence, perception and its errors.
<b>UNIT-IV</b>	<b><i>Work Motivation and Group Behaviour:</i></b> Process of motivation; Theories of motivation - need hierarchy theory, theory X and theory Y, two factor theory, Alderfer's ERG theory, Group: Types of Groups, Stages of Group Development, Group Cohesiveness, Implications of group process of organisation, Understanding Teamwork: Cross functional Teams, Designing a Team- Team Wheel.
<b>UNIT-V</b>	<b><i>Leadership, Organisation Culture, Conflict Management:</i></b> Basic Approaches (Trait Theories, Behavioural Theories & Contingency Theories) & Contemporary Issues in Leadership and Transformational leadership, Role of leader in contemporary Business, Changing Organisational culture, Change management and leading change Strategically and Conflict management.

### References:

1. Luthans Fred (2015): Organizational Behavior, Tata McGraw Hill. (12<sup>th</sup> Edition)
2. Stephen, P Robbins (2009): Organizational Behavior, Prentice Hall of India Private Limited, New Delhi.
3. Koontz & Heinz Weihrich: Essential of Management, McGraw Hill.
4. Tripathy & Reddy: Principles of Management, Tata McGraw-Hill Publications, New Delhi
5. Principles of Management by Terry, G.R.

ARTIFICIAL INTELLIGENCE LAB	
Course Code: 23CS3114	Continuous Evaluation: 60 Marks
Pre-Requisite : Basics of any Programming Language	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### COURSE OBJECTIVE:

1. To implement concepts of AI through different programming languages.
2. To understand the role of each component of AI in designing a smart application.

### COURSE LEARNING OUTCOME:

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

1. Understand the requirement of search strategies in AI.
2. Understand and implement the concepts for uncertainty, knowledge representation and learning.
3. Learn to design the application while deciding the level of requirement of each AI component (search, Planning, Learning, uncertainty).
4. Learn and understand the mapping and interaction among various AI components for an automated/ smart application.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4
CO1	✓	✓		
CO2			✓	✓

### LIST OF PROGRAMS

1. Write a program to solve Water Jug Problem (Using DFS And BFS)
2. Write a program to solve a problem for Means-End Analysis technique (like robot traversal)
3. Write a program to solve 4-Queen's Problem.
4. Write a program to solve travelling salesman problem.
5. Write a program to convert Predicate To Prepositional Logic
6. Write a program for Syntax Checking of English sentences-English Grammar.
7. Write a program to develop an Expert system for Medical diagnosis.
8. Develop any Rule based system for an application of your choice.
9. Write a program to study various fuzzification methods in fuzzy logic.
10. Design fuzzy rule base system for tipping problem.
11. Write a program to design a single layer perceptron for linear logic gates.
12. Write a program to design multi-layer perceptron for non-linear logic gates.
13. Design a classifier for fruit classification using Bayesian and Decision Tree classifier.
14. Develop an algorithm for morphological derivation / verb derivation and implement it.

**Note:**

1. Students can choose any programming language for implementation like Python, C, C++, Java, MATLAB etc.
2. Students will create a project in teams to analyse and apply the concepts learnt.

Learning Resources	
Reference Book and other materials	<ol style="list-style-type: none"><li>1. Laboratory Manual</li><li>2. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Fourth edition, 2020.</li><li>3. Rich and K. Knight, "Artificial Intelligence", Tata McGraw Hill.</li></ol>

**TEST AUTOMATION LAB**

Course Code: 23CD312	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

**COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of Test Automation.

1. To introduce the concepts of software testing, Manual testing and Automated testing.
2. To teach the fundamental techniques and principles in selenium test tool.
3. To enable students to have skills that will help them to understand the need of software testing life cycle.
4. To demonstrate the build an automation in Ecommerce platform.

**COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with

National Education Policy (NEP). After completion of course, students would be able to:

1. Design test scenarios for varied applications
2. Integrate automation Scripts
3. Build & Execute Automation Scripts
4. Understand the Build & Execute Automation Scripts in Ecommerce.

**COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

CLO CO	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

## LIST OF PROGRAMS

1. Design and document test scenarios for any ecommerce web application to validate
2. Build an automation script for registration and login for eCommerce platform
3. Proceed to write the script similarly using Java for Registration page
4. Integrate extent report with automation scripts for result reporting
5. Build an automation script for searching the article eCommerce platform
6. Build an automation script for article details page eCommerce platform
7. Build an automation script for searching the article and validate the searching of the article
8. Build an automation script for navigating to the article details page and validate all the details for an article
9. Implement the parameterized data for the automation script build in starting.
10. Build an automation script for data driven test eCommerce platform
11. Refactor your test code for Login, Search Page and Article details page based on the framework created in above step
12. Execute automation script developed on Chrome and Firefox
13. Integrate automation scripts with Jenkins for execution on build deployment

## TEXT BOOKS

- Selenium Web Driver Practical Guide – Book by Satya Avasarala, Packt Publishing Limited, ISBN: 9781782168850, 2014.

## REFERENCE BOOKS

- Flexible Test Automation –Book by Vitaliano Inglese, Pasquale Arpaia, Momentum Press, ISBN: 9781606503836, 2014.
- Experiences of Test Automation: Case Studies of Software Test Automation – Book by Mark Fewster, Dorothy Graham, Addison Wesley, 1<sup>st</sup> edition, ISBN: 9780321754066, 2012.
- Selenium Testing Tools Codebook – Book by Unmesh Gundecha, Packt Publication Limited, ISBN: 9781849515740, 2012.
- A Course on Software Test Automation Design [http://www.testingeducation.org/course\\_notes/hoffman\\_doug/test\\_automation/aut\\_o8.pdf](http://www.testingeducation.org/course_notes/hoffman_doug/test_automation/aut_o8.pdf)
- Complete Guide to Test Automation Techniques, Practices, and Patterns for Building and Maintaining Effective Software Projects — Arnon Axelrod <http://tisten.ir/wp-content/uploads/2019/01/Complete-Guide-to-Test-Automation-Techniques-Practices-and-Patterns-for-Building-and-Maintaining-Effective-Software-Projects-Apress-2018-Arnon-Axelrod.pdf>

**APPLICATION CONTAINERIZATION LAB**

Course Code: 23CD314	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination:40 Marks
L T P : 0 0 2	
Credits: 1	

**COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of Containers for development & Deployments.

1. To introduce the Vagrant File and Configuration of Sandbox.
2. To teach the fundamental techniques and principles in Dockers.
3. To enable students to have skills in Kubernetes that will help them to understand the need of application containerization for Development.
4. To demonstrate the Deployment and Services in Minikube.

**COURSE LEARNING OUTCOMES**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with

National Education Policy (NEP). After completion of course, students would be able to:

1. Understand containers in DevOps.
2. Learn its containerization.
3. Understand Orchestration tools.
4. Understand the Deployment process.

**COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

CLO CO	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓		
C03			✓	
C04				✓

## LIST OF PROGRAMS

1. Playing with Vagrant
2. Understanding Vagrant File and Configuration of Sandbox
3. Installation and Configuration of Docker Machine
4. Working with Docker Images and running Docker Containers
5. Dockerfile: Working with Containerization Application
6. Docker Extras – Docker Port Binding, Docker Volumes, Docker Linking, Monitoring
7. DTR : Working with Docker Hub and Publishing Images
8. Working with Docker Compose
9. Docker-Swarm : Spin up 3 virtual machines (vagrant in our case) and setup swarm cluster with one manager and 2 node
10. Working with Kubernetes –Minikube
11. Deploying Pods and Services on Minikube

#### **TEXT BOOKS**

- Developing with Docker –Book by Jarosław Krochmalski, Packt Publication Limited, 1<sup>st</sup> edition, ISBN: 9781786469908, 2016.
- Orchestrating, Clustering, and Managing Containers –Book by Adrian Mouat, O'Reilly Media, ISBN: 9781491966112, 2016

#### **REFERENCE BOOKS**

- The Docker Book: Containerization is the new virtualization – Book by James Turnbull, 2014.
- Cloud Native DevOps with Kubernetes by John Arundel & Justin

Domingus[https://get.oreilly.com/rs/107-FMS-070/images/Next-Architecture.pdf?](https://get.oreilly.com/rs/107-FMS-070/images/Next-Architecture.pdf)



Live Project – II & Industrial Visit	
Course Code: 23CS0304A	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

#### **COURSE OBJECTIVE:-**

To provide hands-on experience at site where Computer Science and engineering projects are executed.

#### **LIVE PROJECT-II**

Students have to undergo three weeks practical training at the end of fifth semester in Computer Science and Engineering related project sites or with the faculty members of parent or any other institute of repute. At the end of the training they have to submit a report together with a certificate in the format prescribed and make a power point presentation which shall be evaluated.

#### **LEARNING OUTCOME:**

1. To enable the students to gather a first-hand experience on sites.
2. They will be able to apply the concepts learnt to design and create a application.

## SEMESTER –VII

SYSTEM PROVISIONING AND CONFIGURATION MANAGEMENT	
Course Code: 23CD401	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

COURSE OBJECTIVE
The Objective of this course is to give a strong foundation of System Provisioning and Configuration Management.
1. To introduce the Provisioning tools.
2. To teach the fundamental techniques and principles in Sonarqube tools.
3. To enable students to have skills in the system provisioning and configuration management.
4. To teach the provisioning on cloud.

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
1. Understand the provisioning.
2. Understand configuration management.
3. Learn automation, preventing errors, tracking of changes.
4. Understand the provisioning on Cloud.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO \ CO	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
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<b>UNIT-I</b>	<b>INTRODUCTION TO PROVISIONING</b> What is Provisioning – Basic Definition, Software Definition, Concepts of Provisioning, Why Provisioning Should be Exclusive, Configuration Management, Configuration Management Tools, Why Provisioning is not Configuration Management, Provisioning Tools, Test Machines for Provisioning, Deployment, Relationship between Deployment and Provisioning
<b>UNIT-II</b>	<b>ON PREMISE PROVISIONING</b> Understanding 'On Premise Provisioning, What is On Premise?, Provisioning Infrastructure, Server Templating, Server Templating, Connectivity with Servers, What is a Client?, What is Templating?, Server Side Templating, Challenges of Server Side Templating, Advantages of Server Side Templating, Server Side Templating Vs Client Side Templating
<b>UNIT-III</b>	<b>PROVISIONING ON CLOUD</b> Introduction, Cloud Providers, Benefits of Cloud Computing, Types of Cloud Computing, Types of Deployment Model, Types of Service Model, Life Cycle of Provisioning on Cloud, Automated Provisioning on Cloud, What is Cloud Automation? Benefits of Cloud Automation, What is Sonarqube? Code Quality Checks
<b>UNIT-IV</b>	<b>SONARQUBE</b> Features of Sonarqube, Code Scanner, Application of Code Scanner, Organizational Improvement Using Code Scanner, Organizational Improvement Using Code Scanner Application of Code Scanner, On Premise to Cloud Migration Strategies, What is Cloud Migration? Types of Cloud Migration Strategies, Benefits of Cloud Migration, Network Security Enablement from On-Premises to Cloud, What are Microservices?, Azure Kubernetes Service (AKS), Benefits of AKS, Benefits of EKS
<b>UNIT-V</b>	<b>SYSTEM PROVISIONING AND CONFIGURATION MANAGEMENT</b> State of Various Tools in Provisioning and Configuration, Infrastructure as Code, Continuous Integration/Continuous Deployment, Configuration Management, Configuration Management in DevOps, Monitoring, Reasons for Using Provisioning and Configuration Tools, Automation, Preventing Errors and Tracking of Changes, Tools and their Capabilities

#### TEXT BOOKS

- Get started with Ansible –Book by Lorin Hochstein, O'Reilly Media, ISBN: 9781491965505, 2016.
- Ansible Configuration Management –Book by Daniel Hall, Packt Publication Limited, 2<sup>nd</sup> edition, ISBN: 9781785289521, 2016.

#### REFERENCE BOOKS

- Ansible for DevOps –Book by Jeff Geerling, Midwestern Mac, 1<sup>st</sup> edition, ISBN: 9780986393419, 2015.
- Terraform in Action. <https://livebook.manning.com/book/terraform-in-action/chapter-1/v-11/>

CLOUD COMPUTING	
Course Code: 24CS4003	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVES

1. To introduce students to the foundational concepts of cloud computing, including its history, architecture, characteristics, service models, deployment models, and advantages compared to traditional computing paradigms.
2. To provide a comprehensive understanding of virtualization techniques, their benefits and drawbacks, and their role in cloud computing, including the management of virtual infrastructures and service-oriented architectures.
3. To equip students with the skills to develop cloud-native applications, leveraging microservices architecture, DevOps practices, cloud SDKs, APIs, and various cloud services for database management, scaling, monitoring, and serverless computing.
4. To understand the process of migrating applications and services to the cloud, including challenges, legal issues, cloud economics, and capacity management strategies.
5. To provide an in-depth understanding of the security protocols, algorithms, and tools used to secure data in cloud environments, addressing the unique security concerns and legal issues associated with multi-tenant and multi-cloud architectures.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course the students will be able to:

1. Understand the history and evolution of cloud computing and explain the essential characteristics and architecture of cloud computing.
2. Explain virtualization techniques and their importance in cloud computing.
3. Understand the principles of cloud-native application development and implement microservices architecture in cloud applications.
4. Identify the key challenges associated with cloud migration and discuss the legal issues related to cloud computing.
5. Utilize tools and technologies to secure data in both private and public cloud architectures.

### MAPPING BETWEEN COURSE OBJECTIVES (COS) AND COURSE LEARNING OUTCOMES (CLOS)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION</b> Cloud computing history, architecture and essential characteristics, cloud service models, Cloud Deployment models, advantages of cloud computing, cloud v/s grid computing.
UNIT-II	<b>VIRTUALIZATION</b> Virtualization techniques, Benefits and drawbacks of virtualization, VM migration with its types, hypervisors, types of hypervisors, distributed management of virtual infrastructures, scheduling techniques for advance reservation of capacity, Service-oriented architectures, SOAP v/s REST.
UNIT-III	<b>CLOUD APPLICATION DEVELOPMENT</b> <b>Cloud-Native Development:</b> Principles of Cloud-Native Applications, Microservices Architecture, DevOps and Continuous Integration/Continuous Deployment (CI/CD). <b>Developing with IaaS and PaaS:</b> Setting Up Development Environments, Utilizing Cloud SDKs and APIs, Deployment Strategies. <b>Database Services:</b> Managed Databases (SQL, NoSQL), Database Migration, Performance Optimization. <b>Application Scaling and Monitoring:</b> Auto-Scaling, Load Testing, Monitoring and Logging. <b>Serverless Architecture:</b> Introduction to Serverless, Building and Deploying Serverless Applications, Use Cases and Best Practices
UNIT-IV	<b>MIGRATING INTO THE CLOUD:</b> Introduction, challenges in the cloud, legal issues in cloud computing, Cloud Economics and Capacity Management: Restricted Choices, Capacity Planning, Queuing and Response Time, Evidence Based Decision Making, Instrumentation (Measuring Resource Consumption), Bottlenecks, Key Volume Indicators.
UNIT-V	<b>CLOUD SECURITY</b> Security in clouds, protocols, algorithms, Security as a service, Tools and technologies to secure the data in Private and Public Cloud Architecture. Security Concerns, Legal issues and Aspects, Multi-tenancy issues Multi-cloud.

### TEXT BOOKS

- Cloud Computing Principles and Paradigms, Rajkumar Buyya, Wiley & Sons pub.
- Cloud Computing Web-Based dynamic IT services: Christian Baun, Springer.
- Barrie Sosinky, Cloud Computing: Bible, 1st edition, Wiley Publishing, Inc., 2011.

### REFERENCE BOOKS

- Syed A.Ahson and Mohammed Ilyas, Cloud Computing and Software Services: Theory and Techniques, CRC Press, Taylor and Francis Group, 2010.

• Judith Hurwitz, Robin Bloor, Marcia Kaufman and Fern Halper, Cloud Computing for Dummies. Wiley- India edition, 2010

CLOUD COMPUTING LAB	
Course Code: 23CS4113	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### COURSE OBJECTIVE:

1. To analyse and reveal the core issues in line with the security, privacy, and interoperability in cloud platform.
2. To apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost.
3. To study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, elastic and cost-efficient.
4. To assess the comparative advantages and disadvantages of Virtualization technology.
5. To create a cloud environment using open source software tools.
6. To analyze various cloud programming models and apply them to solve problems on the cloud.

### COURSE LEARNING OUTCOMES (CLOs):

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

1. Explain the fundamental principles of cloud computing and its related Concepts
2. Analyze Prominent Cloud computing technologies available in the marketplace.
3. Discuss virtualization technologies along with the architectural models of cloud computing.
4. Leverage the prominent Cloud computing technologies available in the market place.
5. Demonstrate different features of cloud platforms used in Industry.
6. Understand how energy efficiency achieved in cloud computing using green computing and understand the mechanism needed to harness cloud computing in the respective endeavours.
7. Apply suitable applications to leverage the strength of cloud computing.
8. Develop the applications of cloud Computing that can harness the power of cloud computing.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO \ CO	CL01	CL02	CL03	CL04	CL05	CL06	CL07	CL08
CO1	✓	✓						
CO2		✓	✓					
CO3			✓	✓				
CO4				✓				
CO5					✓	✓		
CO6							✓	✓

## PROGRAMS

- 1) To study of Cloud Computing & Architecture and types of Cloud Computing.
- 2) To create and run virtual machines on open source OS.
- 3) To implement Infrastructure as a Service, Installing OpenStack and use it as Infrastructure as a Service.
- 4) To install Storage as Service. [Installation and understanding features of ownCloud as SaaS.]
- 5) To implement identity management. [installing and using identity management feature of OpenStack]
- 6) To write a program for web feed [ PHP, HTML]
- 7) To simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
- 8) To install Hadoop single node cluster and run simple applications like wordcount.
- 9) To find a procedure to transfer the files from one virtual machine to another virtual machine.
- 10) Install Google App Engine. Create hello world app and other simple web applications using python/java.
- 11) Working of Goggle Drive to make spreadsheet and notes.
- 12) Installation and Configuration of Justcloud.
- 13) Working in Cloud9 to demonstrate different language.
- 14) Working in Codenvy to demonstrate Provisioning and Scaling of a website.
- 15) Installation and Configuration of Hadoop/Eucalyptus

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

<b>TEXT BOOKS</b>
Cloud Computing-A Practical Approach” Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill.
Tim Mather, SubraKumaraswamy, ShahedLatif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O’ReillyMedia Inc.
Barrie Sosinsky, Cloud Computing: Bible, 1st edition, Wiley Publishing, Inc., 2011.

<b>REFERENCE BOOKS</b>
ayed A.Ahson and Mohammed Ilyas, Cloud Computing and Software Services: Theory and Techniques, CRC Press, Taylor and Francis Group, 2010.
udith Hurwitz, Robin Bloor, Marcia Kaufman and Fern Halper, Cloud Computing for Dummies.Wiley- India edition, 2010



<b>Live Project – III &amp; Industrial Training</b>	
Course Code: 23CS4115A	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

### **COURSE OBJECTIVE:**

To provide hands-on experience at site where Computer Science and engineering projects are executed.

### **LIVE PROJECT-III**

Students have to undergo six weeks practical training at the end of sixth semester in Computer Science and Engineering related project sites or with the faculty members of parent or any other institute of repute. At the end of the training they have to submit a report together with a certificate in the format prescribed and make a power point presentation which shall be evaluated.

### **LEARNING OUTCOME:**

1. To enable the students to gather a first-hand experience on site.

**SYSTEM PROVISIONING AND CONFIGURATION MANAGEMENT LAB**

Course Code: 23CD411	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 2	
Credits: 1	

**COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of System Provisioning and Configuration Management.

To enable students to have skills in System Provisioning and Configuration Management.

To teach the fundamental techniques and principles in AWS VPC, Security and Policy.

To introduce the AWS Configuration, User account creation - Terraform.

To teach the AWS security and AWS IAM policy.

**COURSE LEARNING OUTCOMES**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand Provisioning on Cloud.

Learn Automation, Preventing Errors, Tracking of Changes.

Understand Configuration Management.

Understand the AWS security and policy.

**COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO \ CO</b>	<b>CL01</b>	<b>CL02</b>	<b>CL03</b>	<b>CL04</b>
<b>CO1</b>	✓			
<b>CO2</b>		✓		
<b>CO3</b>			✓	
<b>CO4</b>				✓

**LIST OF PROGRAMS**

Working with Infrastructure as Code: Automation of your Infrastructure

## AWS Configuration for Terraform

Open an AWS Account, Create IAM Admin User — Terraform

Work on Creating Security Group

Spinning up EC2 instance - github.com

Exploring Variables, Exploring Resources

Working with Modules

Working with State Management

Creating an AWS VPC using terraform

0. Creating an AWS security group using terraform
1. Creating an AWS IAM policy using terraform
2. Creating an AWS S3 bucket instance using terraform.

### TEXT BOOKS

- Get started with Ansible –Book by Lorin Hochstein, O'Reilly Media, ISBN: 9781491965505, 2016.
- Ansible Configuration Management –Book by Daniel Hall, Packt Publication Limited, 2<sup>nd</sup> edition, ISBN: 9781785289521, 2016.

### REFERENCE BOOKS

- Ansible for DevOps –Book by Jeff Geerling, Midwestern Mac, 1<sup>st</sup> edition, ISBN: 9780986393419, 2015.
- Terraform in Action. <https://livebook.manning.com/book/terraform-in-action/chapter-1/v-11/>

### MINOR PROJECT

Course Code: 23CS4117	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 8	
Credits: 4	

### COURSE OBJECTIVE: -

To simulate real life situations related to Computer Science and engineering and impact adequate training so that confidence to face and tackle any problem in the field is developed.

## **PROJECT**

Each student is given an exercise which will cover all the aspects ( to the extent possible) like investigation, planning, designing, detailing and estimating of a Computer Science and engineering structure in which the aspects like analysis, application of relevant codes, etc., will find a place. Alternately, a few research problems also may be identified for investigation and the use of laboratory facilities to the fullest extent may be taken as a project work. Alternately, a student is encouraged to take an industrial project with any Computer Science and engineering organization or firm. A project report is to be submitted on the topic which will be evaluated.

### **LEARNING OUTCOME:**

1. Identify, formulate and analyse existing problem in the (non-automated) work flow for performing a specific task.
2. Design and implement automated solutions for the assigned/identified real world problems.
3. Write technical reports.
4. Practice and develop skills in time management and reporting within an industrial or research laboratory setting.
5. Contribute to an ethical and professional work culture and also to learn to work in diverse teams.

## SEMESTER –VIII

### APPLIED DEVOPS & SYSTEM MONITORING

Course Code: 24CD402	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

#### COURSE OBJECTIVE

1. The Objective of this course is to give a strong foundation of applied DevOps.
2. Understand the key practices, historical context, and evolution of DevOps.
3. Familiarize with tools and technologies for agile planning, infrastructure management, and cloud computing.
4. Set up and manage comprehensive monitoring solutions for end user, infrastructure, and application performance.
5. Create and automate CI/CD pipelines for reliable and scalable software delivery.
6. Explore emerging trends in DevOps, including AI integration and advanced IAC techniques.

#### COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:	
1.	Describe the evolution, core practices, and impact of DevOps and Agile planning.
2.	Gain hands-on experience with key DevOps tools and technologies including IAC, version control, cloud platforms, and containerization.
3.	Apply various monitoring techniques and tools to ensure system reliability and performance.
4.	Design and implement automated testing and deployment pipelines using CI/CD practices.
5.	Understand emerging trends in DevOps, including AI in monitoring and advanced IAC practices.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<del>CLO</del> CO	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓

#### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
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<b>UNIT-I</b>	<b>Introduction to DevOps</b> Historical context, DevOps in Today's Age, The Baby Steps Towards Transformation, Practices in DevOps, Agile Planning, Case Studies and Industry Examples
<b>UNIT-II</b>	<b>Tools and Technologies in DevOps</b> Tools and Technologies for Agile Planning, Infrastructure as Code (IAC): History and Evolution, Infrastructure as Code: Timeline of Tools, IAC Tools: Terraform Workflow, Tools & Tech: Operating Systems (Linux), Tools & Tech: Version Control Systems, Tools & Tech: Cloud Computing, Cloud Computing Providers
<b>UNIT-III</b>	<b>Continuous Integration and Deployment</b> Practices in DevOps: Test Automation, Test Automation Tools, Practices in DevOps: Continuous Integration, Continuous Integration Tools: Jenkins, Continuous Deployment (CI), Push-Based vs Pull-Based Systems, Containerization and Tools, Containerization: Docker Architecture, Container Orchestrators
<b>UNIT - IV</b>	<b>DevOps Monitoring and Metrics</b> Introduction to Monitoring, Goals and Approaches in DevOps Monitoring, Network Operations Center (NOC) and its Role, Telemetry and Metrics, Types of Monitoring: End User Monitoring, Infrastructure Monitoring, Application Monitoring, Log Monitoring and Analysis
<b>UNIT - V</b>	<b>Advanced DevOps Practices and Trends</b> Cloud Containers and Microservices, Cloud Computing: Providers and Services, Advanced Infrastructure as Code (IAC) Practices, Emerging DevOps Trends and Technologies, AI in Monitoring (AIOps), Monitoring Techniques: Visualization – Dashboards, Alerts, Alert Triage Process, DevOps Dashboard with Hygieia, Tools Overview

#### TEXT BOOKS

- The DevOps Handbook - by John Willis, Patrick Debois, Jez Humble, Gene Kim, IT Revolution Press, ISBN: 9781942788003, 2017.
- DevOps: A Software Architect's Perspective - by Len Bass, Ingo Weber, Liming Zhu, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780134049847, 2015
- Instant Nagios Starter –Book by Michael Guthrie, Packt publication Limited, ISBN: 9781782162513, 2013.
- Building a Monitoring Infrastructure with Nagios –Book by David Josephsen, Prentice Hall, 1st edition, ISBN: 9780132236935, 2007.
- Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation - by Jez Humble (Author), David Farley (Author), Martin Fowler (Foreword), Addison-Wesley, 1st edition, ISBN: 9780321601919, 2010.

#### REFERENCE BOOKS

- DevOps for the Modern Enterprise: Winning Practices to Transform Legacy IT Organizations – Book by Mirco Hering (Author), Bhaskar Ghosh (Foreword), IT Revolution Press, ISBN: 9781942788195, 2018.
- DevOps for Dummies <https://www.immagic.com/eLibrary/ARCHIVES/EBOOKS/W150421S.pdf>

- Learning Nagios – Book by Wojciech Kocjan, Piotr Beltowski, Packt Publication Limited, 3<sup>rd</sup> edition, ISBN: 9781785885952, 2016.
- Monitoring in a DevOps World - Perfect should never be the enemy of better by Theo Schlossnagle, Circonus <https://queue.acm.org/detail.cfm?id=3178371>
- Introduction to DevOps on AWS  
<https://docs.aws.amazon.com/whitepapers/latest/introduction-devops-aws/introduction-devops-aws.pdf>

### MAJOR PROJECT

Course Code: 23CS4114	Continuous Evaluation: 60 Marks
Pre-Requisite : NIL	End Semester Examination: 40 Marks
L T P : 0 0 24	
Credits: 12	

#### COURSE OBJECTIVE:

The objective of the project semester is to make the students solve real world problems using automated solutions, while developing management and writing skills amongst them.

#### PROJECT:

Each student is given an exercise which will cover all the aspects ( to the extent possible) like investigation, planning, designing, detailing and estimating of a Computer Science and engineering structure in which the aspects like analysis, application of relevant codes, etc., will find a place. Alternately, a few research problems also may be identified for investigation and the use of laboratory facilities to the fullest extent may be taken as a project work. Alternately, a student is encouraged to take an industrial project with any Computer Science and engineering organization or firm. A project report is to be submitted on the topic which will be evaluated.

#### COURSE LEARNING OUTCOME:

1. Identify, formulate and analyse existing problem in the (non-automated) work flow for performing a specific task.
2. Design and implement automated solutions for the assigned/identified real world problems.
3. Write technical reports.
4. Practice and develop skills in time management and reporting within an industrial or research laboratory setting.
5. Contribute to an ethical and professional work culture and also to learn to work in diverse teams.



## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES – I

### COMPUTER ARCHITECTURE & ORGANIZATION

Course Code: 24CSPE2007	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVE

1. To impart the basic concepts of component, architecture and register organization.
2. To understand concepts of data representation and binary value implementation using arithmetic algorithms.
3. To teach the students how to describe machine capabilities and design an effective data path of control unit
4. To provide knowledge of memory technologies, interfacing techniques and sub-system.
5. To make students understand the importance of IO interfacing techniques and their performance metrics for a typical computer.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course the students will be able to:

1. Analyse the basic operational concepts of Functional unit, Instruction format and addressing mode.
2. Differentiate the RISC and CISC architecture. Analyze the performance of machines with different capabilities.
3. Illustrate the binary format of numerical and characters. Validate efficient algorithm for arithmetic operations.
4. Understand the need for an interface and instruction cycle phases. Implement the hardwired and microprogrammed control unit for analyse the performance.
5. Explain the importance of hierarchical memory organization. Able to construct larger memories. Analyze and suggest efficient cache mapping technique and replacement algorithm for given design requirements.

### MAPPING BETWEEN COURSE OBJECTIVES (COS) AND COURSE LEARNING OUTCOMES (CLOS)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓	✓		
C03				✓	
C04					✓
C05				✓	

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION</b> Evolution of Computer Systems-Computer Types-Functional units-Basic operational concepts-Bus structures- location and addresses-memory operations- Addressing modes-Design of a computer system- Memory Instruction and instruction sequencing, RISC versus CISC.
UNIT-II	<b>CENTRAL PROCESSING UNIT</b> Introduction-Arithmetic Logic Unit - Fixed point arithmetic, floating point arithmetic-Execution of complete instruction-Basic concepts of pipelining.
UNIT-III	<b>CONTROL UNIT DESIGN</b> Introduction-Control Transfer-Fetch cycle- Instruction Interpretation & Execution,Hardwired control- Micro-programmed control
UNIT-IV	<b>MEMORIES AND SUBSYSTEMS</b> Semiconductor memory - Static and Dynamic -Associative memory- Cache memory-Mapping methods, Organization of a cache memory unit, Fetch and write mechanisms Virtual memory-Secondary memories-Optical magnetic tape & magnetic disks &controllers.
UNIT-V	<b>I/O PROCESSING</b> Introduction-Data transfer techniques- Bus Interface- I/O Channel-I/O Processor, I/O devices -Direct memory access.

### TEXT BOOKS

- Computer Organization and Design - The Hardware/Software Interface-Author D. A. Patterson and J. L. Hennessy publisher Morgan Kaufmann Edition 2014
- Computer Organization, Carl Hamacher, Zvonko Vranesic and Safwat Zaky, V Edition,
- Computer System Architecture, Morris Mano, Third edition-2002, Prentice Hall of India Pvt Ltd publications.
- Computer Organization and Architecture – Designing for Performance”, William Stallings,Ninth edition, Pearson publications.

### REFERENCE BOOKS

- Structured Computer Organization, Andrew S. Tanenbaum
- David A. Patterson and John L. Hennessy, “Computer Organization and Design: TheHardware/Software interface”.
- John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill

## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES – II

THEORY OF COMPUTATION	
Course Code: 23CSPE2004	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVES

1. To understand and design various finite Computing models.
2. To understand the basics of regular expression and its equivalence.
3. To gain knowledge about the concepts of grammar, normal forms.
4. To study the concepts of Push Down Automata and its applications.
5. To understand the recursive and recursively enumerable languages , decidability and un-decidability of various problems.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy-2020 (NEP). After completion of course, students would be able to:	
1. Comprehend regular languages and finite automata and develop ability to provide the equivalence between regular expressions, NFAs, and DFAs.	
2. Design regular expressions to define simple and complex search criteria.	
3. Disambiguate context-free grammars by mastering the concepts of context- free languages.	
4. Design PDA to recognize context free grammars.	
5. Apply the concepts of recursive and recursively enumerable languages and design efficient Turing Machines.	

### COURSE LEARNING OUTCOMES (CLO)-COURSE OBJECTIVES (CO) MAPPING

CLOs \ COs	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

## COURSE CONTENTS

UNIT NUMBER	CONTENTS
UNIT-I	<b>BASIC COMPUTATIONAL CONSTRUCTS</b> Finite State Systems, Basic Definitions Non-Deterministic finite automata(NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA Finite automata with $\epsilon$ -moves, minimization of finite Automata, Concept of basic Machine, Properties and limitations of FSM, Moore and Mealy Machines, Equivalence of Moore and Mealy machines, pumping lemma.
UNIT-II	<b>REGULAR EXPRESSIONS</b> Regular grammars, regular expressions, equivalence between regular languages, properties of regular languages, Regular Expressions, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa. Conversion of NFA to DFA by Arden's Method.
UNIT-III	<b>GRAMMAR</b> Context Free Languages – Leftmost and rightmost derivation, parsing and ambiguity, Chomsky Hierarchy, LR(k) Grammars, properties of LR(k) grammars, Simplification of CFG, Normal forms.
UNIT-IV	<b>PUSHDOWN AUTOMATA</b> Pushdown Automata –Definition, Instantaneous Description, Applications of Pushdown Machines, NDPDA and DPDA, Equivalence: PDA to CFL and vice-versa, pumping lemma for CFL.
UNIT-V	<b>TURING MACHINES &amp; COMPUTATIONAL COMPLEXITY</b> Turing Machines- Introduction, Definition, Instantaneous Description, Turing machine as Acceptors, Halting problem of T.M., Undecidability: Basics, Post's Correspondence Problem, Rice's Theorem, Properties of Recursive and Recursively Enumerable Languages, Introduction to NP-Hardness and NP-Completeness.

### TEXT BOOKS

- E. Hopcroft and J. D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson, Education Publishers, 2nd Edition, 2004

### REFERENCE BOOKS

- |  |
|--|
| • Michael Sipser, "Introduction to the Theory of Computation", Thomson Asia, 2004            |
| • J.C.Martin, "Introduction to Languages and Theory of Computation", McGraw Hill, 2003       |
| • K.L.P. Mishra, N.Chandrasekaran , " Theoretical Computer Science ", PHI, 3rd Edition, 2007 |

## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES – III

PYTHON PROGRAMMING	
Course Code: 23CD321	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

COURSE OBJECTIVE
The Objective of this course is to give a strong programming foundation of Python Programming.
To teach the Python environment setup.
To teach the fundamental techniques and principles in Python Programming
To teach the Data Pre-processing and Statistical Modeling in Python.
To enable students to have skills in Python Programming.

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand to set up Python environment.
Understand the Programming fundamentals.
Understand the Pre-Processing steps with Python.
Learn the statistical Modeling with Python.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO\CO	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>Setting Up The Python Environment</b> Installing Python, Anaconda, Jupyter Notebook, Spyder, Introduction to Python, Components, Versions and Distributions, Difference between Python 2 and Python3, Compiler vs Interpreter, Statically vs Dynamically typed languages.

<b>UNIT-II</b>	<b>Programming With Python</b> Python REPL, variables, control structures, functions, objects, First-class functions, Immutable data, Strict and non-strict evaluation, Recursion instead of an explicit loop state, Functions, Iterators, and Generators, Writing pure functions, Functions as first-class objects, Using strings, tuples and named tuples, Using lists, dicts, and sets, The Itertools Module, Best Practices, Clean coding, Reading data files into Python, manipulating rows and columns in files, writing files, Introduction to python libraries
<b>UNIT-III</b>	<b>Data Pre-Processing</b> Introduction to Pandas and Basic Concepts of Pandas, Data Cleaning and Preparation, Handling Missing Data, Filtering out Missing Data, Filling in Missing Data, Data Transformation, Removing Duplicates
<b>UNIT-IV</b>	<b>Data Pre-Processing Extended</b> Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, String Manipulation, Feature Engineering
<b>UNIT-V</b>	<b>Statistical Modeling</b> Derived Variables, Basic Exploratory Data Analysis, Methods for EDA and Examples, Statistical Modeling, Curve Fitting: Linear Regression, Nonlinear Regression

#### **TEXT BOOKS**

- Head First Python: A Brain-Friendly Guide – Book by Paul Barry, O'Reilly, 2<sup>nd</sup> edition, ISBN: 9781491919538, 2016.
- Automate the Boring Stuff with Python: Practical Programming for Total Beginners – Book by Al Sweigart, 2<sup>nd</sup> edition, ISBN: 9781593279929, 2019.

#### **REFERENCE BOOKS**

- Learning Python: Powerful Object-Oriented Programming – Book by Mark Lutz, O'Reilly, 5<sup>th</sup> edition, ISBN: 9781449355739, 2013.

<b>BIG DATA OVERVIEW</b>	
Course Code: 23CD323	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

<b>COURSE OBJECTIVE</b>
The Objective of this course is to give a strong understanding of Big Data Concepts
To introduce the rate of data growth.
To teach different types of Data and Data Lake Essentials
To teach the types of Scalability and Load Balance.
To teach the fundamental techniques and principles in Big Data ecosystem.

<b>COURSE LEARNING OUTCOMES (CLO)</b>
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the types of data generated.
Learn the Data Lake Essentials.
Understand the Scalability.
Explore the Big Data Ecosystem.

#### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CL01	CL02	CL03	CL04
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

#### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>Data Growth Explosion</b> Data is everywhere, Different sources of data, Types of data, Data explosion, What has led to data explosion?, Increase in Storage Capacities, Data Processing Abilities, Emerging Data Formats and Data Availability, of Data Explosion , Definition(s) of Big Data, Know the history, How Big is Big Data?, Sources of Big Data, Characteristics of Big Data - The Three, Know the numbers, Challenges, Velocity, Applications of the Velocity dimension,



	Challenges, Variety, Dimensions of variety, Challenges, Value- The Big V of Big Data, Drivers of Big Data Value, How to access and analyze big data, Benefits of Processing Big Data, Any other V's
<b>UNIT-II</b>	<b>Categories of Data</b> Data Classification, Organization of structured data, Examples of structured data, How Structured Data expands? Advantages and Disadvantages of Structured Data, What is unstructured data?, Examples of Unstructured Data, Advantages and Disadvantages of Unstructured Data, What is Semi-structured data?, Examples of semi-structured data, Advantages and disadvantages of semi-structured data, Comparison of structured, unstructured and semi-structured data
<b>UNIT-III</b>	<b>Data Lake Essentials</b> What is a data lake?, Key attributes of a data lake, Traditional Analytics Pipeline, Data Lake Pipeline, How Data Lake Compares to Enterprise Data Warehouse, Components of a Data Lake – Ingestion, Components of a Data Lake – Storage, Components of a Data Lake - Catalogue and Search, Components of Data Lake – Process, Security, Components of a Data Lake, Data Access and Visualization, Sources of Data to a Data Lake, Benefits, Use cases of data lake, stores used in data lake, Data Processing Requirements
<b>UNIT-IV</b>	<b>Scalability</b> Improve the Availability and Performance of Systems, Elasticity, Scalability, How to measure scalability?, Types of Scaling, Comparison of Horizontal and Vertical Scaling, Load Balancing, Ways to Balance Load, Database Scalability, Parallelism, Shared Nothing Architecture, Replication, Partitioning
<b>UNIT-V</b>	<b>Big Data Ecosystem</b> The Big Data Ecosystem, Big Data storage, NoSQL Databases, Distributed File Systems, Big Data Processing, MapReduce - An Introduction, Map, Reduce, Other User Interfaces of MapReduce, An Example for MapReduce – Wordcount, Daemons of MapReduce, Key Benefits of using MapReduce, Use case examples, Data Locality, Categories of Data Locality, Advantages of Data Locality, Challenges and Ways to Optimize Data Locality, Resiliency, Fault Tolerance

#### **TEXT BOOKS**

- Big Data Analytics with R and Hadoop – Book by Vignesh Prajapati, Packt Publishing Limited, ISBN: 9781782163282, 2013.
- Big Data: A Revolution That Will Transform How We Live, Work, and Think – Book by Kenneth Cukier and Viktor Mayer-Schönberger, Hodder and Stoughton Publication, ISBN: 9781848547926, 2013.

#### **REFERENCE BOOKS**

- Big Data: Principles and best practices of scalable realtime data systems – Book by Nathan



## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES - IV

SUPERVISED LEARNING	
Course Code: 23CD322	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

COURSE OBJECTIVE
The Objective of this course is to give a strong foundation of Supervised Learning Techniques Applied in the realm of Artificial Intelligence.
To introduce the Machine learning concepts.
To teach the fundamental techniques and principles in Regression techniques.
To teach the Decision tree and various Classification techniques.
To teach the Ensemble models.

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the Machine Learning Concepts.
Understand the Regression Techniques.
Learn the different types of Supervised Algorithms.
Applications of Supervised Learning.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓		
C03			✓	
C04				✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>Difference Between Supervised and Unsupervised Learning</b> Machine learning, why we need machine learning, machine learning process State the different types of learning: Supervised, unsupervised and reinforcement learning,, Detailing out on labeled data and its types, classification and regression models, unlabeled data and its types, clustering model;Gradient Descent- Overview, Gradient Descent, Finding a Minimum

	Using Gradient Descent, Estimating the Gradient, Using the Gradient Descent, Example, Loss Function, Different Loss Functions
<b>UNIT-II</b>	<b>Regression Techniques</b> Regression Technique, Origin of Regression, Regression in Real World, regression concepts, Regression Types, Linear Regression Types, Linear Regression Variance, Co-Variance, Linear Regression Correlation Coefficient, OLS, R Squared, Goodness of fit, Linear Regression Using Gradient Descent, Gradient Descent Explained with an Example, Stochastic Gradient Descent, Cost Function –Partial Derivative, Testing Model Using Cross Validation, Cross Validation Types, regularized regression, Ridge Regression, lasso regression, L1 vs L2 Norm – Regression, Generalized Linear Regression, random component of a GLM
<b>UNIT-III</b>	<b>Classification Techniques- Decision Tress</b> Classification Technique, Decision Tree, Decision Tree Illustration using Sample Dataset, concept of homogeneity., entropy, Entropy Explained with Rainfall Example, plot of entropy versus the proportions, Information Gain, Algorithms to Create a Decision Tree, Gini Index, Truncation and Pruning, Decision Tree Working Methodology, Decision Tree Tuning Parameters
<b>UNIT-IV</b>	<b>Classification Techniques- Naïve Bayes</b> Naïve Bayes, bayes theorem., Example, Naïve Bayes Algorithm for Categorical Data, Popular Naive Bayes Classifiers, Types of Naive Bayes Classifier, Naïve Bayes for Text Classification, popular naive bayes classifiers, Naïve Bayes Algorithm, K Nearest Neighbour classification , Curse of Dimensionality, K-Factor, Implementation of KNN using Python
<b>UNIT-V</b>	<b>Ensemble Methods</b> Ensemble Methods, Why Ensemble?, Example, Methods for Constructing Ensemble, advantages and disadvantages of ensembling. Random Forest, Random Forest Example, Random Forest Use Case, Random Forest Algorithm, Comparing other Models Accuracy, Bootstrapping and Bagging, Out of Bag Error, OOB Score Before Tuning, OOB and Hyper Parameter Tuning, Ensemble Model Using Majority Voting, Gradient Boosting, Weak Learner, Gradient Boosting Example, Moving towards XGBoost, Parameters of XGBoost

#### TEXTBOOKS

- Python Machine Learning: Practical Guide for Beginners – Book by François Duval, CreateSpace Independent Publishing Platform, ISBN: 9781985670969, 2017.
- Understanding Machine Learning: From Theory to Algorithms – Book by Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press, 1<sup>st</sup> edition, ISBN: 9781107057135, 2014.

#### REFERENCE BOOKS

- Machine Learning For Absolute Beginners – Book by Oliver Theobald, Scatterplot Press, 2<sup>nd</sup> edition, 2017.



## DOMAIN-DRIVEN APPROACH TO DESIGN AND IMPLEMENT MICROSERVICES

Course Code: 23CD324	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVE

The Objective of this course is to give a strong foundation of applied DevOps.

1. To introduce the Service Oriented Architecture (SOA)
2. To introduce the design and to implement the Microservices.
3. To teach the fundamental techniques and principles in Security and Scaling Microservices.
4. To discuss various real world application.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand the SOA

Learn the basics of Software Architectures and its Microservices components.

Understand the Domain Driven Approach to Design.

Understand the implementation Microservices in real world applicaton.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CL01	CL02	CL03	CL04
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>SOA Vs Microservices</b> Software Architecture and its Stakeholders, Architectural Patterns and Styles, Monolithic Architecture, Strengths and Limitations, SOA Architecture, Strengths and Limitations, SOA Components and its Principles, Microservices Architecture, Strengths and Limitations, Microservices Components and its Principles

<b>UNIT-II</b>	<b>Domain-Driven Approach to Design and Implement Microservices</b> Domain Driven Design Concepts, Strategic and Tactical Design, Domain, Bounded Context, Ubiquitous Language and Context Mapping, The Building Blocks of DDD, Strengths and Limitations of DDD, How Domain Driven Design Applies to Microservices, Designing Services Applying DDD Concepts, Service Communication, The API Gateway
<b>UNIT-III</b>	<b>Security and Scaling Microservices</b> Web Security Concepts, Information Security, The Top 10 Vulnerabilities and Risk, Stateless Vs Stateful Services, Containerization Vs Virtualization, Microservices with Containerization, Docker and its Role in Microservice, Microservices with Kubernetes, Microservices Observability with Use Case
<b>UNIT-IV</b>	<b>Microservices: Case Studies</b> One Detail Case Study , RainyDay Grocer, UBER, Multiple Case Studies

#### **TEXT BOOKS**

- Microservices: Flexible Software Architecture –Book by Eberhard Wolff, Addison-Wesley, 1<sup>st</sup> edition, ISBN: 9780134602417, 2016.
- Devops and Microservices Handbook: Non-programmer s Guide to Devops and Microservices – Book by Stephen Fleming, Createspace Independent Publication, ISBN: 9781717590077, 2018.

#### **REFERENCE BOOKS**

- Building Microservices: Designing Fine-Grained Systems – Book by Sam Newman, O'Reilly, 1<sup>st</sup> edition, ISBN: 9781491950357, 2015.

## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES – V

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM	
Course Code: 24CS3002	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVE

1. Understand the fundamental concepts of AI and its applications. Relate theoretical concepts to real-world applications through case studies. ethical considerations and the societal impact of AI technologies.

1. Analyze different search algorithms and game playing techniques.

2. Understand techniques for handling uncertainty in AI systems and principles of knowledge-based systems with methods for knowledge representation, acquisition, organization, and manipulation..

3. Explore different types of AI planning and learning system.

4. Develop proficiency in AI techniques such as machine learning, neural networks, natural language processing, speech recognition and expert system.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course, students will be able to:

Understands the definitions and historical evolution of Artificial Intelligence, recognizing key milestones and advancements that have shaped the field.

Develop proficiency in state-space representation and search algorithms and gain an understanding of game theory basics.

Learn techniques for handling uncertainty in AI systems and apply knowledge representation methods

Gain fundamental concepts and components of AI planning and Learning systems.

Learn about various NLP, Pattern recognition and Expert Systems to understand how these models are used in real-world scenario.

### MAPPING BETWEEN COURSE OBJECTIVES (COS) AND COURSE LEARNING OUTCOMES (CLOS)

CLO CO	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓



UNIT NUMBER	COURSE CONTENT
UNIT-I	<p><b>Introduction to AI and Intelligent Agents:</b>  Definition and History of AI, State of Art -Different Types of Artificial Intelligence , AI application areas (Healthcare, Finance, Robotics, Natural Language Processing, Autonomous Systems), AI Techniques Ethical Considerations: Bias in AI, Fairness, Transparency, Accountability, AI regulations and policies.</p> <p><b>Agents:</b> Definition of agents, Agent Environment, Agent architectures (e.g., reactive, layered, cognitive), Multi-agent systems: Collaborating agents, Competitive agents.</p> <p><b>Case Study:</b>  1. Google's DeepMind and AlphaGo: Discuss the architecture of AlphaGo, its environment, and how it represents a breakthrough in AI applications.</p> <p>OpenAI's GPT: Analyze the architecture and applications of GPT models, discussing the ethical implications of advanced AI systems.</p>
UNIT-II	<p><b>Problem Solving and Search Algorithms</b>  Characteristics of intelligent algorithm, State-Space Representation, Search space control: Uninformed Search Algorithms (BFS, DFS, Iterative Deepening), Informed Search Algorithms (Hill climbing, A*, Heuristics), Means-End Analysis, Stochastic search. Constraint satisfaction problem.</p> <p><b>Game Playing and Adversarial Search</b>  Game Theory Basics , Min-max Algorithm, Alpha-Beta Pruning</p> <p><b>Case Study:</b>  IBM's Deep Blue: Analyze Deep Blue's search algorithms focus on the use of heuristic search and game playing techniques.</p>
UNIT-III	<p><b>Handling Uncertainty:</b> Monotonic Reasoning, Non-Monotonic Reasoning, Probabilistic reasoning, Use of certainty factors, Basics of Fuzzy logic.</p> <p><b>Knowledge-Based Systems:</b> Mapping between facts and representations, Propositional Logic, First-Order Predicate Logic (FOPL), Clausal Form, Resolution, Unification algorithm. Approaches to knowledge representation,</p> <p><b>Case Study:</b>  MYCIN Expert System: Examine the MYCIN system for medical diagnosis, its use of probabilistic reasoning and fuzzy logic, and the structure of its knowledge base.</p>

<b>UNIT-IV</b>	<p><b>Planning and Learning:</b>  <b>Planning:</b> The blocks world, Components of Planning Systems, Goal stack Planning, Nonlinear planning, Hierarchical planning, Conditional planning, Planning problem, Analysis of planning approaches.  <b>Learning:</b> Different learning approaches, Machine learning tasks: Classification, Supervised learning, unsupervised learning, Reinforcement learning, Inductive learning, Simple statistical-based learning, Single Layer &amp; Multi-Layer Perceptron.</p> <p><b>Case Study:</b>  Self-Driving Cars: Discuss how companies like Tesla and Waymo utilize planning and learning algorithms to navigate and make decisions in real-time environment.</p>
<b>UNIT-V</b>	<p><b>Natural Language Processing (NLP) and Expert Systems:</b>  <b>NLP:</b> Language models, Text classification, Information retrieval, Semantic analysis.  <b>Pattern recognition-</b> Speech recognition, Image transformation, low level processing, medium and high level processing,  <b>Expert Systems:</b> Basic Components, Architecture of Expert systems, ES-Shells, Rule base Expert systems, Non Monotonic Expert Systems, Decision tree base Expert Systems, Communication in Expert systems.</p> <p><b>Case Study:</b>  1. IBM Watson: Explore Watson's use of NLP , its architecture, and its current applications in healthcare and other industries.  Expert system in Education.</p>

#### TEXT BOOKS

Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Fourth edition, 2020.

Rich and K. Knight, "Artificial Intelligence", Tata McGraw Hill.

#### REFERENCE BOOKS

Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI

Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan-Kaufmann, 1998.

Biere, A., Heule, M., Van Maaren, H., Walsh, T., Handbook of Satisfiability, IOS Press, 2009.

Judea Pearl, Heuristics: Intelligent Search Strategies for Computer Problem Solving, Addison Wesley Publishing Company, 1984.

Pattern Recognition and Machine learning , C.M. Bishop, Springer

## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES – VI

GRID COMPUTING	
Course Code: 24CS3026	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVE

1. To understand introduction and application to Grid Computing.
2. To gain knowledge of web services architecture, XML, and related technologies.
3. To learn about the Open Grid Services Architecture (OGSA) and its platform components.
4. To understand the Open Grid Services Infrastructure (OGSI) and grid service management.
5. To comprehend security issues, including trust models, authentication, authorization, and identity management in grid environments.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course the students will be able to:

1. Understand the genesis & know the applications of grid computing.
2. Understand the technology and tool kits for facilitating grid computing.
3. Evaluate enabling technologies such as high-speed links and storage area networks for building computer grids.
4. Design a grid computing application in one of the key application areas e.g. Computer Animation, E-Research.
5. Implement a grid computing environment; develop communications skills and accept the code of professional conduct and security practice through short presentations and group work.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓	✓		
C03				✓	
C04				✓	✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION AND OVERVIEW OF GRID COMPUTING</b> Early Grid Activities, Current Grid Activities, An Overview of Grid BusinessAreas, Grid Applications, Grid Infrastructure
UNIT-II	<b>WEB SERVICES AND RELATED TECHNOLOGIES</b> Oriented Architecture, Web Service Architecture, XML, Related Technologies and Their Relevance to Web services, XML Messages and Enveloping, Service Message Web Service Interoperability and the Role of the WS-I Organization, Grid Performance Optimization
UNIT-III	<b>OGSA</b> Introduction to Open Grid Services Architecture (OGSA), Commercial Data Center- National Fusion Collaboratory, OGSA Platform Components
UNIT-IV	<b>OGSI</b> Introduction-Grid Services, A High-Level Introduction to OGSI, Introduction to Service Data Concepts, Grid Service: Naming and Change Management Recommendations.
UNIT-V	<b>SECURITY</b> Trust models for Grid security environment, Authentication and Authorization methods, Grid security infrastructure, and Identity and access management architecture.

### TEXT BOOKS

- Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005.
- Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann.
- Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press, 2009.

#### REFERENCE BOOKS

- Barry Wilkinson, "Grid Computing: Techniques and Applications", Chapman and Hall, CRC, Taylor and Francis Group, 2010.
- Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005.

DISTRIBUTED OPERATING SYSTEM	
Course Code: 23CSPE3020	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVE

1. To know about basic concepts of Distributed operating system.
2. To provide hardware and software issues in modern distributed systems.
3. To get knowledge in distributed architecture and accessibility of resources in distributed file systems.
4. To learn how to store data in Distributed File System and Distributed Share memory.
5. To understand naming, synchronization, consistency and replication, fault tolerance, security in DFS.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP).  
After the completion of course the students will be able to:

1. Gain knowledge of distributed operating system architecture.
2. Implement distributed client server applications using remote method invocation.
3. Have knowledge of Synchronization and Deadlock.
4. Have sufficient knowledge about file access.
5. Understand Shared Memory Technique, security, and distributed file systems.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

	CLO1	CLO2	CLO3	CLO4	CLO5
C01	√				
C02		√			
C03			√		
C04				√	

C05					√
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## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENT
UNIT-I	<b>INTRODUCTION TO DISTRIBUTED SYSTEM</b> Definition, Characteristics of Distributed system, Design issues, Resource sharing and the Web Challenges, System models - Architectural and fundamental models -Networking and internetworking Communication in Distributed system: Layered protocols, ATM networks, Client –Server model, Remote Procedure Calls and Group Communication.
UNIT-II	<b>CONCURRENCY CONTROL</b> Clock synchronization, Mutual Exclusion, Election algorithm, the Bully algorithm, a Ring algorithm, Transactions - Nested transactions - Locks - Optimistic concurrency control - Timestamp ordering - Comparison - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions
UNIT-III	<b>DEADLOCK</b> Deadlock in Distributed Systems, Distributed Deadlock Prevention, Distributed Deadlock Detection, Threads, System models, Processors Allocation, Scheduling in Distributed System, Real Time Distributed Systems.
UNIT-IV	<b>DISTRIBUTED FILE SYSTEM</b> Distributed file systems: Distributed file system Design, Distributed file system Implementation, Trends in Distributed file systems. Distributed Shared Memory: What is shared memory, Consistency models, Page based distributed shared memory, shared variables distributed shared memory. Replication in DFS
UNIT-V	<b>SECURITY</b> Overview of security techniques, Cryptographic algorithms, Digital signatures, Cryptography pragmatics, Replication, System model and group communications, Fault tolerant services, Highly available services, Transactions with replicated data

## TEXT BOOKS

- |   |
|---|
| <ul style="list-style-type: none"><li>• Andrew S. Tanenbaum, Maarten van Steen, Distributed Systems, —Principles and Paradigms, Pearson Education, 2002.</li></ul>                  |
| <ul style="list-style-type: none"><li>• George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, 3rd Edition, Pearson Education, 2002.</li></ul> |
|   |

<b>REFERENCE BOOKS</b>
<ul style="list-style-type: none"><li>• Tanenbaum and Steen, Distributed Systems PHI, 2002.</li></ul>
<ul style="list-style-type: none"><li>• Sape Mullender, Distributed Systems 2nd Edition.</li></ul>
<ul style="list-style-type: none"><li>• Albert Fleishman, Distributed Systems: Software Design and Implementation, Springer Verlag, 1994.</li></ul>



## OBJECT ORIENTED ANALYSIS & DESIGN

Course Code: 23CS3028	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVE

To introduce the concepts of OOP and behavioural modelling.
To understand the architectural design methods.
To learn the application, methodology in a software design.
To understand and learn design patterns.
To familiarize with the knowledge of design testing in DPIM.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Demonstrate knowledge of structural and behavioral modeling techniques.

Demonstrate knowledge of a model-based software development methodology.

Application of the methodology and the modeling techniques in a significant software design project.

Demonstrate knowledge of design patterns and their application in a software design project.

Demonstrate knowledge of Design and Testing Process Improvement Models.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION</b> Introduction to OOP concepts, OO model, analysis, design and implementation. Types of models: Unified Modeling Language(UML) views and basic features,

	Object-oriented design methodologies, the rational unified process, Object-oriented CASE tools. Introduction to six-level improvement process of design process improvement model (DPIM).
<b>UNIT-II</b>	<b>STRUCTURAL &amp; BEHAVIOURAL MODELLING</b> Structural Modeling Techniques Basic Building Blocks -- objects and classes, Structural Composition Techniques, Design Scaling Issues, <b>Behavioural Modelling</b> : Use Case Diagrams, Interaction Diagrams, Event State Diagrams, Action Matrices, Business Lifecycle Diagrams, Activity Diagrams, Collaboration Diagrams, Rule Specification Techniques, Behavioral Model-Based Reference Architecture for Component Specification.
<b>UNIT-III</b>	<b>ARCHITECTURAL MODELLING</b> Deployment: Common Modelling technique; Modelling processors and devices, modelling distribution of artifacts. Collaboration: Modeling roles, modelling the realization of a Use Case, modelling the realization of an operation, modelling a mechanism
<b>UNIT-IV</b>	<b>Design Standards Architectural Patterns:</b> Design Patterns, Program Patterns, Behavioral Design Units Component-Based Specification Techniques <b>DPIM - Level One:</b> Requirements Analysis Techniques, Ad Hoc Approach to Design <b>DPIM - Levels Two, Three and Four:</b> Design Methodology, Deployment Design Quality Control Properties and Analysis Techniques, Automatic Convertability, Traceability, Standardizability (Design Units/Reusable Patterns), Modularity Changeability (Change Management) ,Scalability of Design Reliability
<b>UNIT-V</b>	<b>DPIM - Levels Five and Six :</b> Design Process Management and Optimization Design Metric Models Testing Maturity Model Extended V-Model Testing Techniques <b>OO Testing:</b> Introduction, Object Oriented testing process, testing of analysis and design model, testing of classes.

#### TEXT BOOKS

S. R Schach, *Introduction to Object Oriented analysis and Design*, Mc Graw Hill, 2003

Ali Bahrami, *"Object Oriented System Development"*, McGraw Hill International Edition, 1999.

Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" by EMC Education Services

#### REFERENCE BOOKS

Booch G., "Object Oriented Analysis and Design", Addison Wesley Publishing Company, 2nd Edition, 2000.

Rambaugh.J, Blaha. M. Premerlani.W, Eddy F and Loresen W, "Object Oriented Modeling andDesign",Prentice Hall of India, 1997.
Coad P, Yourdon E., "Object oriented analysis", Yourdon Press, 1991.
Bennett, S., "Schuam's Outline of UML". New York: McGraw-Hill 2004
S. Perdita. "Using UML: Software Engineering with Objects and Components." Addison-Wesley 2000
R. Miles, "Learning UML 2.0", O'REILLY 2006
E. Gamma., "Design Patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley

<b>NEURAL NETWORKS &amp; FUZZY LOGIC</b>	
Course Code: 23CS3030	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

<b>COURSE OBJECTIVE</b>
To provide in depth detail for perceptron.
To get familiar with the principles of RBF, RNN, unsupervised learning.
To learn fuzzy set theory, fuzzy logic and understand the role of uncertainty in real-time applications.

<b>COURSE LEARNING OUTCOMES (CLO)</b>
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the mathematics behind the design of perceptron.
Correlate the need of extension of MLP to CNN.
Design and analyse the importance of kernel functions, RNN and memories.
Differentiate between fuzzy sets and crisp sets.
Apply and Analyse the applications of fuzzy to reasoning and clustering

#### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓	✓			
CO2			✓		
CO3				✓	✓

#### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS (ANN) &amp; SINGLE LAYER PERCEPTRON (SLP)</b> ANN, Modelling of Human Brain and ANN, Types of ANN, activation function, learning tasks and rules. SLP: Basics of Perceptron, McCulloch Pitt NN, Perceptron Convergence Theorem in both Discrete and Continuous Domain, Linearity and Non-

	Linearity Problem.
<b>UNIT-II</b>	<b>MULTI-LAYER FEED FORWARD NETWORKS</b> Basics of MLP, Generalized Delta Rule, Training Algorithm for MLP, Batch learning, Online Learning, Cross-validation in Back Propagation, Detail Study on Convolution Neural Networks. Basics and need of RBF, Interpolation Problem, RBF networks,
<b>UNIT-III</b>	<b>RECURRENT NETWORKS &amp; ASSOCIATIVE MEMORIES</b> Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, Architecture of Hopfield Network: Discrete and Continuous Neural network applications, Boltzman Machine, R-CNN, LSTM, Unsupervised Learning of clusters.
<b>UNIT-IV</b>	<b>FUZZY SETS, RELATIONS &amp; LOGIC</b> Classical & Fuzzy Set Theory, Fuzzy Relation, Fuzzy Inference System, Fuzzy Logic and approximate reasoning. Fuzzy control System Design Problem, Industrial Applications.
<b>UNIT-V</b>	<b>FUZZY ARITHMETIC &amp; OPTIMIZATION</b> Functions of fuzzy sets, extension principle, fuzzy mapping, interval analysis, vertex method and DSW algorithm. One dimensional fuzzy optimization, fuzzy concept variables and casual relations, fuzzy cognitive maps, agent based models.

#### TEXT BOOKS

J.M. Zurada, "Introduction to artificial neural systems", Jaico Pub.

Simon Haykin, "Neural Networks", PHI

S. N. Sivanandam and S.N. Deepa, "Principles of Soft Computing," 2<sup>nd</sup> Ed., Wiley India.

#### REFERENCE BOOKS

Laurene Fausett, "Fundamentals of Neural Networks", Pearson Education, 2004

Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003

S. Rajasekharan and G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.

Timothy J. Ross, "Fuzzy Logic With Engineering Applications", Tata McGraw-Hill Inc. 2000

#### CYBER SECURITY

Course Code: 23CS3032

Continuous Evaluation: 40 Marks

Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVE

To aware the students about the cyber security and its implications.  
 To provide students with a practical and theoretical knowledge of cryptography and network security.  
 To provide the students' knowledge of different types of attacks on the Network.  
 To aware the student about data privacy.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Define the concept of ethical hacking and its associated applications in Information Communication Technology (ICT) world.

Underline the need of digital forensic and role of digital evidences.

Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection.

Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications /devices like Windows/Unix system.

Apply the knowledge of IDS to secure network and performing router and network analysis.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CL01	CL02	CL03	CL04	CL05
C01	✓	✓			
C02		✓	✓		
C03			✓	✓	
C04				✓	✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
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<b>UNIT-I</b>	<b>INTRODUCTION</b> Cyber-attacks, types of attacks, Introduction to cyber security, objectives of security, elements of cyber security, Introduction to Information Security, Introduction to Data and Network Security, Finding vulnerabilities and exploits.
<b>UNIT-II</b>	<b>INTRUSION DETECTION SYSTEMS</b> Overview of intrusions, system intrusion process, dangers of system intrusions, anomaly detection, misuse detection, types of IDS, the limitations and open problems of intrusion detection systems, Statistical and machine approaches to detection of attacks on computers, Techniques for studying the Internet attacks, network based attacks, host based attacks.
<b>UNIT-III</b>	<b>SECURITY IN CLOUD COMPUTING</b> What is Cloud Computing, Essential Characteristics, Cloud security challenges, Software as a service security, secure software development life cycle, data usage, data privacy, identity access management, physical security.
<b>UNIT-IV</b>	<b>DATA PRIVACY</b> Fundamental Concepts, Definitions, Data Privacy Attacks, Data linking and profiling, access control models, role based access control, privacy in different domains- medical, financial, etc.
<b>UNIT-V</b>	<b>CRYPTOGRAPHY</b> Services, mechanisms and attacks, the OSI security architecture, Network security Model, classical Encryption techniques, Private and Public Key Cryptography.

#### **TEXT BOOKS**

Michael T. Goodrich and Roberto Tamassia, "Introduction to Computer Security", Addison Wesley, 2011.  
 B. Raghunathan, "The Complete Book of Data Anonymization: From Planning to Implementation", Auerbach Pub, 2013.  
 John W. Rittinghouse, "Cloud Computing: Implementation Management & Security", CRC Press.  
 Roberto Di Pietro, Luigi V. Mancini, "Intrusion Detection System", Springer ,2008  
 William Stallings-"Cryptography and Network Security", Pearson education, 6<sup>th</sup> edition, SBN 10: 0133354695, 2013

#### **REFERENCE BOOKS**

Russell Dean Vines and Ronald L. Krutz,"Cloud Security: A Comprehensive Guide To Secure Cloud Computing", Wiley India Pvt Ltd, 2010.  
 Anderson, James P., "Computer Security Threat Monitoring and Surveillance," Washing, PA, James P. Anderson Co., 1980.  
 L. Sweeney, "Computational Disclosure Control: A Primer on Data Privacy Protection", MIT Computer Science, 2002.





<b>PREDICTIVE ANALYTICS</b>	
Course Code: 23CS3036	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### **COURSE OBJECTIVE**

To provide an overview of an exciting field of Predictive Analytics.

To introduce the tools required For the Predictive Analytics.

Review and explore data to look at data distributions and to identify data problems, including missing values.

To enable students to have skills that will help them to solve complex real-world problems in for decision support.

### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand and critically apply the concepts and methods of Predictive analytics.

To understand and apply IBM SPSS Modeler in Data Mining, what kinds of data can be mined, what kinds of patterns can be mined.

Applying and analyzing how to use functions, deal with missing values, use advanced field operations, handle sequence data and improve efficiency.

To evaluate the Model on the basis of different Predictive Methods.

Building and create advanced analytical model that leverage historical data to uncover real-time insights to predict future events.

### **COURSE LEARNING OUTCOME (CLO) - COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>	<b>CLO5</b>
<b>CO1</b>	✓				
<b>CO2</b>		✓			
<b>CO3</b>			✓		
<b>CO4</b>				✓	✓

### **COURSE CONTENTS**

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>ANALYTICS OVERVIEW</b> Definition of business Analytics with real time examples, How Predictive analytics: Transforming data into future insights, Analytics trends: Past, Present & Future, Towards a Predictive enterprise.
UNIT-II	<b>IBM SPSS MODELER &amp; DATA MINING</b> What is a Data Mining applications? Strategy for data mining: CRISP-DM, Identify nodes and streams, The framework of a Data – mining project, Brief the unit of analysis, Explain the type of dialog box.
UNIT-III	<b>UNIT OF ANALYSIS</b> Concepts of Unit of analysis (Distinct, Aggregate, SetToFlag), Integrate data, CLEM Expression, Role of Relationship between two fields, Identifying the modeling objective.
UNIT-IV	<b>ADVANCED DATA PREPARATION WITH IBM SPSS MODELER</b> Functions to enrich data, Method to transform data, Cross-record functions, Sampling, Partitioning and sampling data, Improving Efficiency.
UNIT-V	<b>PREDICTIVE ANALYTICS WITH IBM WATSON STUDIO</b> IBM Watson Studio, Watson studio Components, Data preparation, Watson Machine learning, Data Refinery, Watson Studio Neural Network Modeler, IBM Watson Studio jobs, Use case with AutoAI.
UNIT-VI	<b>PROJECT</b> Predicting using IBM SPSS Modeler & IBM Watson with real Case studies.

#### TEXT/REFERENCE BOOKS

BM Courseware

#### Further suggested Readings

IBM Courseware

Predictive Analytics Mesmerizing & fascinating by ERIC SIEGEL

<b>BUSINESS INTELLIGENCE</b>	
Course Code: 23CS3038	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

#### **COURSE OBJECTIVE**

To provide an overview of an exciting field of business intelligence.

To introduce IBM Cognos Analytics and its position within an analytics solution.

To teach the fundamental techniques and principles in achieving big business intelligence with scalability and streaming capability.

To enable students to have skills that will help them to solve complex real-world problems in for decision support.

#### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand the vision of Business Intelligence from a global context.

To understand and apply IBM Cognos Analytics in Market perspective of Business Intelligence.

Applying and analyzing various prompt types and conditionally render objects in reports .

To evaluate query models, connect them to the report layout and combine data containers based on relationships from different queries.

Building and create Active Report connection. Creating projects using dashboards, stories and exploration to find business insights.

#### **COURSE LEARNING OUTCOME (CLO) - COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>	<b>CLO5</b>
<b>C01</b>	✓				
<b>C02</b>		✓			
<b>C03</b>			✓		
<b>C04</b>				✓	✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>BUSINESS INTELLIGENCE</b> Definition with Real Time Examples, How business intelligence can turn data into insight, Use of Business Intelligence-how it can help to combat fraud and understand social sentiments,, Future of business intelligence and analytics.
UNIT-II	<b>IBM COGNOS ANALYTICS FOR COUNSUMERS</b> Why IBM Cognos Analytics? What is IBM Cognos? List v/s Crosstab, Examine detail filters and summary filters, Introduction to visualization, Traditional visualization v/s RAVE visualization.
UNIT-III	<b>IBM COGNOS ANALYTICS:AUTHOR REPORT FUNDAMENTALS</b> Concepts and types of prompts, expressions using functions, reuse object, drill -through reports,analyse multi-lingual reports, Highlight exceptional data
UNIT-IV	<b>IBM COGNOS ANALYTICS:AUTHOR REPORT ADVANCED</b> Theory, query models, SQL statements, distribute reports using bursting, Analyze reports by joining queries, dynamic headers and titles that reflect report data, tooltips that clarify report data, send emails using links in a report.
UNIT-V	<b>IBM COGNOS ANALYTICS:AUTHOR ACTIVE REPORTS</b> Active Reports, debug active report, Examine Active Report controls, Active Report variables, Create a simple Active Report using Static and Data-driven controls, decks and data decks to display traditional charts creation and analysis of Dashboard.
UNIT-VI	<b>PROJECT</b> Analysis for real case studies using dashboard, stories and exploration with IBM Cognos.

### TEXT/REFERENCE BOOKS

BM Courseware

### Further suggested Readings

BM Courseware



INTERNET OF THINGS	
Course Code: 23CS3040	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

COURSE OBJECTIVE
To understand and learn about various protocols of IoT, sensors and their types.
To develop schemes for the applications of IoT in real time scenarios.
To design business Intelligence and Information Security for IoT

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the vision of IoT and communication protocols from a global context.
Understand and apply IoT protocols.
Apply and analyze sensor networks and their components to IoT domain.
Design portable IoT using appropriate boards.
Evaluate the applications of IoT in agriculture, healthcare, smart grid, factory.
Build and create state of the art architecture in IoT.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO CO	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6
CO1	✓	✓				
CO2			✓	✓		
CO3					✓	✓

#### COURSE CONTENTS

UNIT NUMBER	CONTENTS
UNIT-I	<b>Introduction to IoT:</b> Definition, Characteristics, Applications, Connectivity Layers, Addressing, Networking, Sensing: Sensors and Transducers, Sensor Classes, Sensor Types, Actuation: Actuator Basics, Actuator Types <b>Basics of IoT Networking:</b> IoT Components, Inter-dependencies, SoA,

UNIT NUMBER	CONTENTS
	Wireless Networks, Protocol Classification, MQTT, Secure MQTT, CoAP, XMPP, AMQP (Advanced Message Queuing Protocol).
UNIT-II	<b>IoT Protocols:</b> Protocol Standardization for IoT-M2M and WSN Protocols. <b>Connectivity Technologies:</b> IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART, NFC, Bluetooth, Zwave, ISA100.11a
UNIT-III	<b>Sensor Networks:</b> Basic Concepts, Wireless Sensor Networks, Sensor Nodes, Node Behaviour, Social Sensing, Application Examples, Target Tracking, Wireless Multimedia Sensor Networks, Coverage, Mobile Wireless Sensor Networks and their Applications, UAV (Unmanned Aerial Vehicle) Networks, Machine to Machine Communication, Interoperability in Internet of Things
UNIT-IV	<b>Introduction to Arduino:</b> Basic Concepts of Arduino Platform, Examples of Arduino Programming, Integration of Sensors and Actuators with Arduino, <b>Introduction to Raspberry Pi,</b> Implementation of IoT with Raspberry, Software Defined Networking, Software Defined IoT Networking
UNIT-V	<b>Cloud Computing:</b> Fundamentals, Service Models, Service Management and Security, Case Studies, Open Source Platform, Sensor Cloud, Fog Computing, <b>Application Domains of IoT :</b> Smart Cities: Need for Smart Cities, Challenges in Building Smart Cities, Some Technical Issues behind Enabling Smart Cities, Smart Homes: Home Area Networks (HANs), Connected Vehicles, Smart Grid, Industrial IoT, Data Handling and Analytics, Case Study: Agriculture, Healthcare, Activity Monitoring,
UNIT-VI	<b>PROJECT</b> Research Activities on IoT with projects and research letters.

#### TEXT BOOKS

Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective" -- CRC Press-2012

Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.

Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer-2011.

Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key

applications and Protocols”, Wiley, 2012.

The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, by Pethuru Raj and Anupama C. Raman (CRC Press)

#### **REFERENCE BOOKS**

Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759



## SYLLABUS OF PROFESSIONAL ELECTIVE COURSES - VII

<b>DIGITAL PRODUCT ENGINEERING and DESIGN THINKING</b>	
Course Code: 23CD421	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### **COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of Digital Product Engineering and Design Thinking.

To introduce the Digital Era.

To teach the fundamental techniques and principles in Product Management and Product Service.

To teach the fundamental techniques and principles in Product Management.

To teach the Digital Innovation and Lean Startup.

### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand the Digital Transformation and its Advantages

Understand the Product Management & Service Mindset Elements.

Understand the Design Thinking and Minimum Viable Product.

Learn the Agile & Lean.

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO \ CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>
<b>CO1</b>	✓			
<b>CO2</b>		✓		
<b>CO3</b>			✓	
<b>CO4</b>				✓

### **COURSE CONTENTS**

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>The Digital Era</b> Digital Era, Digital Transformation, principles of DT, Advantages of DT, Business Model & Its Components, Business Model Canvas
UNIT-II	<b>Product Management and Service Mindset</b> Introduction and History of Product Management, Product Management, The Need for Product Management, Different Roles of Product Management, Definition of a Product Manager, Skill Sets of a Product Manager, Responsibilities of Product Managers, Building Digital Products and Services - Product Management Role, Setting a Product Vision, Idea Management, Planning, Product Roadmap, Product Roadmap, Ideation of Product, Product Feasibility Analysis, Business Case documentation, Definition of Product, Development of Product, Product Launch, Post-launch Feedback
UNIT-III	<b>Product Development Methodology</b> System Thinking, Definition, Systems Thinking Principles, The Iceberg Model in Systems Thinking, Systems Thinking in Software Product Development, Value Chain Analysis, Advantages of Value, Value Chain for Software Development, Capability Optimization, Capability Maturity Model (CMM), Business Integration Methods, Definition and Principles of Lean, Lean Methodology: Customer is King, Agile Methodology – Evolution, Birth of Agile, The Agile Manifesto, The Core Values of Agile, Twelve Principles of the Agile Manifesto
UNIT-IV	<b>Digital Innovation</b> Design Thinking , Different Phases, Empathy Map, Ideation Techniques, Shortlisting Ideas, Low Fidelity Prototype, Pros and Cons of Low Fidelity Prototyping, High Fidelity Prototype, Guidelines for a Test, Divergence, Emergence and Convergence of Design Thinking, Convergent Thinking, Emergent Thinking, Design Thinking vs. Agile vs. Lean, Challenges of Design Thinking, Design Sprint and its Phases, Setting up the stage, Sprints
UNIT-V	<b>Lean Startup</b> Minimum Viable Product (MVP), Building Your MVP, Approaches to Testing Your MVP, Benefits of MVP, Continuous Deployment – Definition, Best Practices for Continuous Deployment, Split Testing, The Process, Actionable Metrics: Definition and Methods, Pivot: definition and types, Build Measure Learn: Its Phases, Build-Measure-Learn: The Process

#### TEXT BOOKS

- Software Engineering: A Practitioner's Approach - Book by Roger S. Pressman, McGraw Hill

Education, 7<sup>th</sup> edition, ISBN: 9780071267823, 2009.

- Agile and Lean Concepts for Teaching and Learning: Bringing Methodologies from Industry to the Classroom – Book by David Parsons, Kathryn MacCallum, Springer, 1<sup>st</sup> edition, ISBN: 9789811327506, 2019.

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**REFERENCE BOOKS**

Software Engineering – Book by Ian Sommerville, Pearson Publication, 10<sup>th</sup> edition, 2015

**SOFTWARE CRAFTMANSHIP OVERVIEW**

Course Code: 23CD423	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

**COURSE OBJECTIVE**

The Objective of this course is to give a strong understanding of Software Design.

1. To introduce the Software Design and its Paradigms.
2. To teach the fundamental techniques and principles in Code Design, Code Structure.
3. To teach the fundamental techniques and principles in Code Formatting.
4. To teach the Test Driven Development and types of Test Debugging.

**COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Learn the Object Oriented Programming concepts.

Understand the Best practices in Coding.

Understand the Code Formatting

Understand the different of Testing Methods.

**COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO\CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>
<b>CO1</b>	✓			
<b>CO2</b>		✓		
<b>CO3</b>			✓	
<b>CO4</b>				✓

**COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>Introduction to Software Craftsmanship</b> Definition, History of the emergence of software craftsmanship, Software craftsmanship, Process versus paradigm, Software development processes, Software development models, Software design paradigms, Software development paradigms, Major programming paradigms Procedural programming paradigm, Object-oriented programming paradigm, Functional programming paradigm, Dimensions of craftsmanship, Craftsmanship -

	Mastery of the paradigm Describing and defining well-crafted code, Becoming a craftsman, The programming process
<b>UNIT-II</b>	<b>Code Design</b> Clean code and its fundamental concepts, Code Design, Software design considerations, Kent Beck's principle of simple design, Fundamental characteristics of good design, Design Patterns: Reusing best practices, SOLID design principles, Programming Principles
<b>UNIT-III</b>	<b>Code Structure</b> Classes, packages and methods: building blocks of code, organizing code: the size of methods and classes, What makes methods and classes "good", Software metaphors, Objects and data structures, data transfer objects, Using libraries, Overview of the best practices in structure: Law of demeter and open close principle
<b>UNIT-IV</b>	<b>Code Formatting &amp; Documentation</b> Introduction, Variants, Vertical Openness, Vertical Density, Distance and Ordering, Naming Best Practices, Intention-Revealing Names, Avoid Mental Mappings, Naming Classes, Methods and Functions, Comments, Writing Code Documentation
<b>UNIT-V</b>	<b>Testing Debugging &amp; Refactoring</b> Testing and Debugging, Basic Test-driven Development (TDD), Categories of TDD and Unit tests, Unit Testing Techniques, Automating Testing Using Junit, Refactoring: Improving Structure, Refactoring: Changing Code Structure without Changing Functionality, The need for Refactoring, The Refactoring Process and the Different Levels of Refactoring, Refactoring Strategies, Code Smells: Symptoms of Poorly Designed Code, Categories of Code Smells, Code Base, Using Frameworks & Tools

#### **TEXT BOOKS**

•Software Craftsmanship - Book by Pete McBreen, Addison Wesley Publication, 1<sup>st</sup> edition, ISBN: 9780201733860, 2001

#### **REFERENCE BOOKS**

The Software Craftsman – Book by Sandro Mancuso, Pearson Publication, 1<sup>st</sup> edition, 2014.

### **SYLLABUS OF PROFESSIONAL ELECTIVE COURSES - VIII**

#### **NETWORK SECURITY & CRYPTOGRAPHY**

Course Code: 23CS4019	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVE

To know the various art of the security exploitation

To learn secure programming techniques

To understand the mathematics behind cryptography

To know the standard algorithms used to provide confidentiality, integrity and authenticity

To learn the public key infrastructure that will be used for security practices

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Present the exploitation present in the security.

Discuss various types of attacks and their characteristics.

Illustrate the basic concept of encryption and decryption for secure data transmission.

Analyze various cryptography techniques and its applications.

Develop solutions for security problems.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓	✓			
C02		✓	✓		
C03			✓		
C04				✓	✓
C05					✓

### COURSE CONTENTS

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>FUNDAMENTALS</b> <b>Security trends</b> - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security -

	Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.
<b>UNIT-II</b>	<b>SYMMETRIC KEY CRYPTOGRAPHY</b> MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: DES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.
<b>UNIT-III</b>	<b>PUBLIC KEY CRYPTOGRAPHY</b> MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.
<b>UNIT-IV</b>	<b>MESSAGE AUTHENTICATION AND INTEGRITY</b> Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509
<b>UNIT-V</b>	<b>SECURITY PRACTICE AND SYSTEM SECURITY</b> Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

#### TEXT BOOKS

Jon Erickson, "Hacking: The Art of Exploitation", 2nd Edition, Starch Press, 2008.

William Stallings, "Cryptography and Network Security: Principles and Practices", Sixth Edition, Pearson Education, 2014.

#### REFERENCE BOOKS

"The Shellcoder's Handbook: Discovering and Exploiting Security Holes", 2nd Edition by Chris Anley et al.

N. Ferguson, B. Schneier, and T. Kohno. "Cryptography Engineering: Design Principles and Practical Applications". Wiley, 2010.

Neil Daswani, Christoph Kern, and Anita Kesavan, "Foundations of Security: What Every Programmer Needs to Know", First Edition, Apress, 2007.

SNMP: A Guide to Network Management (MGH).  
Telecom Network Management by H.H. Wang (MGH).  
Network Management by U. Dlack (MGH).



### WIRELESS ADHOC AND SENSOR NETWORK

Course Code: 23CS4023	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

#### COURSE OBJECTIVE

To covers major aspects of ad hoc and sensor networking, from design through performance issues to application requirements.
To starts with the design issues and challenges associated with implementations of ad hoc and sensor network applications. This includes mobility, disconnections, and battery power consumption.
To provides a detailed treatment of proactive, reactive, and hybrid routing protocols in mobile wireless networks. It also covers the IEEE 802.11 Wireless LAN and Bluetooth standards and discusses their characteristics and operations.
To cover wireless sensor networks (architecture, design, protocols, and applications).
To give students hands-on experience in designing a mobile ad hoc network using the NS2 network simulator.

#### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks. To specify and identify deficiencies in existing wireless protocols for MAC layer and Network layer, and then go onto formulate new and better protocols.
To make students familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.
To enhance the basic knowledge about the principles and characteristics of wireless sensor networks (WSNs).
To understand how proactive and reactive protocols function and their implications on data transmission delay and bandwidth consumption along with design issues in wireless communication.
To understand the congestion control mechanism at transport layer and to acquire skills to design and implement a basic mobile ad hoc or wireless sensor network via simulations or programming of PDAs.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO\CO	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓				
CO2		✓	✓		
CO3				✓	
CO4				✓	✓

C05					✓
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## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>AD HOC Wireless</b> Introduction, Mobile Ad Hoc Networks, Technologies for Ad Hoc Network, Issues in Ad hoc wireless Networks IEEE 802.11 Architecture and protocols. Protocol for AD HOC Wireless Networks. Issues and classification of MAC protocol, other MAC protocols, Dynamic Source Routing (DBR), Adhoc Distance Vector (AoDV) routing, Routing Protocols
UNIT-II	<b>Transport Layer &amp; Security Protocols</b> Issues in designing transport layer protocols, TCP over Ad Hoc Wireless Networks, Network Security Attacks
UNIT-III	<b>Wire Sensor Networks</b> Basic Sensor Network Architectural Elements, Applications of Sensor Networks, Comparison with Ad Hoc Wireless Networks, Challenges and Hurdles. Architecture of WSNs Hardware components, Operating systems and execution environments, some examples of sensor nodes, Network Architecture, Sensor networks scenarios, Optimization goals and figures of merit Design principles for WSNs.
UNIT-IV	<b>Communication Protocols</b> Physical Layer and Transceiver design considerations in WSNs, Fundamentals of (wireless) MAC protocol, Address and name management in wireless sensor networks, Localization and positioning Routing protocols Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless, Routing Strategies in Wireless Sensor Networks
UNIT-V	<b>Transport &amp; QoS in WSN</b> Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples
UNIT-VI	<b>PROJECT</b> Research Activities and hands-on experience in designing a mobile ad hoc network using the NS2 network simulator

## TEXT BOOKS

- C. S. Ram Murthy, B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall of India, 2007.
- Andreas Willig and John H. Karl, Protocols & Architectures for Wireless Sensor Networks, Wiley, 2005

<b>REFERENCE BOOKS</b>
B. Tavli and W. Heinzelman, Mobile Ad Hoc Networks: Energy-Efficient Real-Time Data Communications, Springer, 1st Edition, 2006
Ramin Hekmat, Ad-hoc Networks: Fundamental Properties and Network Topologies, Springer, 1st Edition, 2006

### ADVANCED JAVA PROGRAMMING

Course Code: 23CS4035	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

#### COURSE OBJECTIVE

To developing graphical programs with networking functionality. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.

Design and develop GUI applications using Swing and Event Handling.

Design and develop Web applications.

Designing distributed applications using Remote Method Invocation (RMI)

#### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

To learn the graphics and animation on the web pages, using Java Applets. To learn and design a full set of Event driven UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings Usage.

To learn Java Data Base Connectivity (JDBC) so as to retrieve and manipulate the information on any relational database through Java programs.

To learn the server side programming using Servlets and JSP.

To learn the invocation of the remote methods in an application using RMI.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

CLO\CO	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓	✓			
C02			✓		
C03				✓	
C04					✓

#### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>INTRODUCTION TO ADVANCED JAVA</b> Java Streaming – Components and events handling – Threading concepts –

	Networking features – Byte code interpretation – Media Techniques.
<b>UNIT-II</b>	<b>SWINGS</b> Introduction to swings, difference between AWT and Swings, java foundation classes, java swings classes.
<b>UNIT-III</b>	<b>ADVANCED NETWORKING</b> Client- Sever computing – Sockets – Content and Protocols handlers – Developing distributed applications – RMI – Remote objects – Object serialization
<b>UNIT-IV</b>	<b>REMOTE METHOD INVOCATION</b> Remote Method Invocation (RMI): RMI Architecture, Designing RMI application, Executing RMI application.
<b>UNIT-V</b>	<b>RELATED JAVA TECHNIQUES</b> 3D graphics – JAR file format and creation – Internationalization. <b>SERVLETS</b> Java Servlets: Servlet Interaction & Advanced Servlets, Life cycle of Servlet, Java Servlet Development Kit, javax.servlet package, Reading Servlet Parameters, Reading Initialization Parameters, The javax.servlet. http Package, Handling HTTP.

#### **TEXT BOOKS**

Jame Jaworski, "*Java Unleashed*", SAMS Techmedia Publications, 1999.

H.M.Deitel and P.J.Deitel, "Java how to program with an Introduction to Visual J++", Pearson Education, 1998.

Java: The Complete Reference, Ninth Edition Paperback by Herbert Schildt

#### **REFERENCE BOOKS**

Campione, Walrath and Huml, "*The Java Tutorial*", Addison Wesley, 1999.

Duane A.Bailey, "*Java Structures*", McGraw-Hill Publications, 1999.

Jeff Frentzen and Sobotka, "*Java Script*", Tata McGraw-Hill, 1999.

Jamie Jaworski, "*Java Unleashed*", SAMS Techmedia Publication, 1999.

Jason Bloomberg. Jeff Kawski, and Paul Treffers, "*Web Page Scripting Techniques*", Hayden books, 1996.

<b>DATA WAREHOUSING &amp; DATA MINING</b>	
Course Code: 23CS4025	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

<b>COURSE OBJECTIVE</b>
To teach the basic principles, concepts and applications of data warehousing and data mining.
To introduce the task of data mining as an important phase of knowledge recovery process.
To familiarize Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.
To impart knowledge of the fundamental concepts that provide the foundation of data mining.
To perform classification and prediction of data.

<b>COURSE LEARNING OUTCOMES (CLO)</b>
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the functionality of the various data mining and data warehousing component.
Design data warehouse with dimensional modelling and apply OLAP operations.
Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.
Describe complex data types with respect to spatial and web mining.
Extract knowledge using data mining techniques.
Technical knowhow of the Data Mining principles and techniques for real time applications.

#### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO-CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>	<b>CLO5</b>	<b>CLO6</b>
C01	✓					
C02		✓				
C03			✓	✓		
C04					✓	
C05						✓

#### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>DATA WAREHOUSING AND BUSINESS ANALYSIS:</b>

	Data warehousing Components, Building a Data warehouse, Data Warehouse Architecture, DBMS Schemas for Decision Support, Data Extraction, Cleanup, and Transformation Tools, Metadata, reporting, Query tools and Applications, Online Analytical Processing (OLAP), OLAP and Multidimensional Data Analysis.
<b>UNIT-II</b>	<b>DATA MINING:</b> Data Mining Functionalities, Data Preprocessing, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation, Architecture Of A Typical Data Mining Systems, Classification Of Data Mining Systems. Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules, Association Mining to Correlation Analysis, Constraint-Based Association Mining.
<b>UNIT-III</b>	<b>CLASSIFICATION AND PREDICTION:</b> Issues Regarding Classification and Prediction, Classification by Decision Tree Introduction to Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods, Model Section.
<b>UNIT-IV</b>	<b>CLUSTER ANALYSIS:</b> Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.
<b>UNIT-V</b>	<b>MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA:</b> Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

#### TEXT BOOKS

Data Warehousing In the Real World; Sam Anahory & Dennis Murray; 1997, Pearson.

Data Mining- Concepts & Techniques; Jiawei Han & Micheline Kamber- 2001, Morgan Kaufmann.

Data Mining Techniques; Arun Pujari; 2001, University Press; Hyderabad.

#### REFERENCE BOOKS

Data Mining; Pieter Adriaans & Dolf Zantinge; 1997, Pearson,

Data Warehousing, Data Miniing and OLTP; Alex Berson, 1997, Mc Graw Hill.
Data warehousing System; Mallach; 2000, Mc Graw Hill.
Building the Data Warehouse; W.H. Inman, 1996, John Wiley & Sons.
Developing the Data Warehouses; W.H Ionhman,C.Klelly, John Wiley & Sons.
Managing the Data Warehouses; W.H.Inman, C.L.Gassey, John Wiley & Sons.



<b>MOBILE COMPUTING</b>	
Course Code: 23CS4027	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### **COURSE OBJECTIVE**

- This course provides knowledge of concepts, models, condition of the mobile user and architecture of Mobile networks.
- To learn about various mobile computing Models and to study about various routing protocols that are suitable for mobile networks.
- To understand the concept of mobile agents and their applications.

### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Grasp the concepts and features of mobile computing technologies and applications.

Understand the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support

Develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO-CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>
CO1	✓		
CO2		✓	
CO3			✓

### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>Overview of Ad Hoc Networks:</b> Introduction to Mobile Computing –Challenges and Applications of Mobile Computing- Frequencies for radio transmission- Antennas -Multiplexing — Spread spectrum -MAC Protocols: SDMA- TDMA- FDMA- CDMA. Introduction to Cellular Systems — GSM: Architecture, Services & Protocols-GPRS- Radio frequency identification(Rfid)-Wireless Broadband- Introduction to 1G, 2G, 3G and 4G: features and challenges, Applications of 4G.

<b>UNIT-II</b>	<b>Wireless and Mobile Computing Models</b> LAN Protocols: IEEE 802.11/a /g/n & Bluetooth, Data Management Issues. Sensor Networks- Challenges, Architecture, and Applications.
<b>UNIT-III</b>	<b>Routing in Mobile Networks</b> Routing Taxonomy, Applications, Challenges in Mobile Environments, Hidden and exposed terminal problems, Routing Protocols- Proactive, Reactive, and Hybrid protocols, Dynamic State Routing (DSR), Ad hoc On-Demand Distance Vector (AODV), Destination Sequenced Distance – Vector Routing (DSDV), and Cluster Based Routing Protocol (CBRP), and Temporally Ordered Routing algorithm (TORA), Directed-diffusion, Low Energy Adaptive Clustered Hierarchical (LEACH) routing protocol.
<b>UNIT-IV</b>	<b>Mobile TCP/IP</b> Distributed location and data management: Mobile IP- Problem with Mobility, Terminology, Operation, Tunneling, Data transfer to the mobile system, Transport Control Protocol (TCP) Over wireless- Indirect TCP (I-TCP), Snoop TCP, Mobile TCP (M-TCP), Data management issues, Data delivery models, Broadcast disks, data replication, Data caching and design issues, Air indexing, Transaction processing in mobile computing environment.
<b>UNIT-V</b>	<b>MOBILE AGENTS</b> Introduction to Mobile Agents, Mobile agents vs. Client server, Agent migration and design issues, Mobile agent communication, Mobile Agent Security – Security Requirements and Cryptographic Techniques, Taxonomy of Possible Attacks – Malicious Agents, Malicious Agencies, Protecting Mobile Agents - Preventing Attacks on Mobile Agents, Detecting Attacks on Mobile Agents, Protecting Agencies - Agent Authentication and Authorization.

#### TEXT BOOKS

Charles E. Perkins, Ad hoc Networks, Addison Wesley, 2008.  
Mazliza Othman, Principles of mobile computing and communications, Auerbach Publications, 2007.

#### REFERENCE BOOKS

- Mobile Computing Technology, Applications and service creation, Asoke K Telukder, Roopa R Yavagal by TMH.
- Wireless Communications & Networks, Second Edition, William Stallings by Pearson
- TCP/IP Protocol Suite by Behrouz A Forouzan, Third Edition, TMH

OPEN SOURCE SOFTWARE	
Course Code: 23CS4031	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

COURSE OBJECTIVE
To introduces concepts, principles and applications of open source software.
To discuss about open source software development process.
To understand the difference between open source software and commercial software.
To familiarize with Linux operating system.
To understand and development of web applications using open source web technologies like Apache, MySql and PHP (LAMP/XAMP).

COURSE LEARNING OUTCOMES (CLO)
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Understand the difference between open source software and commercial software.
Identify, install and run Linux operating system.
Install and manage applications.
Identify, install open source web technologies Apache, MySql, PHP.
Develop web applications using LAMP.
Write session control PHP code for a website.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<del>CLO-CO</del>	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6
C01	✓	✓				
C02		✓	✓			
C03			✓	✓		
C04				✓	✓	
C05					✓	✓

#### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>OPEN SOURCE:</b> Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use

	Linux? Linux Kernel – Linux Distributions.
<b>UNIT-II</b>	<b>LINUX:</b> Introduction to Linux Essential Commands - Filesystem Concept - Standard Files 1. The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction 2. String Processing - Investigating and Managing Processes - Network Clients - Installing Application.
<b>UNIT-III</b>	<b>APACHE:</b> Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess.
<b>UNIT-IV</b>	<b>MYSQL:</b> Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.
<b>UNIT-V</b>	<b>PHP:</b> Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code - Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

#### TEXT BOOKS

James Lee and Brent Ware, "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", Dorling Kindersley (India) Pvt. Ltd, 2008.

#### REFERENCE BOOKS

Eric Rosebrock, Eric Filson, "Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP and working Together", Published by John Wiley and Sons, 2004.

Philosophy of GNU URL: <http://www.gnu.org/philosophy/>.

Version control system, URL: <http://git-scm.com/>

SVN version control, URL: <http://svnbook.red-bean.com>

## ADVANCED INTERNET OF THINGS

Course Code: 24CS4041	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

### COURSE OBJECTIVES

1. To provide an in-depth understanding of advanced IoT concepts, architectures, and protocols, emphasizing the integration and interoperability of various IoT components.
2. To delve into the design and implementation of IoT sensor networks and the methods for collecting, processing, and analyzing IoT data.
3. To provide comprehensive knowledge of the security and privacy challenges in IoT, and the strategies to mitigate these challenges.
4. To explore various advanced IoT applications across different industries and analyze real-world case studies to understand the practical implementation of IoT solutions.
5. To investigate the emerging trends and future directions in IoT, including advancements in technologies, standards, and applications.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After the completion of course, students will be able to:

1. Understand advanced concepts and principles of IoT
2. Understanding the design and implementation of IoT sensor networks.
3. Identify and analyze various IoT security threats and vulnerabilities and Implement security protocols and techniques to protect IoT systems.
4. Identify advanced IoT applications in different industries and analyse the real-world case studies of IoT implementations.
5. Evaluate the impact of emerging IoT technologies on various industries and develop a project that should demonstrate proficiency in IoT architecture, sensor networks, data analytics, security, and application development.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOME (CLOs)

	CLO1	CLO2	CLO3	CLO4	CLO5
CO1	✓				
CO2		✓			
CO3			✓		
CO4				✓	
CO5					✓

### COURSE CONTENTS

UNIT NUMBER	CONTENTS
UNIT-I	<b>Advanced IoT Concepts and Architectures</b> Overview of IoT and its evolution, Advanced IoT architectures and their components, IoT communication protocols (MQTT, CoAP, AMQP, etc.), IoT standards and frameworks, Interoperability challenges and solutions in IoT
UNIT-II	<b>IoT Sensor Networks and Data Analytics</b> Design and deployment of IoT sensor networks, Sensor data acquisition and preprocessing techniques, IoT data storage solutions, Data analytics and machine learning for IoT, Performance and scalability in IoT data analytics
UNIT-III	<b>IoT Security and Privacy</b> Security challenges in IoT, Common IoT security threats and vulnerabilities, IoT security protocols and best practices, Privacy concerns and data protection in IoT, Legal and regulatory considerations in IoT security
UNIT-IV	<b>IoT Applications and Case Studies</b> Advanced IoT applications in healthcare, agriculture, smart cities, etc., Case studies of successful IoT implementations, Challenges in IoT application deployment, Impact of IoT on business processes, Planning and managing IoT projects
UNIT-V	<i>Emerging Trends and Future Directions in IoT</i> <b>Emerging IoT technologies and standards, Future directions in IoT research and development, Impact of emerging IoT technologies on different sectors, Research opportunities in IoT, Strategic planning for future IoT advancements</b>

#### TEXT BOOKS

- IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, Gonzalo Salgueiro, Rob Barton Released June 2017  
Publisher(s): Cisco Press ISBN: 9780134307091
- Enterprise Internet of Things Handbook by Arvind Ravulavaru Released April 2018  
Publisher(s): Packt Publishing ISBN: 9781788838399
- Analytics for the Internet of Things (IoT) by Andrew Minter Released July 2017  
Publisher(s): Packt Publishing ISBN: 9781787120730

#### REFERENCE BOOKS

- Analytics: Data Science, Data Analysis and Predictive Analytics for Business" by Daniel Covington.
- "Internet of Things: Principles and Paradigms" by Rajkumar Buyya and Amir Vahid Dastjerdi

<b>ADVANCED BLOCKCHAIN</b>	
Course Code: 23CS4047	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 1 0	
Credits: 4	

<b>COURSE OBJECTIVE</b>
To understand Blockchain technology and the key concepts like cryptography and cryptocurrency concepts.
To gain a deep insight into Bitcoin, its network and how Bitcoin transactions are validated by miners
To interpret the prospects of Blockchain and assess how Blockchain can improve your business standards.
To deploy your private Blockchain on the web where you can visually see your chains & send transactions between nodes
To infer Hyperledger project, its architecture, APIs and network topology

<b>COURSE LEARNING OUTCOMES (CLO)</b>
The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:
Develop a deeper understanding of blockchain technical topics such as consensus, cryptography, privacy and security.
Understand how blockchain solutions are transforming the industry landscape.
Design and develop for a permissioned blockchain
Explore a variety of blockchain case studies, including food provenance, container tracking, payments, identity.
Acquire hands-on expertise using popular blockchain open source technology, including Hyperledger Fabric.

#### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO-CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>	<b>CLO5</b>
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

#### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>COURSE CONTENTS</b>
<b>UNIT-I</b>	<b>Blockchain prerequisites and Introduction to Blockchain</b>

	Introduction to HTML 5 and Javascript Programming, Concept of callback, promises and Async/Await, NodeJS- Server side Javascript, Docker essentials, Containers Orchestration, Implementations Creating and Deploying Docker containers, Introduction to Blockchain
<b>UNIT-II</b>	<b>Blockchain in detail and Blockchain Status</b> Understand the business context behind blockchain and the problems that blockchain aims to solve, Distinguish between blockchain for business and other blockchain implementations, Enumerate the broad categories of blockchain solutions, Understand the state of the blockchain industry in 2019, in terms of technologies, topics and communities, See how today's blockchain implementations vary, Look at the indicators that point to blockchain's future
<b>UNIT-III</b>	<b>Linux Foundation Hyperledger and Blockchain Use-Cases</b> Understand the background behind the Linux Foundation Hyperledger project, Enumerate and compare the different Hyperledger projects, Introduce Hyperledger Fabric, Learn about some successful blockchain projects, Evaluate good vs. bad blockchain ideas, Assess business value
<b>UNIT-IV</b>	<b>Blockchain Developer part 1:</b> Block chain principles and its use in the enterprise, Blockchain infrastructure and applications, Identify participants, assets, transactions in a business network, Hyperledger Fabric, Blockchain solution architecture, Peers, smart contracts, channels, world state
<b>UNIT-V</b>	<b>Blockchain Developer part 2:</b> Consensus, ordering service and transaction endorsement, Chaincode structure, lifecycle and deployment approaches., Blockchain deployment with Docker and Kubernetes, Blockchain security on Hyperledger Fabric
<b>UNIT-VI</b>	<b>PROJECT</b> Research Activities on Blockchain network

<b>TEXT/REFERENCE BOOKS</b>
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- |  |
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| <ul style="list-style-type: none"> <li>• IBM Courseware</li> </ul> |
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## SYLLABUS OF PROGRAM ELECTIVE COURSES - IX

MODERN ARCHITECTURE PATTERNS	
Course Code: 23CD422	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVE

The Objective of this course is to give a strong foundation of modern software architecture.

1. To introduce the Software Architecture.
2. To teach the fundamental techniques and principles in Design Patterns.
3. To introduce the Architectural Patterns.
4. To teach the fundamental techniques and principles in various Design Patterns and Microkernel & Microservices.

### COURSE LEARNING OUTCOMES (CLO)

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand the software architecture.

Learn the software design.

Understand the Architecture Pattern

Understand the Microkernel and Microservices.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓		
C03			✓	
C04				✓

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	Introduction to Software Architecture:

	Software architecture: Overview, Stakeholders, Stakeholders Areas of Concern, Software Architecture: Definition, Architecture Description, ISO / IEC / IEEE 42010, Architecture Structural Description, Architecture Behavioral Description, Benefits, Architectural Patterns, Architectural Style Vs. Architectural Pattern
<b>UNIT-II</b>	<b>Introduction to Design Patterns</b> Design Pattern: Overview, Design Pattern Discovery, Elements, Documenting Design Pattern, Design Pattern: Benefits, Criticisms, Design Pattern Classifications, Creational Patterns, Structural Pattern, Behavioral Patterns, Architectural Patterns Vs. Design Pattern, Anti Patterns, Anti Pattern Vs. Bad Habit, God Object, Anti Patterns in Object Oriented Programming (OOP)
<b>UNIT-III</b>	<b>Architectural Patterns</b> Layered Pattern, Layers, Use Cases, Layered Pattern: Advantages, Layered Pattern: Disadvantages, Event-driven Pattern: Definition, Components, Use Cases, Advantages & Disadvantages
<b>UNIT-IV</b>	<b>Microkernel &amp; Microservices</b> Microkernel Pattern: Definition, Components, Use Cases, Advantages & Disadvantages, Microservices (MS): Definition, MS: Architecture, MS Principles: Single Responsibility, MS Principles: Loose Coupling, Domain Driven Design, Principles: Service Discovery, Fault Tolerance/Circuit Breaker, Automation, Use Cases, Advantages & Disadvantages, Space-Based Architecture, Use Cases, Advantages & Disadvantages
<b>UNIT-V</b>	<b>Design Patterns:</b> Creational Design Patterns, Factory pattern, Builder Pattern, Prototype Pattern, Singleton Pattern, Structural Design Patterns, Adapter Pattern, Bridge Pattern, Composite Pattern, Decorator Pattern, Facade Pattern, Flyweight Pattern, Proxy Pattern, Behavioural Design Patterns, Command Pattern, Iterator Pattern, Mediator Pattern, Memento Pattern, Observer Pattern, Observer Pattern, template pattern, Visitor Pattern

#### **TEXT BOOKS**

Microservices: Flexible Software Architecture – Book by Eberhard Wolff, Addison Wesley Publication, 1<sup>st</sup> edition, ISBN: 9780134602417.

Devops and Microservices Handbook: Non-programmers Guide to Devops and Microservices – Book by Stephen Fleming, Createspace Independent Publication, ISBN: 9781717590077, 2018.

#### **REFERENCE BOOKS**

Microservices Architecture Handbook: Non-Programmmmer’s Guide for building Microservices – Book By Stephen Fleming, ISBN: 9781643701547, 2018

#### **MODERN WEB and MOBILE FRAMEWORKS**

Course Code: 23CD424	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### **COURSE OBJECTIVE**

The Objective of this course is to give a strong foundation of Modern Web And Mobile Frameworks.

To introduce the HyperText Markup Language.

To teach the fundamental techniques and principles in Cascading Style Sheet.

To teach the Implementation JavaScript.

To teach the Frontend Architecture and to implement the Node.JS.

### **COURSE LEARNING OUTCOMES (CLO)**

The syllabus adhere to all Bloom's Taxonomy Levels and has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

Understand the traditional HTML version and integration of CSS with HTML to enhance the design facet.

Understand Javascript, Use of Javascript with CSS, Learn the Syntax Rules and gain insights on functions.

Learn the History of Frontend Architecture.

Understand the Backend Architecture - Node.js.

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

### **COURSE CONTENTS**

<b>UNIT</b>	<b>COURSE CONTENTS</b>
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NUMBER	
UNIT-I	<b>HTML</b> Introduction to HTML, Introduction, HTML Page Structure, Create HTML document, Understand the various elements available in HTML, HTML Use, Attributes in HTML, Need of Attributes, Common Attributes, HTML forms, Apply validations to the form elements, Creating web pages with HTML5, HTML5 introduced features, HTML5 form validate/no validate, HTML5 canvas, embedding audio, and video in a webpage, drag and drop, HTML5 Local Storage, HTML5 web workers and server sent events
UNIT-II	<b>Cascading Style Sheet</b> What is CSS, how to insert CSS in HTML, How CSS adds value to HTML, Difference between Semantic and HTML mark-up, CSS 3, CSS Selectors, Buttons, CSS float and clear, CSS align - horizontal and center, CSS Padding, CSS Links, CSS Lists, CSS Tables
UNIT-III	<b>JavaScript</b> What is JavaScript, Importance of JavaScript, What can JavaScript Do?, JavaScript with HTML Attributes, JavaScript with CSS, Operators, JavaScript Syntax, JavaScript Data Types, JavaScript Functions, Setting up Environment, Variables, Control flow, if. Else, switch, loops, JavaScript HTML DOM Elements, JavaScript Syntax, Operators, Data Types, JavaScript String Methods, JavaScript Functions, Arrays, Sorting, Joins, Reduce map
UNIT-IV	<b>Frontend Architecture</b> Introduction to Frontend Development, History, MVC, MVP, MVVM & Web Apps, Development of AJAX, Introduction to DOM, Basic DOM Manipulation, Reactive Programming
UNIT-V	<b>Node.js</b> Introduction to Node.js, History, Why Node.js, Node.js Architecture, Features, Working of Node.js, Installation & Setting Up Node, setting up React, REPL Environment, REPL Commands, Variable, Components of Node.js, Local Modules, Module Exports: Export Object, Export Class, Loading Module from Separate Folder, Operating System, File Systems

#### TEXT BOOKS

- Learning React: Functional Web Development with React and Redux – Book by Alex Banks and Eve Porcello, Shroff / O'Reilly Publication, 1<sup>st</sup> edition, 2017.
- Learning Web Design: A beginner's guide to HTML, CSS, Javascript, and Web Graphics – Book by Jennifer Niederst Robbins, Shroff Publication, 4<sup>th</sup> edition, 2012.

#### REFERENCE BOOKS

- Programming JavaScript Applications Robust Web Architecture with Node, HTML5, and Modern JS Libraries – Book by Eric Elliot, O'Reilly Publication, 2014.

## SYLLABUS OF OPEN ELECTIVES

GERMAN LANGUAGE PHASE I	
Course Code: 23FLGR301	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 2 0 0	
Credits: 2	

### COURSE OBJECTIVE

To develop oral and written skills of understanding, expressing and exchanging Information/ interacting.

To develops the ability to construct sentences and frame questions.

To provide German language as a competitive edge in career choices.

To know the culture of the countries where the German language is spoken.

This may be useful in the field of employment opportunities as well as helping them to develop projects on browsing German websites

### COURSE LEARNING OUTCOMES (CLOs)

1. After completion of this student will be able to read and write short, simple texts.
2. After completion of this student will have Fluency in reading and writing.
3. After completion of this student will be able understand a dialogue between two native speakers and to take part in short, simple conversations using the skills acquired.
4. Student will able to know the culture of the countries where the German language is spoken.
5. Developing pronunciation so that they can read the text and e-mail during their employment, instructing them to write their own CV and developing a fundamental conversation with any German national.

### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<del>CLO-CO</del>	CLO1	CLO2	CLO3	CLO4
C01	✓			
C02		✓	✓	
C03			✓	
C04				✓

### COURSE CONTENTS

#### UNIT-I : INTRODUCTION

Grüße, Wortschatz

#### UNIT-II : THEMEN

Das Alphabet, die Aussprache, die Zahlen, Land und Stadt beschreibung, Berufe, rede

über Dinge, die Zeit, Mahlzeiten und Getränke

### **UNIT-III : GRAMMATIK**

Plural, Artikel, Possessive Artikel, Adjektive, Sich vorstellen, Verben (regulär, unregelmäßig, Pronomen), Nominativ Pronomen, Präpositionen,

### **UNIT-IV : WORTSCHATZ**

emanden vorstellen, Nationalitäten, Länder, Zahlen, Über die Wochentage sprechen, Die Monate des Jahres, Die Berufe, Die Farben, Die Gegensätze, Die Sätze mit der Zeit

### **UNIT-V : MÜNDLICHER AUSDRUCK**

Mündliche und Höraktivitäten

### **TEXT BOOK**

1. Tangram aktuell 1 (Lektion 1-4 Kursbuch + Arbeitsbuch, Lektion 5-8 Kursbuch + Arbeitsbuch, Übungsheft)

### **REFERENCE BOOKS**

1. Wolfgang Hieber: Lernziel Deutsch, Teil 1. Max Hueber Verlag
2. Korbinian Braun, u.a.: Deutsch als Fremdsprache IA, Grundkurs. Ernst Klett Stuttgart
3. Rolf Brüseke: Starten Wir! A1. München: Hueber Verlag

<b>GERMAN LANGUAGE PHASE II</b>	
<b>Course Code:</b> 23FLGR401	Continuous Evaluation: 40 Marks
<b>Pre-Requisite :</b> NIL	End Semester Examination: 60Marks
<b>L T P :</b> 2 0 0	
<b>Credits:</b> 2	

### **COURSE OBJECTIVE (COs)**

1. Students will demonstrate their ability to recognize, identify, extract and/or differentiate key information conveyed in spoken announcements, instructions, and in interactions between native speakers on familiar topics.
2. Students will demonstrate effective speaking and listening skills in German on informal and some formal topics related to personal, professional, academic, and leisure activities
3. To develop awareness of the nature of language and language learning

### **COURSE LEARNING OUTCOMES (CLOs)**

1. After completion of this student will be able to read and write short, simple texts.
2. After completion of this student will have Fluency in reading and writing.
3. After completion of this student will able to use language creatively and spontaneously.
4. Students will get awareness of cross-cultural and intercultural difference.

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO \ CO</b>	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>
<b>CO1</b>	✓			
<b>CO2</b>		✓	✓	
<b>CO3</b>				✓

### **COURSE CONTENTS**

#### **UNIT-I : THEMEN**

Einkaufen, Tagesablauf, Lebenslauf , Nach dem Weg fragen, Wegbeschreibungen, Der Körper, Ereignisse der Vergangenheit erzählen

#### **UNIT-II : GRAMMATIK**

Trennbare und untrennbare Verben, Dativ , Modalverben, Präteritum von sein, haben, Perfekt

#### **UNIT-III : WORTSCHATZ**

Kleidung, Haushaltswaren, Sachen zum Essen und Trinken, Verkehrsmittel, Namen von



Orten und Sehenswürdigkeiten, Information über Deutschland, Ordinalzahlen

#### **UNIT-IV : KOMPOSITION**

Themen zum schreiben wie Deutschland und Delhi, was haben Sie am wochenende gemacht, Traummann/Traumfrau

#### **UNIT-V: Mündlicher Ausdruck**

Sprechen über die Stadt, Das Haus, Meine Familie

#### **TEXT BOOK**

1. Tangram aktuell 1 (Lektion 1-4 Kursbuch + Arbeitsbuch, Lektion 5-8 Kursbuch + Arbeitsbuch, Übungsheft)

#### **REFERENCE BOOKS**

1. Wolfgang Hieber: Lernziel Deutsch, Teil 1. Max Hueber Verlag
2. Korbinian Braun, u.a.: Deutsch als Fremdsprache IA, Grundkurs. Ernst Klett Stuttgart
3. Rolf Brüseke: Starten Wir! A1. München: Hueber Verlag

#### **Website pages:**

- <https://www.nthuleen.com/teach.html>

### FRENCH LANGUAGE PHASE I

Course Code: 23FLFR301	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 2 0 0	
Credits: 2	

#### COURSE OBJECTIVE

To develop oral and written skills of understanding, expressing and exchanging Information/ interacting.

To develops the ability to construct sentences and frame questions.

To provide French language as a competitive edge in career choices.

To know the culture of the countries where the French language is spoken.

#### COURSE LEARNING OUTCOMES (CLOs)

1. After completion of this student will be able to read and write short, simple texts.
2. After completion of this student will have Fluency in reading and writing.
3. After completion of this student will be able understand a dialogue between two native speakers and to take part in short, simple conversations using the skills acquired.
4. Student will able to know the culture of the countries where the French language is spoken.

#### COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓	✓	
CO3			✓	
CO4				✓

#### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	INTRODUCTION: Les Salutations Vocabulaire

<b>UNIT-II</b>	<b>SUJETS :</b> L'Alphabet, Le Pronunciation, Les Nombres, Décrire votre pays, ville, Les Professions, Parler de choses, L'Heure, Les Repas et les boissons
<b>UNIT-III</b>	<b>GRAMMAIRE:</b> Le Nom et le pluriel des noms, Les Articles, Les Adjectifs Possessifs, Les Adjectifs Qualificatifs, Se présenter, Les Verbes (Regular, irregular, pronominaux), Les Pronoms Sujet, Les Prepositions, L'interrogation
<b>UNIT-IV</b>	<b>LEXIQUE :</b> Présenter quelqu'un, Les nationalités, Les Pays, Les Nombres, Parler des jours de la semaine, Les mois de l'année, Les Professions, Les Couleurs, Les Contraires, Les phrase avec l'heure
<b>UNIT-V</b>	<b>L'EXPRESSION D'ORALE:</b> Les activités d'orale et écouter

#### **TEXT BOOKS**

Version Originale – 1 Livre de l'élève: Monique Denyer, Agustin Garmendia, Marie-Laure Lions Olivieri, Editions Maisons des Langues, Paris

#### **REFERENCE BOOKS**

Nathan verbs conjugation , Le Robert Nathan, Paperback

Larrouse French to English Dictionary, Larrouse, Paperback

Le Nouveau Sans Frontiers, Vol. 1, P. Dominique, J. Girardet et al, Cle International, Paris.

<b>FRENCH LANGUAGE PHASE II</b>	
<b>Course Code:</b> 23FLFR401	Continuous Evaluation: 40 Marks
<b>Credits:</b> 2	End Semester Examination: 60 Marks
<b>L T P : 2 0 0</b>	
<b>Prerequisite:</b> NIL	

### **COURSE OBJECTIVE (COs)**

1. To Demonstrate an elementary knowledge of French sentence structure through speaking and writing
2. To develop the language proficiency required to communicate effectively in French
3. To form a sound base of the skills, language and attitudes required for progression to work or further study, either in French or another subject area.
4. To develop awareness of the nature of language and language learning

### **COURSE LEARNING OUTCOMES (CLOs)**

1. After completion of this student will be able to read and write short, simple texts.
2. After completion of this student will have Fluency in reading and writing.
3. After completion of this student will able to use language creatively and spontaneously.
4. After completion of this student will able to know the culture of the countries where the French language is spoken.

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
CO1	✓			
CO2		✓		
CO3			✓	
CO4				✓

### **COURSE CONTENTS**

#### **UNIT-I : SUJETS**

La France, Le Fromage, le vin, Les saisons, Les recettes, Indiquer un chemin, Demander la direction, Donner des indications, Le corps, Les elements du passé, Raconteur une journée

#### **UNIT-II : GRAMMAIRE**

La negation, L'imperatif, Le passé recent, Le future, Le passé compose, L'imparfait, Les nombres ordinaux

#### **UNIT-III : LEXIQUE**

Les vêtements, Les animaux, Parler de prix, Le corps, Vocabulaire de la gare et du train, Le voyage, Les achats Les Prepositions, L'interrogation

#### **UNIT-IV : Composition**

les sujets pour l'écriture comme la maison, l'école

#### **UNIT-V: L'expression d'orale**

**Les étudiants écrivent le petit paragraphe sur les sujets en utilisant les expression et le temps comme ma maison , ma famille.**

#### **TEXT BOOK**

**1. Version Originale – 1 Livre de l'élève: Monique Denyer, Agustin Garmendia, Marie-Laure Lions Olivieri, Editions Maisons des Langues, Paris**

#### **REFERENCE BOOKS**

1. Nathan verbs conjugation , Le Robert Nathan, Paperback
2. Larrouse French to English Dictionary, Larrouse, Paperback
3. Le Nouveau Sans Frontiers, Vol. 1, P. Dominique, J. Girardet et al, Cle International, Paris.
4. Alter Ego Part 1
5. Echo Part 1

ENTREPRENEURSHIP & NEW VENTURE MANAGEMENT	
Course Code: SEC-FT-01	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE EDUCATIONAL OBJECTIVES AND OUTCOMES:

- To learn about and get an insight of Entrepreneurs and Entrepreneurship development.
- To understand the basic of Business project report, Fund raising and SWOT analysis.
- Understand the different support system for business development.
- Gain knowledge and acquire skill for setting up an enterprise and learn how the management works.

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>Entrepreneurship Development:</b> Concept, definition, types, functions and competencies, stages of entrepreneurship. Barriers and challenges in entrepreneurship in India. Women entrepreneurship, rural entrepreneurship. Role of various institutions in developing entrepreneurship in India
UNIT-II	<b>Business Planning:</b> Idea generation, sensing business opportunities and assessing market potential, market research preparation of feasibility reports/business plan. Components of project report, appraising project report, pitching, angel investors, venture capital funds, technology incubators and their role, student start up, technopreneurs, social entrepreneurs and their significance.
UNIT-III	<b>Food Business Management : Production, Marketing and finance:</b> Managing Production-Organizing Production, Input-output cycle-Ensuring Quality Managing Marketing, Understanding markets and marketing, Functions of marketing, 4Ps of marketing, Financial Marketing, Meaning of Finance, types and sources of finance, Estimation

### References:

- Desai,V. (2011) The Dynamics of Entrepreneurial Development and Management. Mumbai, Himalaya Publishing house Pvt. Ltd. Unit 1,2,4,6,7
- Kottler, P. (1994) Marketing Management, New Delhi, Prentice Hall of India private Limited.
- Acharya, S.S & Aggarwal. N.L (1987), Agricultural Marketing in India, New Delhi, Oxford Publishing.
- David,D. & Erickson S. (1987) Principles of Agri Business Management. New Delhi. Mc Graw Hill Book

<b>SUSTAINABLE GROWTH &amp; DEVELOPMENT</b>	
Course Code: 23ESUG202	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### **COURSE OBJECTIVES**

1. To have an increased awareness among students on issues in areas of sustainability.
2. To understand the role of engineering and technology within sustainable development.
3. To know the methods, tools, and incentives for sustainable product-service system development.
4. To establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental, societal, and economic problems.

### **COURSE LEARNING OUTCOMES**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. To develop an awareness about our environment and elicit collective response for its protection.
2. Able to understand the different types of environmental pollution problems and their sustainable solutions.
3. Able to work in the area of sustainability for research and education.
4. Having a broader perspective in thinking for sustainable practices by utilizing the engineering knowledge and principles gained from this course

### **MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES**

<b>Course Objectives (COs)</b>	<b>Course Learning Outcomes (CLOs)</b>			
	<b>CLO 1</b>	<b>CLO 2</b>	<b>CLO 3</b>	<b>CLO 4</b>
<b>CO1</b>				
<b>CO2</b>				
<b>CO3</b>				
<b>CO4</b>				

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>Basics of Sustainable Development &amp; Natural Resources:</b> Environment, ecology and economy; Economics of natural resources; Resource taxonomy, Resource scarcity; Managing exhaustible and renewable resources; Natural environment as a natural resource; Irreversibility and uncertainty in environmental processes; Concept of sustainable development and intergenerational justice; Indicators of sustainability; Goals of Sustainable Development (SDGs), Sustainable development – a critical assessment of past and present view.
UNIT-II	<b>Climate Change &amp; Sustainable Development</b> Introduction to energy economics; Energy- environment interactions; Options to address energy related environmental problems-Regulatory approach to environmental management, economic instruments for pollution control, Assessment and selection of instruments, Nuclear energy and climate change; Promises and limits of bioenergy; Economics of climate change; Alternative options to cope with global warming - Generic options, National policy options, Emissions trading scheme (ETS) of the EU; International climate change agreements- UNFCCC, The Kyoto Protocol.
UNIT-III	<b>Corporate Social Responsibility (CSR) &amp; Sustainable Development:</b> Environmental Corporate Social Responsibility- Definition, concept, linkages to development Growth of CSR-historical & contemporary perspectives, National & International scenario Factors influencing growth of CSR in societies ideological, socio-economic, legal & environmental perspectives Government initiatives for promoting CSR Impact of globalization & liberalization on CSR initiatives. Ethical philosophy, Corporate reputation, the Gaia hypothesis Environmental sustainability & CSR-redefining sustainability, the Brundtland report & critique, distributable sustainability, sustainability & the cost of capital CSR.
UNIT-IV	<b>Applied Field of Sustainability:</b> Environment Laws: Environment Protection Act; Air Sustainability- need and concept, challenges, Environment acts and protocols, Global, Regional and Local environmental issues, Natural resources and their pollution, Carbon credits, Zero waste concept ISO 14000, Life Cycle Analysis, Environmental Impact Assessment studies, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Technology and sustainable development, Sustainable urbanization, Industrial Ecology.



**Text Books**

Bhattacharya R.N., (2002). Environmental Economics. Oxford University Press

Bhattacharya, S.C. (2011). Energy Economics. Springer, London

Biswas, A.K. Anand Tortajada, Cecilia, (2005). Appraising Sustainable Development. Oxford University Press.

Zaleski C.P and Meritet Sophie, (2011) —Nuclear energy and climate change

**Reference Books**

Sengupta Ramprasad., (2002). Ecology and Economics: An Approach to Sustainable Development. Oxford University Press: New Delhi

Kolstad, Charles, D., (2010). Environmental Economics. Oxford University Press

WASTE MANAGEMENT	
Course Code: 23ESUG203	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVES

1. Able to understand the fundamentals of waste generation and its environmental health impact
2. Formulate and design engineered solutions to waste management
3. To Apply best waste management practices for sustainable development

### COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. To develop an awareness about solid waste and management practices
2. Able to design feasible solutions for waste management
3. Students will have understanding of waste management practices, law and regulation related to solid waste management.

### MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES

Course Objectives (COs)	Course Learning Outcomes (CLOs)		
	CLO 1	CLO 2	CLO 3
CO1			
CO2			
CO3			

### COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
UNIT-I	<b>Solid Waste Generation and Characterization- Introduction</b> Definition and fundamentals of solid waste, Sources and Types; Residential Waste, Industrial waste, Commercial waste, Institutional Waste, Industrial Waste and Construction and Demolition waste Characterisation of Wastes; physical and chemical composition. Solid waste management: Overview, Key components, Fundamentals of waste segregation,

	screening, collection, transport, disposal and processing techniques, Concepts of Integrated solid waste management.
<b>UNIT-II</b>	<b>Municipal Solid Waste Management</b> Municipal solid waste; Concept, Sources; Generation rate, composition; Segregation, collection of waste; transfer and transport of waste; disposal options; Landfill (Site selection criteria, layout,) concept of waste reduction, recycling and reuse. Impact of waste on environmental health, Legislation on management and handling of municipal solid wastes
<b>UNIT-III</b>	<b>Hazardous Waste Management</b> Hazardous waste definition, sources, identification, characterisation and classification; Collection, handling, storage and transport of hazardous waste, Environmental health impact of hazardous waste. Management of different Hazardous wastes; Nuclear waste, Biomedical waste, E waste, Radioactive waste, Introduction, generation, characterisation, transport and disposal methods. Legislation on management and handling of hazardous wastes, Biomedical waste management rules, E-waste waste management rules and regulations
<b>UNIT-IV</b>	<b>Processing and Treatment of Solid Waste,</b> Thermal Treatment; Incineration, Pyrolysis, Gasification, co-combustion. Biological treatment; Composting, bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; Biomethanation, Biogas, Waste to Energy. Landfill design; Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; Geo spatial technology application in waste management

#### **Text Books**

1. John Pichtel (2014). *Waste Management Practices: Municipal, Hazardous and Industrial*, 2nd Ed., CRC Press, USA
2. Tchobanoglous G., Frank Kreith., (2002). *Hand Book of Solid Waste Management*, 2nd Ed., McGraw Hill, USA.

#### **Reference Books**

1. LaGrega, M.D. Buckingham, P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, New York, 1994.
2. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York, 1997



## MICROPROCESSORS AND INTERFACING

Course Code: 23EC390	Continuous Evaluation: 40 Marks
Pre-Requisite : NIL	End Semester Examination: 60 Marks
L T P : 3 0 0	
Credits: 3	

### COURSE OBJECTIVES

1. To develop an in-depth understanding of the operation of microprocessors.
2. To master the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts etc.
3. To create an exposure to basic peripherals, its programming and interfacing techniques
4. To understand the concept of Interrupts and interfacing details of 8085.
5. To impart the basic concepts of microcontroller 8051 and 8086

### COURSE LEARNING OUTCOMES

Up on successful completion of this course, student will be able to:

1. Understand the architecture of microprocessors and micro controller
2. Understand the programming model of microprocessors and micro controllers
3. Interface different external peripheral devices with microprocessors and micro controllers
4. Analyze a problem and formulate appropriate computing solution for processor or controller based application.
5. Develop an assembly language program for specified application

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

COURSE LEARNING OUTCOME COURSE OBJECTIVES	CLO 01	CLO 02	CLO 03	CLO 04	CLO 05
CO 01	✓	✓			
CO02		✓	✓		
CO 03			✓		

CO 04			✓	✓	
CO 05			✓	✓	✓

## COURSE CONTENTS

UNIT NUMBER	COURSE CONTENTS
<b>UNIT-I</b>	<b>MICROPROCESSOR- 8086</b> Register Organization -Architecture-Signals-Memory Organization-Bus Operation-IO Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts & Service Routines
<b>UNIT-II</b>	<b>PROGRAMMING OF 8086</b> Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086
<b>UNIT-III</b>	<b>INTERFACING DEVICES</b> IO and Memory Interfacing concepts-Programmable interval timer (8254)- Programmable Interrupt Controller (8259A) – Programmable DMA Controller (8257) –Programmable communication Interface (8251)-Stepper motor interfacing
<b>UNIT-IV</b>	<b>MICROCONTROLLER-8051</b> Register Set-Architecture of 8051 microcontroller- IO and memory addressing-Interrupts-Instruction set-Addressing modes.
<b>UNIT-V</b>	<b>PROGRAMMING OF 8051</b> Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADCs, Sensors.

## TEXT BOOKS

1. A. K. Ray and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGrawHill, 2000.
2. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 – Microcontroller and Embedded systems", 7th Edition, Pearson Education, 2004
3. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S. Gaonkar Pub: Penram International.

## REFERENCE BOOKS

1. Douglas.V.Hall, Microprocessor and Interfacing: Programming and Hardware, 2<sup>nd</sup> edition, McGraw Hill, 1991.
2. Kenneth.J.Ayala, 8051 Microcontroller Architecture, Programming and Applications. 2<sup>nd</sup> edition, Thomson.

## SYLLABUS OF ABILITY ENHANCEMENT COURSES

COMMUNICATIVE ENGLISH	
<b>Course Code:</b> 24HS101/24HS201	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 2	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 2 0 0	
<b>Prerequisite:</b> Nil	

### COURSE OBJECTIVES (COs)

1. To prepare the students for their career which will require them to listen to, read, speak, and write in English both for their professional as well as interpersonal communication
2. To empower the students to improve both abilities to communicate and their linguistic competence and boost their confidence.
3. To enable the students to properly communicate and express themselves in writing.
4. To enable students to identify the common mistakes made by most learners of English and not make those errors both in their writing and speaking.
5. To study, understand and implement each unit according to National Education Policy 2020 and Bloom's Taxonomy.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Recall and identify English vocabulary words and grammatical structures.
2. Analyse the structure and organization of written texts, identifying the introduction, body, and conclusion.
3. Examine how the use of specific language techniques impacts the effectiveness of communication.
4. Assess and critique public speeches and presentations based on clarity, coherence, and persuasiveness.
5. Evaluate one's own language skills and identify areas for improvement.

### MAPPING MATRIX OF COURSE OBJECTIVES & COURSE LEARNING OUTCOMES

Course Objective	Course Learning Outcomes				
	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
CO 1	✓	✓	✓		
CO 2		✓		✓	
CO 3					
CO 4				✓	✓
CO 5					✓

### COURE CONTENTS

#### Unit-I: Introduction to Communication

- Elements and Process of Communication, Types and Barriers to Communications, Grice Conversational Maxims and Cooperative Principles
- Verbal and non-verbal communication.
- Body Language: Proxemics, Chronemics and Haptics
- Identifying and rectifying common errors: Types of Sentences (Statements, interrogative, exclamatory, Optative, and imperative, Wh/How-questions, question-tags).
- Basic Grammar: - Articles, Prepositions, Cliches, Collocations and Punctuations

**Unit-II: Workplace Communication**

- Communication Challenges in Culturally Diverse Workplace; Ethics in Communication, Bias-free communication
- Effective Business Presentations: Importance in workplace communication; Planning, Preparing, Organizing, Rehearsing, and Delivering Oral presentations, Handling Questions; and Power Point Presentation.

**Unit-III: Effective Writing**

- Paragraph Writing: Topic Sentence, Guided composition, Free-writing
- Reading comprehension practice: Technical and General text, use of different techniques (skimming and scanning)
- Selection of Words; Coherence and Cohesion
- Use of discourse markers with respect to technical writing

**Unit-IV: Business Writing at Work**

- Cover Letters and Applications
- Writing notices and circulars
- Email Writing and Memorandum
- Writing reports

**TEXT BOOKS**

1. English Grammar in Use. Raymond Murphy. Cambridge UP. 4<sup>th</sup> Edition.
2. Business Communication by Carol M Lehman, Debbie D Dufrene and Mala Sinha. Cengage Learning. 2<sup>nd</sup> Edition.
3. A Textbook of English Phonetics for Indian Students by T. Balasubramanian [Macmillan]
4. Soft Skills: Key to Success in Workplace and Life by Meenakshi Raman and Shalini Upadhyay. Cengage Learning. 2018 Edition.



COMMUNICATIVE ENGLISH LAB	
Course Code: 24HS151/24HS251	Continuous Evaluation: 60 Marks
Credits: 1	End Semester Examination: 40 Marks
L T P : 0 0 2	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. To prepare the students for their career which will require them to listen to, read, speak, and write in English both for their professional as well as interpersonal communication.
2. To empower the students to improve both abilities to communicate and their linguistic
3. Competence and boost their confidence.
4. To enable the students to properly communicate and express themselves in writing.
5. To enable students to identify the common mistakes made by most learners of English and not make those errors both in their writing and speaking.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After Completion of course, students would be able to:

1. Summarize conversations, demonstrating understanding of the content.
2. Apply communication strategies to maintain conversations and express ideas clearly.
3. Critique and assess various spoken interactions to identify strengths and areas for improvement in communication.
4. Create engaging dialogues or role-plays that demonstrate real-life communicative scenarios.
5. Develop and present persuasive arguments or opinions on various topics in English.

### MAPPING MATRIX OF COURSE OBJECTIVES & COURSE LEARNING OUTCOMES

Course Objective	Course Learning outcomes				
	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
CO 1	✓	✓	✓		
CO 2		✓		✓	
CO 3			✓	✓	
CO 4				✓	
CO 5					✓

### COURSE CONTENTS

#### Unit-1

- Listening and Speaking
- Practicing Sounds of English

- Accent in speech (British and American)

#### **Unit-2**

- Role-play
- Extempore
- Public Speaking and Rhetoric

#### **Unit-3**

- Presentations
- Interview Simulations
- Group Discussions and Debates

#### **Unit-4**

- Guided composition
- Free-writing
- Reading comprehension practice: Technical and General text

### **TEXT BOOKS**

- i. English Grammar in Use. Raymond Murphy. Cambridge UP.4th Edition.
- ii. Business Communication by Carol M Lehman, Debbie D Dufrene and Mala Sinha. Cengage Learning. 2nd Edition.
- iii. A Textbook of English Phonetics for Indian Students by T. Balasubramanian [MACMILLAN].
4. Soft Skills: Key to Success in Workplace and Life by Meenakshi Raman and Shalini Upadhyay. Cengage Learning. 2018 Edition.

### **REFERENCE BOOKS**

1. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma,
2. Oxford University Press.
3. Communication skill by Sanjay Kumar & Puspa Lata, Oxford University Press. 2nd Edition.
4. Business Communication Today by Courtland L Bovee and Thill, Pearson

HINDI -I	
Course Code: 24HIN-101- I	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P : 2 0 0	
Prerequisite: Nil	

### Course Description:

विश्वविद्यालय ने वर्ष 2024-25 सत्र से स्नातक स्तर पर हिन्दी विषय का पाठ्यक्रम तैयार किया है। हिन्दी विषय के प्रश्न पत्र की सामग्री में ज्ञान तथा शिक्षा के बदलते परिदृश्य को ध्यान में रखा गया है। हिन्दी के भक्तिकाल, रीतिकाल और आधुनिक काल के कवियों की कविताओं को पाठ्यक्रम में शामिल किया है। व्याकरण की विभिन्न कोटियों तथा भाषा के सम्प्रेषण से हिन्दी का प्रचार-प्रसार होगा। संचार कौशल के द्वारा छात्रों का ज्ञान परिमार्जित होगा। साहित्येतर छात्रों के ज्ञानवर्धन, भाषायी क्षमता एवम् अभिवृद्धि भी इस पाठ्यक्रम का लक्ष्य है।

### (Course Content)

#### (Unit-A)

इस इकाई में हिंदी भक्तिकाल के प्रमुख कवि कबीरदास हैं।

कबीरदास- कबीरदास के दोहे (5 दोहे)

#### (Unit-B)

इस इकाई में हिंदी रीतिकाल के प्रमुख कवि बिहारीलाल हैं।

बिहारीलाल – दोहे (5 दोहे)

#### (Unit-C)

इस इकाई में हिंदी आधुनिक काल के प्रमुख कवि माखनलाल चतुर्वेदी हैं।

माखनलाल चतुर्वेदी- पुष्प की अभिलाषा (कविता)

#### (Unit-D)

यह इकाई संचार कौशल से सम्बन्धित है. इसमें

(i) हिंदी के प्रमुख मुहावरे और लोकोक्तियाँ

(ii) आत्म परिचय (self-introduction), साक्षात्कार कौशल (interview skills), कार्यक्रम संचालन/मंच प्रबंधन (event management)

### Course Outcomes:-

पाठ्यक्रम परिणाम

#### (1.Knowledge Outcome)

##### 1. ज्ञान का परिणाम

(At the end of the course, the student should be able to)

पाठ्यक्रम के अंत में छात्र सक्षम होना चाहिए

-हिन्दी के प्रमुख कवि जो पाठ्यक्रम में शामिल हैं, उनकी कविताओं की व्याख्या और काव्यगत विशेषताओं को छात्र समझेंगे।

- छात्रों को काव्य में रस, अलंकार और छन्द का ज्ञान प्राप्त होगा।

-व्याकरण के अध्ययन से छात्रों को भाषा बोलने, लिखने और पढ़ने में सहायता प्राप्त होगी।

#### (2.Skill Outcome)

कौशल का परिणाम

**(At the end of the course, the student should be able to)**

पाठ्यक्रम के अंत में छात्र सक्षम होना चाहिए

-हिंदी कवियों व उनकी कविताओं से परिचित हो जाएंगे।

- छात्र दोहे और कविता समझने में सक्षम होंगे।

-व्याकरण के ज्ञान के साथ-साथ शब्दों के उच्चारण के बोध से अवगत होंगे।

**(Methodology)**

(पद्धति)

- कक्षा व्याख्यान

-व्याकरण के माध्यम से हिंदी शब्दों का उच्चारण व लेखन का अभ्यास किया जाएगा।

-समय-समय पर छात्रों को प्रदत्त कार्य दिया जाएगा।

-साप्ताहिक प्रश्नावली।

**(Required Books and Materials)**

आवश्यक पुस्तकें और सामग्री

-कबीर ग्रन्थावली, संपादक-श्यामसुन्दर दास, काशी नागरी प्रचारिणी सभा।

- बिहारी सतसई, साहित्य संस्थान प्रयाग।

-भाषा विज्ञान, डॉ. भोलानाथ तिवारी, किताब महल इलाहाबाद।

-हिंदी व्याकरण, कामता प्रसाद गुरु, प्रभात प्रकाशन दिल्ली।

<b>GERMAN-I</b>	
<b>Course Code: 24FLGR101- I</b>	<b>Continuous Evaluation: 40 Marks</b>
<b>Credits: 2</b>	<b>End Semester Examination: 60 Marks</b>
<b>L T P : 2 0 0</b>	
<b>Prerequisite: Basics of English Language</b>	

### **COURSE OBJECTIVES (COs):**

The objective of this course is to impart basic knowledge of German language to the students. The course intends to develop an ability for discussions, debates, research ventures, etc. Overall, the objective is to facilitate comprehension of the legal concepts better and develop the ability to write effective propositions in legal contexts.

1. To develop oral and written skills of understanding, expressing and exchanging information in German language.
2. To develop awareness of the nature of language and language learning.
3. To develop the ability to construct sentences and frame questions.
4. To provide German language as a competitive edge in career choices.

### **COURSE LEARNING OUTCOMES (CLOs):**

After completion of the course the students will have the ability to:

1. Read and write short, simple texts.
2. Have Fluency in reading and writing.
3. Understand the dialogue between two native speakers and to take part in short, simple conversations using the skills acquired.
4. Know the culture of the countries where the German language is spoken.

### **MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)**

<b>COURSE OBJECTIVES</b>	<b>Course Learning Outcome</b>			
	<b>CLO 01</b>	<b>CLO 02</b>	<b>CLO 03</b>	<b>CLO 04</b>
CO 01	✓			
CO02		✓	✓	
CO 03			✓	
CO 04				✓

### **COURSE CONTENTS**

#### **UNIT 1**

- Information über Deutschland
- Buchstaben, Regeln der Aussprache, Wochentage, Monate
- Grüße, sich vorstellen, Einige nützliche Ausdrücke des Alltagslebens, Zahlen bis 100

#### **UNIT 2**

- Zahlen, Über Personen sprechen (Name, Herkunft, Adresse, Telefonnummer, Alter,

Beruf, Familie)

- Länder und Städte, Sprachen, Berufe, Bezeichnungen für Personen, Familienmitglieder
- Personalpronomen, Konjugation von Verben (heißen, wohnen, kommen, machen, lernen, arbeiten, studieren, sein)

### **UNIT 3**

- Nomen (Genus, Singular-Plural), Bestimmter Artikel, Unbestimmter Artikel, Negation, W-Frage, Ja-Nein-Frage
- Über Sachen sprechen
- Sachen des Alltagslebens, Haushaltswaren, Adjektive, Gegenteile
- Satz Struktur

### **UNIT 4**

- Akkusativ, Artikel und Personalpronomen im Akkusativ, Verben und Präpositionen mit Akkusativ, Konjugation und Verwendung von Verben (haben, kaufen, sehen, lieben, lesen, kennen, hören, verstehen, usw.)
- Kleidung, Farben, Wetter, Lebensmittel

**TEXT BOOKS:**

- Netzwerk Neu A1 (Kursbuch+Arbeitsbuch)  
Dengler, Stefanie, et al. Netzwerk neu: A1. Ernst Klett Sprachen., 2019.

**REFERENCE BOOKS:**

- Rusch, Paul, Helen Schmitz, and Humorvolle Zeichnungen. "Einfach Grammatik." *Übungsgrammatik Deutsch A1 bis B 1* (2012): 329-330. Einfach Gramatik, Paul Rusch
- Carlson, Antje. "Lemcke, Christiane, Lutz Rohrmann, and Theo Scherling. Berliner Platz 1 Neu-- German for Beginners." *Die Unterrichtspraxis/Teaching German* 44.1 (2011): 46-49.
- Dallapiazza, Rosa-Maria, Eduard Von Jan, and Sabine Dinsel. *Tangram: Deutsch als Fremdsprache. Lehrerbuch*. Vol. 1. Hueber Verlag, 1998.
- Wolfgang Hieber: Lernziel Deutsch, Teil 1, Max Hueber Verlag, 1984.

**WEBSITE PAGES:**

- <https://www.nthuleen.com/teach.html>

## FRENCH-I

<b>Course Code: 24FLFR101-I</b>	<b>Continuous Evaluation: 40 Marks</b>
<b>Credits: 2</b>	<b>End Semester Examination: 60 Marks</b>
<b>L T P : 2 0 0</b>	
<b>Prerequisite: Basics of English Language</b>	

### COURSE OBJECTIVE (COs)

1. To develop **listening, speaking, reading, and writing** requisites of a language.
2. To develop the ability **to construct sentences and frame questions**.
3. To equip the students with **cultural elements and communication strategies** that will help them **communicate in varied situations**.
4. To familiarize the students with the **French and Francophone culture**.

### COURSE LEARNING OUTCOMES (CLOs)

1. After completion of this course, the student will be able **to express and interact in French** used in daily conversations.
2. The student will be able **to write short and simple texts**.
3. The student will be able to **initiate, understand and respond to the queries of cultural significance in various settings**.
4. The student can demonstrate **knowledge and understanding** of French and Francophone culture.

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES	Course Learning Outcome			
	CLO 01	CLO 02	CLO 03	CLO 04
CO 01	✓			
CO02		✓	✓	
CO 03			✓	
CO 04				✓

S. No	Unités	Objectifs de Communication	Grammaire	Lexique
1	<b>La Salutation et l'Introduction</b>	Saluer. Entrer en Contact. S'Excuser. Remercier. Se Présenter/Présenter Quelqu'un.	Les Pronoms Personnels Sujets. L'Alphabet. Les Articles Indéfinis. Les Verbes en -ER au Présent.	Salutations, Les Nombres. Les Objets de la Classe. La Nationalité.



2	<b>On Partage des Renseignements</b>	Demander de Se Présenter. Donner des Renseignements Personnels.	Etre et Avoir au Présent. Les Verbes en -ER au Présent. Les Adjectifs de Nationalités. L'Interrogation.	Les Adjectifs de Nationalité, Métiers et Secteurs Professionnels, L'Expression des Goûts et Intérêts
3	<b>Ma Ville et Mon Quartier</b>	Décrire et Qualifier une Ville ou un Quartier. Localiser. Demander et Donner la Directions.	Le Verbe Vivre. Les Articles Définis. Il y a/ Il n'y a pas. Les Prépositions. Les Adjectifs Qualificatifs. L'Impératif.	Les Prépositions de Localisation. Le Lexique des Sites. Etablissements et Service d'une Ville.
4	<b>Mes Intérêts et Goûts</b>	Parler de Ses Goûts et de Ses Loisirs. Donner Son Impression sur le Caractère de Quelqu'un.	Le Présent des Verbes en -ER, et du Verbe Faire. La Négation, Les Adjectifs Possessifs.	Avoir l'air. Loisirs. L'Expression des Goûts. Faire du/ de la. Ma Famille.

## HINDI-II

Course Code:24HIN201-II	Continuous Evaluation: 40 Marks
Credits: 2	End Semester Examination: 60 Marks
L T P : 2 0 0	
Prerequisite: Nil	

### LAGHU KATHAEN AUR SANCHAR KAUSHAL

#### Course Description:

विश्वविद्यालय ने वर्ष 2024-25 सत्र से स्नातक स्तर पर हिंदी विषय का पाठ्यक्रम तैयार किया है। हिंदी विषय के प्रश्न पत्र की सामग्री निर्धारण में ज्ञान तथा शिक्षा के बदलते परिप्रेक्ष्य को ध्यान में रखा गया है। इस सत्र में हिंदी लघु कथाओं को सम्मिलित किया गया है। छात्रों की मौखिक अभिव्यक्ति की क्षमता का विकास करने में निहित मूल्यों का महत्वपूर्ण योगदान होता है, इससे विद्यार्थियों की कल्पना शक्ति के विकास के साथ-साथ मनोरंजन भी होता है। संचार कौशल में मुहावरे, लोकोक्तियां, पत्र लेखन और अपठित गद्यांश की समझ के द्वारा हिंदी का प्रचार-प्रसार होगा। इस प्रकार साहित्य के ज्ञान की अभिवृद्धि वैश्वीकरण के संदर्भ में प्रासंगिकता और उपयोगिकता सिद्ध करती है।

#### Course Content

##### (Unit-A)

इस इकाई में हिंदी लघु कथाओं का संक्षिप्त परिचय दिया गया है –

- 1 हिंदी लघु कथा का सामान्य परिचय।
- 2 हिंदी लघु कथा के प्रमुख प्रकार।

##### (Unit-B)

इस इकाई में हिंदी की दो लघु कथाएं सम्मिलित की गई हैं-

- 1 अंगूर की बेल
2. किसान और ठग

##### (Unit-C)

इस इकाई में हिंदी की दो लघु कथाएं सम्मिलित की गई हैं-

- 1 बुराई का फल
- 2 चार विद्वान ब्राह्मण

##### (Unit-D)

यह इकाई संचार कौशल से सम्बंधित है, इसमें

- (i) प्रेस रिपोर्ट, विज्ञापन, अनुवाद
- (ii) हिंदी पत्र लेखन और अपठित गद्यांश को समझना व तर्कसंगत उत्तर देना अपेक्षित है।

#### (Course Outcome)

पाठ्यक्रम परिणाम

(1.Knowledge Outcome)

### 1 ज्ञान का परिणाम

(At the end of the course, the student should be able to)

पाठ्यक्रम के अंत में छात्र सक्षम होना चाहिए

हिंदी लघु कथाओं के मूल उद्देश्य को समझने में विद्यार्थी निपुण हो जाएंगे। लघु कथाओं से क्या शिक्षा मिलती है? इसका ज्ञान छात्रों को होगा। व्याकरण के अध्ययन से विद्यार्थियों को भाषा बोलने, लिखने और पढ़ने में सहायता प्राप्त होगी।

(2.Skill Outcome)

### 2 कौशल का परिणाम

(At the end of the course, the student should be able to)

-पाठ्यक्रम के अंत में छात्र सक्षम होना चाहिए

-हिंदी लघु कथाओं से मनोरंजन भी होगा।

-विद्यार्थी लघु कथाओं के मूल कथ्य को समझेंगे।

-विचार तत्व के बोध से अवगत होंगे।

-हिंदी में पत्र लेखन और अपठित गद्यांश को समझने में सक्षम होंगे।

(Methodology)

(पद्धति)

- कक्षा व्याख्यान

-व्याकरण के माध्यम से हिंदी शब्दों का उच्चारण व लेखन का अभ्यास किया जाएगा।

-समय-समय पर छात्रों को प्रदत्त कार्य दिया जाएगा।

-दैनिक प्रश्नावली।

(Required Books and Materials)

आवश्यक पुस्तकें और सामग्री

-पाठ्यक्रम में निर्धारित लघु कथाओं का संकलन।

-भाषा विज्ञान, डॉ. भोलानाथ तिवारी, किताब महल इलाहाबाद।

-हिंदी व्याकरण, कामता प्रसाद गुरु, प्रभात प्रकाशन

## GERMAN-II

<b>Course Code:</b> 24FLGR201- II	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 2	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 2 0 0	
<b>Prerequisite:</b> Basics of English Language	

### COURSE OBJECTIVES (COs):

The objective of this course is to impart basic knowledge of German language to the students. The course intends to develop an ability for discussions, debates, research ventures, etc. Overall, the objective is to facilitate comprehension of the legal concepts better and develop the ability to write effective propositions in legal contexts.

1. To develop oral and written skills of understanding, expressing and exchanging information in German language.
2. To develop awareness of the nature of language and language learning.
3. To develop the ability to construct sentences and frame questions.
4. To provide German language as a competitive edge in career choices.

### COURSE LEARNING OUTCOMES (CLOs):

After completion of the course the students will have the ability to:

1. Read and write short, simple texts.
2. Have Fluency in reading and writing.
3. Understand the dialogue between two native speakers and to take part in short, simple conversations using the skills acquired.
4. Know the culture of the countries where the German language is spoken.

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES	Course Learning Outcome			
	CLO 01	CLO 02	CLO 03	CLO 04
CO 01	✓			
CO02		✓	✓	
CO 03			✓	
CO 04				✓

### COURSE CONTENTS

#### UNIT- 1

- Zeit-Ausdrücke, Tagesteile, Uhrzeit
- Präpositionen mit Akkusativ/Dativ, Ordinalzahlen
- Wegbeschreibung, Reisen, Verkehrsmittel
- Das Haus

#### UNIT- 2

- Modalverben

- Essen und Trinken, Mahlzeiten, Tagesablauf, Messeinheiten, Einkaufen
- Körperteile und Krankheiten
- Futur

### **UNIT- 3**

- Dativ, Artikel und Personalpronomen im Dativ, Verben und Präpositionen mit Dativ, Konjugation und Verwendung von Verben (geben, kaufen, schenken, gratulieren, gehören, gefallen, gehen, fahren, fliegen, usw.)
- Possessiv-Artikel
- Trennbare Verben, Untrennbare Verben

### **UNIT 4**

- Perfekt
- E- Mail Schreiben/ SMS Schreiben
- Vergangenheit erzählen, Das Wochenende, Lebenslauf

### **TEXT BOOKS :**

- Netzwerk Neu A1 (Kursbuch+Arbeitsbuch)  
Dengler, Stefanie, et al. Netzwerk neu: A1. Ernst Klett Sprachen., 2019.

### **REFERENCE BOOKS:**

- Rusch, Paul, Helen Schmitz, and Humorvolle Zeichnungen. "Einfach Grammatik." Übungsgrammatik Deutsch A1 bis B 1 (2012): 329-330. Einfach Gramatik, Paul Rusch
- Carlson, Antje. "Lemcke, Christiane, Lutz Rohrmann, and Theo Scherling. Berliner Platz 1 Neu--German for Beginners." Die Unterrichtspraxis/Teaching German 44.1 (2011): 46-49.
- Dallapiazza, Rosa-Maria, Eduard Von Jan, and Sabine Dinsel. Tangram: Deutsch als Fremdsprache. Lehrerbuch. Vol. 1. Hueber Verlag, 1998.
- Wolfgang Hieber: Lernziel Deutsch, Teil 1, Max Hueber Verlag, 1984.

### **WEBSITE PAGES:**

- <https://www.nthuleen.com/teach.html>

## FRENCH-II

<b>Course Code:</b> 24FLFR201-II	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 2	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 2 0 0	
<b>Prerequisite:</b> French-I	

### COURSE OBJECTIVE (COs)

1. To develop **listening, speaking, reading and writing** requisites of a language.
2. To develop the ability **to construct sentences** and **frame questions**.
3. To equip the students with **cultural elements and communication strategies** which will help them **communicate in varied situations**.
4. To familiarise the students with the **French and Francophone culture**.

### COURSE LEARNING OUTCOMES (CLOs)

1. After completion of this course, the student will be able **to express and interact in French** used in daily conversations.
2. The student will be able **to write short and simple texts**.
3. The student will be able to **initiate, understand and respond to the queries of cultural significance in various settings**.
4. The student can demonstrate **knowledge and understanding** of French and Francophone culture.

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES	Course Learning Outcome			
	CLO 01	CLO 02	CLO 03	CLO 04
CO 01	✓			
CO02		✓	✓	
CO 03			✓	
CO 04				✓

## COURSE CONTENT

S. No	Unités	Objectifs de Communication	Grammaire	Lexique
1	<b>Journée Typique</b>	Parler de Nos Habitudes, Exprimer l'Heure, S'Informer sur l'Heure, le Moment et la Fréquence.	Les Verbes Pronominaux au Présent. Les Verbes Aller et Sortir	L'Heure, Les Moments de la Journée. Les Activités Quotidiennes. Les Adverbes. La Météo.
2	<b>Achats</b>	S'informer sur un Produit. Acheter et Vendre un Produit. Donner Son Avis. Parler du Temps qu'il Fait	Les Adjectifs Interrogatifs. Les Adjectifs Démonstratifs. Le Genre et le Nombre. Le Verbe Prendre.	Les Vêtements. Les Couleurs. Les Fruits et Les Légumes.
3	<b>Alimentation</b>	Parler des Plats et des Aliments. Commander un Menu dans un Restaurant. Situer une Action dans le Futur	Le Future Proche: Aller +Infinitif. Les Partitifs. Les Pronoms COD. Le Future.	Les Aliments. Le Lexique des Quantités.
4	<b>expérience vécue</b>	Parler de faits passés. Parler de Nos expériences. Parler de ce que nous savons faire.	Le Passé Composé. L'Imparfait.	Les Verbes Savoir, Pouvoir et Connaître. Les Adjectifs Qualificatifs. Le Lexique des Savoirs et Compétences. Le Récit de Vie.

## TEXT BOOK

- Version Originale 1, Livre de l'élève: Denyer M. & Agustin Garmendia A. & Olivieri M L L., éd. Maisons des Langues, Paris. 2013.

## REFERENCE BOOKS

- Alter Ego 1, Livre d'élève, Berthet A. & Hugo C. & Kizirian M. V. & Sampsonis B. & Waendendries M., éd Hachette, Paris, 2006.
- Connexions 1, Loiseau Y. & Mérieux R., éd. Didier, Paris, 2004.
- Le Nouveau Sans Frontiers, Vol. 1, P. Dominique, J. Girardet et al, CLE International, Paris, 2013.
- Le Robert & Nathan Conjugation, Paperback, Le Robert Nathan, 2011.





## SYLLABUS OF SKILL ENHANCEMENT COURSES

### DIGITAL MARKETING

<b>Course Code: 24CS0201A</b>	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination:30 Marks
L T P : 0 0 2	
Credits: 1	

#### TRAINING OBJECTIVES(TOs)

1. To provide a foundational understanding of digital marketing concepts and strategies.
2. To explain the principles and practices of Search Engine Optimization (SEO).
3. To explore the role and strategies of social media marketing.
4. To examine digital advertising tools and methods for optimizing ad performance.
5. To design marketing strategy.

#### TRAINING LEARNING OUTCOMES (TLO's)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the importance and components of digital marketing.
2. Understand how search engines work and apply SEO techniques to improve website visibility.
3. Develop strong social media profiles and create effective social media marketing strategies.
4. Utilize digital advertising tools and measure the performance of digital advertising campaigns.
5. Analyze and design marketing strategy for a given application or domain.

#### TRAINING LEARNING OUTCOMES (TLOs)-TRAINING OBJECTIVES (TOs) MAPPING

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4	CLO5
C01	✓				
C02		✓			
C03			✓		
C04				✓	
C05					✓

#### COURSE CONTENTS

UNIT NUMBER	TRAINING CONTENTS	ACTIVITY
UNIT-I	<b>INTRODUCTION TO DIGITAL MARKETING &amp; MARKETING ANALYSIS:</b> Introduction To Online Digital Marketing, Importance Of Digital Marketing,	Use keyword planner tools to identify high-potential keywords for their industry.

	Traditional Vs. Digital Marketing, Types of Digital Marketing, Market Research, Keyword Research And Analysis	
<b>UNIT-II</b>	<b>SEARCH ENGINE OPTIMIZATION(SEO):</b> Introduction to SEO, How Search engine works, SEO Phases, History Of SEO, How SEO Works, , Types Of SEO technique, Keywords, Keyword Planner tools	<b>Review the SEO history and current status of a real-world website</b>
<b>UNIT-III</b>	<b>SOCIAL MEDIA MARKETING:</b> Introduction to Social Media Networks, Types of Social Media Websites and their Marketing strategies. Creating Strong Social Media Profiles.	<b>Develop a social media strategy for a startup, focusing on creating strong profiles and engaging content.</b>
<b>UNIT-IV</b>	<b>ADVERTISING TOOLS and OPTIMIZATION:</b> Advertising & its importance, Digital Advertising, Different Digital Advertisement, Performance of Digital Advertising, Display Advertising Media, Digital metrics.	Analyze the digital advertising strategy of a major e-commerce platform
<b>UNIT-V</b>	<b>CASE STUDY/HANDS-ON:</b> Googlebot (Google Crawler) /You-tube advertising/ Develop a social media strategy for a startup, focusing on creating strong profiles and engaging content/ Design a digital advertising campaign for a local business and measure its performance using digital metrics.	

#### TEXT BOOKS

- Digital Marketing –Kamat and Kamat-Himalaya
- Marketing Strategies for Engaging the Digital Generation, D. Ryan

#### REFERENCE BOOKS

- Digital Marketing, V. Ahuja, Oxford University Press
- Digital Marketing, S.Gupta, McGraw-Hill
- Quick win Digital Marketing, H. Annmarie , A. Joanna, Paperback edition

## DESIGN THINKING AND AUGMENTED VIRTUAL REALITY

Course Code:23CS0301	Continuous Evaluation: 70 Marks
Prerequisite: NIL	End Semester Examination: 30 Marks
L T P : 0 0 2	
Credits: 1	

### TRAINING OBJECTIVE

1. To recognize the importance of DT
2. To explain the phases in the DT process
3. To familiarize the students with the Augmented Virtual Reality Environment.
4. To establish and cultivate a broad and comprehensive understanding of this rapidly evolving and commercially viable field of Computer Science

### TRAINING LEARNING OUTCOMES (TLOS)

After the completion of TRAINING the students will be able to:

1. Understand and critically apply the concepts and methods of business processes.
2. Understand and analyzing design thinking history and its various concepts.
3. Understand, analyzing and create models with users collaboration to apply design thinking concepts.
4. Understands the role and importance of graphics in VR, AR and MR.
5. Understand the technical and experiential design foundation required for the implementation of immersive environments in current and future virtual, augmented and mixed reality platforms.

### TRAINING LEARNING OUTCOME (TLO)-TRAINING OBJECTIVE (TO) MAPPING

TLO TO	TLO1	TLO2	TLO3	TLO4	TLO5
TO1	✓				
TO2		✓	✓		
TO3				✓	
TO4					✓

## TRAINING CONTENTS

MODULE	TRAINING CONTENT	STUDENTS ENGAGEMENT ACTIVITY
I	Recognize the importance of Design Thinking, Identify the steps in the DT process, Recognize the steps in the empathize phase of DT, Identify the steps required to conduct an immersion activity	Product that you loved and hated activity.
II	Conduct an immersion activity and fill up the DT question template, Recognize the steps to create personas in the define phase of DT, Recognize the steps to create problem statements in the define phase of DT, Define the problem statements in the define phase of DT.	Interview people and fill the DT Question template
III	Recognize the steps in the ideate phase of DT, Apply the steps in the ideate phase of DT, Recognize how doodling can help to express ideas, Recognize the importance storytelling in presenting ideas and prototypes, Recognize the importance of the prototype phase in DT.	Ideate a solution for a Given problem.
IV	<b>INTRODUCTION TO VR</b> Historical Overview, Current Trends and Future applications of Immersive Technologies, Best practices in VR,AR and MR including design, prototyping and an ethical code of conduct, Input devices – controllers, motion trackers and motion capture technologies for tracking, navigation and gestural control. • Output devices – Head Mounted VR Displays, Augmented and Mixed reality glasses • 3D interactive and procedural graphics	To study various AR and VR based existing applications.

<b>V</b>	<b>IMMERSIVE PLATFORMS</b> Systems architecture and integrative immersive media platforms, Rapid prototyping and physical computing.	Designing of Solution to the Problem.
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## LEARNING RESOURCES

1. Hooked by Nir Eyal
2. The Art of Creative Thinking by Rod Judkins
3. Start Up nation by Dan Senor and Saul singer
4. Start with Why by Simon Sinek
5. Kelly S. Hale (Editor), Kay M. Stanney (Editor). 2014. Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition (Human Factors and Ergonomics) ISBN-13: 978-1466511842
6. Michael Madary and Thomas K. Metzinger. 2016. Real Virtuality: A Code of Ethical Conduct. Recommendations for Good Scientific Practice and the Consumers of VR-Technology. Frontiers in Robotics and AI 3, February: 1–23. <http://doi.org/10.3389/frobt.2016.00003>
7. Jason Jerald. 2015. The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool Publishers. <http://doi.org/10.1145/2792790>

<b>WEARABLE Technology</b>	
Course Code: 24CS0301A	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination: 30 Marks
L T P :0 0 2	
Credits: 1	

### **COURSE OBJECTIVES (CO's)**

1. To know the hardware requirement of wearable systems
2. To understand the communication and security aspects in the wearable devices
3. To know the applications of wearable devices in the field of medicine

### **COURSE LEARNING OUTCOMES (CLO's)**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Describe the concepts of wearable system.
2. Explain the energy harvestings in wearable device.
3. Use the concepts of BAN in health care.
4. Compare the various wearable devices in healthcare system

### **COURSE LEARNING OUTCOME (CLO)-COURSE OBJECTIVE (CO) MAPPING**

<b>CLO CO</b>	CLO1	CLO2	CLO3	CLO4
CO1	✓	✓		
CO2		✓	✓	
CO3			✓	✓

### **COURSE CONTENTS**

<b>UNIT NUMBER</b>	<b>TRAINING CONTENTS</b>
<b>UNIT-I</b>	<b>INTRODUCTION TO WEARABLE SYSTEMS AND SENSORS</b> Wearable Systems- Introduction, Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Types of Wearable Systems, Components of wearable Systems. Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, Impedance plethysmography, Wearable ground reaction

<b>DATA ANALYTICS TOOLS</b>	
	force sensor.
<b>UNIT-II</b>	<b>SIGNAL PROCESSING AND ENERGY HARVESTING FOR WEARABLE DEVICES</b> Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements- Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.
<b>UNIT-III</b>	<b>WIRELESS HEALTH SYSTEMS</b> Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Wireless communication Techniques.
<b>UNIT-IV</b>	<b>APPLICATIONS OF WEARABLE SYSTEMS</b> Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, neural recording, Gait analysis, Sports Medicine.

<b>TEXT BOOKS</b>
<ul style="list-style-type: none"> <li>Annalisa Bonfiglio and Danilo De Rossi, Wearable Monitoring Systems, Springer, 2011</li> <li>Zhang and Yuan-Ting, Wearable Medical Sensors and Systems, Springer, 2013</li> <li>Edward Sazonov and Micheal R Neuman, Wearable Sensors: Fundamentals, Implementation and Applications, Elsevier, 2014</li> <li>Mehmet R. Yuce and Jamil Y. Khan, Wireless Body Area Networks Technology, Implementation applications, Pan Stanford Publishing Pte.Ltd, Singapore, 2012</li> </ul>
<b>REFERENCE BOOKS / RESOURCES</b>
<ul style="list-style-type: none"> <li>Sandeep K.S, Gupta, Tridib Mukherjee and Krishna Kumar Venkatasubramanian, Body Area Networks Safety, Security, and Sustainability, Cambridge University Press, 2013.</li> <li>Guang-Zhong Yang, Body Sensor Networks, Springer, 2006.</li> </ul>

Course Code: 24CS0302D	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination: 30 Marks
L T P :0 0 2	
Credits: 1	
<b>TRAINING OBJECTIVES (TOs)</b>	
<ol style="list-style-type: none"> <li>1. To provide an understanding of the fundamental concepts and processes of data analytics.</li> <li>2. To introduce students to R and R-Studio, and teach basic data types and structures in R.</li> <li>3. To equip students with skills for importing, exporting, and performing exploratory data analysis (EDA) in R.</li> <li>4. To familiarize students with report generation tools like Google Data Studio and Tableau, focusing on creating interactive dashboards.</li> <li>5. To enable students to apply their knowledge through hands-on activities and case studies, enhancing their practical skills in data analytics.</li> </ol>	

<b>TRAINING LEARNING OUTCOMES (TLO's)</b>
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to: <ol style="list-style-type: none"> <li>1. Demonstrate an understanding of the basic principles and processes of data analytics.</li> <li>2. Utilize R and R-Studio to handle basic data types and structures, and perform fundamental operations.</li> <li>3. Import, export, and clean data in R, and conduct exploratory data analysis (EDA) using descriptive statistics and data visualization techniques.</li> <li>4. Create interactive reports and dashboards using Google Data Studio and Tableau, effectively visualizing data insights.</li> <li>5. Apply data analytics tools and techniques to real-world datasets through hands-on projects, presenting and interpreting their findings accurately.</li> </ol>

#### TRAINING LEARNING OUTCOMES (TLOs)-TRAINING OBJECTIVES (TOs) MAPPING

<b>TLO TO</b>	TL01	TL02	TL03	TL04	TL05
T01	✓				
T02		✓			
T03			✓		
T04				✓	
T05					✓

#### TRAINING CONTENTS

UNIT NUMBER	TRAINING CONTENTS
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<b>UNIT-I</b>	<b>Introduction to Data Analytics</b> Overview of Data Analytics: Definition and importance, Types of data analytics, Applications and examples; Data Analytics Process: Steps in the data analytics process, Key concepts; Introduction to Data Analytics Tools: Overview of tools, Comparison of tools
<b>UNIT-II</b>	<b>Foundations of R and Data Structures</b> Introduction to R and RStudio: Installation and setup, RStudio interface; Basic R Syntax and Operations: Writing and executing R commands, Basic arithmetic and logical operations, Understanding variables and assignments; Data Types and Structures in R: Vectors, matrices, and arrays, Data frames and lists, Factors and strings
<b>UNIT-III</b>	<b>Data Handling and Exploratory Analysis in R</b> File Import and Export in R: Reading data from CSV, Excel, Writing data to CSV and Excel, Handling different file types; Exploratory Data Analysis (EDA) with R: Descriptive statistics, Data visualization using `ggplot2`, Data manipulation using `dplyr`, Case study
<b>UNIT-IV</b>	<b>Interactive Data Visualization Tools : Google Data Studio / Tableau / Any other</b> Introduction, Creating an account/installation, Connecting to data sources, Building basic visualizations, Creating interactive dashboards;
<b>UNIT-V</b>	<b>Hands-On Activity / Case Study</b> Mini Project with R: Choose a dataset, Perform data manipulation, visualization, and analysis, Present findings; Mini Project with Google Data Studio / Tableau: Choose a dataset, Create visualizations and dashboard, Present the dashboard and insights

#### TEXT BOOKS

- Grolemond, G., & Wickham, H. (2017). R for Data Science: Import, Tidy, Transform, Visualize, and Model Data. O'Reilly Media.
- Matloff, N. (2011). The Art of R Programming: A Tour of Statistical Software Design. No Starch Press.
- Murray, D. (2016). Tableau Your Data!: Fast and Easy Visual Analysis with Tableau Software. John Wiley & Sons.
- Devey, B. (2020). Google Data Studio for Beginners: A Step by Step Guide to Building Better Data Visualizations and Business Intelligence with Google Data Studio. Independently Published

#### REFERENCE BOOKS / RESOURCES

- Shmueli, G., Patel, N. R., & Bruce, P. C. (2010). Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner. John Wiley & Sons.
- Adler, J. (2010). R in a Nutshell: A Desktop Quick Reference. O'Reilly Media.
- Few, S. (2013). Information Dashboard Design: Displaying Data for At-a-Glance Monitoring. Analytics Press.

- Google. (n.d.). Google Data Studio Help Center. Retrieved from <https://support.google.com/datastudio/answer/6283323?hl=en>
- Google. (n.d.). Introduction to Data Studio. Coursera. Retrieved from <https://www.coursera.org/learn/google-data-studio>

**Department Of Training & Placement**

**Training Cell**

<b>Programme</b>	<b>Faculty of Engineering &amp; Technology</b>		
<b>Year / Semester</b>	<b>2 / 3</b>	<b>Course Category</b>	<b>SEC</b>
<b>Course Code</b>	<b>23SS351</b>	<b>Course Title</b>	<b>Effective Communication Skills</b>
<b>Continuous Evaluation: 70</b>		<b>End Term Examination: 30</b>	
<b>Prerequisite: Nil</b>		<b>L T P: 0 0 2</b>	<b>Credits: 1</b>

**Training Objectives (TO): -**

TO1. To define and understand communication and its process.

TO2. To make student practice on communication skills via LSRW approach via instructing, engaging, assessing and re engaging.

TO3. To enhance the confidence and motivation of a student by honing his communication skills.

**Training Learning Outcomes (TLO): -**

**After the completion of the training, the student will have ability:**

TL01. To communicate effectively and interact with people with confidence.

TL02. To demonstrate and differentiate between various forms of communication.

TL03. To apply effective communication skills confidently which a student needs to get ahead in job and life.

**Mapping Matrix of Training Objectives (TO) & Training Learning Outcomes (TLO)**

<div>TRAINING LEARNING OUTCOMES (TLO)</div> <div>TRAINING OBJECTIVES (TO)</div>	TLO1	TLO2	TLO3
TO1	✓		
TO2	✓	✓	
TO3		✓	✓

<b>Unit</b>	<b>Course Contents</b>	<b>Student Engagement Activity</b>
<b>Unit-I</b>	<b>Verbal Communication Skills</b> Communication Process & its importance 7 C's of Communication Formal & Informal Conversation Requirements of effective verbal communication	Conversation Cards Activity
<b>Unit-II</b>	<b>Nonverbal Communication Skills</b> Importance of nonverbal skills in effective communication Types of nonverbal (body language) skills Barriers to nonverbal communication	Power of Body Language Activity
<b>Unit-III</b>	<b>Listening Skills</b> Role of listening skills in effective communication Barriers to listening Overcoming listening barriers	Chinese Whisper Activity

	Empathetic listening & avoiding selective listening	
<b>Unit-IV</b>	<b>Reading &amp; Writing Skills</b> Types of reading strategies to enhance improve reading skills Types of written communication	The What IF Activity
<b>Unit- V</b>	<b>Visual Communication</b> Types of visual communication Importance of visual communication Picture narration/description technique	Interpret The Picture Activity

### Learning Resources

<b>Text Book</b>	<b>Communication Skills</b> by Sanjay Kumar & Pushp Lata: Oxford University Press, 2019.
<b>Suggested Reference Book</b>	<b>Personality Development &amp; Communication Skills-1</b> by C B Gupta: Scholar Tech Press, 2019.

### Pedagogy

- The training will be based on the concept of learning by practice.
- The training will involve 30% of the training time on briefing and demonstration & the remaining 70% will be focusing on student's engagement in training activities.
- The training will follow a circular approach where students are engaged, evaluated, given feedback and then re engaged.

### Internal (Continuous Assessment & Evaluation) & End Term (Assessment & Evaluation) for Effective Communication Skills Course

Unit No.	Unit Name	Internal Assessment Parameter	Internal Marks (70)	End Term Assessment Parameters	End Term Marks (30)
I	Verbal Communication Skills	Speech Activity	15	Written Test	10
II	Non Verbal Communication Skills	Role Play	15		
III	Listening Skills	Oral Assessment / Written Assessment	10		
IV	Reading & Writing Skills		20	Viva	20
V	Visual Communication		10	Viva	20

#### Department Of Training & Placement

#### Training Cell

Programme	Faculty of Engineering & Technology		
Year / Semester	2 / 4	Course Category	SEC
Course Code	23SS452	Course Title	Teamwork & Interpersonal Skills
Continuous Evaluation: 70		End Term Examination: 30	

**Prerequisite: Nil**

**L T P: 0 0 2**

**Credits: 1**

**Training Objectives (TO): -**

- T01. To make the students learn & demonstrate effective teamwork, leadership & interpersonal skills.
- T02. To equip the students with capability of handling stress and utilization of work time effectively.
- T03. To make the students understand the importance and application of Emotional Quotient, Critical Thinking & Problem-Solving Skills.

**Training Learning Outcomes (TLO): -**

**After the completion of the training, the student will have ability:**

- TLO1. To be confident working in a team and leading it as well.
- TLO2. To categorize the work and achieve expected performance within the time frame & will be able to adapt himself to work under various kinds of stress and re-energies himself to bounce back from such situations.
- TLO3. To get benefitted from Emotional Quotient in building stronger professional relationships and achieving career and personal goals.
- TLO4. To face complex problems and effectively deal with it in the job due to Critical Thinking & Problem Solving Skills.

**Mapping Matrix of Training Objectives (TO) & Training Learning Outcomes (TLO)**

Training Learning Outcomes (TLO) Training Objectives (TO)	TLO1	TLO2	TLO3	TLO4
T01	✓			
T02		✓		
T03			✓	✓

Unit	Course Contents	Student Engagement Activity
Unit - I	<b>Team Management</b> Team communication & team conflict resolution Role of a team leader Team goal setting & understanding team development Team dynamics & multicultural team activity	Collaborative Working Game Activity

	Johari Window Model	
<b>Unit-II</b>	<b>Time Management</b> Time management matrix Pareto Principle (80/20 rule) Development process of plan of action	What You Did Yesterday Activity
<b>Unit-III</b>	<b>Leadership</b> Difference between leadership & management Types of leadership style Core leadership skills	Lead The Blindfolded Activity
<b>Unit-IV</b>	<b>Stress Management</b> Sign of stress & its impact Types of stress Techniques of handling stress	Keeping Cool Activity
<b>Unit - V</b>	<b>Emotional Intelligence</b> Emotional intelligence & emotional competence Components & behavioral skills of emotional intelligence	Guess The Emotion Game Activity
<b>Unit - VI</b>	<b>Critical Thinking</b> Types of thinking & Characteristics Critical thinking standards Barriers to critical thinking	Think Pair Share Activity

<b>Learning Resources</b>	
<b>Text Book</b>	<b><i>Communication Skills</i></b> by Sanjay Kumar & Pushp Lata: Oxford University Press, 2019.
<b>Suggested Reference Book</b>	<b><i>Personality Development &amp; Communication Skills-1</i></b> by C B Gupta: Scholar Tech Press, 2019. (ISBN No. – 9382209131)

## **Pedagogy**

- The training will be based on the concept of learning by practice.
- The training will involve 30% of the training time on briefing and demonstration & the remaining 70% will be focusing on student's engagement in training activities.
- The training will follow a circular approach where students are engaged, evaluated, given feedback and then re engaged.

**Internal (Continuous Assessment & Evaluation) & End Term (Assessment & Evaluation) for Teamwork & Interpersonal Skills**

Unit No.	Unit Name	Internal Assessment Parameter	Internal Marks (70)	End Term Assessment Parameters	End Term Marks (30)
I	Team Management	Role Play / Group Activity	10	Written Test	10
II	Time Management		10		
III	Leadership		10		
IV	Stress Management	Assignment	10	Viva	20

PRESENTATION SKILLS	
Course Code: 23SS553	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination: 30 Marks
L T P : 0 0 2	
Credits: 1	

#### Training Objectives (TO):-

TO1: To develop the public speaking skills in the student.

TO2: To make the students learn and adapt to the necessary etiquettes required to work and grow in corporate culture.

TO3: To make the student learn to speak in a debate session by putting his arguments and making others accept his viewpoint convincingly.

#### Training Learning Outcomes (TLO): -

After the completion of the training, the student will have ability:

TLO1: To be confident in presenting himself in front of audience.

TLO2: The student will become professional in his approach towards work culture.

TLO3: The level of communication skills will be further enhanced in the student's conversation with others.

#### TRAINING LEARNING OUTCOME (TLO)-TRAINING OBJECTIVE (TO) MAPPING

TLO TO	TL01	TL02	TL03
TO1	✓	✓	
TO2		✓	
TO3		✓	✓

#### COURSE CONTENTS



Unit	Course Contents	Student Engagement Activity
Unit-I	<b>Presentation Skills</b> <ul style="list-style-type: none"> <li>Importance of presentation skills</li> <li>4 P's of presentation skills – plan, prepare, practice &amp; present</li> <li>Guidelines for effective presentation</li> </ul>	PPT Presentation Activity
Unit-II	<b>Story Telling Skills</b> <ul style="list-style-type: none"> <li>4 P's of story telling skills – people, place, plot &amp; purpose</li> <li>Types of story telling techniques</li> <li>Importance of story telling skills</li> </ul>	Start From Where I Stopped Activity
Unit-III	<b>Corporate Culture Etiquettes</b> <ul style="list-style-type: none"> <li>Importance of professional behaviour at work place</li> <li>Understand &amp; implementation of etiquettes at work place</li> <li>Importance of values &amp; ethics</li> <li>Types of professional / corporate etiquettes</li> </ul>	Etiquettes Role Play Activity
Unit-IV	<b>Debate / Extempore</b> <ul style="list-style-type: none"> <li>Difference between debate, extempore &amp; group discussion</li> <li>Learning argument /counter argument in debate</li> <li>Role of verbal &amp; non verbal communication in debate / extempore</li> <li>Importance of current affairs / general knowledge</li> </ul>	Current Affair Topic Speech Activity
Unit-V	<b>Art of Creating Impression</b> <ul style="list-style-type: none"> <li>Importance of creating first impression</li> <li>6 ways to master the art of creating impression</li> </ul>	Speech Activity
Unit-VI	<b>Problem Solving</b> <ul style="list-style-type: none"> <li>Types of problems &amp; its solutions</li> <li>Problem solving process &amp; tools</li> </ul>	Think Pair Share Activity

Learning Resources	
Text Book	<i>Communication Skills</i> by Sanjay Kumar & Pushp Lata: Oxford University Press, 2018.
Reference Book	<i>Personality Development &amp; Communication Skills-1</i> by C B Gupta: Scholar Tech Press, 2019. (ISBN No. – 9382209131)

## Pedagogy

- The training will be based on the concept of learning by practice.
- The training will involve 30% of the training time on briefing and demonstration & the remaining 70% will be focussing on student's engagement in training activities.
- The training will follow a circular approach where students are engaged, evaluated, given feedback and then re engaged.

### **Internal (Continuous Assessment & Evaluation) & End Term (Assessment & Evaluation) for Teamwork & Interpersonal Skills**

Unit No.	Unit Name	Internal Assessment Parameter	Internal Marks (70)	End Term Assessment Parameters	End Term Marks (30)
1	Presentation Skills	Presentation Activity	20	Written Test	10
2	Story Telling Skills	Speech Activity	15		
3	Corporate Culture Etiquettes	Assignment	10		
4	Debate/Extempore	Speech Activity	15	Viva	20
5	Art of Creating Impression		10		

**PROFESSIONAL SKILLS**

Course Code: 23SS551A	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination: 30 Marks
L T P : 0 0 2	
Credits: 1	

**Training Objective:**

1. To encourage student to learn and apply the effective writing skills.
2. To make the students learn various types of business correspondence letters, cover letters & resume.
3. To encourage student to learn as to how to talk and convince people in GD & interview.
4. To make the student learn to build rapport for building positive relationships professionally at workplace.

**Training Learning Outcome:****After the completion of the training, the student will have ability:**

1. The student will understand the importance of professional writing required in workplace.
2. The student will explore different formats in resume, cover letters & other business related letters.
3. The student will develop knowledge, skills and understanding people in-group and individually.
4. The student will be able to learn to apply communication strategies either in-group or one on one basis and will be confident to lead the discussion among them.

**TRAINING LEARNING OUTCOME (TLO)-TRAINING OBJECTIVE (TO) MAPPING**

<b>TLO TO</b>	<b>TLO1</b>	<b>TLO2</b>	<b>TLO3</b>	<b>TLO4</b>
T01	✓			
T02	✓	✓		
T03		✓	✓	✓
T04			✓	✓

Unit	Course Contents	Student Engagement Activity
Unit-I	<b>Email Writing</b> <ul style="list-style-type: none"> <li>• Importance of email communication skills</li> <li>• Basic rules of effective email writing</li> <li>• Structure of email – address, subject, message text, attachments, signature</li> </ul>	Email Practice Activity
Unit-II	<b>Resume Writing</b> <ul style="list-style-type: none"> <li>• Difference between Resume, CV &amp; Bio data</li> <li>• Guidelines of resume writing</li> <li>• Resume preparation of the student</li> </ul>	Resume Making Activity
Unit-III	<b>Cover Letter Writing</b> <ul style="list-style-type: none"> <li>• Objective of cover letter writing</li> <li>• Types of cover letters</li> <li>• Format &amp; content of the cover letter</li> </ul>	Cover Letter Practice Activity
Unit--IV	<b>Other Business Letters Writing</b> <ul style="list-style-type: none"> <li>• Application Letters</li> <li>• Acknowledgement Letters</li> <li>• Complaint Letters</li> <li>• Memos</li> </ul>	Letter Writing Practice Activity

Learning Resources	
<b>Text Book</b>	<i>Communication Skills</i> by Sanjay Kumar & Pushp Lata: Oxford University Press, 2018.
<b>Reference Book</b>	<i>Personality Development &amp; Communication Skills-1</i> by C B Gupta: Scholar Tech Press, 2019.(ISBN No. – 9382209131)

## Pedagogy

The training will be based on the concept of learning by practice.

- The training will involve 30% of the training time on briefing and demonstration & the remaining 70% will be focusing on student's engagement in training activities.
- The training will follow a circular approach where students are engaged, evaluated, given feedback and then re engaged.

## Internal (Continuous Assessment & Evaluation) & End Term (Assessment & Evaluation) for Professional Skills

Unit No.	Unit Name	Internal Assessment Parameter	Internal Marks (70)	End Term Assessment Parameters	End Term Marks (30)
1	Email Writing	Written Assignment	15	Written Test	10
2	Resume Writing		20		
3	Cover Letter Writing		15		
4	Other Business Letters Writing	Written Assignment	20	Viva	20

<b>APTITUDE And REASONING (COMMON TO ALL BRANCHES)</b>	
Course Code: 23SS651A	Continuous Evaluation: 70 Marks
Pre-Requisite : NIL	End Semester Examination: 30 Marks
L T P : 0 0 2	
Credits: 1	

### **Training Objectives (TO):**

1. To encourage student to learn as to how to talk and convince people in GD & interview.
2. To make the student learn to build rapport for building positive relationships professionally at workplace.
3. To make the students learn to convince others and reduce conflict and improve the relations among individuals.

### **Training Learning Outcome (TLO):**

**After the completion of the training, the student will have ability:**

1. The student will develop knowledge, skills and understanding people in-group and individually.
2. The student will be able to learn to apply communication strategies either in-group or one on one basis and will be confident to lead the discussion among them.
3. To work with people even with conflicts and reducing the differences among them by reaching to an equilibrium.

### **TRAINING LEARNING OUTCOME (TLO)-TRAINING OBJECTIVE (TO) MAPPING**

<b>TLO TO</b>	TLO1	TLO2	TLO3
TO1	✓		
TO2	✓	✓	✓
TO3		✓	✓

### **TRAINING CONTENTS**

<b>Unit</b>	<b>Course Contents</b>	<b>Student Engagement Activity</b>
<b>Unit-I</b>	<b>Group Discussion (GD)</b> Characteristics of GD & subject knowledge Do's & Don'ts in GD Strategies of GD Types of GD	Group Discussion Activity
<b>Unit-II</b>	<b>Interview Skills</b> Preparation of the interview & Company details information Do's & Don'ts in interview Types of Interviews	Mock Interview practice

	Strategies of interview	
<b>Unit-III</b>	<b>Art of Creating Impression</b> Importance of creating first impression 6 ways to master the art of creating impression	Speech Activity
<b>Unit-IV</b>	<b>Negotiation Skills</b> Importance of negotiation skills Four phases of negotiation skills Barriers to negotiation & overcoming it Win Win negotiation	Win Win Activity
<b>Unit-V</b>	<b>Leadership</b> Leadership qualities Ways to develop leadership skills Causes of leadership failures	Leadership Act Role Play

Learning Resources	
<b>Text Book</b>	<i>Communication Skills</i> by Sanjay Kumar & Pushp Lata: Oxford University Press, 2018.
<b>Reference Book</b>	<i>Group Discussion &amp; Interview Skills</i> by Priyadarshi Patnaik: Cambridge University Press, 2015 (ISBN No. - 978-1107548664)

## Pedagogy

- The training will be based on the concept of learning by practice.
- The training will involve 30% of the training time on briefing and demonstration & the remaining 70% will be focusing on student's engagement in training activities.
- The training will follow a circular approach where students are engaged, evaluated, given feedback and then re engaged.

Internal (Continuous Assessment & Evaluation) & End Term (Assessment & Evaluation)					
Unit No.	Unit Name	Internal Assessment Parameter	Internal Marks (70)	End Term Assessment Parameters	End Term Marks (30)
1	Group Discussion	GD Activity	20	Written	10

2	Interview Skills	Mock Interview	20	Test	
3	Art of Creating Impression	Role Play	10		
4	Negotiation Skills	Assignment	10	Viva	20
5	Leadership	Role Play	10		





## SYLLABUS OF VALUE ADDED COURSES

ENVIRONMENTAL BIOENGINEERING	
<b>Course Code:</b> 23ESEB101/23ESEB201	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 2	<b>End Semester Examination:</b> 60 Marks
<b>L T P :</b> 2 0 0	
<b>Prerequisite:</b> Nil	

**Course Objectives (COs)** - The Course is designed with the following objectives:

1. To provide a comprehensive understanding of the relationship between humans and the environment.
2. Aims to introduce students to the different components of the environment.
3. To develop the understanding of pollution, its causes, and their effects
4. To familiarize the students with the different biological concepts. Including artificial intelligence and its applications.

**Course Learning Outcomes (CLOs)** - The Syllabus has been prepared in accordance with the NEP-2020 and based on the UGC curriculum framework. Upon completion of this course, learners will be able to:

1. Analyse the environmental pollution and sensitize themselves to adverse health impacts of pollution.
2. Demonstrate to safeguard the Earth's environment and its resources.
3. Explain sustainable development, its goals, challenges, and global strategies.
4. Improve biological concepts using an engineering approach.

### MAPPING COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES (COs)	COURSE LEARNING OUTCOMES (CLOs)			
	CLO1	CLO2	CLO3	CLO4
<b>CO1</b>	√			
<b>CO2</b>		√		
<b>CO3</b>			√	
<b>CO4</b>				√

### COURSE CONTENTS

#### Unit-1: Human and Environment

Introduction to earth environment, Scope and importance. Components of the environment: Lithosphere, Hydrosphere, Biosphere, Atmosphere. The man- environment interaction, Population growth and natural resource exploitation, Industrial revolution, and its impact on the environment. Understanding of pollutant and pollution; Types of Pollution, Air pollution: Water pollution, Soil pollution and solid waste, Noise pollution, Thermal pollution and their impact on human health.

#### Unit-2: Natural Resources, Sustainable Development & Sustainable living

Overview of natural resources, Classification of natural resources, Resources: Forests, wetlands, Status and challenges. Water resources: Types of water resources, issues and challenges; Soil and mineral resources, Energy resources: renewable and non-renewable sources of energy. Biodiversity and its distribution, Levels and types of biodiversity; Biodiversity in India and the world; Biodiversity hotspots; Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges, and strategies for SDGs. Ways to live in sustainable manner- Conservation of energy, water at home, plantation, waste segregation, kitchen gardening.

### **Unit-3: Introduction of Bioengineering:**

Significance of biology, fundamental similarities, and differences between science and engineering-humans as the best machines, brain as a computer, comparison between eye camera, **Biomolecules:** molecules of the life –monomeric unit and polymeric structure, carbohydrates, proteins; nucleotides and lipids. Bio-engineering introduction and current status in Agriculture, Medicine (vaccine and biosensors) enzyme technology, and environment, and the role of artificial intelligence and robotics in human health monitoring.

### **Unit 4: Bioengineering in Environment Protection:**

What is environmental bioengineering? Applications of bioengineering in the environment Protection.-Global environmental problems and bioengineering approaches for their management. sewage treatment, bio fertilizers, biofuels, bioreactors, bioremediation, and bioengineering for biomedical waste management. Role of artificial intelligence in handling biomedical waste.

### **RECOMMENDED TEXT BOOKS:**

1. Masters, G. M., & Ela, W. P. (2008). Introduction to environmental engineering and science Englewood Cliffs, NJ: Prentice Hall.
2. Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education.
3. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press
4. Environmental Studies for Undergraduate Courses by Erach Bharucha, UGC New Delhi
5. Biology: a Gopal approach Campbell, N.A Reece, J.B Urry, Lisa; Cain M.L Wasserman, S.A Minorsky, P. V Jackson, R. B Person Education ltd.

### **REFERENCE BOOKS:**

1. A.K De Environmental Chemistry New age Publisher, 2016.
2. "Ecology & Environment" P D Sharma, Rastogi Publications, 2009.
3. www.ipcc.org; <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>.
4. Central Pollution Control Board Web page for various pollution standards. <https://cpcb.nic.in/standards>.
5. Principles of Biochemistry (V Edition) by Nelson, D.L; and Cox, M. M. W. H Freeman and company.

INDIAN CONSTITUTION & POLITY	
<b>Course Code:</b> 23VAC102/23VAC202	<b>Continuous Evaluation:</b> 40 Marks
<b>Credits:</b> 2	<b>End Semester Examination:</b> 60 Marks
<b>L T P : 2 0 0</b>	
<b>Prerequisite:</b> Nil	

### COURSE OBJECTIVES (COs)

1. To acquaint the students with the fundamental concepts of democracy, diversity and the Constitution.
2. To make students understand the functioning of the three wings of the State
3. To make the students appreciate the purpose of decentralised administration under the Constitution and its functioning
4. To make students analyse and discuss various rights and duties under the Constitution of India

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in alignment with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the concept of democracy, diversity and the Constitutional Values
2. Describe the functioning of the three wings of the State
3. Sketch the functioning of decentralised administration under the Constitution of India and appreciate the political dimensions.
4. Examine the scope of various rights and duties under the Constitution of India.

### Mapping Matrix of Course Objectives (CO) and Course Learning Outcomes (CLOs)

Course Objectives	CLO 1	CLO 2	CLO 3	CLO 4
C01	✓	✓	✓	
C02		✓		✓
C03			✓	✓
C04				✓

### COURSE CONTENTS

#### UNIT 1 DEMOCRACY, DIVERSITY AND THE CONSTITUTION:

- Concept of democracy and importance of right to vote
- Electoral Politics
- Concepts of diversity and discrimination on the grounds of gender, religion and caste
- Concept of democratic government
- Constitution design and salient features
- Preamble to the Constitution of India

#### UNIT 2 THE THREE WINGS OF THE STATE :

- The definition of State in Constitution of India
- Parliament, the State legislature and the making of laws
- Concept of cooperative federalism

- The Executive and Administration
- Role of Governor and the President of India
- The Judiciary

### **UNIT 3 LOCAL GOVERNMENT AND ADMINISTRATION:**

- Panchayati Raj System
- Rural and Urban administration
- Social and Economic Justice for the marginalized
- Directive Principles of State Policy

### **UNIT 4 RIGHTS AND DUTIES:**

- Fundamental Rights (Part III of the Constitution)
- Protection of Fundamental Rights – Writ petitions in High Court and Supreme Court of India
- Fundamental Duties
- The concept of Fraternity and secularism
- Public utilities and privatization

### **TEXT BOOKS:**

1. D.D. Basu, *Introduction to the Constitution of India*, (LexisNexis, 26<sup>th</sup> Ed., 2022).
2. M. Laxmikant, *Indian Polity*(McGraw Hill, 7<sup>th</sup> Ed., 2023)
3. Subhash C. Kashyap, *Constitution of India* (Vitasta Publishing Pvt. Ltd, 1<sup>st</sup> Ed., 2019)

### **REFERENCE BOOKS:**

1. M.P. Jain, *Indian Constitutional Law* (Lexis Nexis, 8<sup>th</sup> Ed., 2018).
2. H.M. Seervai, *Constitutional Law of India* (Law & Justice 4<sup>th</sup> Ed., 2023)
3. P.M. Bakshi, *The Constitution of India*, (Universal Law Publishing Co.,18<sup>th</sup> Ed., 2022)
4. J.N.Pandey, *Constitutional Law of India*(Central Law Agency, 59<sup>th</sup> Ed.,2022, Allahabad).

<b>Year/Semester</b>	2 <sup>nd</sup> Year/ 3 <sup>rd</sup> Semester	<b>Course Category</b>	<b>VAC</b>
<b>Course Code</b>	23 VAC 301	<b>Course Title</b>	Sports , Yoga & Fitness
<b>Continuous Evaluation : 80</b>		<b>End Semester Examination : 20</b>	
<b>Prerequisite: Nil</b>		<b>L T P :1 0 2</b>	<b>Credits: 2</b>

**Course Objectives (CO)** - The Course is designed with the following objectives:

1. To know about the physical body
2. To discuss about improve range of motion, mobility and coordination in body
3. To understand the ways to improve strength, balance and flexibility.
4. To grasp the significance of yoga and sports in fitness
5. To construct environment for individual and community health.

**Course Learning Outcomes (CLO)**–The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to :( **BLOOM'S TEXONOMY**)

1. Explain the role of yoga and fitness in life.
2. Apply the rules of healthy and fit life
3. Analyse the ways and methods of yoga and sports
4. Recommend the practices of Asanas and different sports
5. Integrate the concept of yoga and sports in all round development of students and beings.

**Mapping Matrix between Course Objectives and Course Learning Outcomes:**

## **COURSE CONTENTS:**

### **UNIT-I: Health and Wellness**

- Meaning Definition and Importance of Health and Wellness
- Dimensions of Health and Wellness
- Role of Exercise in maintaining Health and Wellness
- Stress and Its management through Exercise
- Nutrition for Health and Wellness
- Practical-Exercise for Health and Wellness
- Warming –Up
- Stretching Exercises
- Strengthening Exercises
- Cardiovascular Exercises
- Flexibility and Agility Exercises
- Limbering Down
- Relaxation Techniques (IRT, QRT, DRT etc.)

### **UNIT-II Yoga and Fitness**

- Importance of Yoga and Fitness
- Types and Principles of Asanas
- Fitness Components
- Specific Exercises for Strength, Flexibility, Speed, Agility & Coordinative Abilities

- Yoga, Fitness and Personality
- General Specific Warm up
- Aerobics / Zumba Dance
- Asanas
- Recreation for Fitness
- Report preparation, Records and PPT

### **UNIT-III Sports and Psychology**

- Definition of Sports Psychology
  - Adolescence-Problems related with Adolescence i.e.physical problems, Peer group Relationship, Career Selection, Drug Abuse, Psychological and Emotion problems
- Importance of Sports Psychology

### **UNIT-IV Sports and Recreation**

- Meaning Definition and Concept of Sports Fitness and Recreation
- Objectives, Characteristics and principles of Sports Fitness and Recreation
- Importance, Purpose, Benefits of Fitness and Recreation
- Types of Recreation
- Recreation through Sports and Games
- Use of Leisure Time Activities and their educational values
- Traditional, Folk and Indigenous Games
- Three Days outdoor camp and Hiking
- Cycling, tie up with District/State Associations
- Visits to Recreational Clubs

### **RECOMMENDED TEXT BOOKS:**

1. Foundations of Physical Education, Chales A. Bucher
2. Foundations of Physical Eduction, M.L.Kamlesh
3. History and Principles in Physical Education, Dr. Karan Singh
4. Essentials of Physical Education, Dr. Ajmer Singh
5. Foundations of Physical Education, Dr. A.K.Uppal
6. Physical Education, Manu Sood, New SP Books
7. Health the basis of life: Dr. John Maclay
8. Natural Health & Yoga, Brij Bhushan
9. Health Education, S.K.Mangal
10. Essential of Physical Education, Dr. Ajmer Singh & Dr. Bains

## SYLLABUS OF MULTIDISCIPLINARY COURSES

Department of Mathematics			
Multi-Disciplinary Course (MDC)			
Year/Semester		Course Category	Multidisciplinary Course
Course Code	23MDC101	Course Title	Statistical Methods
Continuous Evaluation: 40		End Semester Examination:60	
Prerequisite: Basic Mathematics		L T P : 3 0 3	Credits: 3

**Course Objectives (CO)** - The Course is designed with the following objectives:

1. To introduce the basics of statistics and graphical representation of data
2. To equip the students with measures of central tendency and dispersion
3. To learn about correlation and regression analysis
4. To know about the probability in daily life

**Course Learning Outcomes (CLO)** – The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

1. Understand the basics of statistics and explain data for graphical representation
2. Understand the concept of measures of central tendency and measures of dispersion
3. Understand the basics of correlation and regression
4. Understand the concept of probability in real life scenario

**Mapping Matrix between Course Objectives and Course Learning Outcomes:**

CO	CLO	CL 1	CL 2	CL 3	CL 4
	CO 1	✓			
	CO 2		✓		
	CO 3			✓	
	CO4				✓

### COURSE CONTENTS:

#### Unit-I: Introduction to Statistics

Importance of statistics, concepts of statistical population and a sample, data collection methods, primary and secondary data, primary and secondary data. Designing a questionnaire, types of data—quantitative and qualitative data. Measurement scales –Nominal, Ordinal, Interval and Ratio. Classification and tabulation of data, Diagrammatic and Graphical representation of data.

#### Unit -II: Univariate Data Analysis

Measures of Central Tendency- mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Skewness and Kurtosis.

#### Unit-III: Bivariate Data Analysis

Bivariate Data, Scatter plot, Correlation, Karl Pearson's correlation coefficient, Rank correlation – Spearman's and Kendall's measures. Concept of errors, Principle of least squares, fitting of polynomial and exponential curves. Simple linear regression and its properties. Fitting of linear regression line and coefficient of determination



#### **Unit -IV: Probability**

Probability: Introduction, random experiments, sample space, events, and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes' theorem, and its applications.

#### **Practical/Lab Work to be performed in Computer Lab**

The practical will be taught using Excel software and/or using some statistical software like R /SPSS. Students are encouraged to use resources available on open sources.

- Graphical representation of data.
- Practical based on measures of central tendency.
- Practical based on measures of dispersion.
- Practical based on combined mean and variance and coefficient of variation.
- Practical based on moments, skewness, and kurtosis.
- Fitting of polynomials, exponential curves.
- Karl Pearson correlation coefficient.
- Correlation coefficient for a bivariate frequency distribution.
- Lines of regression, angle between lines and estimated values of variables.
- Problems based on conditional probability and Baye's theorem

#### **Reference Books**

1. Agresti, A. (2010): Analysis of Ordinal Categorical Data, 2nd Edition, Wiley
2. Goon A.M., Gupta M.K. and Dasgupta B. Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata, 2002
3. Fundamental of Mathematical Statistics by S.C. Gupta and V.K Kapoor, Saurabh Jain 2017
4. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7<sup>th</sup> Edition R for beginners by Emmanuel Paradis (Freely available) at <https://cran.rproject.org/doc/contrib/ParadISRdebutsen.pdf>

<b>COMPUTER-BASED NUMERICAL AND STATISTICAL TECHNIQUES</b>	
Course Code: 24MDC101A	Internal Examination: 40 Marks
Credits: 3	External Examination: 60 Marks
L T P : 3 0 0	
Prerequisite: Engineering Mathematics – III	

### **COURSE OBJECTIVES (COs)**

1. To familiar with different operators which are useful in Numerical Analysis and introduce the concept of interpolation.
2. To Familiar with numerical solutions of algebraic, transcendental and simultaneous equations. Also introduce numerical differentiation and integration with applications.
3. Familiarize with numerical solutions of ordinary differential equations.
4. To equip the students with the knowledge of basic probability, Random variables, discrete as well as continuous distributions with their applications, correlation and regression.

### **COURSE LEARNING OUTCOMES (CLOs)**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Get exposed to finite differences and interpolation.
2. Get numerical solution of equations and find the numerical differentiation and integration.
3. Demonstrate the numerical solutions of ordinary differential equations by different methods.
4. Implement the probability concepts and the corresponding distributions and compute correlation coefficients and regression lines.

### **MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)**

<b>CO \ CLO</b>	<b>CLO-01</b>	<b>CLO-02</b>	<b>CLO-03</b>	<b>CLO-04</b>
<b>CO-01</b>	✓			
<b>CO-02</b>		✓		
<b>CO-03</b>			✓	
<b>CO-04</b>				✓

### **COURSE CONTENTS**

#### **Unit-I: Finite Differences and Interpolation**

First and higher order differences - Forward differences and backward differences and Central Differences - Differences of a polynomial - Properties of operators - Factorial polynomials - Shifting operator E - Relations between the operators. Interpolation - Newton-Gregory Forward and Backward Interpolation formulae - Divided differences - Newton's Divided difference formula - Lagrange's Interpolation formula.

**Unit-II: Numerical Solution of Equations, Differentiation and Numerical integration**

Bisection Method, Newton-Raphson method - Gauss Elimination method - Gauss Jacobi method - Gauss Seidel method. Numerical Differentiation and Integration: Newton's forward and backward differences formulae to compute first and higher order derivatives - The Trapezoidal rule - Simpson's one third rule and three eighth rule.

**Unit-III: Numerical Solutions of Ordinary Differential Equations**

Solution by Taylor's series - Euler's method, Modified Euler method - Runge-Kutta methods of second and fourth orders.

**Unit-IV: Statistics**

Introduction, Measures of Central tendency and dispersion , Moments - Skewness and kurtosis based on moments..

**TEXT BOOKS/REFERENCE BOOKS**

1. Grewal, B.S., Numerical Methods, Khanna Publishers, 6th edition,
2. Sastry, S.S., Introductory Methods of Numerical Analysis, PHI New Delhi , 2007
3. Balagurusamy, E. , Computer Oriented Statistical and Numerical Methods - TMH, 2000
4. Jain, M.K. Iyengar, S.R.K. and Jain, R.L., Numerical Methods for Scientific and Engineering Computation, Wiley Eastern Ltd., 1987
5. Gupta, S.C. and Kapoor,V.K., Fundamental of Mathematical Statistics, S. Chand, New Delhi, 2017

<b>PROBABILITY &amp; RANDOM PROCESS</b>	
Course Code: 24MDC101B	Internal Examination: 40 Marks
Credits: 3	External Examination: 60 Marks
L T P : 3 0 0	
Prerequisite: Engineering Mathematics-III	

### **COURSE OBJECTIVE (CEOs)**

1. To familiarize the students with concepts of random variables, two dimensional random variables, distributions, random process and linear systems with random inputs that are used in many engineering problems.
2. To introduce basic Probability theory and Random variables, its types and concept of moments.
3. To equip the students with the knowledge of Discrete and continuous probability distributions with their applications.
4. To get exposed the students with the knowledge of two dimensional Random variables and their transformations.
5. To extend the concept of random variable to random process and its basics that are applicable in engineering problems.

### **COURSE LEARNING OUTCOMES (CLOs)**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate knowledge of basic probability & random variables.
2. To understand techniques of developing discrete & continuous probability distributions and its applications.
3. Describe a random process in terms of its mean and correlation functions.
4. Gain knowledge in special processes like Poisson, Renewal processes.
5. Gain knowledge in spectral density, linear systems with random inputs.

### **MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)**

<b>CO \ CLO</b>	<b>CLO-01</b>	<b>CLO-02</b>	<b>CLO-03</b>	<b>CLO-04</b>	<b>CLO-05</b>
<b>CO-01</b>	✓				
<b>CO-02</b>		✓			
<b>CO-03</b>			✓		
<b>CO-04</b>				✓	
<b>CO-05</b>					✓

### **COURSE CONTENTS**

#### **Unit-I: Random Variables & Probability Distributions**

Random variables, Discrete Random Variables, probability mass functions; continuous random variables, probability density functions, Expectation, Moments - Moment generating function,

Bernouli distribution, Binomial distribution, Poisson distribution, Geometric distribution, uniform Distribution, Exponential distribution, Normal distributions,

#### **Unit-II: Two Dimensional Random Variables**

Two dimensional Random Variables - Marginal and conditional distributions, Conditional mean and variance, covariance, correlation and Linear regression - Transformation of Random Variables.

#### **Unit-III: Random Processes, Correlation and Power Spectral Densities**

Classification of Random processes - Stationarity - WSS and SSS processes, Random telegraph process, Ergodicity of Random Process, Poisson Random process, Autocorrelation function and its properties - Cross Correlation function and its properties. Spectral density function- Auto power spectral density and Cross power spectral density.

#### **Unit-IV: Linear Systems with Random Inputs**

Linear time and invariant system, system transfer function. Linear system with random inputs. System in the form of convolution - Unit Impulse Response of the System - Weiner-Khinchine Relationship.

#### **TEXT BOOKS/ REFERENCE BOOKS**

1. Veerarajan, T., Probability, Statistics and Random Processes, TMH, New Delhi, 2019.
2. Walpole R. E., Myers S. L., Ye K., Probability and Statistics for Engineers and Scientists, Pearson, 2017.
3. Moorthy M.B.K., Subramani K, Santha A. Probability and Random process. SciTech Publications, 7th edition 2018.
4. Trivedi K S, Probability and Statistics with reliability, Queueing and Computer Science Applications, Wiley-Blackwell; 2<sup>nd</sup> Edition, 2001.

## BIOSTATISTICS

Course Code: 24MDC101C	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
LTP: 3 0 0	
Prerequisite: Nil	

### COURSE OBJECTIVES (CEOs)

1. The objective of the course is to make the students familiar with basic of probability
2. The course is providing probability applications in biomedical engineering.
3. The basics of probability, conditional probability and Baye's theorem.
4. Understand the random variable and probability distributions.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus as been prepared in accordance with National Education Policy (NEP-2020). After completion of course, students would be able to explain

1. All descriptive statistics
2. Basic statistical concepts of probability.
3. Correlation and Regression analysis.
4. Testing of hypothesis.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUT COMES (CLOs)

CO \ CLO	CLO-01	CLO-02	CLO-03	CLO-04
CO-01	✓			
CO-02		✓		
CO-03			✓	
CO-04				✓

### COURSE CONTENTS

#### Unit-I: Graphical Representation and Descriptive Statistics

Quantitative and Qualitative Variables, Frequency Tables, Histograms, Bar Chart, Pie Chart, Box Plot, Measures of central tendency: Mean, Median and Mode, Measures of dispersion: Range, Standard Deviation and Variance, Measures of Position :Quartiles and Percentiles.

### **Unit-II: Probability Theory**

Introduction of Probability, Mutually Exclusive Events, Independent vs Dependent events, Experiment, Outcomes, Events and Sample Space, Conditional Probability, Total Probability and Bayes' theorem.

### **Unit-III: Correlation and Regression**

Introduction to Correlation and regression. Correlation model, correlation coefficient, multiple correlation. Simple linear regression, multiple regression.

### **Unit-IV: Testing of Hypothesis**

Type I error and Type II error and power of test. Hypothesis testing for- population means, difference of two population means, population proportions, difference between two population proportions, population variance, ratio of two population variances. Chi-square test: test of goodness of fit, independence and heterogeneity.

### **TEXT BOOKS/REFERENCE BOOKS**

1. Gupta, S.C. and Kapoor, V.K. , Fundamental of Mathematical Statistics, S Chand Publications, New Delhi 2017
2. Mann , P.S. ,Introductory Statistics, John Wiley& Sons, Global edition, 2017.
3. Daniel, W.W., Biostatistics- A foundation for analysis in health sciences, John Wiley & Sons;11th Edition, EMEA edition, 2019.
4. Lipschutz, Seymour and Schiller, John , Introduction to Probability and Statistics, Tata McGraw Hill,2017.
5. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists,9<sup>th</sup> Edition, Prentice Hall,2017.

## NUMERICAL METHODS

Course Code: 24MDC101D	Internal Examination: 40 Marks
Credits: 3	External Examination: 60 Marks
L T P : 3 0 0	
Prerequisite: Engineering. Mathematics – II	

### COURSE OBJECTIVES (COs)

1. To have a clear perception of the power of numerical techniques, ideas.
2. To demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.
3. To make familiar with error analysis and some numerical methods to solve equations which are not easily solved by algebraic methods.
4. To familiar with different operators which are useful in Numerical Analysis and introduce the concept of interpolation

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Find solutions by various numerical methods to get approximation solutions of algebraic a transcendental, simultaneous linear equations.
2. Get interpolating values by different numerical methods.
3. Do differentiation and integrations of tabular data.
4. To find numerical solutions of ordinary and partial differential equations.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CO \ CLO	CLO-01	CLO-02	CLO-03	CLO-04
CO-01	✓			
CO-02		✓		
CO-03			✓	
CO-04				✓



## **COURSE CONTENTS**

### **Unit-I: Error Analysis and Numerical Solution of Equations**

Approximations and error in computation: Significant figures, approximate numbers, Errors: Round-off Errors, Truncation Errors, Absolute Relative and Percentage Errors, Error in approximation of a function and series, Solution of algebraic and transcendental equation: basic properties of equation, Bisection method, Newton-Raphson method. Solution of simultaneous equations: Gauss Elimination method, Gauss Jacobi method, Gauss Seidel method.

### **Unit-II: Differences and Interpolation**

Finite differences - Forward differences and backward differences, shifting operator E - Difference tables, relation between operators, Differences of a polynomial - Factorial polynomials -. Interpolation with equal intervals: Newton- Forward and Backward Interpolation formulae, Interpolation with unequal interval: Divided differences - Newton's Divided difference formula - Lagrange's Interpolation formula.

### **Unit-III: Numerical Differentiation and Integration**

Numerical Differentiation: Newton's forward and backward differences formulae to compute first and higher order derivatives, Numerical Integration: The Trapezoidal rule - Simpson's one third rule and Simpson's three eighth rule.

### **Unit-IV: Numerical Solutions of Ordinary and Partial Differential equations**

Solution by Taylor's series - Euler's method - Improved and modified Euler method - Runge-Kutta methods of second and fourth orders (No proof). Classification of Partial differential equations of the second order - Difference quotients - Laplace's equation and its solution by Liebmann's process

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## **TEXT BOOKS/ REFERENCE BOOKS**

1. B.S. Grewal, "Numerical Methods in engineering and science", Khanna Publishers, 42nd Edition, 2015.
2. Steven Chapra and Raymond Canale, Numerical Methods for Engineers, 8th Edition, McGraw Hill, 2020.
3. M.K. Venkataraman, Numerical Methods in Science and Engineering, National Publishing Co., 1999
4. Gerald C. F., Wheatley P. O., Applied Numerical Analysis, Pearson, 2011.
5. Arumugam S., Isaac A. T., Somasundaram A., Numerical Methods, Scitech Publications Pvt. Ltd, 2009.
6. S.S. Sastry, Introductory Methods of Numerical Analysis, 2012.
7. E. Balagurusamy, Computer Oriented Statistical and Numerical Methods- Laxmi Publications, 2009.

Department of Environmental Sciences			
Program: UG program			
Year/Semester		Course Category	MDC
Course Code	23MDC102	Course Title	Environmental Geoscience & Disaster Management
Continuous Evaluation: 40		End Semester Examination: 60	
Prerequisite: Nil		L T P : 3 0 0	Credits: 3

**COURSE OBJECTIVES (COs):** The Course is designed with the following objectives:

1. To provide fundamental knowledge of earth origin and earth Processes.
2. Educate the students about the types of rocks & geological resources.
3. To understand the Disaster and Disaster management.
4. Role of Geospatial technology in geological resources and Disaster management.

### COURSE LEARNING OUTCOMES (CLOs)

The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

1. Able to explain the origin and Internal structure of earth.
2. Analyse the Geological resources and geochemistry of minerals.
3. Collect a comprehensive understanding of disaster management.
4. Evaluate the role of technology in disaster management.

### MAPPING MATRIX OF COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES (COs)	COURSE LEARNING OUTCOMES (CLOs)			
	CLO1	CLO2	CLO3	CLO4
CO1	√			
CO2		√		
CO3			√	
CO4				√

### COURSE CONTENTS

#### Unit-1

##### Origin of the Earth:

Theories and hypothesis of the origin of earth- Oparin-Haldane hypothesis, Big bang theory, the material basis of life, geological time scale, evolution of earth's atmosphere and life through the geological time scale.

#### Unit-2

##### Internal Structure of the Earth:

Internal Structure of Earth, differentiation of the earth into core, mantle, crust. Formation of core, mantle, crust, atmosphere, hydrosphere, and biosphere. Convection in Earth's core and production of its magnetic field. Geothermal gradient and internal heat of the Earth. Earthquake and earthquake belts: seismic waves and internal constitution of the Earth. Volcanoes and volcanism, distribution of volcanoes.

#### Unit-3

##### Fundamentals of Earth process

Concepts Rocks, Formation of rocks, types of rock (Igneous rock, Metamorphic Rocks, and Sedimentary rocks), Continental drift theory, Plate tectonic, sea floor spreading. Basic concepts of

weathering, erosion, and deposition of earth materials by water wind and glaciers.

#### **Unit-4**

##### **Geological Resources and Exploration:**

Fundamentals of geological resources, their formation, reserves in minerals, coal, oil, gas geological constraints in their availability and use; environmental consequences of their exploitation to air, water, soil, climate, and life. Distribution of minerals in India.

#### **Unit-5**

##### **Disaster Management:**

Disaster introduction- disaster management, capability vulnerability, risk, preparedness and mitigation. Disaster management cycle. Hazard zonation and mapping- risk reduction measures. Landslide, Earthquake, Tsunami, Flood, Minamata Disaster, Bhopal Gas Disaster, 1984, Chernobyl Disaster, 1986, Fukushima Daiichi nuclear disaster, 2011. Role of geo-spatial technology in surveillance, monitoring, risk assessment, and disaster management Sendai Framework for Disaster Risk Reduction.

#### **RECOMMENDED TEXTBOOKS:**

1. Mukherjee, S. (2004). Text Book of Environmental remote Sensing. Published by Macmillan India Limited New Delhi ISBN: 1403922357.
2. Keller, E.A. (1996). Introduction to Environmental Geology. Prentice Hall, Upper Saddle River, New Jersey.
3. Disaster management by R. Subramanian, Vikash Publishing house, ISBN 9352718704

#### **REFERENCE BOOKS**

1. Keller, E.A. (1996). Introduction to Environmental Geology. Prentice Hall, Upper Saddle River, New Jersey.
2. J.R Jensen, Remote Sensing of the Environment: An Earth Resource Perspective, 2012

<b>Management Process &amp; Organizational Behaviour</b>	
Course Code: 23MDC 401	Continuous Evaluation: 40 Marks
Credits: 3	End Semester Examination: 60 Marks
Prerequisite: NIL	Course Category: Multidisciplinary

## **COURSE OBJECTIVES**

1. To understand the functions and responsibilities of managers.
2. To acquaint the students with the fundamentals of managing business.
3. To understand individual and group behaviour at work place so as to improve the effectiveness of an organization.
4. To analyse human behaviour in the organization setting in order to manage it in accordance to the intentions.

## **COURSE LEARNING OUTCOMES**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate the roles, skills and functions of management.
2. Analyse the causes and consequences of applying different business strategies.
3. Analyse and compare individual behaviour related to motivation and rewards.
4. Identify group behaviour, leadership styles and the role of leaders in a decision making process.

## **MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES**

<b>Course Objectives (COs)</b>	<b>Course Learning Outcomes (CLOs)</b>			
	<b>CLO 1</b>	<b>CLO 2</b>	<b>CLO 3</b>	<b>CLO 4</b>
<b>CO 1</b>				
<b>CO 2</b>				
<b>CO 3</b>				
<b>CO 4</b>				

## **COURSE CONTENTS**

### **Unit 1: Introduction to the management**

Management Concept, Nature, Process and significance, levels of management, managerial skills, functions of management, management and administration, evolution of management, Role of management and insights from Indian practices and ethos.

### **Unit 2: Functions of the management**

Planning: Types of Plans & The planning process; Organizing: Common organisational structures; Staffing: features and necessity; Leading: types of leaders; Controlling: functions and types

### **Unit 3: Introduction to Organizational Behaviour**

Meaning, importance and scope of OB; abilities: meaning and forms, attitudes: framework, work related attitudes, personality: types, assessment, perception: process, factors influencing perception, perceptual errors

### **Unit 4: Foundation of Group Behaviour**

Defining and classifying groups; need to join groups, stages of group development; group dynamics: group properties as roles, norms and size; group decision making techniques, conflict management

## **TEXT BOOKS**

1. Stephen Robbins, Organizational Behavior, 16<sup>th</sup> edition (2012), Pearson Education.

2. K. Aswathappa, Organizational Behaviour, 13<sup>th</sup> edition (2016), Himalaya Publishing House.
3. Fred Luthans, Organizational Behavior, 14<sup>th</sup> edition (2017), McGraw-Hill.

#### **SUGGESTED READINGS**

1. Gregory Moorhead & Ricky W. Griffin, Organizational Behaviour, 11th edition (2009), Jaico Publication.
2. Tripathy PC and Reddy PN, Principles of Management, 6<sup>th</sup> edition (2011), McGraw-Hill.

<b>Year/Semester</b>		<b>Course Category</b>	<b>MDC</b>
<b>Course Code</b>	<b>23MDC302</b>	<b>Course Title</b>	<b>Library Information Science &amp; Media Literacy</b>
<b>Continuous Evaluation: 40</b>		<b>End Semester Examination:60</b>	
<b>Prerequisite: Nil</b>		<b>L T P : 3 0 0</b>	<b>Credits: 3</b>

**Course Objectives (CO)** - The Course is designed with the following objectives:

- CO-1: To know the library collection and their classifications.
- CO-2: To discuss the library information services.
- CO-3: To understand the importance of media
- CO-4: To grasp the significance of motive of media

**Course Learning Outcomes (CLO)** – The Syllabus has been prepared in accordance with the NEP-2020.

Upon completion of this course, learners will be able to:

- CLO-1: Explain the library collection and their classifications.
- CLO-2: Analyse the library information services.
- CLO-3: Analyse the media roles.
- CLO-4: Analyse the motive of media.

**Mapping Matrix between Course Objectives and Course Learning Outcomes:**

	<b>CO-1</b>	<b>CO-2</b>	<b>CO-3</b>	<b>CO-4</b>
<b>CLO-1</b>	√			
<b>CLO-2</b>		√		
<b>CLO-3</b>			√	
<b>CLO-4</b>				√

## **COURSE CONTENTS:**

### **UNIT-1: Library Collection**

- Type of Information Sources : Primary, Secondary and Tertiary
- Reference Collection: Type of reference sources
- Indexing and Abstracting Journals
- Multimedia Collection
- Arrangement of Information Sources : Classification

### **UNIT-2: Information Services**

- Bibliography: Type of Bibliography
- Reviews Literature
- Citation Style
- Citation Analysis: Web of Science and Scopus
- Online Databases : Structure and Retrieval

### **UNIT-3: Media Literacy**

- Introduction to Media Literacy
- Type of media: Traditional versus social media
- Bias in media

### **UNIT-4: Motive of Media**

- Media tycoons and conditions in which media works
- Research and Publication ethics

**Recommended Books:**

1. Richard E. Rubin & Rachel G. Rubin ,Foundations of Library and Information Science, 5<sup>th</sup> Edition. ISBN-9781783304776, Facet Publication, UK
2. <https://en.unesco.org/themes/media-and-information-literacy/resources>

<b>Year/Semester</b>		<b>Course Category</b>	<b>Multidisciplinary Course (MDC)</b>
<b>Course Code</b>	<b>23MDC301</b>	<b>Course Title</b>	IPR for Business
<b>Continuous Evaluation: 40</b>		<b>End Semester Examination: 60</b>	
<b>Prerequisite: Nil</b>		<b>L T P: 3 0 0</b>	<b>Credits: 3</b>

## COURSE OBJECTIVES:

The objective of this Multidisciplinary Course (MDC) is to familiarize the students with various types of IPR and its relevance to the businesses and their respective streams.

**CO 1:** To provide students with a basic understanding of various types of IPR and its relevance for business.

**CO 2:** To acquaint students with the strategies and management techniques associated with intellectual property assets, and the legal considerations and challenges involved.

**CO 3:** To familiarize the students with the challenges and legal considerations related to intellectual property disputes.

**CO 4** To develop skills related to management of intellectual property in business.

## COURSE LEARNING OUTCOMES

At the end of this course, the students would be able to:

**CLO1:** Define and discuss about the various types of IPR and its relevance for business

**CLO2:** Discuss the adjudicating bodies and mechanisms under each of these IPRs

**CLO3:** Analyze and resolve business disputes relating to IPR

**CLO4:** Apply the learning to the real-life situations in business

## MAPPING COURSE OBJECTIVES (COs) & COURSE LEARNING OUTCOMES (CLOs)

COURSE OBJECTIVES (COs)	COURSE LEARNING OUTCOMES (CLOs)			
	CLO1	CLO2	CLO3	CLO4
CO1	√			
CO2		√		
CO3			√	
CO4				√

## COURSE CONTENT

### UNIT 1

#### INTRODUCTION TO INTELLECTUAL PROPERTY AND BUSINESS

- Concept of IPR in business and its types
- International Context - Introduction to the leading International Instruments concerning Intellectual Property Rights: the Berne Convention, Universal Copyright Convention, The Paris Convention, Patent Co-operation Treaty, TRIPS, The World Intellectual Property Organization (WIPO), World Trade Organization (WTO) and the UNESCO
- Innovation as a Business Strategy and relevance of protecting the ideas legally
- National IPR Policy

### UNIT 2

#### COPYRIGHT

- Concept of Copyright and importance for businesses



- Media business – protecting performer’s rights
- Performers’ and Broadcasters’ Rights Law
- Assignment, Transmission, Licensing of Copyrights
- Infringement of Copyrights and remedies

### **UNIT 3**

#### **TRADEMARKS**

- Trademark – value of and relevance for businesses
- Protecting brand value- acquiring trademark nationally and internationally
- Trade mark disputes – case studies

### **UNIT 4**

#### **PATENTS**

- Protecting innovation – acquiring patents nationally and internationally
- Product and process patents
- Assigning patents and its commercialization
- Patent Disputes

### **UNIT 5**

#### **INDUSTRIAL PROPERTIES**

- Industrial designs – protection - Procedure for Registration of Designs • Copyright under Design
- Semiconductor Integrated Circuits Layout-Designs
- Plant varieties – commercialization - Monsanto cases
- Geographical Indications
- Biotechnology and IPR

### **UNIT 6**

#### **REGISTRATION AND ENFORCEMENT MECHANISMS**

- Registration authorities of various IPRs
- IP Management and assertion of rights through declarations – use of copyright, trademark signs
- IP Litigation – Approach of courts – landmark cases

#### **TEXT BOOKS:**

- WIPO DL-101 General Course on Intellectual Property (online)
- Elizabeth Verkey and Jithin Saji Issac, *Intellectual Property*, Eastern Book Company 2021
- Anurag K. Agarwal, *Business and Intellectual Property: Protect your Ideas*, IIM Ahmedabad. Random House India (2016)
- *Handbook on IP Commercialisation - Strategies for Managing IPRs and Maximising Value* Jakarta: ASEAN Secretariat, November 2019

#### **REFERENCES BOOKS:**

- ICSI Study Material, Intellectual Property Rights: Law and Practice, A. Ramaiya, Guide to the Companies Act, LexisNexis, 19th Ed. 2020 (in 6 volumes)
- WIPO, *Enterprising Ideas A Guide to Intellectual Property for Startups*, 2023
- Manuals published by Office of the Controller General of Patents, Designs & Trade (CGPDTM), available at <https://ipindia.gov.in/>
- Guide Books by WIPO –Intellectual Property for Business, available at <https://www.wipo.int/publications/en/series/index.jsp?id=181>

<b>Year/Semester</b>		<b>Course Category</b>	<b>Multidisciplinary Course</b>
<b>Course Code</b>	<b>23MDC304</b>	<b>Course Title</b>	<b>Indian Economy</b>
<b>Continuous Evaluation: 40</b>		<b>End Semester Examination:60</b>	
<b>Prerequisite: Nil</b>		<b>L T P : 3 0 0</b>	<b>Credits: 3</b>

### **COURSE OBJECTIVES**

1. To introduce about different demography terms and trends.
2. To make students familiar with growth and its distribution.
3. To discuss the major changes in agriculture sector over-time.

### **COURSE LEARNING OUTCOMES**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. review major demographic indicators
2. comprehend the concept of inequality
3. analyse agriculture sector

### **MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES**

<b>Course Objectives (COs)</b>	<b>Course Learning Outcomes (CLOs)</b>		
	<b>CLO 1</b>	<b>CLO 2</b>	<b>CLO 3</b>
<b>CO 1</b>			
<b>CO 2</b>			
<b>CO 3</b>			

### **COURE CONTENTS**

#### **Unit-I**

#### **Population and Human Development**

Demographic trends and issues; education; health and malnutrition. Demographic features of India's population.

#### **Unit-II**

#### **Growth and Distribution**

Trends and policies in poverty; inequality and unemployment.

#### **Unit-III**

#### **Agriculture**

Importance of Agriculture; Causes of backwardness and low productivity; Land Reforms: Need, Implementation and Critical Evaluation

### **TEXT BOOKS**

1. Jean Dreze and Amartya Sen, 2013. *An Uncertain Glory: Indiaand its Contradictions*, Princeton UniversityPress.
2. Pulapre Balakrishnan, 2007, The Recovery of India: Economic Growth in the Nehru Era, *Economic and Political Weekly*,November.
3. Rakesh Mohan, 2008,—Growth Record ofIndian Economy: 1950-2008.AStory of Sustained Savings and Investment, *Economic and Political Weekly*,May.
4. S.L. Shetty, 2007,—India's SavingsPerformancesincethe Advent ofPlanning,in K.L. Krishna and A. Vaidyanathan, editors, *Institutions and Markets in India's Development*.
5. Himanshu, 2010,—TowardsNew Poverty LinesforIndia, *Economicand Political*

*Weekly*, January.

<b>Year/Semester</b>		<b>Course Category</b>	<b>MDC</b>
<b>Course Code</b>	<b>23MDC305</b>	<b>Course Title</b>	<b>Electoral Literacy in India</b>
<b>Continuous Evaluation : 40</b>		<b>End Semester Examination : 60</b>	
<b>Prerequisite: Nil</b>		<b>L T P : 3 0 0</b>	<b>Credits: 3</b>

**Course Objectives (CO)** - The Course is designed with the following objectives:

1. To know the meaning and nature of the electoral democracy in India
2. To discuss electoral institutions in India
3. To understand the procedural aspect of elections in India
4. To grasp the significance of elections and electoral aspects of democracy, the electoral model code of conduct, issues, and challenges in India's democracy.

**Course Learning Outcomes (CLO)** – The Syllabus has been prepared in accordance with the NEP-2020. Upon completion of this course, learners will be able to:

1. The student shall be able to understand the meaning, definition, and significance of elections in India.
2. The course will help the students to analyse and understand electoral institutions, and their role and functions in the conduct of free and fair elections.
3. The student shall be able to know the party system of India.
4. The course will help the student understand issues and challenges in conducting free and fair elections in India.

**Mapping Matrix between Course Objectives and Course Learning Outcomes:**

<b>Course Learning Objectives (Cos)</b>	<b>Course Learning Outcome (CLOs)</b>				
	<b>CLO1</b>	<b>CLO2</b>	<b>CLO3</b>	<b>CLO4</b>	<b>CLO5</b>
<b>CO1</b>					
<b>CO2</b>					
<b>CO3</b>					
<b>CO4</b>					

## **COURSE CONTENTS:**

### **UNIT-1: Elections in India**

- Suffrage, Types, and Methods of Elections
- Parliamentary elections: Lok Sabha & Rajya Sabha
- Presidential Elections
- State Legislative Assembly Elections
- Local Body Elections

### **UNIT-2: Electoral Institutions**

- Election Commission (EC)
- State Election Commission
- Constitution: Part-15

### **UNIT-3: Political Parties in India**

- One-party, Two Party, Multi-party system
- Model Code of Conduct, Party Funding, and Campaign

### **UNIT-4: Elections: Issues and Challenges**

## **RECOMMENDED TEXTBOOKS:**

1. Subhash C. Kashyap, Our Political System, 2nd, National Book Trust, India, 2008, ISBN: 8123752520
2. D. D. Basu, Introduction to The Constitution Of India, 26<sup>th</sup> Edition, Lexis Nexis, ISBN: 978-9388548861
3. Bidyut Chakrabarty, Rajendra Kumar Pandey, Indian Government and Politics, Sage Text, ISBN: 8132100581

## **REFERENCE BOOKS:**

1. Sanjay Kumar, Elections in India: An Overview, 1st, Routledge, ISBN: 9781032033136

2. <https://eci.gov.in/>
3. <https://www.lokniti.org/>
4. Websites of State Election Commission
5. NCERT, Chapter-3 Indian Constitution at Work

<b>Creating Entrepreneurial Mind Set</b>	
<b>Course Code: 23MDC402</b>	<b>Continuous Evaluation: 40 Marks</b>
<b>Credits: 3</b>	<b>End Semester Examination: 60 Marks</b>
<b>L T P : 3-0-0</b>	<b>Course Type: MDC</b>

### **COURSE OBJECTIVES**

1. To disseminate knowledge about basics of entrepreneurship and forms of ownership.
2. To enlighten students regarding the relevance of creativity and innovation from an entrepreneurship point of view.
3. To give clarity to students regarding formulation of business plan.
4. To familiarize students with the upcoming trends in the entrepreneurship field.

### **COURSE LEARNING OUTCOMES**

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand basics of entrepreneurship and different types of ownerships.
2. Grasp relevance of creativity and innovation and its application in a business.
3. Acknowledge components of a business plan and ways to launch it.
4. Utilize conceptual building skills in interpreting trends for the entrepreneurs.

### **MAPPING BETWEEN COURSE OBJECTIVES AND COURSE LEARNING OUTCOMES**

<b>Course Objectives (COs)</b>	<b>Course Learning Outcomes (CLOs)</b>			
	<b>CLO 1</b>	<b>CLO 2</b>	<b>CLO 3</b>	<b>CLO 4</b>
<b>CO 1</b>				
<b>CO 2</b>				
<b>CO 3</b>				
<b>CO4</b>				

Year/Semester		Course Category	MDC
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## CONTENTS

UNIT	CONTENTS
<b>UNIT-I</b>	<b>Basics of Entrepreneurship</b> Entrepreneur: Definition, characteristics, functions, types of an entrepreneur; Concept of Entrepreneurship, types, role of entrepreneurship in economic development, Factors affecting Entrepreneurship.
<b>UNIT-II</b>	<b>Entrepreneurial Development Programme</b> Entrepreneurial Development Programme (EDP): meaning & concept; The Role and Relevance of Entrepreneurial Development Program in India; Role of Government in Organizing EDP's Critical Evaluation; Women Entrepreneurship- Meaning, Reasons for Slow Growth, Problems faced by Women Entrepreneurs, Development of women Entrepreneurship.
<b>UNIT-III</b>	<b>Business Planning</b> Opportunity Identification and selection, Formulation of business plan, External Environmental Analysis - Economic, Social, financial, technological, competitive, and legal. Financing: Sources, venture capital, export finance.
<b>UNIT-IV</b>	<b>Entrepreneurial Trends in the Digital Age</b> Definition and significance of digital entrepreneurship; Brief overview of key digital trends impacting businesses; Disruptive Technologies; Promoting innovation and adaptability in a digital ecosystem

## TEXT BOOKS

1. Burns, Entrepreneurship and small business, 4<sup>th</sup> edition (2016), Palgrave.
2. Norman M. Scarborough, Essentials of entrepreneurship and small business management, 9<sup>th</sup> edition (2018), Pearson.
3. Hisrich, R., & Peters, M., Entrepreneurship, 11<sup>th</sup> edition (2020), Tata McGraw Hill.
4. Prahalad, C. K. (2006). Fortune at the bottom of the pyramid, eradicating poverty through profits. Wharton school Publishing.
5. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries

## SUGGESTED READINGS

1. Khandwalla, P., Corporate creativity, 7<sup>th</sup> edition (2017), Tata Mc. Graw Hill.
2. Mullins, J., New business road test, 4<sup>th</sup> edition (2013), Prentice Hall.
3. Drucker, P. F. (2006). Innovation and entrepreneurship: Practice and principles. USA: Elsevier.
4. Gersick, K. E., Davis, J. A., Hampton, M. M., & Lansberg, I. (1997). Generation to generation: Life cycles of the family business. Boston: Harvard Business School Press.
5. Holt, D. H. (2004). Entrepreneurship new venture creation. New Delhi: Prentice Hall of India.

Course Code	23MDC303	Course Title	Psychology and Emotional Intelligence
Continuous Evaluation : 40		End Semester Examination : 60	
Prerequisite: Nil		L T P : 3 0 0	Credits: 3

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### **COURSE OBJECTIVES (COs):**

- CO1:** To know the concepts in sociology relevant to the study of society.
- CO2:** To discuss classical sociological thoughts by sociologists.
- CO3:** To understand modern and post modern sociological thoughts.
- CO4:** To grasp the significance of sociological theories in understanding society
- CO5:** To construct the relation between individual and social structure in the society.

### **COURSE LEARNING OUTCOMES (CLOs):**

After the successful completion of the course, the students will have the ability to:

- CLO1:** Explain various sociological concepts important in the understanding of society.
- CLO2:** Application of critical conceptual understanding that is central to sociological investigations.
- CLO3:** Analyzing the social phenomena with respect to theoretical understanding of society.
- CLO4:** Recommend analytical as well as methodological understanding to generate authentic knowledge.
- CLO5:** Integrate the knowledge of social issues in society according to advanced, contemporary, interdisciplinary knowledge.

### **Mapping Matrix between Course Objectives and Course Learning Outcomes:**

CLO CO	CLO 1	CLO 2	CLO 3	CLO 4	CLO
CO 1	✓				
CO 2		✓			
CO 3			✓		
CO4				✓	
CO5					✓

## **COURSE CONTENTS**

### **UNIT-I: INTRODUCTION**

- Definition, Scope, Nature and Importance of Sociology
- **SOME BASIC CONCEPTS:** Status & Role, Power & Authority, Social Structure & Function

### **UNIT-II : SOCIETY AND SOCIAL BEHAVIOUR**



- **SOCIETY AND SOCIAL BEHAVIOUR:** Society: Meaning & Characteristics, Culture, Socialization: Definition & Agencies, Social Mobility: Meaning & Types, Social Group: Meaning and Types

### **UNIT-III : SOCIAL CONTROLS & SOCIAL BEHAVIOUR**

- **MEANING AND NATURE OF SOCIAL CONTROL:** Social Controls & Social Behaviour : Types: Folkways, Mores, Norms, Values, Law
- **SOCIAL CONFORMITY AND DEVIANCE :** Meaning of Conformity & Deviance

### **UNIT-IV: THEORETICAL PERSPECTIVES**

- **MACRO PERSPECTIVE:** Theoretical perspectives: Functionalism, Conflict, Structuralism
- **MICRO PERSPECTIVE:** Theoretical perspectives: Symbolic Interactionism, Exchange Theory, Labelling Theory

### **UNIT-V: CLASSICAL THEORISTS**

- **EMILE DURKHEIM:** Division of Labour in Society, Suicide
- **KARL MARX:** Historical Materialism, Class and Class Conflict, Alienation
- **MAX WEBER:** Authority, Social Action, Ideal Types

### **UNIT-VI : THEORIES OF MODERNITY**

- Juggernaut of Modernity, McDonaldization, Risk Society
- **GLOBALIZATION AND INEQUALITY:** Global justice, Need for Global governance

### **TEXT BOOKS**

1. Anthony Giddens, Sociology, Polity Press (2019)
2. Harlambois, M. Sociology: Themes and Perspectives, Oxford University Press
3. C.N. Shankar Rao, **Sociology: Principles Of Sociology With An Introduction To Social Thoughts**, S. Chand Publications, (2019)

### **REFERENCE BOOKS**

1. Transformation: Theory and Society in India, Oxford University Press (2010)
2. Andre Beteille. Six Essays in Comparative Sociology, Oxford University Press
3. M. Francis, Abraham. Contemporary Sociology: An Introduction to Concepts and Theories, Oxford University Press (2014)
4. J.P.S. Uberoi. Mind and Society: From Indian Studies to General Sociology, Edited by Khalid Tyabji, Oxford University Press (2019)



## PERSONAL FINANCIAL PLANNING

<b>Course Code: 23MDC403</b>	<b>Continuous Evaluation: 40</b>
<b>Credits: 03</b>	<b>End Semester Examination: 60</b>
<b>L T P : 3-0-0</b>	<b>Course Type: MDC</b>
<b>Prerequisite:</b> Student should be aware about various saving schemes and their future benefits.	

### COURSE OBJECTIVES

1. Build an understanding to familiarize different aspect of personal financial planning.
2. Analyze and compare different sources of savings and investment.
3. Develop a perspective to understand necessary knowledge and skills for effective Tax planning.
4. Develop skills to assess need for the insurance and retirement planning.

### COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Analyze the meaning and appreciate the relevance of financial planning
2. Analyze the Integration of various avenues of investment for future benefit.
3. Examine the scope and ways of personal tax planning.
4. Analyze the insurance and retirement planning with relevance.

### MAPPING MATRIX COURSE OBJECTIVES & COURSE LEARNING OUTCOMES

<b>CLO \ CO</b>	<b>01</b>	<b>02</b>	<b>03</b>	<b>04</b>
<b>01</b>				
<b>02</b>				
<b>03</b>				
<b>04</b>				

UNIT	Course contents
<b>UNIT-I</b>	<b>Introduction to Financial Planning</b> Financial goals, steps in financial planning, budgeting incomes and payments, time value of money. Introduction to savings, benefits of savings, management of spending & financial discipline, Setting alerts and maintaining sufficient funds for fixed commitments.
<b>UNIT- II</b>	<b>Investment Planning</b> Process and objectives of investment, concept and measurement of return & risk for various asset classes, measurement of portfolio risk and return, diversification & portfolio formation, Various Investment avenues
<b>UNIT- III</b>	<b>Personal Tax Planning</b> Tax structure in India for personal taxation, Scope of personal tax planning, exemptions and deductions available to individuals under different heads of income and gross total income.
<b>UNIT- IV</b>	<b>Insurance and Retirement Benefits Planning</b> Need for insurance. Life insurance, health insurance, property insurance, credit life insurance and professional liability insurance, Pension plans available in India

## BOOKS

1. Halan, M. —Let's Talk Money: You've Worked Hard for It, Now Make It Work for You! Harper Collins Publishers, 2020 New York.
2. Madura, J. —Personal Finance, 2021, Pearson Publication
3. Indian Institute of Banking & Finance. —Introduction to Financial Planning, Taxmann Publication, 2021, New Delhi.
4. Keown A.J. —Personal Finance, Pearson Publication, 2021, New York.

## REFERENCE BOOKS

1. Pandit, A. —The Only Financial Planning Book that You Will Ever Need, Network 18 Publications Ltd., Mumbai.
2. Sinha, M. —Financial Planning: A Ready Reckoner, McGraw Hill Education, New York.
3. Tripathi, V. —Fundamentals of Investment, Taxmann Publication, New Delhi.

NUMERICAL METHODS IN BME	
Course Code: 24MDC106A	Internal Examination: 40 Marks
Credits: 3	External Examination: 60 Marks
L T P : 3 0 0	
Prerequisite:	

### COURSE EDUCATIONAL OBJECTIVES (CEOs)

1. To have a clear perception of the power of numerical techniques, ideas.
2. To demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.
3. To make familiar with error analysis and some numerical methods to solve equations which are not easily solved by algebraic methods.
4. To familiar with different operators which are useful in Numerical Analysis and introduce the concept of interpolation

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Find solutions by various numerical methods to get approximation solutions of algebraic a transcendental, simultaneous linear equations.
2. Get interpolating values by different numerical methods.
3. Do differentiation and integrations of tabular data.
4. To find numerical solutions of ordinary and partial differential equations.

### MAPPING BETWEEN COURSE EDUCATIONAL OBJECTIVES (CEOs) AND COURSE LEARNING OUTCOME (CLOs)

CEO \ CLO	CLO-01	CLO-02	CLO-03	CLO-04
CEO-01	✓			
CEO-02		✓		
CEO-03			✓	
CEO-04				✓

## **COURSE CONTENTS**

### **Unit-I: Error in Computation and Numerical Solution of Equations**

Approximations and error in computation: Significant figures ,approximate numbers, Errors: Round- off Errors, Truncation Errors ,Absolute Relative and Percentage Errors ,Solution of algebraic and Transcendental equation: basic properties of equation, Bisection method, Newton-Raphson method Solution of simultaneous equation: Gauss Elimination method , Gauss Jacobi method , Gauss Seidel method.

### **Unit-II: Interpolation with Equal and Unequal Interval**

Finite differences - Forward differences and backward differences, difference tables, Interpolation with equal intervals: Newton- Forward and Backward Interpolation formulae, Interpolation with unequal interval: Divided differences - Newton's Divided difference formula - Lagrange's Interpolation formula.

### **Unit-III: Numerical Differentiation and Integration**

Numerical Differentiation and Integration: Newton's forward and backward differences formulae to compute first and higher order derivatives - The Trapezoidal rule - Simpson's one third rule and three eighth rule.

### **Unit-IV: Numerical Solutions of Differential Equations**

Solution by Taylor's series - Euler's method - Improved and modified Euler method - Runge-Kutta methods of fourth order (No proof).

## **TEXT BOOKS / REFERENCE BOOKS**

1. B.S. Grewal, "Numerical Methods in engineering and science", 11th Edition Mercury Learning and Information, 2018.
2. Steven Chapra and Raymond Canale, Numerical Methods for Engineers, McGraw-Hill Education, 8th edition 2020.
3. Gerald C. F., Wheatley P. O., Applied Numerical Analysis, Pearson, 2011.
4. Arumugam S., Isaac A. T., Somasundaram A., Numerical Methods, Scitech Publications Pvt.Ltd, 2010.
5. S.S. Sastry, Introductory Methods of Numerical Analysis, 5th Edition 2012
6. E. Balagurusamy, Computer Oriented Statistical and Numerical Methods -Laxmi Publications, 2009.
7. M.K.Jain, SRK Iyengar and R.L.Jain, Numerical Methods for Scientific and Engineering Computation, NEW AGE; 6th edition, 2019.
8. P.Kandasamy, Numerical Methods, S Chand & Company; Reprint Edition, 2006.

## DISCRETE MATHEMATICS

Course Code: 24MDC 106B	Internal Examination: 40 Marks
Credits: 3	External Examination: 60Marks
L T P : 3 0 0	
Prerequisite:	

### COURSE OBJECTIVES (COs)

1. To introduce most of the basic terminologies for Logical and Mathematical maturity that impart analytical ability to describe, analyze and solving mathematical problems
2. To get idea about recurrence relation & algebraic systems.
3. To familiarize the students with Boolean algebra and its terminologies.
4. To solve practical problems to the respective branches of Engineering in a logical and systematic fashion

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Write an argument using logical notation and determine if the argument is or is not valid.
2. Understand the basic principles of sets and operations in sets and prove basic set equalities.
3. Understanding recurrence relation and properties of algebraic structures such as groups, rings and fields.
4. Get idea of Boolean algebra and its applications.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CO \ CLO	CLO-01	CLO-02	CLO-03	CLO-04
CO-01	✓			
CO-02		✓		
CO-03			✓	
CO-04				✓

## **COURSE CONTENTS**

### **Unit-I: Mathematical Logic**

Propositions and Logical operators - Truth tables and propositions generated by a set -Equivalence and Implication - Tautologies - Laws of logic - Proofs in Propositional calculus -Direct proofs - Conditional conclusions - Indirect proofs - Propositions over a universe -Mathematical Induction - The existential and universal quantifiers - Predicate calculus including theory of inference.

### **Unit-II: Set Theory & Relations**

Laws of Set theory - Partition of a set – Relations – Binary relation - Domain and range of a relation– Inverse relation – Composite relation – Equivalence relation – Equivalence classes – Partitions – Quotient set – Graphs of relations - Hasse diagram - Matrices of relations - Closure operations on relations -Warshall's algorithm

### **Unit-III: Recurrence Relation & Algebraic Systems**

Recurrence relations - Solving a recurrence relation - Recurrence relations obtained from solutions - Generating functions - Solution of a recurrence relation using generating functions- Closed form expression for generating function. Groups - Cyclic groups and subgroups -Normal subgroups - Coding theory - Group codes.

### **Unit-IV: Boolean Algebra, Posets and lattices**

Definitions and Basic Properties of Boolean Algebra, Boolean Expressions, Logic Gates and Circuits, Boolean Function - Method to find Truth Table of a Boolean Function – Disjunctive Normal Form or Canonical Form - Karnaugh map. Posets– Hasse Diagram, Chain and anti-chain, Dual of a poset- Isomorphic posets. Lattices –Properties of Lattices, sub-lattices, well ordered set - complete order - Complete lattice - Lattice Homomorphism. Application of Boolean algebra to switching theory.

## **TEXT BOOKS / REFERENCE BOOKS**

1. B. Kolman, R. Busby, and S. C. Ross., Discrete Mathematical Structure, 6<sup>th</sup> edition., Pearson's Publication, 2017.
2. Sarkar S. K., Discrete Mathematics, S Chand & Co Ltd 2016. Prentice Hall India Learning Private Limited; Second edition, 2014.
3. Kenneth H. Rosen, Discrete Mathematics and its application, Tata McGraw Hill, 7th edition, 2017.
4. Bondy J. A., Murty U. S. R., Graph Theory, Springer, 2013.
5. C.L. Liu, Elements of Discrete Mathematics, Tata McGraw Hill, 4<sup>th</sup> edition, 2017.
6. Yadav S. K., Discrete Mathematics with Graph Theory, Anne Books Pvt. Ltd., 2013.



## PROBABILITY AND STATISTICS

Course Code: 24MDC107	Internal Examination: 40 Marks
Credits: 3	External Examination: 60Marks
L T P : 3 0 0	
Prerequisite: Nil	

### COURSE OBJECTIVES (COs)

1. To apply the basis rules of probability and gain knowledge of theoretical distributions.
2. To apply the knowledge of Regression lines and analysis of variance.
3. Understand how to develop null and alternative hypothesis and draw conclusions using hypothesis tests.
4. Acquire the knowledge to solve the problem of process control.

### COURSE LEARNING OUTCOMES (CLOs)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Implement the concept of probability and random variables and model them using various distributions.
2. Examine the regression lines and interpret the results in the analysis of variants.
3. Infer the results by using hypothesis testing on large and small samples.
4. Utilize quality control technique to solve real world problems.

### MAPPING BETWEEN COURSE OBJECTIVES (COs) AND COURSE LEARNING OUTCOMES (CLOs)

CO \ CLO	CLO-01	CLO-02	CLO-03	CLO-04
CO-01	✓			
CO-02		✓		
CO-03			✓	
CO-04				✓

### COURSE CONTENTS

#### Unit-I: Probability and Probability Distributions

Introduction, Conditional Probability, Baye's Theorem and its applications, Random Variable, Discrete and Continuous random variables, Binomial, Poisson and Normal distributions.

#### Unit-II: Correlation, Regression and ANOVA

Correlation and its properties, Karl Pearson's Coefficient of correlation, Spearman's Rank Correlation Coefficient for repeated and non-repeated ranks, Linear regression lines and properties, Introduction to

ANOVA, one way and two way classifications.

### **Unit-III: Testing of Hypothesis**

Sampling distribution, Type-I and Type-II errors, large sample test, Test of significance for single proportion, difference of proportion, single mean and difference of means. Small sample test, t-test for single mean, for difference of means.

### **Unit-IV: Statistical Quality Control**

Introduction, Process control, Control charts for variable,  $\bar{X}$ , R and S charts.

### **TEXT BOOKS / REFERENCE BOOKS**

7. S.Ross, "A first Course in Probabilty", Pearson Education, India, 2010
8. Veera Rajan,T, "Probability and Statistics," TMH, New Delhi-2010
9. V.K.Rohatagi, A.K.Md. Ehsan's Saleh, "An Introduction to Probability and Statistics," Wiley, Oxford, 2<sup>nd</sup> Ed. 2008.
10. S.C.Gupta and V.K. Kapoor, "Fundamental of Mathematical Statistics", S.Chand ,New Delhi, 2015.

