



**Dr.V.S.KRISHNA GOVT. DEGREE COLLEGE**

(AUTONOMOUS)

NODAL RESOURCE CENTRE & AU CENTRE FOR RESEARCH

Maddilapalem, Visakhapatnam - 530013, Andhra Pradesh.

0891-2553262, <https://www.drvskrishnagdc.edu.in>



**DEPARTMENT OF COMPUTER SCIENCE**

**Curriculum for B.Sc. Honours in Artificial Intelligence (Major)**

**As per  
NEP- 2020**

**SYLLABUS FOR I to VIII SEMESTER  
UNDERGRADUATE PROGRAMME  
2024-2025 onwards**



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### **Resolutions adopted by the Board of Studies (BoS) of B.Sc. Honours in Artificial Intelligence (Major) 2024-25**

1. Approval and Ratification of changes/modifications in the curriculum designed for I/II/III/IV/V/VI/VII and VIII Semesters under Choice Based Credit System for Major and Minor subjects for the Academic Year 2024-25 onwards.
2. Approval of Multi Disciplinary Courses, Value Added Certificate Courses, Skill Enhancement Courses, Ability Enhancement Compulsory Courses (Languages), Open Online Transdisciplinary Courses, Environmental Course, IKS (Two courses with Zero (0) credits,
3. Approval of Community Service Project of 180 hours with 4 credits after the end of II semester, Short Term Internship/ Apprenticeship/ Online Job Training of 180 hours with 4 credits after the end of IV Semester, Semester Internship/Apprenticeship/ Online Job Training with 12 credits in the VI Semester.
4. Approval of Multiple Entry and Multiple Exit from Programme
5. Suggestions for innovative teaching and evaluation techniques, students' seminars, workshops and student-centred activities, research and extension activity/start-ups, value added certificate courses to be introduced.
6. Approval of Question Paper Blueprint and Model Question Paper for 60 External Marks and 40 Internal marks for core and language courses, 50 External Marks for Multidisciplinary Courses and Skill Enhancement Courses.
7. List of examiners.
8. Any other relevant matter.



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### Scheme of Evaluation for Practical examinations

The duration of examination for each theory course is 3Hrs.

The duration of each practical examination is 3Hrs with 50 Max. Marks

Distribution of marks

Program and output: 30M

Viva-Voce: 10M

Record: 10M

**Internal: External Evaluation is 40:60**

The Internal Evaluation Method (CIA)

Type of Assessment	Max Marks
2 Mid Examinations	20M + 20 M = 40 M
Seminar/ Group Discussion	5 M + 5 M = 10 M
Project Based Learning	10M
Peer Group Learning	10M
Attendance and Participation in Clean and Green Activities	5 M
	75 Marks

Scale down to 40 Marks.



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## COURSE STRUCTURE

Year	Semester	S.No	Title of the Course	Course Code	No. of Hrs /Week	No. of Credits	
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	24BSPM11	3+2	4	
		2	Advances in Mathematical, Physical and Chemical Sciences	24BSPM12	3+2	4	
	II	3	Python for Data Science	24AINM21	3	3	
			Python for Data Science Lab	24AINM21P	2	1	
		4	Statistical Methods and Probability Distribution	24AINM22	3	3	
			Statistical Data Analysis Using SPSS - I Lab	24AINM22P	2	1	
			Community Service Project	INTERNSHIP001	4	8 weeks	
		II	III	5	Document Oriented Database	24AINM31	3
	Document Oriented Database Lab				24AINM31P	2	1
	6			Operating Systems	24AINM32	3	3
Operating Systems Lab				24AINM32P	2	1	
7	Introduction to OOP using JAVA			24AINM33	3	3	
	Introduction to OOP using JAVA Lab			24AINM33P	2	1	
8	Inferential Statistics		24AINM34	3	3		
	Statistical Data Analysis Using SPSS - II Lab		24AINM34P	2	1		
IV	9		Data Warehousing and Data Mining	24AINM41	3	3	
			Data Warehousing and Data Mining Lab	24AINM41P	2	1	
	10		Machine Learning using Python	24AINM42	3	3	
			Machine Learning using Python Lab	24AINM42P	2	1	

		11	Introduction to AI	24AINM43	3	3
			Introduction to AI Lab	24AINM43P	2	1
			Short Term Internship	INTERNSHIP002	4	8weeks

III	V	12	Introduction to Predictive Analytics using Python	24AINM51	3	3		
			Introduction to Predictive Analytics using Python Lab	24AINM51P	2	1		
		13	Algorithms for Intelligent Systems	24AINM52	3	3		
			Algorithms for Intelligent Systems Lab	24AINM52P	2	1		
		14	Natural Language Processing	24AINM53	3	3		
			Natural Language Processing Lab	24AINM53P	2	1		
		15	Software Project Management	24AINM54	3	3		
			Software Project Management Lab	24AINM54P	2	1		
			VI		Internship	INTERNSHIP003	12	15 weeks
			VII	16	Deep Learning	24AINM71	3	3
					Deep Learning Lab	24AINM71P	2	1
				17	Text Mining	24AINM72	3	3
					Text Mining Lab	24AINM72P		
				18	Computer Networks	24AINM73	3	3
	Computer Networks Lab	24AINM73P			2	1		
	<b>SEC</b>							
	19	Mobile Application Development		24AINS74	3	3		
		Mobile Application Development Lab		24AINS74P	2	1		
	20	Big Data Analysis using R		24AINS75	3	3		
		Big Data Analysis using R Lab	24AINS75P	2	1			
	VIII	21	Neural Networks	24AINM81	3	3		
			Neural Networks Lab	24AINM81P	2	1		

		22	Design Thinking	24AINM82	3	3
			Design Thinking Lab	24AINM82P	2	1
		23	Robotics and Intelligent Systems	24AINM83	3	3
			Robotics and Intelligent Systems Lab	24AINM83P	2	1
		SEC				
		24	Cyber Security Essentials	24AINS84	3	3
			Cyber Security Essentials	24AINS84P	2	1
		25	Big Data Analysis using SPARK	24AINS85	3	3
			Big Data Analysis using SPARK Lab	24AINS85P	2	1



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## Curriculum framework BSc Single major Programme

<b>B.Sc (Honours) with Single Major</b>																								
Semester	Major* (4 Cr)			Minor (4 Cr)			Languages (3 Cr)			Multi Disny' (2 Cr)			Skill Enhanceme nt Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total		
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr
Sem 1	2*	10	8				2	8	6	1	2	2	2	4	4							7	24	20
Sem 2	2	6+4	8	1	3+2	4	2	8	6				2	4	4							7	27	22
<b>Community Service Project of 180 hours with 4 Credits.</b> Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																								
Sem 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24
Sem 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24
<b>Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits.</b> Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																								
Sem 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26
Sem 6	<b>Semester Internship/Apprenticeship/OJT with 12 Credits.</b> Student is eligible for Exit Option-3 with the award of Degree in respeptive major with																							
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
Sem 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0	47		<b>160</b>
20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship <b>C Courses                      H Hours                      Cr Credits                      OOTC Open Online Transdisciplinary</b> <b>IKS# Indian Knowledge Systems - Audit Course</b>																								

### Credit Requirements

- For UG Honours Degree the number of credits required is 160 along with 20 additional credits assigned for Community Service Project (4 credits), Short Term Internship (4 credits) and Semester Internship (12 credits).
- These 160 credits are apportioned as, 84 for Major Courses, 24 for Minor Courses, 12 for Languages, 6 for Multidisciplinary Courses, 28 for Skill Courses, 4 for Open Online Transdisciplinary Courses and 2 for Common Value-Added Courses.
- **The thumb rule for assigning credits is 1 hour of theory per week is equivalent to 1 credit. Similarly, 2 hours of practical per week is equivalent to 1 credit. The credits assigned for Internship/Apprenticeship/OJT are not to be equalized with the hours of work done.**
- A student can acquire a maximum of 40% of credits online

## Major Courses

- Major discipline is the discipline or subject of main focus and the degree will be awarded in that discipline. Students should secure the minimum prescribed number of credits, i.e., 84 (about 50% of total credits) through core courses in the major discipline.
- A student of UG Honours Degree has to study 21 course papers with 84 credits in the chosen major.

## Minor Courses

- Students have to choose a Minor in the second semester. The student can choose a minor cutting across the disciplines or from the allied disciplines.
- A student has to study 6 courses in the chosen minor with 24 credits. The minor courses start from the second semester onwards
- **A student can complete a second minor online from approved sources during the period of study and submit the credits to the institution for inclusion in the Degree certificate.**
- **Minor courses can be studied offline or online or in blended mode.**

## Languages

- Two courses in English Language and two courses in Modern Indian Language are to be completed in the first two semesters.
- Each language course is taught for 4 hours with 3 credits.
- A student can opt for doing the English Language Courses online which are equivalent to IELTS/TOEFL/OET, etc. Or the minimum required scores for qualifying in IELTS/TOEFL/OET can be reckoned for the 6 credits assigned for English Language

## Skill Courses

- Enhancing student employability is the top priority for higher education. Employability is a measure of a student's ability to secure their first job and remain employed throughout their working lives.
- A pool of Skill Enhancement Courses is offered in Semesters I to IV. These Skill Enhancement Courses are contemporary in nature and not major-specific.
- A student has to complete 6 such courses (2 credits each) in Semesters I to IV assigned with 12 credits. Students are offered choices for sAINcting skill enhancement courses of their interest.

- Major subject-specific Skill Enhancement courses with choices are offered in Semester V/VI as two of the four major courses.
- And two Skill Enhancement courses each with choices are offered in Semesters VII and VIII in the concerned major.

Semester	Skill Courses	Title of the course	Course Code	No of credits	No of hours per week
I	<b>A student has to choose any TWO of the following four courses</b>	Entrepreneurship Development	24EPDS11	2	2
		Leadership Skills	24LSSS12	2	2
		Analytical Skills	24ALSS13	2	2
		Communication Skills	24CCSS14	2	2
II	<b>A student has to choose any TWO of the following five courses</b>	Business Writing	24BNSS21	2	2
		Marketing Skills	24MKTS22	2	2
		Investment Planning	24INVS23	2	2
		Stock Market Operations	24SMOS24	2	2
		Digital Literacy	24DTLS25	2	2
III	<b>A student has to choose any ONE of the following four courses</b>	Business Forecasting	24BFCS31	2	2
		Project Management	24PJMS32	2	2
		Information and Communication Technology	24ICTS33	2	2
		Data Analysis	24DTAS34	2	2
IV	<b>A student has to choose any ONE of the following four courses</b>	Cyber Security	24CYSS41	2	2
		Digital Marketing	24DGMS42	2	2
		Tourism Guidance	24TRGS43	2	2
		Design thinking	24DGTS44	2	2

### Multidisciplinary Courses

- In consonance with NEP – 2020 all UG students are required to undergo multidisciplinary courses. These courses are intended to broaden the intellectual experience.
- **Students are not allowed to choose the courses in a major discipline or repeat courses already undergone at the higher secondary level or Intermediate level or 12<sup>th</sup> class as the multidisciplinary course.**

- A student has to complete 3 multidisciplinary courses each carrying 2 credits.
- Students are offered choices for sAINcting multidisciplinary courses of their interest.

Semester	Multidiscipline Course	Title of the course	Course Code	No of Credits	No of Hours per week
I	<b>A student has to choose ONE course from the six courses listed against the semester.</b>	Introduction to Social Work	24ISWD11	2	2
		Principles of Psychology	24POPD12	2	2
		Indian History	24INHD13	2	2
		Principles of Biological Sciences	24PBSD14	2	2
		Principles of Chemical Sciences	24PCSD15	2	2
		Principles of Physical Sciences	24PPSD16	2	2
III	<b>A student has to choose ONE course the six courses listed against the semester.</b>	Introduction to Public Administration	24IPAD31	2	2
		Principles of Management	24POMD32	2	2
		Principles of Accounting	24POAD33	2	2
		Basic electronics	24BELD34	2	2
		Health and Hygiene	24HAHD35	2	2
		Basic Mathematics	24BMTD36	2	2
IV	<b>A student has to choose ONE course from the six courses listed against the semester.</b>	Fundamentals of Economics	24FOED41	2	2
		Indian Philosophy	24IPYD42	2	2
		Performing Arts	24PATD43	2	2
		Introduction to Geography	24IOGD44	2	2
		Basic Statistics	24BSTD45	2	2
		Introduction to Nanotechnology	24ITND46	2	2

### Common Value-Added Courses

- Common Valued Added Course includes Environmental science/education, and shall carry 2 credits.

Semester	Common Value-added Course	Title of the course	Course Code	No of credits	No of hours per week
V		Environmental Education	<b>24ENEV51</b>	2	2

### List of add on/certificate/value added program which are optional and offered outside the curriculum of the programs by the department

S.No	Title of the Value-added course	Course Code	No of credits

### Courses on Indian Knowledge Systems (IKS)

- Courses on IKS are integrated into the curricular framework. The IKS course shall be an Audit Course which is a mandatory course with only a Pass or Fail.
- A student has to complete 2 courses on IKS one in the VII semester and one in the VIII semester.
- Students are offered choices for selecting IKS courses of their interest.

Semester	IKS	Title of the course	No of credits	No of hours per week
VII	IKS 1	IKS 1	0	2
VIII	IKS 2	IKS 2	0	2

### Open Online Transdisciplinary Courses (OOTC)

- Two mandatory Open Online Transdisciplinary Courses, with 2 credits per course, are to be done by the students, one in each of Semesters VII and VIII.
- Students are free to select courses of their interest from any discipline.

Semester	OOTC	Title of the course	No of credits	No of hours per week
VII		OOTC 1	2	2
VIII		OOTC 2	2	2

### **10-month mandatory Internship**

Three internships are mandatory for all students irrespective of the of the Program of study.

#### **A. First internship (April-May after 1st year examinations): Community Service Project**

- To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project.

#### **Learning outcomes:**

- To facilitate an understanding of the issues that confronts the vulnerable/marginalized sections of the society.
- To initiate team processes with the student groups for societal change.
- To provide students an opportunity to familiarize themselves with urban/rural community they live in.
- To enable students to engage in the development of the community.
- To plan activities based on the focused groups.
- To know the ways of transforming society through systematic programme implementation.

#### **B. Second Internship (April-May after 2<sup>nd</sup> year examinations): Apprenticeship / Internship / On-the-job training / In-house Project / Off-site Project**

- To make the students employable, an Apprenticeship / Internship / On the job training / In-house Project / Off-site Project shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years.

#### **Learning outcomes**

- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function towards future .
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the future job.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job following graduation from college.

#### **C. Third internship (5th/6thSemester period):**

During the entire 5th /6th Semester, the student shall undergo

Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work.

### Learning outcomes

- Explore career alternatives prior to graduation.
- Integrate theory and practice.
- Assess interests and abilities in their field of study.
- Learn to appreciate work and its function towards future.
- Develop work habits and attitudes necessary for job success.
- Develop communication, interpersonal and other critical skills in the future job.
- Build a record of work experience.
- Acquire employment contacts leading directly to a full-time job following graduation from college.

### Internal Evaluation

**Internal: External Evaluation is 40:60**

#### The Internal Evaluation Method (CIA)

Mid exam	Type of Assessment	Max Marks
<b>I</b>	<b>Assignment</b>	<b>10M</b>
	<b>Seminar/ Study project/Filed trip/Quiz etc</b>	<b>10M</b>
	<b>NCC/NSS (extra-curricular)</b>	<b>10M</b>
	<b>Exam (Summative)</b>	<b>20M</b>
<b>II</b>	<b>Assignment</b>	<b>10M</b>
	<b>Seminar/ Study project/Filed trip/Quiz etc</b>	<b>10M</b>
	<b>NCC/NSS (extra-curricular)</b>	<b>10M</b>
	<b>Exam (Formative)</b>	<b>20M</b>
<b>Grand total</b>		<b>100M</b>
<b>Total marks Scaled down to 40M</b>		

### Multiple Entry and Exit Options

Operative Details of ME-ME

1st year of Entry 1: **The entry requirement for the 1st year of 4-year Degree (Level – 4.5 of National Credit Framework (NCrF) of UGC) is Intermediate/12th class of CBSE/ or any other equivalent certificate approved by the Board of Intermediate Education.**

Exit 1: A Certificate will be awarded when a student exits at the end of the year 1 (Level 4.5).

Certificate in Sciences is to be awarded, if students exit after successful completion of 1 year of study in B.Sc. However, the students are required to pass all courses, Languages, Multidisciplinary, Skill Enhancement and Core Courses in Major and Minor along with completion of Community Service Project in the summer term.

2nd year:

Entry 2: **The entry requirement for 2nd year of 4-year Degree (Level – 5 of NCrF of UGC) is a Certificate obtained after completing the first two semesters of the**

**undergraduate programme. A student can seek entry into the 2nd year of study in a college, provided there are vacancies in that particular programme in that college. The transfer admission shall be within the intake permitted to the college.**

Exit 2: A Diploma will be awarded when a student exits at the end of the 2nd year (Level 5 of NCrf).

Diploma in Sciences is to be awarded if students exit after successful completion of 2nd year of study in B.Sc. However, the students are required to pass all courses, Languages, Multidisciplinary, Skill Enhancement and Core Courses in Major and Minor along with completion of Community Service Project in the summer term between 1st and 2nd year and short-term internship in the summer term between 2nd and 3rd year.

3rd year:

**Entry 3: The entry requirement for 3rd year of 4-year Degree (Level – 5.5 of NCrf of UGC) is a Diploma obtained after completing two years (4 semesters) of the undergraduate programme. A student can seek entry into the 3rd year of study in a college, provided there are vacancies in that particular programme in that college. The transfer admission shall be within the intake permitted to the college.**

Exit 3: A Degree will be awarded when a student exits at the end of the 3rd year (Level – 5.5 of NCrf). Bachelor's Degree in Sciences B.Sc

is to be awarded if students exit after successful completion of 3rd year of study. However, the students are required to pass all courses, Languages, Multidisciplinary, Skill Enhancement and Core Courses in Major and Minor along with completion of Community Service Project in the summer term between 1st and 2nd year and short-term internship in the summer term between 2nd and 3rd year and a full-semester internship.

The Degree awarded shall include the Major and Minor/s in parenthesis. For Ex., **B.Sc (Artificial Intelligence with Mathematics Minor)**

4th year:

**Entry 4: The entry requirement for 4th year of 4-year Degree (Level – 6 of NCrf of UGC) is a degree obtained after completing three years (6 semesters) of the undergraduate programme. A student can seek entry into the 4th year of study in a college, provided there are vacancies in that particular programme in that college. The transfer admission shall be within the intake permitted to the college.**

Exit 4: A Degree with Honours will be awarded when a student exits at the end of the 3rd year (Level – 6 of NCrf). Bachelor's Degree with Honours in Sciences is to be awarded if students exit after successful completion of 4th year of study.

**The name of the Major/s shall be indicated in parenthesis and the name of the Minor/s. For ex., B.Sc Honours (Artificial Intelligence with Mathematics Minor).**

If the student completes the 4th year with courses in research methodologies and a rigorous research project in one of the major courses of study, a Bachelor degree (Honours with research) is awarded.

#### **Career Opportunities and Graduate Employability**

- Career options and graduate employability are the significant program outcomes and benefits of the 4-year Honours Degree Program. The program equips students

with the necessary knowledge, skills, and experiences to pursue diverse career paths and enhances their potential for successful employment after graduation.

- The 4-year Honours Degree Program provides students with specialized knowledge and expertise in their chosen field of study through advanced coursework and in-depth study.
- Graduates possess a deep understanding of their subject, making them more attractive to employers seeking candidates with specialized knowledge and skills.
- Throughout the program, students develop a range of industry-relevant skills such as critical thinking, problem-solving, data analysis, research, and communication skills.
- Graduates are well-prepared to meet the demands of the job market and can apply their skills effectively in professional settings.
- Honours Degree Program incorporate mandatory internships; hence graduates gain valuable practical experience during their studies, enhancing their employability by demonstrating hands-on skills and industry exposure.
- Honours Degree Program emphasizes critical thinking and adaptability, preparing students for the rapidly changing job market.
- Graduates are equipped to navigate and thrive in dynamic work environments, and they possess a strong foundation for continuous learning and skill development.
- As a result of the specialized knowledge, skills, and experiences gained, graduates are highly sought after by employers. And enjoy enhanced employability and marketability, increasing their chances of securing rewarding job opportunities and career advancement.

#### **Further Education and Postgraduate Studies**

- After completion of the first 3 years of study in the Honours Degree Program, if a student exits, he/she is awarded a Degree and is eligible to pursue a 2-year Postgraduate Program.
- A student getting a UG Honours Degree can do 1-year Postgraduate Program.
- A student awarded with UG Honours Degree with Research is eligible to get direct admission into Ph.D. program provided the student secures 75% and above marks



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Programme Outcome (POs)	
PO 1	<b>Critical Thinking:</b> Ability to take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO 2	<b>Effective Communication:</b> Ability to speak, read, write, and listen clearly in person and through AINctronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media, and technology.
PO 3	<b>Social Interaction:</b> Ability to elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO 4	<b>Effective Citizenship:</b> Ability to demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO 5	<b>Ethics:</b> Ability to recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO 6	<b>Environment and Sustainability:</b> Ability to understand the issues of environmental contexts and sustainable development
PO 7	<b>Employability skills:</b> Equipping graduates with the essential abilities and knowledge to excel in their chosen careers
PO 8	<b>Entrepreneurship skills:</b> Seeks to empower students with the competencies needed to be successful entrepreneurs, enabling them to launch, operate, and innovate in their own businesses or entrepreneurial ventures.
PO 9	<b>Multidisciplinary Knowledge:</b> Multidisciplinary knowledge is crucial for developing graduates who can think critically, innovate, and collaborate effectively. This approach not only enhances the educational experience but also ensures that students are well-prepared to meet the challenges of an increasingly complex and interconnected world.
PO 10	<b>Self-directed and Life-long Learning:</b> Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes



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	Program specific Outcomes (PSOs)
<b>PSO 1</b>	Ability to analyse and apply the knowledge of Artificial Intelligence, Machine Learning in terms of real world problems to meet the challenges of the future.
<b>PSO 2</b>	Ability to develop computational knowledge and project development skills using AI tools and techniques to solve problems in the areas related to Deep Learning, Machine learning, Artificial Intelligence.
<b>PSO 3</b>	Design, develop, test and maintain System and Application software in the area of Artificial Intelligence and Machine Learning for different domains and platforms
<b>PSO 4</b>	Ability to lead a product development company/team and use the acquired knowledge to identify real-world research problems.
<b>PSO 5</b>	Design the algorithms to model the automation systems for modernizing contemporary societal, Industrial, organizational and public welfare needs with rational insight.



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### Courses mapped with Employability skills/Cross cutting issues

Year	Semester	S.No	Title of the Course	Course Code	Employability Skills	Cross Cutting Issues	
I	I	1	Essentials and Applications of Mathematical, Physical and Chemical Sciences	24BSPM11	√	√	
		2	Advances in Mathematical, Physical and Chemical Sciences	24BSPM12	√	√	
	II	3	Python for Data Science	24AINM21	√	√	
			Python for Data Science Lab	24AINM21P	√	√	
		4	Statistical Methods and Probability Distribution	24AINM22	√	√	
			Statistical Data Analysis Using SPSS - I Lab	24AINM22P	√	√	
			Community Service Project	INTERNSHIP001	√	√	
		II	III	5	Document Oriented Database	24AINM31	√
	Document Oriented Database Lab				24AINM31P	√	√
	6			Operating Systems	24AINM32	√	√
Operating Systems Lab				24AINM32P	√	√	
7	Introduction to OOP using JAVA			24AINM33	√	√	
	Introduction to OOP using JAVA Lab			24AINM33P	√	√	
8	Inferential Statistics			24AINM34	√	√	
	Statistical Data Analysis Using SPSS - II Lab			24AINM34P	√	√	
IV	9		Data Warehousing and Data Mining	24AINM41	√	√	
			Data Warehousing and Data Mining Lab	24AINM41P	√	√	

		10	Machine Learning using Python	24AINM42	√	√
			Machine Learning using Python Lab	24AINM42P	√	√
		11	Introduction to AI	24AINM43	√	√
			Introduction to AI Lab	24AINM43P	√	√
			Short Term Internship	INTERNSHIP002	√	√

III	V	12	Introduction to Predictive Analytics using Python	24AINM51	√	√		
			Introduction to Predictive Analytics using Python Lab	24AINM51P	√	√		
		13	Algorithms for Intelligent Systems	24AINM52	√	√		
			Algorithms for Intelligent Systems Lab	24AINM52P	√	√		
		14	Natural Language Processing	24AINM53	√	√		
			Natural Language Processing Lab	24AINM53P	√	√		
		15	Software Project Management	24AINM54	√	√		
			Software Project Management Lab	24AINM54P	√	√		
			VI		Internship	INTERNSHIP003	√	√
			VII	16	Deep Learning	24AINM71	√	√
					Deep Learning Lab	24AINM71P	√	√
				17	Text Mining	24AINM72	√	√
	Text Mining Lab	24AINM72P			√	√		
	18	Computer Networks		24AINM73	√	√		
		Computer Networks Lab		24AINM73P	√	√		
	<b>SEC</b>							
	19	Mobile Application Development		24AINS74	√	√		
		Mobile Application Development Lab		24AINS74P	√	√		
	20	Big Data Analysis using R		24AINS75	√	√		
		Big Data Analysis using R Lab	24AINS75P	√	√			

	VIII	21	Neural Networks	24AINM81	√	√
			Neural Networks Lab	24AINM81P	√	√
		22	Design Thinking	24AINM82	√	√
			Design Thinking Lab	24AINM82P	√	√
		23	Robotics and Intelligent Systems	24AINM83	√	√
			Robotics and Intelligent Systems Lab	24AINM83P	√	√
		SEC				
		24	Cyber Security Essentials	24AINS84	√	√
			Cyber Security Essentials	24AINS84P	√	√
		25	Big Data Analysis using SPARK	24AINS85	√	√
			Big Data Analysis using SPARK Lab	24AINS85P	√	√



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## Courses Mapped with POs

Title of the Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
Essentials and Applications of Mathematical, Physical and Chemical Sciences	√	√		√		√			√	√
Advances in Mathematical, Physical and Chemical Sciences	√		√	√		√			√	
Python for Data Science	√		√		√			√		
Python for Data Science Lab	√		√		√				√	√
Statistical Methods and Probability Distribution	√		√		√				√	√
Statistical Data Analysis Using SPSS - I Lab	√		√		√				√	√
Community Service Project	√									√
Document Oriented Database	√		√		√				√	√
Document Oriented Database Lab	√		√		√				√	√
Operating Systems	√		√		√				√	√
Operating Systems Lab	√		√		√				√	√
Introduction to OOP using JAVA	√		√		√				√	√

Introduction to OOP using JAVA Lab	√		√		√				√	√
Inferential Statistics	√		√		√				√	√
Statistical Data Analysis Using SPSS - II Lab	√		√		√				√	√
Data Warehousing and Data Mining	√		√							√
Data Warehousing and Data Mining Lab	√		√							√
Machine Learning using Python	√		√							√
Machine Learning using Python Lab	√		√		√				√	√
Introduction to AI	√								√	√
Introduction to AI Lab	√								√	√
Short Term Internship	√								√	√
Introduction to Predictive Analytics using Python	√		√		√				√	√
Introduction to Predictive Analytics using Python Lab	√		√		√				√	√
Algorithms for Intelligent Systems	√		√		√				√	√
Algorithms for Intelligent Systems Lab	√		√		√				√	√
Natural Language Processing	√		√		√				√	√
Natural Language Processing Lab	√		√		√				√	√
Software Project Management	√		√		√				√	√
Software Project Management Lab	√		√		√				√	√

Internship	√								√	√
Deep Learning	√								√	√
Deep Learning Lab	√								√	√
Text Mining	√								√	√
Text Mining Lab	√								√	√
Computer Networks	√								√	√
Computer Networks Lab	√		√							√
Mobile Application Development	√		√							√
Mobile Application Development Lab	√		√							√
Big Data Analysis using R	√		√		√				√	√
Big Data Analysis using R Lab	√		√		√				√	√
Neural Networks	√		√		√				√	√
Neural Networks Lab	√				√				√	√
Design Thinking	√				√				√	√
Design Thinking Lab	√		√		√				√	√
Robotics and Intelligent Systems	√		√						√	√
Robotics and Intelligent Systems Lab	√		√						√	√
Cyber Security Essentials	√		√						√	√
Cyber Security Essentials	√		√		√				√	√
Big Data Analysis using SPARK	√		√		√				√	√
Big Data Analysis using SPARK Lab	√		√		√				√	√



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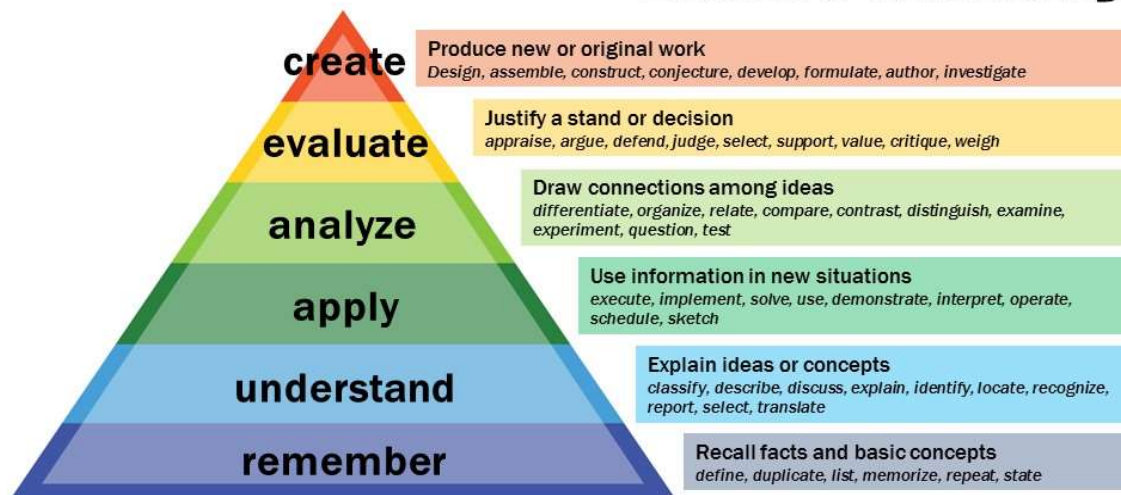
## List of new courses introduced

S.No	Title of the course	Course code	Year of introduction
1	Statistical Methods and Probability Distribution	24AINM22	2024-25
2	Statistical Data Analysis Using SPSS - I Lab	24AINM22P	2024-25

## Levels of Bloom's Taxonomy

Level-1	Knowledge/Remember
Level-2	Understand
Level-3	Application
Level-4	Analyze
Level-5	Evaluation
Level-6	Create

## Bloom's Taxonomy



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**Programme: B.Sc. Honours in Artificial Intelligence (Major) 2024-2025**

### SEMESTER-I

**Course Code: 24BSPM11**

**Title : ESSENTIALS AND APPLICATIONS OF MATHEMATICAL,  
PHYSICAL AND CHEMICAL SCIENCES**

**Theory**

**Credits: 4**

**5 hrs/week**

#### **Course Objective:**

- The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences.
- The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

#### **Learning outcomes:**

<b>Course outcomes – Mapping with Blooms Taxonomy levels</b>	
CO1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.	Level-3 , Level-6
CO2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations	Level-1 , Level-2
CO3. To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life	Level-1 , Level-2
CO4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.	Level-1 , Level-2



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CO5. To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.	Level-4, Level-5
---	------------------

CO-PO Mapping	
1-	Low, 2- Moderate, 3- High, ‘-‘ No Correlation

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	-	1	-	-	-	3	1	3	3
CO 2	2	-	2	2	-	2	3	1	3	3
CO 3	2	-	2	2	-	2	3	1	3	3
CO 4	2	1	2	2	-	2	3	1	3	3
CO 5	1	1	3	2	3	2	3	2	3	3

CO-PSO Mapping	
1-	Low, 2- Moderate, 3- High, ‘-‘ No Correlation

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	1	1	2
CO 2	2	1	1	1	2
CO 3	2	2	1	1	1
CO 4	2	2	1	1	1
CO 5	3	3	3	3	3

## SYLLUBUS

### UNIT-I

#### ESSENTIALS OF MATHEMATICS

**Complex Numbers:** Introduction of the new symbol (i) – General form of a complex number – Modulus- Amplitude form and conversions.

**Trigonometric Ratios:** Trigonometric Ratios and their relations – Problems on calculation of angles.

**Vectors:** Definition of vector addition – Cartesian form – Scalar and vector product and problems.



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**Statistical Measures:** Mean, Median, Mode of a data and problems.

**Graphical representation of data.** Bar graphs, histograms of uniform width and of varying widths

## **UNIT- II**

### **ESSENTIALS OF PHYSICS**

Definition and Scope of Physics- Measurements and Units.

Motion of objects: Newtonian mechanics and relativistic mechanics perspective.

Laws of Thermodynamics and Significance. Entropy.

Difference between Acoustic waves and electromagnetic waves and their properties.

Electric and Magnetic fields and their interactions.

Behaviour of atomic and nuclear particles.

Wave-particle duality, the uncertainty principle. Introduction to quantum theory.

Theories and understanding of universe.

## **UNIT -III**

### **ESSENTIALS OF CHEMISTRY**

Definition and Scope of Chemistry- Importance of Chemistry in daily life -

Branches of chemistry and significance- Periodic Table- atomic models.

Electronic Configuration, chemical changes, classification of matter,

Biomolecules- carbohydrates, proteins, fats and vitamins.

## **UNIT IV:**

### **APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY**

**Applications of Mathematics in Physics & Chemistry:** Calculus, Differential Equations & Complex Analysis. Integrations and basic formulas.

**Application of Physics in Industry and Technology:** Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.



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**Application of Chemistry in Industry and Technology:** Chemical Manufacturing, Pharmaceuticals and Drug Discovery, synthesising of Nano-materials, Food and Beverage Industry. Food preservation techniques.

### UNIT-V

#### ESSENTIALS OF COMPUTER SCIENCE

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications. Basic types operating systems.

**Ethical and social implications:** cyber security - Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection.

#### **Recommended books:**

1. Functions of one complex variable by John.B.Conway, Springer-Verlag.
2. Elementary Trigonometry by H.S.Hall and S.R.Knight
3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. Basic Statistics by B.L.Agarwal, New age international Publishers
5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman
6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett Jr.
8. Physics for Technology and Engineering" by John Bird
9. Chemistry in daily life by Kirpal Singh
10. Chemistry of bio molecules by S. P. Bhutan
11. Fundamentals of Computers by V. Raja Raman
12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson



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### **STUDENT ACTIVITIES**

#### **UNIT I: ESSENTIALS OF MATHEMATICS**

##### 1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms.

They will plot the complex numbers on the complex plane and identify their properties

##### 2: Trigonometric Ratios Problem Solving

Give students a set of problems that require the calculation of trigonometric ratios and their relations.

Students will solve the problems using the appropriate trigonometric functions (sine, cosine, tangent, etc.) and trigonometric identities.

##### 3: Vector Operations and Applications

Provide students with a set of vectors in Cartesian form.

Students will perform vector addition and subtraction operations to find the resultant vectors.

They will also calculate the scalar and vector products of given vectors.

##### 4: Statistical Measures and Data Analysis

Give students a dataset containing numerical values.

Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation).

They will interpret the results and analyse the central tendencies and distribution of the data.

#### **UNIT II: ESSENTIALS OF PHYSICS**

1. Concept Mapping: Divide students into groups and assign each group one of the topics. Students will create a concept map illustrating the key concepts, relationships, and applications related to their assigned topic. Encourage students to use visual elements, arrows, and labels to represent connections and interdependencies between concepts.



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- Laboratory Experiment. Select a laboratory experiment related to one of the topics, such as motion of objects or electric and magnetic fields. Provide the necessary materials, instructions, and safety guidelines for conducting the experiment.

Students will work in small groups to carry out the experiment, collect data, and analyse the results.

After the experiment, students will write a lab report summarizing their findings, observations, and conclusions.

### **UNIT III: ESSENTIALS OF CHEMISTRY**

#### 1: Chemistry in Daily Life Presentation

Divide students into groups and assign each group a specific aspect of daily life where chemistry plays a significant role, such as food and nutrition, household products, medicine, or environmental issues.

Students will research and create a presentation (e.g., PowerPoint, poster, or video) that showcases the importance of chemistry in their assigned aspect.

#### 2: Periodic Table Exploration

Provide students with a copy of the periodic table.

Students will explore the periodic table and its significance in organizing elements based on their properties.

They will identify and analyse trends in atomic structure, such as electronic configuration, atomic size, and ionization energy.

3: Chemical Changes and Classification of Matter: Provide students with various substances and chemical reactions, such as mixing acids and bases or observing a combustion reaction. Students will observe and describe the chemical changes that occur, including changes in color, temperature, or the formation of new substances.

4: Biomolecules Investigation: Assign each student or group a specific biomolecule category, such as carbohydrates, proteins, fats, or vitamins. Students will research and gather information about their assigned biomolecule category, including its structure, functions, sources, and



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importance in the human body. They can create informative posters or presentations to present their findings to the class.

### **UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY**

#### 1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.

Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

#### 2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

#### 3: Laboratory Experiments

Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and chemistry.

Examples include investigating the relationship between concentration and reaction rate, analysing the behaviour of electrical circuits, or measuring the properties of materials.

#### 4: Mathematical Modelling

Present students with real-world problems that require mathematical modelling and analysis.

### **UNIT V: ESSENTIALS OF COMPUTER SCIENCE**

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth of
2. Your college network) and prepare a report covering network architecture.



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3. Identify the types of malwares and required firewalls to provide security.
4. Latest Fraud techniques used by hackers.



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**Programme: B.Sc. Honours in Computer Science (Major) 2024-2025**

**SEMESTER-I**

**COURSE Code: 24BPM11**

**Title: ESSENTIALS IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES**

**Model Paper**

**Max Marks: 60**

**Part –A**

**Answer the following multiple choice Questions with suitable choices (20×1=20 M)**

- Analyzing rates of change in related quantities
  - modeling population growth
  - solving related rates problems
  - Heat conduction in a rod
  - finding maximum or minimum of a function
- in a right-angled triangle, the tangent of an angle is equal to
  - opposite/hypotenuse
  - adjacent/hypotenuse
  - opposite/adjacent
  - hypotenuse/opposite
- Newton's first law of motion states that an object will remain at rest or in uniform motion unless acted upon by a.
  - force
  - velocity
  - mass
  - acceleration
- Which law of thermodynamics states that energy cannot be created or destroyed, only transferred or converted from one form to another?
  - zeroth law
  - first law
  - second law
  - third law
- what type of wave is an acoustic wave?
  - Longitudinal wave
  - transverse wave
  - electromagnetic wave
  - standing wave
- what is the primary function of a semiconductor in electronic devices?
  - to amplify signals
  - to store data
  - to generate power
  - to control mechanical systems
- basic principle of optical fiber?
  - Absorbing
  - refraction
  - total internal reflection
  - interference
- In the context of integrated circuits what does CMOS stand for?
  - current mode operational systems
  - circuit miniaturization and optimization systems
  - complementary metal-oxide semiconductor
  - continuous modulation of signals
- what is the definition of chemistry?
  - the study of living organisms
  - the study of matter and its properties



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- c) the study of celestial bodies      d) the study of historical events
10. which household item contains acetic acid ?  
a) baking soda    b) vinegar    c) salt    d) lemon juice
11. what is the general formula of a carbohydrate ?  
a)  $C_nH_{2n+2}$     b)  $C_nH_{2n}$     c)  $C_nH_{2n-2}$     d)  $C_nH_{2n}$
12. what is the conjugate of the complex number  $3+4i$ ?  
a)  $3-4i$     b)  $-3+4i$     c)  $-3-4i$     d)  $3-i$
13. Describing the charging or discharging of a capacitor  
a) modeling population growth    b) heat conduction in a rod  
c) solving related rates problems    d) RC circuit analysis
14. if  $\sin(\theta) = 3/5$ , what is the value of  $\cos(\theta)$  in the same triangle?  
a)  $3/5$     b)  $5/2$     c)  $2/5$     d)  $5/4$
15. for the set of data  $\{4, 8, 2, 6, 2, 10\}$ , what is the mean ?  
a) 5      b) 6      c) 5.2      d) 8
16. which of the following is a fibrous protein found in hair and nails  
a) insulin    b) collagen    c) hemoglobin    d) myoglobin
17. what is the primary purpose of quenching in material science /  
a) increase hardness    b) improve ductility    c) enhance conductivity    d) reduce density
18. who built the first digital computer?  
a) William Babbage    b) Charles Babbage    c) Blaise Pascal    d) Gottfried von Leibniz
19. Which is called as global collection of computer networks?  
a) internet    b) TCP    c) Router    d) FTP
20. M-commerce is an acronym for ?  
a) MAN commerce    b) mobile commerce    c) monthly commerce    d) memo commerce

### PART-B

21. The \_\_\_\_\_ of a complex number  $a+bi$  is a
22. The rate of change in displacement is \_\_\_\_\_
23. Avogadro's number represents the number \_\_\_\_\_ in one mole of a substance.
24. The process of converting unsaturated fats into saturated fats by adding hydrogen is called \_\_\_\_\_
25. Calculate the number of moles in 25 grams of water ( $H_2O$ ).
26. In \_\_\_\_\_ was the hallmark of third generation of computers
27. \_\_\_\_\_ invented Mechanical calculating Machine
28. Expand DARPA \_\_\_\_\_



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29. An electric current flowing through a conductor creates a \_\_\_\_\_

30. The wavelength ( $\mu$ ) of a particle is inversely proportional to its \_\_\_\_\_

### PART-C

Write Very Short Answers for the following Questions (10×1=10 M)

31. Explain the concept of entropy in the context of the Second Law of Thermodynamics, choulie 201

32. Define Molality (m).

33. Name a fat-soluble vitamin

34. Name a table sugar.

35. Define the imaginary unit i.

36. What is the dot product of vectors  $p=2+3j-k$  and  $q=-i-2j-3k$ ?

37. How does the integration of artificial intelligence impact the electronics industry?

38. What is a Software Program that Attaches itself to other software programs

39. E-Mail, E-Commerce, Chatting, and Newsgroup are Applications of?

40. What is the Relative High Speed of LAN?

### PART-D

Match the following Group-A with Most suitable words Group-B (10×1=10 M)

- |                         |         |   |
|-------------------------|---------|---|
| 41. Proton              | [     ] | A) the real transfer takes place          |
| 42. Ohm's Lan           | [     ] | B) intense service provider               |
| 43. Ghycogen            | [     ] | C) Electrical. Conductivity               |
| 44. ISP                 | [     ] | D). Vacunam Tubes                         |
| 45 First Generation     | [     ] | E). Mixture of gases                      |
| 46. Homogeneous mixture | [     ] | F) Glucose                                |
| 47. a.b                 | [     ] | G) Middle value:                          |
| 48. Median              | [     ] | H) Dot product                            |
| 49. a+ bi               | [     ] | i). Positively charged subatomic particle |
| 50. Adiabatic Process   | [     ] | J). Complex number                        |

### PART-E

State the below statements are True(or)False. v(10×1=10 M)

51 The mode is always a measure of central tendency.

52. According to Newton's Second Law, the acceleration of an object is inversely proportional to the net force acting on it.

53. Fiber optic cables are not affected by electromagnetic interference



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54. The production of soap involves a chemical process Known as saponification
55. In the food industry, the Millard reactions responsible for the browning of bread crust and the development of flavors in roasted coffee.
56. ARTEL 85% MTNL and RELIANCE are examples of Networks
57. LAN stands Local Area Network
58. The internet is not a global collection of computer networks
59. The tangent of an angle is equal to the cotangent of its complementary angle.
60. The product of two imaginary units is a real number



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**Programme: B.Sc. Honours in Artificial Intelligence (Major) 2024-2025**

### SEMESTER-I

**Course Code: 24BPM12**

**Title: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES**

Hours: 5 hrs/week

Credits: 4

#### Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Course outcomes – Mapping with Blooms Taxonomy levels	
CO1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.	Level-3 , Level-6
CO2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.	Level-1 , Level-2
CO3. Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.	Level-1 , Level-2
CO4. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nanosensors. Explore the effects of chemical pollutants on ecosystems and human health.	Level-1 , Level-2



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CO5. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used

Level-4,  
Level-5

### CO-PO Mapping

1-Low, 2- Moderate, 3- High, '-' No Correlation

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10
CO 1	2	-	1	-	-	-	3	1	3	2
CO 2	2	-	2	2	-	2	3	1	3	2
CO 3	2	-	2	2	-	2	3	1	3	1
CO 4	2	1	2	2	-	2	3	1	3	3
CO 5	1	1	3	2	3	2	3	2	3	2

### CO-PSO Mapping

1-Low, 2- Moderate, 3- High, '-' No Correlation

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	2	2	2	2
CO 2	2	2	1	1	1
CO 3	2	2	1	1	2
CO 4	2	2	1	1	2
CO 5	3	3	3	3	3

## SYLLUBUS

### UNIT I: ADVANCES IN BASICS MATHEMATICS 9hrs

Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function – Problems on product rule and quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration



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Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose of a matrix and determinants

### **UNIT II: ADVANCES IN PHYSICS: 9hrs**

Renewable energy: Generation, energy storage, and energy-efficient materials and devices. Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

### **UNIT III: ADVANCES IN CHEMISTRY: 9hrs**

Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method.

### **UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs**

Mathematical Modelling applications in physics and chemistry Application of Renewable energy: Grid Integration and Smart Grids, Application of nanotechnology: Nanomedicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,

Application of medical physics: Radiation Therapy, Nuclear medicine

Solid waste management, Environmental remediation- Green Technology, Water treatment.

### **UNIT V: Advanced Applications of computer Science 9hrs**

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

### **Recommended books:**



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1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
  
6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by Bahrouz Forouzan.

### STUDENT ACTIVITIES

#### UNIT I: ADVANCES IN BASIC MATHEMATICS

##### 1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in different forms, such as slope-intercept form, point-slope form, or general form.

Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

##### 2: Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications, such as analyzing rates of change or optimizing functions.



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### **3: Integration Exploration**

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or integration by parts.

Students can discuss the significance of integration in various fields, such as physics and chemistry

### **4: Matrices Manipulation**

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

Students can apply their knowledge of matrices to real-world applications, such as solving systems of equations or representing transformations in geometry.

## **UNIT II: ADVANCES IN PHYSICS:**

### **1: Case Studies**

Provide students with real-world case studies related to renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

Students will analyze the case studies, identify the challenges or problems presented, and propose innovative solutions based on the recent advances in the respective field.

They will consider factors such as energy generation, energy storage, efficiency, sustainability, materials design, biomedical applications, or technological advancements.

### **2: Experimental Design**

Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.



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They will identify a specific research question or problem to investigate and design an experiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions based on their findings.

They will discuss the implications of their experimental results in the context of recent advances in the field.

### **3: Group Discussion and Debate**

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials.

Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key points and arguments to support their positions.

## **UNIT III: ADVANCES IN CHEMISTRY:**

### **Experimental Design and Simulation**

In small groups, students will design experiments or simulations related to the assigned topic.

For example, in the context of computer-aided drug design, students could design a virtual screening experiment to identify potential drug candidates for a specific disease target.

For nano sensors, students could design an experiment to demonstrate the sensitivity and selectivity of nano sensors in detecting specific analytes.

Chemical biology-related activities could involve designing experiments to study enzyme- substrate interactions or molecular interactions in biological systems.

Students will perform their experiments or simulations, collect data, analyze the results, and draw conclusions based on their findings.

Case Studies and Discussion



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Provide students with real-world case studies related to the impact of chemical pollutants on ecosystems and human health.

Students will analyze the case studies, identify the sources and effects of chemical pollutants, and propose mitigation strategies to minimize their impact.

Encourage discussions on the ethical and environmental considerations when dealing with chemical pollutants.

For the dye removal using the catalysis method, students can explore case studies where catalytic processes are used to degrade or remove dyes from wastewater.

Students will discuss the principles of catalysis, the advantages and limitations of the catalysis method, and its applications in environmental remediation.

### **3: Group Project**

Assign students to work in groups to develop a project related to one of the topics.

The project could involve designing a computer-aided drug delivery system, developing a nano sensor for a specific application, or proposing strategies to mitigate the impact of chemical pollutants on ecosystems.

Students will develop a detailed project plan, conduct experiments or simulations, analyze data, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

## **UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY**

### **1: Mathematical Modelling Experiment**

Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can



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develop a mathematical model to optimize the placement and configuration of solar panels in a solar farm.

Students will work in teams to design and conduct the experiment, collect data, and analyze the results using mathematical models and statistical techniques.

They will discuss the accuracy and limitations of their model, propose improvements, and

interpret the implications of their findings in the context of renewable energy or the specific application area.

### **2: Case Studies and Group Discussions**

Assign students to analyze case studies related to the applications of mathematical modelling in nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.

Encourage group discussions on the challenges, ethical considerations, and potential advancements in the field.

Students will present their findings and engage in critical discussions on the advantages and limitations of mathematical modelling in solving complex problems in these areas.

### **Group Project**

Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize waste management practices.



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Students will plan and execute their project, apply mathematical modelling techniques, analyze the results, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

### **UNIT V: Advanced Applications of computer Science**

Students must be able to convert numbers from other number system to binary number systems

Identify the networking media used for your college network

Identify all the networking devices used in your college premises.



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**Programme: B.Sc. Honours in Computer Science (Major) 2024-2025**

**SEMESTER-I**

**COURSE Code: 24BPM12**

**Title : ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES**

**Model Paper**

**Max Marks: 60**

**SECTION-A**

**(MULTIPLE CHOICE QUESTIONS)**

1. Two lines with slopes  $m_1$  &  $m_2$  are perpendicular to each other if [ ]  
A.  $m_1 = m_2$  B.  $m_1 + m_2 = 1$   
C.  $m_1 m_2 = 1$  D.  $m_1 m_2 = -1$
2.  $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4} =$  [ ]  
A. 2 B. 4 C. 8 D. undefined
3. What is the standard form of LNG? [ ]  
A. Liquefied Natural Gas B. Liquefied Nuclear Gas  
C. Liquefied Natural or Nuclear Gas D. None of the above
4. Which one of the following damages the ozone layer? [ ]  
A. CFCs B. Aerosols C. Freons D. All of the above
5. In which era CADD molecular biology started? [ ]  
A. 1890 B. 1795  
C. 1980 D. 1675
6. In which year the GIT developed the first nanosensor? [ ]  
A. 1888 B. 1988 C. 1788 D. 1999
7. Which mathematical concept is the basis for error-correcting codes used in Computer Science? [ ]  
A. Group theory B. Probability theory  
C. Game theory D. Differential Equations



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8. In which one of the following nanomaterials quantum confinement occurs in two directions? [ ]
- A. One dimensional  
B. Two dimensional  
C. Three dimensional  
D. Zero dimensional
9. Which of the following number system is known as base-10 system. [ ]
- A. Binary Number System  
B. Hexadecimal Number System  
C. Octal Number System  
D. Decimal Number System
10. Which one of the following network devices stores the IP addresses? [ ]
- A. Router  
B. Switch  
C. Both A and B  
D. None of the above
11. In what ratio the x-axis divide the line segment joining the points (2,-3) and (5,6) [ ]
- A. 1:2  
B. 2:1  
C. 1:3  
D. None of these
12. If the matrices  $\begin{bmatrix} 3x + 7 & 5 \\ y + 1 & 2 - 3x \end{bmatrix} = \begin{bmatrix} 5 & y - 2 \\ 8 & 4 \end{bmatrix}$  then the values of x and y are [ ]
- A.  $x = -1/3, y = 7$   
B.  $x = -1/3, y = -2/3$   
C.  $x = -2/3, y = 7$   
D.  $x = 5, y = -2/3$
13. The measurement range of small angle X-ray scattering is around \_\_\_\_\_ meters? [ ]
- A. 5 nm  
B. 5-500 m  
C. 20 m  
D. 12 mm
14. The carbon nanotubes, graphene, and fullerenes are the \_\_\_\_\_ based nanoparticles? [ ]
- A. Organic  
B. Inorganic  
C. Carbon based  
D. None of the above
15. Expand QSARs [ ]
- A. Quantitative structure activity relationship  
B. Quality strong applicable relationship  
C. Quality strengthen affordable ratio  
D. Quantitative sorted affinity refund



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16. In which drug design structure of the target protein is known? [ ]
- A. SBDD  
B. CBDD  
C. QSAR  
D. GIT
17. Which of the tool is used to find favorable bioactive compounds? [ ]
- A. Virtual screening  
B. QSAR  
C. CADD  
D. None of the above
18. What is the primary focus of Biophysics? [ ]
- A. The study of living organisms' behavior  
B. The study of the physical properties of living organisms  
C. The study of the chemical reactions in living organisms  
D. The study of the genetics of living organisms
19. Binary equivalent of decimal number 65 is [ ]
- A. 1000001  
B. 1000000  
C. 1000011  
D. 100001
20. What is the name for converting digital signal to analog signal? [ ]
- A. Modulation  
B. Demodulation  
C. Bypass  
D. Encapsulation
21. If  $y = \log(\tan x)$ , then  $dy/dx$  is [ ]
- a)  $\frac{1}{\tan x}$  b)  $\frac{\sec^2 x}{\tan x}$  c)  $-\sec^2 x$  d) 0
22.  $\lim_{x \rightarrow 1} \frac{x^{15} - 1}{x^{10} - 1} =$  [ ]
- A. 3/2 B. 5/2 C. 1/2 D. 7/2
23. How does Biophysics contribute to the field of neuroscience? [ ]
- A. By studying the social behavior of organisms  
B. By developing new brain imaging techniques  
C. By analyzing the genetic basis of neurological disorders  
D. By studying the electrical signaling in neurons
24. The forces acting on a runner near the end of a race are [ ]
- A. Weight  
B. friction  
C. Air resistance  
D. all the above.



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**SECTION-B  
(FILL IN THE BLANKS)**

25.  $\int 10^{5x} dx =$
26. The line which cuts off equal intercepts from the axes and pass through the point (1, -2) is \_\_\_\_\_
27. Standard form of CNT is -----++
28. The ratio of the surface of the collector receiving light divided by the total surface of the collector is known as \_\_\_\_\_
29. Full form of CADD \_\_\_\_\_
30. \_\_\_\_\_ developed the first nanosensor.
31. \_\_\_\_\_ chemical cause cancer and heart disease as well as infertility in human being.
32. Radiosotope used for estimation of plasma volume is \_\_\_\_\_

**SECTION-C  
(VERY SHORT ANSWERS)**

33. Find the equation of the straight line cutting off an intercept 3 from the negative direction of the y-axis and inclined at  $60^\circ$  to the axis of x
34. Evaluate  $\int e^x(1 + x^2)dx$
35. what is Quantum Key distribution
36. How does Biophysics contribute to the field of medical imaging?
37. What is chemical biology ?
38. State chemical pollution ?
39. If  $x = -9$  is a root of  $\begin{vmatrix} x & 37 \\ 2x & 2 \\ 7 & 6x \end{vmatrix} = 0$  , , then find the other roots?
40. What is the standard form of NOMFET?



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### SECTION-D (MATCH THE FOLLOWING)

- |   |                                    |
|---|------------------------------------|
| 41. Intercept form of a straight-line in all directions                 | A) Quantum Confinement             |
| 42. Mathematical modeling for rate of chemical reaction and spinal cord | B) Brain                           |
| 43. Zeo dimension   | C) Network Device                  |
| 44. Central Nervous system  | D) Dye removal                     |
| 45. LBDD  | E) Arrhenius Equation              |
| 66. Molecular docking methods Web Page                                  | F) The Address of The              |
| 47. Nano sensors  | G) $\frac{x}{a} + \frac{y}{b} = 1$ |
| 48. $\int \frac{f'(x)}{f(x)} dx =$                                      | H) affinity and virtual screening  |
| 49. HUB design  | I) ligand based drug               |
| 50. URL   | J) $\log  f(x)  + C$               |
|   | K) $y = mx + c$                    |
|   | L) $e^{f(x)}$                      |

### SECTION-E (TRUE/FALSE)

51. If  $\theta$  is the angle between two lines with slopes  $m_1$  and  $m_2$ , then  $\tan \theta = \frac{m_1 + m_2}{1 + m_1 m_2}$  [ ]
52. If  $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ , then  $(A + B)^2 \neq A^2 + B^2$  [ ]
53. At memory Transfer temperature a shape memory alloy return to its original shape [ ]
54. Radiation kills fast-growing cells in the area of treatment [ ]
55. Carbon nanotubes, quantum dots, etc are examples of nano sensors [ ]



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56. Bisphenol A (BPA) is an extremely harmful chemical. [ ]
57. Mining, agriculture and waste disposal doesn't cause any pollution [ ]
58. The high temperature phase in shape memory effect is Martensite [ ]
59. A hub connects two different LANs. [ ]
60. The computer network that began the internet was called ARPAN [ ]



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## SEMESTER-II

Course Code: 24AINM21

Course Title: PYTHON FOR DATA SCIENCE

Theory

Credits: 3

3 hrs/week

### Course Objective:

The objective of this course is to study main elements of python programming and perform dataanalysis using data structures and tools in python.

### Course Outcomes:

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	To Understand Features and basic concepts of python.	Level 1, Level 2
CO2	To learn control structures in python and apply them to real world problems.	Level 1, Level 2, Level 3
CO3	To implement functions and modules in python.	Level 2, Level 3
CO4	To understand data structures in python. oops concepts	Level 2, Level 3
CO5	To construct data and perform data analysis.	Level 2, Level 3, Level 4

### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2



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<b>CO – PSO Mapping</b>	
<b>1-Low, 2-Moderate, 3-High, 0- No Correlation</b>	

	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	2	1	2	2	1
<b>CO2</b>	3	3	2	3	3
<b>CO3</b>	3	2	1	2	2
<b>CO4</b>	2	2	2	3	3
<b>CO5</b>	3	2	2	2	3

## UNIT-1: Basics of Python

Features of python, literal constants-numbers, variables, identifiers, data types, input operation, comments, operators, operations on strings, other data types, type conversion.

Selection or conditional branching statements-if, if else , nested if, if elif else, loops or iterativestatemnts-while, for, nested loops, break, continue, pass, else statement with loops.

## UNIT-2: Functions and Modules

**Functions**-Definition and call, return statements, anonymous function-LAMBDA, recursive functions. **Modules**-Using existing modules, making own modules, packages in python, Names of standard library modules.

## UNIT-3: Data Structures

**List**-Accessing lists, updating lists, nested lists, basic list operations, list methods, loops in lists. **Tuples**-Creation, Accessing, updating, deletion in tuples and basic tuple operations. **Sets**-creation, set operations. **Dictionaries** - creation, accessing, adding and modifying items, deleting items.



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### **UNIT-4: Object Oriented Programming concepts**

**OOPs concept-** Introduction, Classes and Objects, Class method Inheritance  
Introduction Inheriting classes in python Types of Inheritance, Error and Exception Handling.

### **UNIT-5: Data Analysis**

**Data preparation using pandas and series:** pandas data frame basics,  
Creating your own data, Series, Data frames, Making changes to series and data frames

**Plotting:** Matplotlib Introduction, Univariate plots-Histograms

#### **Text Books:**

1. **Python Programming Using Problem Solving Approach** –Reema Thareja , OxfordUniversity Press, ©2017
2. **Pandas for Everyone (Python data Analysis)**-Daniel Y.Chen, Pearson Addison WesleyData and Analytics series,©2018.

#### **Recommended Co – Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shallencourage self/independent and group learning)

##### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))



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### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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### **SEMESTER-II**

**Course Code: 24AINM21P**

**Course Title: PYTHON FOR DATA SCIENCE LAB**

Practical

Credits: 1

2 hrs/week

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#### **Experiments List**

1. Write a program to read and print values of variables of different data types.
2. Write a program to find the roots of quadratic equations.
3. Write a program to find the largest of 3 numbers.
4. Write a program to check whether a given number is prime or not.
5. Write a program to generate Fibonacci series.
6. Write a program to find whether a given number is Armstrong or not.
7. Write a program using functions to swap two numbers.
8. Write a program to find factorial of a number using recursion .
9. Write a program to find square root of a given number using math module.
10. Write a program to generate 10 random numbers between 1 to 100 using random module.
11. Create a list and perform different operations on it.
12. Create a tuple and perform different operations on it.
13. Create a set and perform different operations on it.
14. Create a dictionary and perform different operations on it.
15. Import pandas and create a dataframe and perform operations on it.
16. Generate histogram using Matplotlib.
17. Generate scatter plot using Matplotlib.
18. Generate box plot using Matplotlib.



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**SEMESTER END EXAMINATIONS MODEL PAPER**  
**SEMESTER- II**  
**Programme : B.Sc(Artificial Intelligence) – Honours**  
**Course title: PYTHON FOR DATA SCIENCE**

**Course code: 24AINM21**

**Time: 3 hours**

**Maximum Marks: 60**

**PART- A**

Answer any **five** of the following questions.

Each question carries **Four** marks.

5 X 4 = 20 Marks

1. List out some of the features of Python.
2. Write the rules for choosing names of variables.
3. Explain about the decision making statements in python?
4. Explain about recursive functions.
5. Differentiate between list and tuple.
6. Describe about exceptions in python
7. Differentiate between Series and DataFrame.
8. Draw the histogram in python using matplotlib.

**PART- B**

Answer **all the following** questions.

Each carries **Eight** marks

5 X 8 = 40 Marks

9 (a) Explain various operators in Python.

(OR)

(b) Illustrate the different types of control flow statements available in Python.

10 (a) Explain about functions in Python.

(OR)

(b) Describe about modules in Python.

11 (a) Explain various methods of list data structure in Python.

(OR)

(b) Explain about dictionaries.

12 (a) Define Inheritance. Explain various types of inheritance.

(OR)

(b) Write a Python program to illustrate classes and objects

13 (a) Describe various operations performed on data frames

Or

(b) Explain about Univariate plots

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### **Question Bank**

#### **Unit-I**

1. Explain the features of python
2. Explain various operators in Python.
3. Illustrate the different types of control flow statements available in Python.
4. Describe various iterative statements in python.
5. Discus about type conversion

#### **Unit-II**

1. Explain about functions in Python.
2. Write a python program to illustrate recursive function.
3. Describe about modules in Python
4. Explain packages in Python.
5. Describe different standard library modules in python.

#### **Unit-III**

1. Define List. How to access and update the elements of list?
2. Describe different list operations.
3. Explain various methods of list data structure in Python.
4. Explain about dictionaries.
5. Define tuple. How to access and update the elements of tuple?
6. Differentiate between list and tuple.

#### **Unit-IV**

1. Define Inheritance. Explain various types of inheritance.
2. Write a Python program to illustrate classes and objects
3. Explain about Exception Handling in python
4. Describe various Object Oriented Programming concepts.

#### **Unit-V**

1. Describe various operations performed on data frames.
2. Explain about Univariate plots.
3. Explain about histograms.



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### SEMESTER-II

Course Code: 24AINM22

Course Title: STATISTICAL METHODS AND PROBABILITY DISTRIBUTION

Theory

Credits: 3

3 hrs/week

**Course Objective:** The purpose is to familiarise the students about the basic concepts required for artificial intelligence and Machine learning.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	know about correlation and regression techniques, the two very powerful tools in statistics	Level 1 , Level 2, Level 3
CO2	Study concept of coefficient of determination and inference on partial and multiple correlation and regression coefficients.	Level 1 , Level 2, Level 3
CO3	knowledge of important discrete distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper geometric and their interrelations if any,	Level 1 , Level 2, Level 3, Level 4
CO4	knowledge of important continuous distributions such as Uniform, Normal, Exponential and Gamma and relations with some other distributions,	Level 1 , Level 2, Level 3, Level 4
CO5	basic knowledge of complete enumeration and sample, sampling frame, sampling distribution, sampling and non-sampling errors, principal steps in sample surveys, limitations of sampling etc.	Level 1 , Level 2, Level 3, Level 4



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## CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

## CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### Unit I

#### Correlation Analysis

Meaning Measures of Correlation- Scatter diagram, Karl Pearson's and Spearman's rank correlation. Calculation of the correlation coefficient for bi-variate frequency distribution  
Multiple and Partial correlation( 3 variables only)

### Unit II

#### Curve fitting and Regression Analysis:

Principle of least squares, fitting of straight line, second degree polynomial or parabola, power and exponential curves.

**Regression:** Introduction, Linear Regression- Regression coefficients and its properties, Angle between two lines of regression. Standard error of estimate (residual variance),



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Explained and Unexplained variation, coefficient of determination. Multiple Linear Regression(3 variables only)

### **Unit III**

#### **Discrete Probability Distributions:**

Uniform, Bernoulli, Binomial, Poisson, distributions along with their characteristic properties, applications and limiting/approximation cases.

### **Unit IV**

**Continuous probability distributions:** Normal, Exponential, Uniform, distributions along with their characteristic properties, applications and limiting/approximation cases.

### **Unit V**

**Basic concepts:** population and sample, census and sample survey, sampling frame, sampling distribution, standard error, sampling design, sampling and non-sampling errors, sample surveys, principles of sample survey, principal steps in sample survey, limitations of sampling, Sample survey versus complete enumeration survey. Types of sampling - Simple random sampling, stratified sampling, systematic sampling, and cluster sampling (only concept)

**Note: without proofs of named theorems and more importance to applications.**

**Text Book( Unit I to IV):** Fundamentals of Mathematical Statistics, 12th Edition, 10th September 2020, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, New Delhi.

**Text Book( Unit V) :** Fundamentals of Applied Statistics, 4th Edition, 1st January 2014,(ISBN-10 : 8180547051)S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, New Delhi.

#### **Recommended References books:**

1. Mathematical Statistics with Applications, 2009, K.M.Ramachandran and Chris P.Tsokos Academic Press(Elsevier), Haryana .
2. Probability and Statistics, Volume I, D.Biswas, New central book Agency (P) Ltd, New Delhi.
3. An outline of Statistical theory, Volume Two, 3rd Edition, 2010 (with corrections) A.M.Goon, M.K. Gupta, B.Dasgupta, The World Press Pvt.Ltd., Kolakota.
4. Sanjay Arora and Bansilal.: New Mathematical Statistics, SatyaPrakashan, New Delhi.



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**Websites of Interest: <http://onlinestatbook.com/rvls/index.html> Co-Curricular Activities in the class:**

1. Pictionary
2. Case Studies on topics in field of statistics
3. Snap test and Open Book test
4. Architectural – To be build the procedures
5. Extempore – Random concept to students
6. Interactive Sessions
7. Teaching through real world examples

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### SEMESTER-II

Course Code: 24AINM22P

Course Title: STATISTICAL METHODS AND PROBABILITY DISTRIBUTION Lab

Practical

Credits: 1

2 hrs/week

#### List of experiments using SPSS

1. Diagrams & Graphs- Bar, Pie , Histogram, frequency polygon, and Ogive curves
2. Computation of measures of central tendency- Arithmetic Mean, Geometric mean and Harmonic Mean – Grouped Data.
3. Computation of measures of central tendency- Median, Mode and Partition Values - Grouped Data.
4. Computation of measures of Dispersion – Quartile Deviation, Mean Deviation, Standard Deviation, Variance and Coefficient of Variation – Grouped Data.
5. Computation of non-central, central moments,  $\beta_1$  and  $\beta_2$  and Sheppard's corrections for grouped data.
6. Computation of Karl Pearson's coefficients, Bowley's coefficients of Skewness and coefficients of Skewness based on moments – Grouped Data
7. Computation of correlation coefficient and regression lines for (i) ungrouped data (ii) grouped bivariate data
8. Construction regression line equations for (i) ungrouped data (ii) grouped bi-variate data.

**Note: Training shall be in SPSS and derive the results. The SPSS output shall be exported to MS word for writing inference.**

**Reference Manual:** Practical Manual -Prepared by the Department Faculty Members

**Websites of Interest:** <http://www.statsci.org/datasets.html>

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**SEMESTER END EXAMINATIONS MODEL PAPER  
SEMESTER- II**

**Programme : B.Sc(Artificial Intelligence) – Honours**

**Course title: STATISTICAL METHODS AND  
PROBABILITY DISTRIBUTION**

**Course code: 24AINM22**

**Time: 3 hours**

**Maximum Marks: 60**

**PART- A**

Answer any **five** of the following questions.

Each question carries **Four** marks.

5 X 4 = 20 Marks

1. Define Spearman's rank correlation coefficient
2. Fit a straight line to the following data.

X	0	5	10	15	20	25	30
Y	10	14	19	25	31	36	39

3. Describe angle between two lines of regression
4. Explain the properties of Bernouli distribution.
5. Describe applications of Binomial distribution.
6. Find the area under the normal curve for  $z=1.54$ .
7. Describe sample surveys
8. Explain the limitations of sampling

**PART- B**

Answer **all the following** questions.

Each carries **Eight** marks

5 X 8 = 40 Marks

**9 (A)** Calculate Karl Pearson's coefficient of correlation from the following data

X	100	200	300	400	500	600	700
Y	30	50	60	80	100	110	130

(OR)



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(B) The ranks of the same 15 students in two subjects A and B are given below

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subject A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subject B	10	7	2	6	4	8	3	1	11	15	9	5	14	12	13

Calculate Spearman's rank correlation coefficient

10 (A) Fit an exponential curve of the form  $y = ab^x$  to the following data.

X	1	2	3	4	5	6	7	8
Y	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

(OR)

(B) From the following data obtain two regression equations.

X	6	2	10	4	8
Y	9	11	5	8	7

11 (A) The number of defects per unit in a sample of 330 units of manufactured product was found as follows.

No. of defects	0	1	2	3	4
No. of Units	214	92	20	3	1

Fit a Poisson distribution to the data and test for goodness of fit.

(OR)

(B) Define Binomial distribution. Explain its characteristic properties and applications.



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12 (A) Fit a normal curve to the following data by the method of ordinates.

Variable	Frequency
60-62	5
63-65	18
66-68	42
69-71	27
72-74	8

(OR)

(B). Define Exponential distribution. Explain its characteristic properties and applications.

13 (A) Define sample. Explain principal steps in sample survey

(OR)

(B). Explain various types of sampling.

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Programme : B.Sc(Artificial Intelligence) – Honours

Course title: STATISTICAL METHODS AND PROBABILITY  
DISTRIBUTION

Course code: 24AINM22

## Question Bank

### Unit-I

1. Calculate Karl Pearson's coefficient of correlation from the following data

X	100	200	300	400	500	600	700
Y	30	50	60	80	100	110	130

2. The ranks of the same 15 students in two subjects A and B are given below

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subject A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Subject B	10	7	2	6	4	8	3	1	11	15	9	5	14	12	13

Calculate Spearman's rank correlation coefficient

3. Calculate Karl Pearson's coefficient of correlation from the following data.

X	24	27	28	28	29	30	32	33	35	40
Y	18	20	22	25	22	28	30	27	30	22

4. Two ladies were asked to rank 7 different types of lipsticks. The ranks given by them are as follows

Lipsticks	A	B	C	D	E	F	G
Neelu	2	1	4	3	5	7	6
Neena	1	3	2	4	5	6	7

Calculate Spearman's rank correlation coefficient.



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## Unit-II

1. Fit an exponential curve of the form  $y = ab^x$  to the following data.

X	1	2	3	4	5	6	7	8
Y	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

2. From the following data obtain two regression equations.

X	6	2	10	4	8
Y	9	11	5	8	7

3. Explain about multiple linear regression.
4. Fit a parabola  $Y = a + bX + cX^2$  to the following data.

X	1	2	3	4	5	6	7
Y	2.3	5.2	9.7	16.5	29.4	35.5	54.4

## Unit-III

1. The number of defects per unit in a sample of 330 units of manufactured product was found as follows.

No. of defects	0	1	2	3	4
No. of Units	214	92	20	3	1

Fit a Poisson distribution to the data and test for goodness of fit.

2. Define Binomial distribution. Explain its characteristic properties and applications.
3. Define Uniform distribution. Explain its characteristic properties and applications.
4. Define Bernoulli distribution. Explain its characteristic properties and applications.



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### Unit-IV

1. Fit a normal curve to the following data by the method of ordinates.

Variable	Frequency
60-62	5
63-65	18
66-68	42
69-71	27
72-74	8

2. Define Exponential distribution. Explain its characteristic properties and applications.

### Unit-V

1. Define sample. Explain principal steps in sample survey.
2. Explain various types of sampling.
3. Explain the following
  - (i) Population and sample
  - (ii) sampling distribution
  - (iii) sampling and non sampling errors
  - (iv) sampling design.



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## SEMESTER-III

Course Code: 24AINM31

Course Title: DOCUMENT ORIENTED DATABASE

Theory

Credits: 3

3 hrs/week

### Course Objectives:

- To educate student regarding databases and how to manage databases.
- To handle the large amount of data handling demands of business
- To implement a data store that provides high performance, high availability, and automatic scaling
- To Process an immense diversity of data that needs to be stored and processed.
- To make use of features and functionalities to work on NO SQL Data Base Mongo DB

Course Outcome No.	Upon successful completion of this course, student should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Have knowledge about database and DBMS architecture	Level 1, Level 2
CO2	Able to know No SQL databases, various features of Mongo DB, the installation procedure and how to interact with Mongo DB.	Level 1, Level 2, Level 3
CO3	Able to work on Mongo DB's rich query language to support create, read, update and delete (CRUD) operations	Level 1, Level 2, Level 3, Level 4
CO4	Analyses the aggregation framework to perform aggregation operations.	Level 3, Level 4
CO5	Able to work on indexes, types of index, index properties and various indexing strategies to be considered. Indexes are used to improve the query performance.	Level 3, Level 4, Level 5



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## CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

## CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### Unit –I

#### Overview of Database Management Systems:

Introduction, Data and Information, Characteristics of the Database Approach - Self-Describing Nature of the a Database System, Insulation between Programs and Data, Data Abstraction, Support

of Multiple Views of the data , Sharing of Data and multiuser Transaction Processing , Actors on the Scene - Database Administrators , Database Designers , End Users , System Analysts and Application Programmers , Advantages of using a DBMS - Controlling Redundancy



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, Restricting unauthorized Access , Providing Persistent Storage for Program Objects and Data Structures, Permitting Inferencing and Actions Using Rules , Providing Multiple User Interfaces , Representing Complex Relationships Among data , Enforcing Integrity Constraints , Providing Backup and Recovery

, Database System Concepts and Architecture, DBMS Architecture and Data Independence - The Three-Schema Architecture, Data Independence, Database Languages and Interfaces.

### **Unit – II**

Mongo DB Features and Installation, The Need for No SQL Databases, What Are No SQL Databases?

CAP Theorem, BASE Approach, Types of NoSQL Databases, MongoDB Features, Document Database

MongoDB Is Schemaless MongoDB Uses BSON, Rich Query Language, Terms Used in MongoDB, Data Types in MongoDB, Working with Database Commands, Create Database, Drop Database.

### **Unit III**

MongoDB CRUD Operations, Collections, Create a Collection, Create Capped Collections, Create Operations, Insert Documents, Read Operations, Query Documents, Update Operations, Update Documents, Delete Operations, Delete Documents, Working with Arrays.

### **Unit IV**

Data Modelling and Aggregation, Data Models, Embedded Data Models, Normalized Data Models Data Model Relationship Between Documents, Data Model Using an Embedded Document, Data Model Using Document References.

### **Unit V**

Indexes and Working with Indexes, Index Types, Index Properties, Indexing Strategies.

### **Text Book:**

1. “Fundamentals of Database Systems” by R.Elmasri and S.Navathe
2. “Database System Concepts” by Abraham Silberschatz, Henry Korth, and S. Sudarshan, McGrawhill, 2010.
3. MongoDB Recipes: With Data Modeling and Query Building Strategies By Subhashini Chellappan, Dharanitharan Ganesan , Publisher : Apress



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### **Reference Book:**

1. “Database Management Systems” by Raghu Ramakrishnan, McGrawhill, 2002
2. “Principles of Database Systems” by J.D.Ullman
3. MongoDB Basics 1st ed. Edition, by Peter Membrey (Author) Publisher : Apress Web Resources

### **Web Links:**

1. <https://docs.mongodb.com/manual/tutorial/getting-started>
2. <https://www.tutorialspoint.com/mongodb/index.htm>

### **Recommended Co – Curricular Activities:**

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

#### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

1. Programming exercises,
2. Practical assignments and laboratory reports,
3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs from individual and collaborative work.

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### SEMESTER-III

**Course Code: 24AINM31P**

**Course Title: DOCUMENT ORIENTED DATABASE LAB**

Practical

Credits: 1

2 hrs/week

#### **List of Experiments**

1. Installing configuring running of Mongo DB.
2. Working with data base commands in Mongo DB:
3. Working with CRUD operations in Mongo DB.
4. Implementing aggregation operations in Mongo DB.
5. Implementing index operations.
6. Working with create, alter, drop, rename and Truncate tables using MYSQL.
7. Working with insert, update, delete, select statements using MYSQL.
8. Write an MYSQL Program to retrieve the data from two tables using joins.
9. Write a MYSQL program to retrieve and display the names of the top5 students with highest marks in a specified course.
10. Write an MYSQL Program to calculate the average marks of all students and display it along with their name.

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## SEMESTER-III

Course Code: 24AINM32

Course Title: OPERATING SYSTEMS

Theory

Credits: 3

3 hrs/week

### Course Objectives

1. To understand the services provided by and the design of an operating system.
2. To understand what a process is and how processes are synchronized and scheduled.
3. To understand different approaches to memory management.
4. To understand the structure and commands in unix
5. Students should be able to understand shell programming

Course Outcome No.	Upon successful completion of this course, student should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Analyze the services and functions of operating systems	Level 1, Level 2, Level 4
CO2	Analyze the concepts of processes in operating system and illustration of the scheduling of processor for a given problem instance.	Level 1, Level 2, Level 4
CO3	Analyze memory management techniques, concepts of virtual memory	Level 1, Level 2, Level 4
CO4	To understand Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands	Level 1, Level 2
CO5	To understand Shell programming and Simple shell program examples	Level 1, Level 2, Level 3



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<b>CO – PO Mapping</b>										
<b>1-Low, 2-Moderate, 3-High, 0- No Correlation</b>										

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>CO1</b>	2	2	1	1	1	2	3	2	2	1
<b>CO2</b>	3	2	1	1	1	2	3	3	3	2
<b>CO3</b>	3	2	1	1	1	1	3	3	3	2
<b>CO4</b>	3	2	1	1	1	1	2	2	2	1
<b>CO5</b>	3	2	1	1	1	1	3	2	3	2
<b>CO – PSO Mapping</b>										
<b>1-Low, 2-Moderate, 3-High, 0- No Correlation</b>										

	PSO1	PSO2	PSO3	PSO4	PSO5
<b>CO1</b>	2	1	2	2	1
<b>CO2</b>	3	3	2	3	3
<b>CO3</b>	3	2	1	2	2
<b>CO4</b>	2	2	2	3	3
<b>CO5</b>	3	2	2	2	3

### UNIT – I

#### Operating System:

Introduction, Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations. Evolution of Operating Systems ,types of operating system, Simple ,Batch, Multi programmed, time shared, Parallel, Distributed Systems, Real-Time Systems, Operating System services.



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### **UNIT – II**

#### **Process and CPU Scheduling –**

Process concepts The Process, Process State, Process Control Block, Process communication. Threads. Process Scheduling, Scheduling Queues, Schedulers, Context Switch, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Process Synchronization, The Critical section Problem, Semaphores, Classic Problems of Synchronization,

### **UNIT – III**

#### **Memory Management and Virtual Memory –**

Logical & physical Address Space, Swapping, Contiguous Allocation, Paging-Structure of Page Table Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Page Replacement Algorithms.

### **UNIT – IV**

Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands – PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

#### **UNIT – V Shell programming:**

Ordinary and environment variables. The profile. Read and read only commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here ( << ) document and trap command. Simple shell program examples.

#### **TEXT BOOK:**

"Operating System Concepts"-Silberschatz, Galvin, Gagne—eight Edition-John Willey & Sons INC 1,2,3 units

Sumitabha Das., Unix Concepts and Applications. 4thEdition. Tata McGraw Hill(4,5) units

#### **REFERENCES BOOKS:**

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Principles of Operating Systems by Naresh Chauhan, OXFORD University Press



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### **Student Activity:**

1. Load any new operating system into your computer.
2. Partition the memory in your system
3. Create a semaphore for process synchronization.

### **Recommended Co – Curricular Activities:**

Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

1. Programming exercises,
2. Practical assignments and laboratory reports,
3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work.

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### **SEMESTER-III**

**Course Code: 24AINM32P**

**Course Title: OPERATING SYSTEMSLAB**

**Practical**

**Credits: 1**

**2 hrs/week**

#### **List of Experiments**

1. Write the program to implement CPU scheduling algorithm for first come first serve
2. Scheduling
3. Write the program to implement CPU scheduling algorithm for first come first serve
4. Scheduling
5. Write a program to implement CPU scheduling algorithm for shortest job first scheduling.
6. write a program to implement CPU scheduling algorithm for shortest job first scheduling.
7. Write a 'C' program to perform priority scheduling.
8. Write a 'C' program to perform priority scheduling.
9. Write a program to implement CPU scheduling for Round Robin Scheduling.
10. Execute various file/directory handling commands in UNIX.
11. Execute various file/directory handling commands in UNIX.
12. Write a Simple shell script for basic arithmetic and logical calculations.
13. Write a shell script to display list of users currently logged in.
14. Write a shell script to delete all the temporary files.
15. Write a shell script to search an element from an array using binary searching.
16. Write a shell script to determine whether a given number is a prime number or not
17. Write a shell script to print the first  $n$  Fibonacci numbers.
18. Execute various system administrative commands.

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### SEMESTER-III

Course Code: 24AINM33

Course Title: Introduction to OOP using JAVA

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

The Objective of the course is to assist the student in understanding the concepts of Object Oriented Programming using Java language.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Overview of java programming, history and its features.	Level 1, Level 2
CO2	Understand fundamentals of programming such as variables, conditional and iterative execution, statements, etc.	Level 1, Level 2
CO3	Understand the principles of arrays, inheritance, packages and multi-threading.	Level 1, Level 2, Level 3
CO4	Understand the Fundamental features of Managing Errors, Exceptions and Applet Programming.	Level 1, Level 2, Level 3
CO5	Understand the Files concept in java.	Level 1, Level 2, Level 3

#### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation



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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2
<b>CO – PSO Mapping</b>										
<b>1-Low, 2-Moderate, 3-High, 0- No Correlation</b>										

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### UNIT -I

JAVA Evolution: History – Features, Overview of Java Language: Introduction - Simple Java program

- Structure - Java tokens - Statements - Java virtual Machine. Constants - Variables - Data types - Operators and expressions.

### UNIT -II

Decision making and Branching: Simple If Statement, the IF...Else statement, The Else... If ladder, The Switch Statement, The? : Operator, Decision making and looping: The While statement, The do Statement - The for Statement - Jumps in loops - labelled loops - Classes, Objects and Methods. Arrays, Strings

### UNIT -III

Interfaces- Multiple Inheritance – Packages: Putting classes together –Threaded Programming - Thread life cycle,. Managing Errors and Exceptions, I/O Exceptions.



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### **UNIT -IV**

Applet Programming – advantages and disadvantages of Applets, Applet life cycle - Event Handling in Applet, Applet Parameters and Communications

### **UNIT -V**

Files: Introduction – concept of streams – Stream classes – Using stream – I/O classes – File class – creation of files – Reading / Writing characters/ Bytes.

#### **Text Books:**

1. **Programming with JAVA - A Primer, 2015**, E Balaguruswamy, McGraw Hill Professional

#### **Reference Books**

1. Programming in Java , Sachin Malhotra , OXFORD University Press
2. Programming with Java, Second Edition , John R. Hubbard , Schaum's outline Series, TATA McGraw-Hill Company.
3. Java TM: How to Program 2007, Deitel &Deitel. PHI
4. Java Programming: From Problem Analysis to Program Design, D.S Mallik
5. Object Oriented Programming Through Java, 2008, P. Radha Krishna Universities Press

**Course Delivery method:** Face-to-face / Blended

**Course has focused on:** Skill Development.

#### **Recommended Co – Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems)



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pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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### **SEMESTER-III**

**Course Code: 24AINM33P**

**Course Title: Introduction to OOP using JAVA Lab**

Practical

Credits: 1

2 hrs/week

#### **List of Experiments**

1. Write a java program to print Hello World.
2. Write a java program on Variables.
3. Write a java program to use various Data types.
4. Write a java program to implement main method inside and outside of a class.
5. Write a java program on Operators.
6. Write a java program on Looping.
7. Write a java program to display Fibonacci series.
8. Write a java program to find out the given number is palindrome or not.
9. Write a java program on single and Multi-dimensional array.
10. Write a java program on Strings.
11. Write a java program on interface.
12. Write java programs on various types of Inheritance.
13. Write java programs on Packages.
14. Write a java program on Multi-Threading.
15. Write java programs on various types Exceptions.
16. Write an Applet program to draw a Line, Rectangle, Circle, Ellipse, Arcs a.
17. Write an Applet program to draw Line graphs and Bar charts.
18. Write a java program to create a file.
19. Write a java program to perform read data from a file.
20. Write a java program to perform write data from a file.

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## SEMESTER-III

Course Code: 24AINM34

Course title: INFERENTIAL STATISTICS

Theory

Credits: 3

3 hrs/week

### Course Objective:

This course enables students to gain knowledge in sampling, hypothesis testing and non parametric methods.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonom Levels
CO1	a fundamental understanding of Parametric models for developing relevant inferences on associated parameters	Level 1, Level 2
CO2	knowledge of point and interval estimation procedures and different methods of point estimation	Level 1, Level 2
CO3	using Neyman Pearson Lemma and finding Uniformly Most Powerful Test	Level 1, Level 2
CO4	various basic concepts on sampling distributions and large sample tests based on normal distribution,	Level 1, Level 2, Level 3
CO5	small sample tests based on chi-square, Student's and Snedecor's F distributions	Level 1, Level 2, Level 3



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### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### Unit I

Theory of Estimation: Parameter, Statistic, Standard Error of the statistic, concept of bias and mean square error of an estimate, Criteria of good estimator - unbiasedness, consistency, efficiency, and sufficiency. Methods of estimation- Maximum Likelihood estimator(MLE) and Method of Moments(MME). Concepts of confidence interval and confidence coefficient, confidence intervals for the parameters of univariate normal,



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### **Unit II**

Testing of Hypothesis : Statistical hypotheses, critical region, size and power of a test, most powerful test, two types of errors. Neyman Pearson lemma(WITHOUT PROOF) and its applications, uniformly most powerful unbiased test . One and two tailed tests. Procedure for testing of hypothesis, Tests of significance of large samples - Single proportion and difference of proportions, single mean and difference of means.

### **Unit III**

Exact Sampling distributions : Student's t-distribution, Chi-square distribution, Snedecor's Fdistribution – definitions, properties and applications. Tests of significance for small samples: Student's t-distribution - single mean, difference of means and paired t-test. Chi-square distribution- test for goodness of fit and independence of attributes.

### **Unit IV**

F-distribution – definition, properties and applications – F-test for equality of two population variances. ANOVA one way and two-way classifications

### **Unit V**

Non-parametric methods- definition, advantages and disadvantages. One sample test- Sign test, Run test, Wilcoxon-signed rank test. Two independent sample tests: Median test, Wilcoxon- Mann Whitney U - test, Kruskal Wallis test - Simple Problems Note: Without proofs of named theorems and more importance to applications.

### **TEXT BOOK:**

S.C. Gupta, (2019), Seventh Edition, Fundamentals of Statistics, Mumbai: Himalaya Publishing House.

### **REFERENCE BOOKS**

1. Sharma, J. K. (2013), Business statistics, New Delhi: Pearson Education
2. Levine, D.M., Berenson, M. L. & Stephan, D. (2012), Statistics for managers using Microsoft Excel, New Delhi: Prentice Hall India Pvt.
3. Aczel, A. D. & Sounderpandian, J. (2011), Complete Business Statistics, New Delhi: Tata McGraw Hill.
4. Anderson, D., Sweeney, D., Williams, T., Camm, J., & Cochran, J. (2013), Statistics for Business and Economics, New Delhi: Cengage Learning.



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5. Davis, G., & Pecar, B. (2014), Business Statistics using Excel, New Delhi: Oxford University Press. Websites of Interest:

<http://onlinestatbook.com/rvls/index.html>

Co-Curricular Activities in the class:

1. Pictionary
2. Case Studies on topics in field of statistics
3. Snap test and Open Book test
4. Architectural – To be build the procedures
5. Extempore – Random concept to students
6. Interactive Sessions
7. Teaching through real world examples

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### SEMESTER-III

**Course Code: 24AINM34P**

**Course title: Statistical Data Analysis Using SPSS - II Lab**

Practical

Credits: 1

2 hrs/week

List of Experiments using SPSS

1. Large Sample Tests: Test of significance of (a) Single Mean (b) Difference of means
2. Large Sample Tests: Test of significance of (a) Single Proportion (b) Difference of Proportions
3. Small Sample Tests: t-Test for significance of (a) Single mean (b) Difference of means- samples are independent (c) Difference of means- samples are dependent
4. Chi square Test of (a) Independence 2x2 Cross tabulation, (b) Goodness of fit 5 Test for several means ANOVA (a) One-way (b) Two- way classification,
- 6 Non Parametric Tests (a) Mann Whitney U test, (b) Wilcoxon Signed ranks test, (c) Kruskal Wallis Test, (d) Friedman test Note: Training shall be in SPSS and derive the results. The SPSS output shall be exported to MS word for writing inference.

Websites of Interest: <http://www.statsci.org/datasets.html>



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### SEMESTER-IV

Course Code: 24AINM41

Course Title: DATA WAREHOUSING AND DATA MINING

Theory

Credits: 3

3 hrs/week

#### OBJECTIVE:

The course should enable the students to learn principles of Data warehousing and data mining with its architecture and understand data preprocessing methods to perform classification and prediction of data. Technical knowledge is helpful to implement Data Mining principles and techniques for real time applications.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	To understand the principles of Data warehousing and Data Mining.	Level 1, Level 2
CO2	To be familiar with the Data warehouse architecture and its Implementation.	Level 1, Level 2
CO3	To know the Architecture of a Data Mining system.	Level 1, Level 2
CO4	To understand the various Data preprocessing Methods.	Level 1, Level 2,
CO5	To perform classification and prediction of data	Level 1, Level 2, Level 3, Level 4



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1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### UNIT I

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture — Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

#### UNIT II

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept



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Hierarchy Generation- Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis –

### **UNIT III**

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor.

### **UNIT IV**

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods.

### **UNIT V**

Model-Based Clustering Methods, Outlier Analysis, Text Mining, Spatial Data Mining

### **Text Book**

Jiawei Han, Micheline Kamber and Jian Pei “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011.

### **Reference Books**

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.



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### **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

#### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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## SEMESTER-IV

**Course Code: 24AINM41P**

**Course Title: DATA WAREHOUSING AND DATA MINING LAB**

Practical

Credits: 1

2 hrs/week

### LAB EXPERIMENTS:

1. List applications for mining
2. File format for data mining
3. Conversion of various data files
4. Training the given dataset for an application
5. Testing the given dataset for an application
6. Generating accurate models
7. Data pre-processing – data filters
8. Feature selection
9. Web mining
10. Text mining
11. Design of fact & dimension tables
12. Generating graphs for star schema

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### SEMESTER-IV

Course Code: 24AINM42

Course Title MACHINE LEARNING USING PYTHON

Theory

Credits: 3

3 hrs/week

Course OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Explain the basic concepts of machine learning.	Level 1, Level 2
CO2	Construct supervised learning models.	Level 2, Level 3, Level 4
CO3	Construct unsupervised learning algorithms.	Level 2, Level 3, Level 4
CO4	Evaluate and compare different models	Level 2, Level 3, Level 4, Level 5



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CO – PO Mapping										
1-Low, 2-Moderate, 3-High, 0- No Correlation										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2
CO – PSO Mapping										
1-Low, 2-Moderate, 3-High, 0- No Correlation										

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### UNIT I INTRODUCTION TO MACHINE LEARNING

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, VapnikChervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

### UNIT II SUPERVISED LEARNING

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Naive Bayes,

### UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING



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Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

### **UNIT IV NEURAL NETWORKS**

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

### **UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING**

**EXPERIMENTS** Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test

#### **TEXT BOOKS:**

1. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, “Machine Learning: An Algorithmic Perspective, “Second Edition”, CRC Press, 2014.

#### **REFERENCES**

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
2. Tom Mitchell, “Machine Learning”, McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, “Foundations of Machine Learning”, Second Edition, MIT Press, 2012, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016
5. Sebastain Raschka, Vahid Mirjalili , “Python Machine Learning”, Packt publishing 3rd Edition, 2019.

Recommended Co – Curricular Activities:

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and



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outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individual activity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

B. General

1. Group Discussion

2. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

1. Programming exercises,

2. Practical assignments and laboratory reports,

3. Observation of practical skills,

4. Individual and group project reports.

5. Efficient delivery using seminar presentations,

6. Viva voce interviews.

7. Computerized adaptive testing, literature surveys and evaluations,

8. Peers and self-assessment, outputs form individual and collaborative work.

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### **SEMESTER-IV**

**Course Code: 24AINM42P**

**Course Title MACHINE LEARNING USING PYTHON LAB**

Practical

Credits: 1

2 hrs/week

#### **EXPERIMENT LIST:**

1. Write a python program to import and export data using Pandas library functions.
2. Demonstrate various data pre-processing techniques for a given dataset
3. Implement Dimensionality reduction using Principle Component Analysis (PCA) method.
4. Write a Python program to demonstrate various Data Visualization Techniques.
5. Implement Simple and Multiple Linear Regression Models.
6. Develop Logistic Regression Model for a given dataset.
7. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
8. Implement Naïve Bayes Classification in Python.
9. Build KNN Classification model for a given dataset.
10. Build Artificial Neural Network model with back propagation on a given dataset.
  - a. Implement Random forest ensemble method on a given dataset.
  - b. Implement Boosting ensemble method on a given dataset.
11. Write a python program to implement K-Means clustering Algorithm.

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### SEMESTER-IV

Course Code: 24AINM43

Course Title: INTRODUCTION TO AI

Theory

Credits: 3

3 hrs/week

**Course Objective:**

The objective of this course is to educate students in basic Artificial Intelligence concepts and provide insights of solving problems using AI. This course also aims to educate students in basics of practical natural language processing and robotics.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Understand the need of AI and Intelligent Agents.	Level 1, Level 2
CO2	Understand knowledge based agents and propositional logic.	Level 1, Level 2
CO3	Gain knowledge about learning agents and decision trees.	Level 1, Level 2
CO4	Gain knowledge about practical applications of NLP.	Level 1, Level 2, Level 3
CO5	Understand parts, tasks and architecture of Robotics.	Level 1, Level 2, Level 3



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### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### UNIT – I:

Introduction to AI: What is AI? AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

#### UNIT-II:

Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A\*, AO\* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm



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### **UNIT-III:**

Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and Dempstershafer theory.

### **UNIT-IV**

First order logic: Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

### **UNIT-V:**

Expert systems:- Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems works, problem areas addressed by expert systems, expert systems success factors, types of expert systems, knowledge engineering, scope of knowledge, difficulties in knowledge acquisition methods of machine learning, selecting an appropriate knowledge acquisition method, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty.

### **TEXT BOOKS**

Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach", 2nd Edition, Pearson Education, 2007

### **REFERENCES**

1. Artificial Neural Networks B. Yagna Narayana, PHI
2. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight (TMH).
3. Artificial Intelligence and Expert Systems – Patterson PHI.
4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
6. Neural Networks Simon Haykin PHI



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### **Web Resources:**

<https://www.javatpoint.com/artificial-intelligence-ai>

[https://www.tutorialspoint.com/artificial\\_intelligence/artificial\\_intelligence\\_overview.html](https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_overview.html)

[https://www.academia.edu/32098490/Introduction\\_to\\_artificial\\_intelligence](https://www.academia.edu/32098490/Introduction_to_artificial_intelligence)

### **Recommended Co – Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A: Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

#### **B: General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
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9. Computerized adaptive testing, literature surveys and evaluations,
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## SEMESTER-IV

**Course Code: 24AINM43P**

**Course Title: INTRODUCTION TO AI LAB**

Practical

Credits: 1

2 hrs/week

### Experiments List

1. A) Basic programs in python.  
B) Programs demonstrating list, Vector, Matrix and Array
2. Solving water – jug problem using Python.
3. Implementing DFS and BFS using Python.
4. Solve 8 – puzzle problem using A\* algorithm.
5. Solve 8 – puzzle problem using hill climbing Algorithm.
6. Implement Tic – Tac – Toe game using Python.
7. Develop Python code for mini – max algorithm.
8. Develop Python code for Hangman game.
9. A) Develop Python code for removing punctuation marks from the given string.  
B) Develop Python code for sorting the sentence in alphabetical order.
10. A) Using Pylog programming, display first order logic.  
B) Using Pylog programming, display unification process.
11. A) Find mean and mode for given data set.  
B) Calculate variance and standard deviation for given data set.
12. A) Determining probability of a prime number appearing when a 20 sided die is rolled.  
B) Time series analysis to predict rain fall information base on record.
13. Predict the class of testing sample using Bayes Classification.

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### SEMESTER-V

Course Code: 24AINM51

Course Title: PREDICTIVE ANALYTICS USING PYTHON

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

The course serves to advance and refine expertise on theories, approaches and techniques related to prediction and forecasting.

Course Outcome No.	Upon successful completion of this course, studentssould have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Understand prediction-related principles, theories and approaches.	Level 1, Level 2, Level 3
CO2	Learn model assessment and validation.	Level 2, Level 3, Level 4
CO3	Understand the basics of predictive techniques and statistical approaches.	Level 2, Level 3, Level 4
CO4	Understand basics of neural networks	Level 1, Level 2, Level 3, Level 4
CO5	Analyze supervised and unsupervised algorithms.	Level 2, Level 3, Level 4



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### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
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### CO – PSO Mapping

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CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### UNIT - I Introduction to Linear Regression .

Linear Methods for Regression and Classification: Overview of supervised learning, Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection, Ridge regression, Lasso regression, Linear Discriminant Analysis, Logistic regression, Perceptron learning algorithm.

#### UNIT - II Model Assessment and Selection

Model Assessment and Selection: Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error, Effective number of parameters, Bayesian approach and BIC, Cross- validation, Bootstrap methods, conditional or expected test error.



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### **UNIT - III Additive Models, Trees and Boosting**

Additive Models, Trees, and Boosting: Generalized additive models, Regression and classification trees, Boosting methods-exponential loss and AdaBoost, Numerical Optimization via gradient boosting, Examples (Spam data, California housing, New Zealand fish, Demographic data).

### **UNIT - IV Introduction to NN**

Neural Networks (NN), Support Vector Machines (SVM), and K-nearest Neighbor: Fitting neural networks, Back propagation, Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest – Neighbour classifiers (Image Scene Classification).

### **UNIT - V Unsupervised and Supervised Learning**

Unsupervised Learning and Random forests: Association rules, Cluster analysis, Principal Components, Random forests and analysis.

#### **TEXT BOOK:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.

#### **REFERENCE BOOKS:**

1. C.M.Bishop –Pattern Recognition and Machine Learning, Springer, 2006.
2. L. Wasserman-All of statistics.
3. Gareth James. Daniela Witten. Trevor Hastie Robert Tibshirani. An Introduction to Statistical Learning with Applications in R.

#### **Recommended Co – Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

##### **A. Measurable**

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2. Student seminars (on topics of the syllabus and related aspects (individual activity))



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3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerised adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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## SEMESTER-V

**Course Code: 24AINM51P**

**Course Title: PREDICTIVE ANALYTICS USING PYTHON LAB**

Practical

Credits: 1

2 hrs/week

### List of Experiments

1. Demonstrating logistic regression.
2. Demonstrating perceptron learning algorithm.
3. Demonstrating Bayesian model.
4. Demonstrating numerical optimization.
5. Demonstrating classification trees.
6. Demonstrating regression analysis.
7. Demonstrating L - nearest neighbour.
8. Demonstrating back propagation.
9. Demonstrating SVM for regression analysis.
10. Demonstrating random forests and analysis.

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### SEMESTER-V

Course Code: 24AINM52

Course Title: ALGORITHMS FOR INTELLIGENT SYSTEMS

Theory

Credits: 3

3 hrs/week

Course Objectives:

The course should enable the students to focus on developing machine that can think which leads to gain fundamental knowledge for understanding AI. these topics are closely related with each other. For example, the knowledge acquired through learning can be used both for problem solving and for reasoning. In fact, the skill for problem solving itself should be acquired through learning. Also, methods for problem solving are useful both for reasoning and planning. Further, both natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Understanding the foundations of Artificial Intelligence.	Level 1, Level 2
CO2	Representing a problem as a search solving problem.	Level 1, Level 2
CO3	Searching a space of answers for a solution to a problem in practical time.	Level 1, Level 2, Level 3
CO4	Representing problems in terms of logic and deduction.	Level 1, Level 2, Level 3
CO5	Representing intelligent behavior in terms of agent.	Level 1, Level 2, Level 3



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### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### Unit-I

**Introduction and History of AI:** What is AI ? A brief history ? The state of the art

#### Unit-II

**Intelligent Agents:** Agents and environments, Rationality, PEAS (Performance measure, Environment, Actuators, Sensors), Environment types, Agent types

#### Unit-III

**Solving Problem by Searching:** Problem-solving agents, Problem types, Problem formulation, Example problems, Basic search algorithms

#### Unit-IV

**Informed search algorithms:** Best-first search, A\*\_ search, Heuristics



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### **Unit-V**

**Adversial Search:** Games, Perfect play, minimax decisions, pruning, Resource limits and approximate evaluation, Games of chance, Games of imperfect information.

### **Reference Text Book:**

Title: Artificial Intelligence: A Modern Approach, Author(s):Stuart Russell and Peter Norvig,  
Edition:3rd Edition, Publisher:Prentice-Hall.

### **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups asteam))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

#### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,



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8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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### **SEMESTER-V**

**Course Code: 24AINM52P**

**Course Title: ALGORITHMS FOR INTELLIGENT SYSTEMS LAB**

Practical

Credits: 3

2 hrs/week

#### **LAB EXPERIMENTS:**

1. Study of PROLOG
2. Write the following programs using PROLOG:
3. Write a program to solve 8-queens problem.
4. Solve any problem using depth first search.
5. Solve any problem using best first search.
6. Solve 8-puzzle problem using best first search
7. Solve Robot (traversal) problem using means End Analysis.
8. Solve the Traveling Salesman problem.

**@@@@**



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### SEMESTER-V

Course Code: 24AINM53

Course Title: NATURAL LANGUAGE PROCESSING

Theory

Credits: 3

3 hrs/week

#### Course Objective:

A Given text with basic Language features and to design an innovative application using NLP components to implement a rule-based system to tackle morphology/syntax of a language.

Course Outcome No.	Upon successful completion of this course, student should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	To understand the use of CFG and PCFG in NLP	Level 1 Level 2
CO2	To learn control structures in python and apply them to real world problems.	Level 1, Level 2, Level 3
CO3	To understand the role of semantics of sentences and pragmatics	Level 1 Level 2
CO4	To apply the NLP techniques to IR applications	Level 1, Level 2, Level 3
CO5	To construct data and perform data analysis .	Level 1, Level 2, Level 3, Level 4



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### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
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CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

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	PSO1	PSO2	PSO3	PSO4	PSO5
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CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### UNIT I INTRODUCTION

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

#### UNIT II WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.



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### **UNIT III SYNTACTIC ANALYSIS**

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow

parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

### **UNIT IV SEMANTICS AND PRAGMATICS**

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

### **UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES**

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

#### **TEXT BOOKS:**

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O\_Reilly Media, 2009.

#### **REFERENCES**

1. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Javal, O\_Reilly Media, 2015.



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3. Nitin Indurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

### **Recommended Co – Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
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4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

#### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
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7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
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## SEMESTER-V

**Course Code: 24AINM53P**

**Course Title: NATURAL LANGUAGE PROCESSING LAB**

Practical

Credits: 1

2 hrs/week

### Experiments List

- 1) Write a program in prolog to implement simple facts and Queries
- 2) Write a program in prolog to implement simple arithmetic
- 3) Write a program in prolog to solve Monkey banana problem
- 4) Write a program in prolog to solve Tower of Hanoi
- 5) Write a program in prolog to solve 8 Puzzle problems
- 6) Write a program in prolog to solve 4-Queens problem
- 7) Write a program in prolog to solve Traveling salesman problem
- 8) Write a program in prolog for Water jug problem List of Experiments (NLP)
  1. Word Analysis
  2. Word Generation
  3. Morphology
  4. N-Grams
  5. N-Grams Smoothing

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### SEMESTER-V

Course Code:24AINM54

Course Title: SOFTWARE PROJECT MANAGEMENT

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

- To understand the fundamental principles of software project management.
- To have a good knowledge of responsibilities of project manager.
- To be familiar with the different methods and techniques used for project management.

Course Outcome No.	Upon successful completion of this course, student should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Evaluate and decide the software project management.	Level 1, Level 2, Level 5
CO2	Determine and classify the project life cycle and estimate the effort of Agile methods.	Level 1, Level 2, Level 3
CO3	Formulate the project activity plan and project risk management.	Level 1, Level 2, Level 3
CO4	Organize and manage the project contracts.	Level 1, Level 2, Level 4
CO5	Establishing the staffing pattern and Document the organizational behavior.	Level 1, Level 2, Level 4



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CO – PO Mapping										
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CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2
CO – PSO Mapping										
1-Low, 2-Moderate, 3-High, 0- No Correlation										

	PSO1	PSO2	PSO3	PSO4	PSO5
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CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### UNIT - I

#### PROJECT EVALUATION AND PROJECT PLANNING

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

### UNIT - II

#### PROJECT LIFE CYCLE AND EFFORT ESTIMATION:

Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques



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–COSMIC Full function points - COCOMO II A Parametric Productivity Model - Staffing Pattern.

### **UNIT - III**

#### **ACTIVITY PLANNING AND RISK MANAGEMENT:**

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling

–Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method– Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation

–Resource Allocation – Creation of critical patterns – Cost schedules.

### **UNIT - IV**

#### **PROJECT MANAGEMENT AND CONTROL:**

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control, Software Configuration Management – Managing contracts – Contract Management.

### **UNIT - V**

#### **STAFFING IN SOFTWARE PROJECTS:**

Managing people – Organizational behaviour — Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres –Communication plans

#### **TEXT BOOK:**

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

#### **REFERENCES:**

1. Robert K. Wysocki “Effective Software Project Management” – Wiley Publication,2011.

2. Walker Royce: “Software Project Management”- Addison-Wesley, 1998.

3. Gopaldaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.

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### **SEMESTER-V**

**Course Code:24AINM54P**

**Course Title: SOFTWARE PROJECT MANAGEMENT LAB**

Practical

Credits: 1

2 hrs/week

#### **LAB LIST**

1. Demonstrate function point analysis.
2. Demonstrate flexi model.
3. Demonstrate SEL model.
4. Demonstrate basic COCOMO.
5. Demonstrate intermediate COCOMO.
6. Demonstrate detailed COCOMO.
7. Demonstrate early design model and calculate effort for development of project.

**Ref:** Software Project Management -Lab file - LABORATORY FILE Software Project Management (SE-405) 2021 – Studocu



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### SEMESTER-VII

Course Code: 24AINM71

Course Title: DEEP LEARNING

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

- To understand the basic ideas and principles of Neural Networks
- To understand the basic concepts of Big Data and Statistical Data Analysis
- To familiarize the student with The Image Processing facilities like Tensorflow and Keras
- To appreciate the use of Deep Learning Applications
- To understand and implement Deep Learning Architectures

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Understand the role of Deep learning in Machine Learning Applications.	Level 1, Level 2, Level 3
CO2	To get familiar with the use of Tensor Flow/Keras in Deep Learning Applications.	Level 1, Level 2, Level 3, Level 4
CO3	To design and implement Deep Learning Applications.	Level 2, Level 3, Level 4
CO4	Critically Analyze Different Deep Learning Models in Image Related Projects.	Level 3, Level 4, Level 5
CO5	To design and implement Convolutional Neural Networks.	Level 4, Level 5, Level 6



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### CO – PO Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### UNIT I BASICS OF NEURAL NETWORKS

Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

### UNIT II INTRODUCTION TO DEEP LEARNING

Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – ReLU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent – Regularization – Dropout.



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### **UNIT III CONVOLUTIONAL NEURAL NETWORKS**

CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning

### **UNIT IV MORE DEEP LEARNING ARCHITECTURES**

LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- Variational Auto encoders – Adversarial Generative Networks – Autoencoder and DBM

### **UNIT V APPLICATIONS OF DEEP LEARNING**

Image Segmentation – Object Detection – Automatic Image Captioning – Image generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

#### **TEXT BOOK:**

1. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018.

#### **REFERENCES:**

1. Ian Good Fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
2. Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress , 2017.
3. Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press, 2018.
4. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.
5. Joshua F. Wiley, “R Deep Learning Essentials”, Packt Publications, 2016.

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#### **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A. Measurable



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2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

### B. General

1. Group Discussion
2. Others

### RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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### **SEMESTER-VII**

**Course Code: 24AINM71P**

**Course Title: DEEP LEARNING LAB**

Practical

Credits: 1

2 hrs/week

#### **Experiments List**

1. Perceptron Learning Implementation
2. Multilayer Perceptron and its Hyper parameter Tuning
3. Hyper parameter Tuning
4. Implementation of Multilayer Neural Network using Keras and Data Augmentation on MNIST dataset.
5. CNN Implementation on MNIST Dataset.
6. Transfer learning of pretrained models on MNIST dataset
7. Transfer Learning on Plant Village dataset for Plant Disease Detection
8. Sentiment Analysis using Recurrent Neural Networks (RNN)
9. Text Generation using LSTM
10. Denoising and Dimensionality Reduction for Medical MNIST dataset using Autoencoders.



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### SEMESTER-VII

Course Code: 24AINM72

Course Title: TEXT MINING

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

To understand the principles, issues with text mining.

To understand techniques and solutions connected with text mining,

To understand the Fundamentals of natural language processing.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	To Understand the enhancing user experience of information provision and seeking, the business case for text mining.	Level 1, Level 2
CO2	To Understand The text mining pipeline.	Level 1, Level 2
CO3	To Understand Approaches to text mining	Level 1, Level 2
CO4	To Understand Dealing with real text and Information extraction	Level 1, Level 2, Level 3
CO5	To Understand Evaluation of text mining systems	Level 1, Level 2, Level 5



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### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### Unit -1

Introduction: background, motivation, dealing with information overload and information overlook, unstructured vs. (semi-)structured data, evolving information needs and knowledge management issues, enhancing user experience of information provision and seeking the business case for text mining.

#### Unit -2

The text mining pipeline: information retrieval, information extraction and data mining. Fundamentals of natural language processing: linguistic foundations, levels of linguistic analysis.



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### **Unit- 3**

Approaches to text mining: rule-based vs. machine learning based vs. hybrid; generic vs. domain specific; domain adaptation.

### **Unit -4**

Dealing with real text: text types, document formats and conversion, character encodings, markup, low-level processes (sentence splitting, tokenization, part of speech tagging, chunking)

Information extraction: term extraction, named entity recognition, relation extraction, fact and event extraction; partial analysis vs. full analysis.

Data mining and visualization of results from text mining.

### **Unit -5**

Evaluation of text mining systems: evaluation measures, role of evaluation challenges, usability evaluation.

Resources for text mining: annotated corpora, computational lexica, ontologies, computational grammars; design, construction and use issues.

Issues in large scale processing of text: distributed text mining, scalable text mining systems.

### **TEXT BOOKS**

1. The text mining handbook: BY advanced approaches in analyzing unstructured data BY Feldman, Ronen, 1962-Cambridge University Press.
2. Linked lexical knowledge bases : foundations and applications BY Gurevych, Iryna, Morgan & Claypool Publishers
3. Speech and language processing : an introduction to natural language processing, computational linguistics, and speech recognition Jurafsky, Dan, 1962-Pearson/Prentice Hall.

### **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)



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2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

### B. General

1. Group Discussion
2. Others

### RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs from individual and collaborative work.

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### **SEMESTER-VII**

**Course Code: 24AINM72P**

**Course Title: TEXT MINING LAB**

Practical

Credits: 1

2 hrs/week

#### **LAB LIST**

programs for various elements of textual data and see how we can extract these using the NLTK library.

Hierarchy of Text

1. Tokens
2. Vocabulary
3. Punctuation
4. Part of speech
5. Root of a word
6. Base of a word
7. Stop words using distributions
8. Operations on Text
9. Parts of speech tagging
10. Searching strings

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### SEMESTER-VII

Course Code: 24AINM73

Course Title: COMPUTER NETWORKS

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

1. To educate students on fundamental concepts of data communication and the design of computer networks.
2. To educate student on basic aspects of data link layer.
3. To educate student on datagram routing algorithm and shortest path routing algorithm.
4. To educate student on elements of transport layer protocol.
5. To educate student on fundamental concepts of application layer.

Course Outcome No.	Upon successful completion of this course, student should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	gain knowledge in the need of OSI reference model and various types of transmission media, switching techniques.	Level 1, Level 2
CO2	gain knowledge in data link protocols, error detection and correction.	Level 1, Level 2
CO3	gain knowledge regarding design issues of network layer and can implement shortest path algorithm.	Level 1, Level 2, Level 3, Level 4
CO4	gain knowledge in elements of transport layer protocols.	Level 2, Level 3, Level 4
CO5	gain knowledge in domain name system, WWW architecture and Email architecture and services	Level 2, Level 3, Level 4



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CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### UNIT I: Introduction to Networking

Uses of computer networks, Types of computer networks, ISO OSI reference model, Multiplexing - Frequency Division Multiplexing, Wave Length Division Multiplexing, Time Division Multiplexing; Guided media - Twisted pair cable, Coaxial cable, Fibre optics; Unguided media - Radio waves, Micro waves, Satellites; Switching - Circuit switching, Packet switching, Message switching.

#### UNIT II: Data Link Layer

Design issues of data link layer, Data link protocols - unrestricted simplex protocol, simplex stop and wait protocol, one bit sliding window protocol; Bluetooth, Error detection and correction



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**UNIT III: Network Layer** Introduction, Design issues of network layer, Virtual vs Datagram routing algorithms, Shortest path routing algorithm, Flooding, Distance vector routing algorithm, Congestion control algorithms.

**UNIT IV: Transport Layer** Introduction, Design issues of Transport Layer, Elements of Transport Protocols, Addressing - Connection Establishment, Connection Release, Flow control and Buffering, Multiplexing, Crash Recovery; Remote Procedure Call, User Datagram Protocol, Transmission Control Protocol

### **UNIT V: Application Layer**

Domain Name system, Email architecture and services, User agent sending and receiving Email, WWW Architectural Overview, Client side Server side URL, Cookies, Cryptography.

#### **Text book:**

1. Computer Networks-Andrew.S.Tanenbaum, Pearson Edu Asia Fourth edition.
2. Introduction to Data Communications and Networking-Behrouz Forouzan,Tata McGraw Hill Edition

**Course Delivery method:** Face-to-face / Blended

**Course has focus on:** Employability

#### **Websites of Interest:**

1. <https://www.javatpoint.com/java-tutorial>
2. <https://www.w3schools.com/java/>
3. <https://www.tutorialspoint.com/jdbc/index.htm>

**Co-curricular Activities:** Programming Contests, Assignments & Quiz.

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### **SEMESTER-VII**

**Course Code: 24AINM73P**

**Course Title: COMPUTER NETWORKS LAB**

Practical

Credits: 1

2 hrs/week

#### **Lab List**

1. Implementation of Stop and Wait Protocol
2. Implementation of Sliding Window Protocol
3. Study of Socket Programming and Client – Server model
4. Write a code simulating ARP /RARP protocols.
5. Write a code simulating PING and TRACEROUTE commands
6. Create a socket for HTTP for web page upload and download.
7. Write a program to implement RPC (Remote Procedure Call).
8. Implementation of Subnetting.
9. Applications using TCP and UDP Sockets like DNS, SNMP and File Transfer
10. Applications using TCP Sockets like  
A) Echo client and echo server B) Chat C) File Transfer

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## SEMESTER-VIII

Course Code: 24AINM81

Course Title: NEURAL NETWORKS

Theory

Credits: 3

3 hrs/week

### Course Objective:

The main objective of this course is to provide the student with the basic understanding of neural networks fundamentals, Program the related algorithms and Design the required and related systems

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Demonstrate ANN structure and activation Functions.	Level 1, Level 2, Level 3
CO2	Define foundations and learning mechanisms and state-space concepts.	Level 1, Level 2
CO3	Identify structure and learning of perceptions.	Level 1, Level 2, Level 3
CO4	Explain Feed forward, multi-layer feed forward networks and Back propagation algorithms.	Level 2, Level 3, Level 4
CO5	Analyze Radial Basis Function Networks, Theory Regularization and RBF networks fuzzy systems.	Level 2, Level 3, Level 4

### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2



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### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

#### UNIT I:

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

#### UNIT II:

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

#### UNIT III:

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning.



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### **UNIT IV:**

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.

### **UNIT V:**

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm  
Hopfield Models – Hopfield Models, restricted boltzmen machine.

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

### **Reference Books:**

Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.

### **Student Activity:**

1. Load any new operating system into your computer.
2. Partition the memory in your system
3. Create a semaphore for process synchronization.

### **Recommended Co – Curricular Activities:**

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))



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### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

1. Programming exercises,
2. Practical assignments and laboratory reports,
3. Observation of practical skills,
4. Individual and group project reports.
5. Efficient delivery using seminar presentations,
6. Viva voce interviews.
7. Computerized adaptive testing, literature surveys and evaluations,
8. Peers and self-assessment, outputs form individual and collaborative work.

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## SEMESTER-VIII

Course Code: 24AINM81P

Course Title: NEURAL NETWORKS LAB

Practical

Credits: 1

2 hrs/week

### Lab Experiments:

1. Write a program to implement Perceptron.
2. Write a program to implement AND gates.
3. Write a program to implement OR gates.
4. Implement Crab Classification using pattern net.
5. Write a program to implement Wine Classification using Back propagation.
6. Write a Script Addition function.
7. Write a Script Subtraction function.
8. Write a Script Multiply function.
9. Write a Script Divide function.
10. Write a program to implement classification of linearly separable Data with a perceptron.
11. Implement single layer neural network classification.
12. Implement multi-layer neural network classification
13. Implement Regression.
14. To study Convolutional Neural Network and Recurrent Neural Network.
15. To study ImageNet, GoogleNet, ResNet convolutional Neural Networks.

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## SEMESTER-VIII

Course Code: 24AINM82

Course Title: DESIGN THINKING

Theory

Credits: 3

3 hrs/week

### Course Objectives

To solve problems using Design Thinking and to radically increase likelihood of success by using Design Thinking.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Learn what design thinking is and when to use it.	Level 1, Level 2
CO2	Understand principles of Design Thinking.	Level 1, Level 2
CO3	Understand process of Design thinking.	Level 1, Level 2
CO4	Develop application using design thinking .	Level 1, Level 2, Level 3
CO5	Apply Design thinking to real world scenarios.	Level 1, Level 2, Level 3, Level 6

### CO – PO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	1	1	2	3	2	2	1
CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1



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CO5	3	2	1	1	1	1	3	2	3	2
<b>CO – PSO Mapping</b>										
<b>1-Low, 2-Moderate, 3-High, 0- No Correlation</b>										

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

## UNIT – I:

**Introduction to Design thinking:** History of design thinking, where design thinking is used, why design thinking is effective, how it works, What is design thinking ?, thinking vs doing, how design thinking supports delivering products?, the roots of design thinking, myth busting design thinking.

## UNIT – II:

**Core Principles of Design Thinking:** Principle 1-users over stake holders-user research basics-observations, interviews, co-creation, concept reviews, existing research, known problems, how might we statements, acceptance criteria. Principle 2-practical creativity-getting people to be impractical, getting from impractical to practical. Principle 3-making through learning.

## UNIT – III:

Design thinking process: Think about content to be included, state the need being solved, the process that led to defining the problem, the ideation phase, getting feed back from your coworkers, presenting the prototype and testing results. Empathize, define, ideate, prototype , Test.

## UNIT – IV:

### Applying design thinking process:

ACNE breakfast center use case: who are users, what are their pain points, developing how might we solve statements, developing acceptance criteria. putting users in context-busy



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professionals, picky and particular, frenetic families. Identifying user needs, key behavior, their problems and framing new solutions or ideas. Ideas evaluation, ranking of ideas, identifying best idea to solve the problem.

### **UNIT – V:**

#### **Application of Design Thinking to real world scenarios:**

Case 1: Developers creating a banking app with an easier to navigate UI than current competitors, case 2: teachers releasing new online course based on previous student experiences.

#### **BOOKS:**

- What is Design Thinking? By Julie Stanford, Ellen Siminoff & Mia Silverman, O'Reilly
- Design thinking 101 by Gretchen Anderson, O'Reilly (course)
- Web references: <https://slidemodel.com/how-to-present-design-thinking-process/#header-4>

#### **RECOMMENDED CO-CURRICULAR ACTIVITIES:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

##### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

##### **B. General**

1. Group Discussion
2. Others

#### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;



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1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
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## **SEMESTER-VIII**

**Course Code: 24AINM82P**

**Course Title: DESIGN THINKING LAB**

Practical

Credits: 1

2 hrs/week

### **Lab Experiments List**

1. Developers creating a banking app with an easier-to-navigate UI than current competitors
2. Teachers releasing a new online course based on previous student experiences
3. To improve business of start up company Air bed and breakfast.
4. Redesigning the Customer Contact Center at Toyota
5. GE Adventure MRI

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### SEMESTER-VIII

COURSE Code: 24AINM83

Course Title: **ROBOTICS AND INTELLIGENT SYSTEMS**

Theory

Credits: 3

3 hrs/week

#### Course Objectives:

The course should enable the students to learn the fundamental concepts of various configurations of the robot manipulators and their working principles used in the industries along with the performance of various feedback components like sensors and actuators and how they can be used according to the specifications of the manipulator.

Course Outcome No.	Upon successful completion of this course, students should have the knowledge and skills to:	Bloom's Taxonomy Levels
CO1	Outline the relationship between mechanical structures of industrial robots and their operational workspace characteristics.	Level 1, Level 2
CO2	Demonstrate an ability to apply spatial transformation to obtain forward kinematics equations of robot manipulators and develop the mechanism for solving forward and inverse kinematics of simple robot manipulators.	Level 1, Level 2, Level 3
CO3	Develop an ability to obtain the Jacobian matrix and use it to identify singularities.	Level 2, Level 3, Level 4
CO4	Outline the various motions of the manipulator and use it for trajectory and also explain an ability to generate the trajectory for given application of robot manipulator and Identify the knowledge of robot controllers and actuators used in the manipulators.	Level 2, Level 3, Level 4
CO5	Recall the applications of robots in manufacturing, material handling, assembly and inspections and Illustrate the considerations of workspace for a given robot application.	Level 1, Level 2, Level 3



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CO2	3	2	1	1	1	2	3	3	3	2
CO3	3	2	1	1	1	1	3	3	3	2
CO4	3	2	1	1	1	1	2	2	2	1
CO5	3	2	1	1	1	1	3	2	3	2

### CO – PSO Mapping

1-Low, 2-Moderate, 3-High, 0- No Correlation

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	2	2	1
CO2	3	3	2	3	3
CO3	3	2	1	2	2
CO4	2	2	2	3	3
CO5	3	2	2	2	3

### UNIT -I INTRODUCTION TO ROBOTICS

Introduction: Automation and robotics, an overview of robotics, classification by coordinate system and control systems, components of the industrial robotics: Degrees of freedom, end effectors: mechanical gripper, magnetic vacuum cup and other types of grippers, general consideration on gripper selection and design.

### UNIT -II MOTION ANALYSIS AND KINEMATICS

Motion analysis: Basic rotation matrices, composite rotation matrices, equivalent angle and axis homogeneous transformation, problems; Manipulator kinematics: D-H notations, joint coordinates and world coordinates, forward and inverse kinematics, problems.



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### **UNIT -III KINEMATICS AND DYNAMICS**

Differential kinematics: Differential kinematics of planar and spherical manipulators, Jacobians problems. Robot dynamics: Lagrange, Euler formulations, Newton-Euler formulations, problems on planar two link manipulators.

### **UNIT -IV TRAJECTORY PLANNING AND ACTUATORS**

Trajectory planning: Joint space scheme, cubic polynomial fit, avoidance of obstacles, types of motion: Slew motion, joint interpolated motion, straight line motion, problems, robot actuators and feedback components; actuators: pneumatic and hydraulic actuators.

### **UNIT -V ELECTRIC ACTUATORS AND ROBOTIC APPLICATIONS**

Electric actuators: DC servo motors, stepper motors, feedback components: position sensors, potentiometers, resolvers and encoders, velocity sensors, tactile sensors; Robot application in manufacturing: Material handling, assembly and inspection.

#### **Text Books:**

- 1 Groover M. P, “Industrial Robotics”, Tata McGraw-Hill, 1st Edition, 2013.
- 2 J.J Criag, “Introduction to Robotic Mechanics and Control”, Pearson, 3rd Edition, 2013.

#### **Reference Books:**

1. K.S Fu, “Robotics”, McGraw-Hill, 1st Edition, 2013
2. Richard, D. Klafter, “Robotic Engineering”, Prentice Hall, 1st Edition, 2013.

#### **Web Reference:**

1. <https://www.doc.ic.ac.uk/~ajd/Robotics/RoboticsResources/lecture1.pdf>
  2. <http://opencourses.emu.edu.tr/course/view.php?id=323>.
- [https://www.researchgate.net/publication/277712686\\_Introduction\\_to\\_Robotics\\_class\\_notes\\_UG\\_level](https://www.researchgate.net/publication/277712686_Introduction_to_Robotics_class_notes_UG_level)

#### **E-Book:**

1. <http://www.robot.bmstu.ru/>
2. <http://www.robotee.com/index.php/download-free-robotic-e-books/>



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### **Recommended Co – Curricular Activities:**

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

#### **A. Measurable**

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging).
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity))

#### **B. General**

1. Group Discussion
2. Others

### **RECOMMENDED CONTINUOUS ASSESSMENT METHODS:**

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Programming exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports.
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work.

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## SEMESTER-VIII

**COURSE Code: 24AINM83P**

**Course Title: ROBOTICS AND INTELLIGENT SYSTEMS LAB**

Practical

Credits: 1

2 hrs/week

### LAB CYCLE

1. Develop a CPP programme to demonstrate classes and constructors.
2. Develop a CPP programme to demonstrate user defined functions.
3. Develop a Rhino robotic arm and perform following operations:
  - A) Move the Rhino using the teach pendant.
  - B) Send the Rhino to the hard home and soft home configurations.
  - C) Store sequences of encoders count as “programs”.
  - D) Demonstrate a sequence of motions that, at minimum, places one block on top of another.
4. Demonstrate Rhino robot arm in CPP to solve towers of hanoi.
5. Demonstrate forward kinematics problem with a physical implementation on the Rhion robot.
6. Demonstrate inverse kinematics problem for Rhino robot arm and use CPP function to move the arm to space specified by the user.

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## List of Computer Science Faculty Members

<b>S.No.</b>	<b>Name of the Faculty</b>	<b>College</b>	<b>Experience</b>	<b>Phone No.</b>
1	Smt D. Aruna Padma	Visakha GDC (W)	18	9030615618
2	Sri M Ravi Kiran Kumar	GDC Seethampeta	7	9949976158
3	Smt I Sri Lakshmi	GDC(W)(A) , Srikakulam	7	9492543638
4	Sri B Raghu Ram	GDC(M) Srikakulam	7	8886003083
5	Smt Sri Devi	GDC(A) Tuni	3	9985135993
6	Sri Rasmi Ranjan Khansama	GDC(A) Tuni	3	6371002597
7	Smt K Leela Pavani	GDC Chintapalli	3	9948487769
8	Ms Ch Kavitha	GDC Tekkali	3	9966734743
9	Sri Bhadrachalam	GDC(A), Palakollu	3	9573523795
10	Sri M Venkateswara Rao	GDC, Nakkapalli	19	8790934202
11	Sri G Vasudeva Rao	GDC Ponduru	6	9963559593
12	Sri R V Satyanarayana	PR GDC(A) , Kakinada	6	9394052555
13	Dr N Sridhar	GDC(A) , Tuni	6	9483999000
14	Dr J Sarada Lakshmi	SRR CVR GDC(A), Vijayawada.	2	9246660822
15	K Krishna Kumar	Gayatri Vidya Parishad	16	9247169341